PROJECT MANUAL

for

MOUNTAIN VIEW TOWNHOMES

Acero Ave. and Sprague Ave.

I.F.B. 19-522-RAD

April 16, 2019

Prepared By:

HGF Architects, Inc.

SECTION 00 01 02
PROJECT INFORMATION

PART 1 GENERAL

1.01 PROJECT IDENTIFICATION

A. Project Name: MOUNTAIN VIEW TOWNHOMES, located at:

Acero Ave. and Sprague Ave..

Pueblo, Colorado 81004.

B. The Owner, hereinafter referred to as Owner: Housing Authority of the City of Pueblo

1.02 PROJECT DESCRIPTION

A. Summary Project Description: The Project consists of the construction of [12 individual buildings with a total 51 dwelling units consisting of one, two, and three bedroom units]

1.03 PROCUREMENT TIMETABLE

A. The Owner reserves the right to change the schedule or terminate the entire procurement process at any time.

1.04 PROCUREMENT DOCUMENTS

A. Availability of Documents: Complete sets of procurement documents may be obtained:

1. From Owner at the Project Manager's address listed above.

END OF SECTION

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BID NUMBER: I.F.B. 19-522-RAD
PROJECT: Infrastructure & New Construction of 51 Units – Mountain View Townhomes
LOCATION: Acero & Crawford Avenues, Pueblo, Colorado

INVITATION TO BIDDERS

The El Centro Pueblo Development Corp. and the Housing Authority of the City of Pueblo will receive bids for the **Infrastructure & New Construction of 51 Units – Mountain View Townhomes located at Acero & Crawford Avenues, Pueblo, Colorado.**

A pre-bid conference and Contractor walk-thru will be conducted **Wednesday, June 5th, 2019 @ 10:00 a.m. Mountain Time** starting at the Owner's chosen location at **201 S. Victoria, Pueblo, Colorado.** All bidders are encouraged to attend.

Bids will be received until Thursday, June 20th, 2019 at 11:00 a.m. Mountain Time at the Owner's chosen location at **201 S. Victoria Avenue, Pueblo, Colorado**. All bids received by the date and time of receipt specified will be publicly opened and read.

The El Centro Pueblo Development Corp. and the Housing Authority of the City of Pueblo reserve the right to reject any or all bids and to waive informalities in the bid specifications.

THE PROPOSED BID PACKAGE SHALL CONTAIN THE FOLLOWING:

1. **BID SECURITY**, is required according to Article 9 of the Instructions to Bidders.

2. **NON-COLLUSIVE AFFADAVIT** is to be signed and notarized.

3. **BID PROPOSAL FORM**, (2) copies signed, attested, and sealed if applicable. Copies provided in the specifications.

   NOTE: Bid Proposal form shall also contain:

   1) Amount of bid
   2) Calendar days to complete the work
   3) Acknowledgment of the receipt of the Addenda, if applicable
   4) Form and amount of bid security
   5) Unit pricing and alternates as required.

NOTE: **1)** **THE BID PACKAGE SHALL BE ENCLOSED IN A SEALED ENVELOPE** AND CLEARLY MARKED WITH THE BID NO. **(I.F.B. 19-522-RAD)**, ALONG WITH THE CONTRACTOR'S NAME, ADDRESS AND TELEPHONE NUMBER.

END OF SETION

BID NUMBER: I.F.B. 19-522-RAD
PROJECT: Infrastructure & New Construction of 51 Units – Mountain View Townhomes
LOCATION: Acero & Crawford Avenues, Pueblo, Colorado

INFORMATION FOR BIDDERS

A. PLANS AND SPECIFICATIONS

1. A complete bid proposal package for all portions of the work will be on deposit at the following location and may be examined by Contractors, Sub-Contractors, and Material Suppliers:

Office of the Owner: El Centro Pueblo Development Corp.
201 S. Victoria Avenue, 2nd Floor
Pueblo, CO 81003
Attn: Cindy A. Bowles, P&D Admin. Asst.

B. GENERAL INFORMATION

1. Successful Bidder will provide the following documents to the Owner prior to the execution of the Contract:

***** Assurance of Completion - According to Article 11 of the General Conditions
***** City of Pueblo Contractor's License Copy
***** Insurance Certificates - According to Article 11 of the General Conditions
* **NOTE: Owner's responsibility regarding insurance under subparagraph 11.3.1.1 of the General Conditions**

2. The Bidder will, within **seven (7) days** after the Notice of Award, submit proprietary names of suppliers and sub-contractors according to Article 6 of the Instructions to Bidders.
3. City of Pueblo taxes, County of Pueblo taxes, and State of Colorado taxes are to be paid by the Contractor. (See Article 3.6 of the General Conditions). The City of Pueblo requires a pre-payment of a portion of the city sales and use tax, (see Article 3.6.7 of the General Conditions).
4. Contractor shall exercise due care for the safety of employees and residents.
5. All laborers and mechanics employed under this contract in the demolition and deconstruction of the project shall be subject to the prevailing wage (see Article 13.9 of the General Conditions Labor Standards – Davis Bacon Wage Rates).

WARNING:
The above information is provided for general reference only. Prospective bidders are directed to review in detail the Contract Documents in order to determine the specific requirements of the Contract. To the extent, if any, that inconsistencies exist between this information and the Contract Documents, the Contract Documents shall control. All bids should be based upon the information contained and reasonably inferable from the Contract Documents. (The Information for Bidders shall not be part of the Contract between the parties).

END OF SECTION

Instructions to Bidders

TABLE OF ARTICLES

CONSTRUCTION PROCEDURES

INSTRUCTIONS TO BIDDERS

ARTICLE

DEFINITIONS

1.1 Bidding documents include the Invitation to Bid, Instructions to Bidders, the bid form, and other sample bidding and contract forms. The proposed Contract Documents consist of the form of Agreement between the Owner and Contractor, Conditions of the Contract (General and other Conditions), Drawings, Specifications and all Addenda issued prior to execution of the Contract.

1.2 All definitions set forth in the General Conditions of the Contract for Construction, or in other Contract Documents are applicable to the Bidding Documents.

1.3 Addenda written or graphic instruments issued by the Architect prior to the execution of the Contract which modify or interpret the bidding Documents by additions, deletions, clarifications or corrections.

1.4 A Bid is a complete and properly signed proposal to do the Work or designated portion thereof for the sums stipulated therein, submitted in accordance with the Bidding Documents.

1.5 The Base Bid is the sum stated in the Bid for which the Bidder offers to perform the Work described in the Bidding Documents as the base, to which work may be added or from which work may be deleted for sums stated in Alternate Bids.

1.6 An Alternate Bid (or Alternate) is an amount stated in the Bid to be added to or deducted from the amount of the Base Bid if the corresponding change in the Work, as described in the Bidding Documents, is accepted.

1.7 A Unit Price is an amount stated in the Bid as a price per unit of measurement for materials or services complete as described in the Bidding Documents and listed on the Bid for Lump Sum Contract.

1.8 A Bidder is a person or entity who submits a Bid.

1.9 A Sub-bidder is a person or entity who submits a bid to a Bidder for materials or labor for a portion of the Work.

ARTICLE 2

BIDDER'S REPRESENTATIONS

2.1 Each Bidder by making his Bid represents that:

2.1.1 He has read and understands the Bidding Documents and his Bid is made in accordance therewith.

2.1.2 The Bidder has read and understands the Bidding Documents or Contract Documents, to the extent that such documentation relates to the Work for which the Bid is submitted, for other portions of the Project, if any, being bid concurrently or presently under construction.

2.1.3 He has visited the site, has familiarized himself with the local conditions under which the Work is to be performed and has correlated his observations with the requirements of the proposed Contract Documents.

2.1.4 His Bid is based upon the materials, systems and equipment required by the Bidding Documents without exception.

ARTICLE 3

BIDDING DOCUMENTS

3.1 COPIES

3.1.1 Bidders may obtain complete sets of the Bidding Documents from the issuing office designated in the Information for Bidders in the number and for the deposit sum, if any, stated therein. The deposit will be refunded to Bidders who submit a bonafide Bid and return the Bidding Documents in good condition within ten days after receipt of Bids. The cost of replacement of any missing or damaged documents will be deducted from the deposit. Any Bidding Documents not returned within 60 days will cause the deposit to be forfeited. A Bidder receiving a Contract award may retain the Bidding Documents and his deposit will be refunded.

3.1.2 Bidding Documents will not be issued directly to sub-bidders or others unless specifically offered in the Advertisement or Invitation to Bid.

3.1.3 Bidders shall use complete sets of Bidding Documents in preparing Bids; neither the Owner nor the Architect assume any responsibility for errors or misinterpretations resulting form the use of incomplete sets of Bidding Documents.

3.1.4 In making copies of the bidding Documents available on the above terms, the Owner and the Architect do so only for the purpose of obtaining Bids on the Work and do not confer a license or grant permission for any other use of the Bidding Documents.

3.2 INTERPRETATION OR CORRECTION OF BIDDING DOCUMENTS

3.2.1 The bidder shall carefully study and compare the Bidding Documents with each other, and with other work being bid concurrently or presently under construction to the extent that it relates to the Work for which the Bid is submitted, shall examine the site and local conditions, and shall at once report to the Architect errors, inconsistencies or ambiguities discovered.

3.2.2 Bidders and sub-bidders requiring clarification or interpretation of the Bidding Documents shall make a written request which shall reach the Architect at least five days prior to the date for receipt of Bids.

3.2.3 Any interpretation, correction or change of the Bidding Documents will be made by the Addendum. Interpretations, corrections or changes of the Bidding Documents made in any other manner will not be binding, and Bidders shall not rely upon such interpretations, corrections and changes.

3.3 SUBSTITUTIONS

3.3.1 The materials, products and equipment described in the Bidding Documents establish a standard of required function, dimension, appearance and quality to be met by any proposed substitution.

3.3.2 No substitution will be allowed unless Article 3.3 is followed. The Owner reserves the right to maintain a proprietary specification on certain products. It is the responsibility of the Bidder to verify if any substitution is allowed. No substitution will be considered after the Contract award unless specifically provided in the Contract Documents.

3.3.3 If the Architect approves any proposed substitution prior to receipt of Bids, such approval will be set forth in an Addendum. Bidders shall not rely upon approvals made in any other manner.

3.3.4 No substitutions will be considered after the Contract award unless specifically provided in the Contract Documents.

3.3.5 The Owner reserves the right to maintain a proprietary specification on certain products. It is the responsibility of the bidder to verify if any substitution is allowed.

3.4 ADDENDA

3.4.1 Addenda will be mailed or delivered to all who are known by the Architect to have received a complete set of Bidding Documents.

3.4.2 Copies of Addenda will be made available for inspection wherever Bidding Documents are on file for that purpose.

3.4.3 No Addenda will be issued later than four days prior to the date for receipt of Bids except an Addendum withdrawing the request for Bids or one which includes postponement of the date for receipt of Bids.

3.4.4 Each Bidder shall ascertain prior to submitting his bid that he has received all Addenda issued, and he shall acknowledge their receipt in his Bid.

ARTICLE 4

BIDDING PROCEDURE

4.1 FORM AND STYLE OF BIDS

4.1.1 Bids shall be submitted on forms identical to the form included with the Bidding Documents. (2) copies signed and attested (sealed if applicable).

4.1.2 All blanks on the Bid Proposal Form shall be filled in by typewriter or manually in ink.

4.1.3 Where so indicated by the makeup of the Bid Proposal Form, sums shall be expressed in both words and figures, and in case of discrepancy between the two, the amount written in words shall govern.

4.1.4 Any interlineation, alteration or erasure must be initialed by the signer of the Bid.

4.1.5 All requested Alternates shall be bid. If no change in the Base Bid is required, enter "No Change."

4.1.6 Where two or more Bids for designated portions of the Work have been requested, the Bidder may, without forfeiture of his bid security, state his refusal to accept award of less than the combination of Bids he so stipulates. The Bidder shall make no additional stipulations on the Bid Proposal Form nor qualify his Bid in any other manner.

4.1.7 Each copy of the Bid shall include the legal name of the Bidder and a statement that the Bidder is a sole proprietor, a partnership, a corporation, or some other legal entity. Each copy shall be signed by the person or persons legally authorized to bind the Bidder to a contract. A Bid by a corporation shall further give the state of incorporation and have the corporate seal affixed. A Bid submitted by an agent shall have a current power of attorney attached certifying the agent's authority to bind the Bidder.

4.2 BID SECURITY

4.2.1 Bid security shall be forfeited to the Owner as liquidated damages, not as a penalty.

4.2.2 A surety bond is required it shall be written on AIA Document A310, Bid Bond, and the attorney-in-fact who executes the bond on behalf of the surety shall affix to the bond a certified and current copy of his Power of Attorney. Power of Attorney shall be similar to the form provided in the Bidding Documents.

4.2.3 The Owner will have the right to retain the bid security of Bidders to whom an award is being considered until either (a) the Contract has been executed and bonds, if required, have been furnished, or (b) the specified time has elapsed so that Bids may be withdrawn, or (c) all Bids have been rejected.

4.3 SUBMISSION OF BIDS

4.3.1 all copies of the Bid, the bid security, if any, and any other documents required to be submitted with the Bid shall be enclosed in a sealed opaque envelope. The envelope shall be addressed to the Owner receiving the Bids and shall be identified with the Bid number, Project name, the Bidder's name and address and the designated portion of the work for which the Bid is submitted. If the Bid is sent by mail the sealed envelope shall be enclosed n a separate mailing envelope with the notation "SEALED BID ENCLOSED" on the face thereof.

4.3.2 Bids shall be deposited at the designated location prior to the time and date for receipt of Bids indicated in the Advertisement or Invitation to Bid, or any extension thereof made by Addendum. Bids received after the time and date for receipt of Bids will be returned unopened.

4.3.3 Oral, telephonic or telegraphic Bids are invalid and will not receive consideration.

4.3.4 The Bidder shall assume full responsibility for timely delivery at the location designated for receipt of bids.

4.4 MODIFICATION OR WITHDRAWAL OF BID

4.4.1 A Bid may not be modified, withdrawn or cancelled by the Bidder during the stipulated time period following the time and date designated for the receipt of bids, and each Bidder so agrees in submitting his Bid.

4.4.2 Prior to the time and date designated for receipt of Bids, any Bid submitted may be modified or withdrawn by notice to the party receiving Bids at the place designated for receipt of Bids. Such notice shall be in writing over the signature of the Bidder or by telegram; if by telegram, written confirmation over the signature of the Bidder shall be mailed and postmarked on or before the date and time set for receipt of Bids, and it shall be so worded as not to reveal the amount of the original Bid.

4.4.3 Withdrawn Bids may be resubmitted up to the time designated for the receipt of Bids provided that they are fully in conformance with these Instructions to Bidders.

4.4.4 Bid security shall be in an amount sufficient for the Bid as modified or resubmitted.

ARTICLE 5

CONSIDERATION OF BIDS

5.1 OPENING OF BIDS

5.1.1 Unless stated otherwise in the Advertisement or Invitation to Bid, the properly identified Bids received on time will be opened publicly and will be read aloud. An abstract of the Base Bids and Alternate Bids, if any, will be made available to Bidders. When it has been stated that Bids will be opened privately, an abstract of the same information may, at the discretion of the Owner, be made available to the Bidders within a reasonable time.

5.2 REJECTION OF BIDS

5.2.1 The Owner shall have the right to reject any or all Bids and to reject a Bid not accompanied by any required bid security or by other data required by the Bidding Documents, or to reject a Bid which is in any way incomplete or irregular.

5.3 ACCEPTANCE OF BID (AWARD)

5.3.1 It is the intent of the Owner to award a Contract to the lowest responsible Bidder provided the Bid has been submitted in accordance with the requirements of the Bidding Documents and does not exceed the funds available. The Owner shall have the

right to waive any informality or irregularity in any Bid or Bids received and to accept the Bid or Bids which, in his judgement, is in his own best interest.

5.3.2 The Owner shall have the right to accept Alternates in any order or combination, unless otherwise specifically provided in Article 9, and to determine the low Bidder on the basis of the sum of the Base Bid and the Alternates accepted.

ARTICLE 6

POST BID INFORMATION

6.1 SUBMITTALS

6.1.1 The Bidder shall, within seven days after notification of selection for the award of a Contract for the Work, submit the following information to the Architect:

.1 a designation of the Work to be performed by the Bidder with his own forces;

.2 the proprietary names and the suppliers of principal items or systems of materials and equipment proposed for the Work;

.3 a list of names of the sub-contractors or other persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for the principal portions of the work.

6.1.2 The Bidder will be required to establish to the satisfaction of the Architect and the Owner the reliability and responsibility of the persons or entities proposed to furnish and perform the Work described in the Bidding Documents.

6.1.3 Prior to the award of the Contract, the Architect will notify the Bidder in writing if either the Owner or the Architect, after due investigation, has reasonable objection to any such proposed person or entity. If the Owner or Architect has reasonable objection to any such proposed person or entity, the Bidder may, at his option, (1) withdraw his Bid, or (2) submit an acceptable substitute person or entity with an adjustment in his bid price to cover the difference in cost occasioned by such substitution. The Owner may, at his discretion, accept the adjusted bid price or he may disqualify the Bidder. In the event of either withdrawal or disqualification under this subparagraph, bid security will not be forfeited, notwithstanding the provisions of Paragraph 4.4.1.

6.1.4 Persons and entities proposed by the Bidder and to whom the Owner and the Architect have made no reasonable objection under the provisions of subparagraph 6.3.3 must be used on the work for which they were proposed and shall not be changed except with the written consent of the Owner and the Architect.

ARTICLE 7

ASSURANCE OF COMPLETION

7.1 BOND

7.1.1 Prior to execution of the Contract, the Bidder shall furnish an Assurance of Completion prior to the execution of any Contract under this solicitation. This Assurance may be one of the following:

a. A performance and payment bond 100 percent of the contract price, or, as may be required or permitted by State law;

b. A 50% performance bond and a 50% payment bond the total shall be 100% of the contract price.

7.2 TIME OF DELIVERY AND FORM OF ASSURANCE OF COMPLETION

7.2.1 The Bidder shall deliver the required Assurance of Completion to the Owner no later than the date of execution of the contract, or if the Work is to be commenced prior thereto in response to a letter of intent, the Bidder shall, prior to commencement of the Work, submit evidence satisfactory to the Owner that such Assurance of Completion will be furnished.

7.2.2 The Bidder shall require the attorney-in-fact who executes the required bonds on behalf of the surety to affix thereto a certified and current copy of his power of attorney.

ARTICLE 8

FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR

8.1 FORM TO BE USED

8.1.1 The Agreement for the Work will be written on the Form Agreement Between Owner and Contractor, where the basis of payment is a Stipulated Sum. Sample as provided in the project manual.

END OF SECTION

FORM OF NON-COLLUSIVE AFFIDAVIT

(PRIME BIDDER)

State of Colorado)ss.

County of Pueblo)

_____, being first duly sworn deposes and say:

That he is _____

The party making the foregoing proposal or bid, that such proposal or bid is genuine and not collusive or sham; that said bidder has not colluded, conspired, connived or agreed, directly or indirectly, with any bidder or person, to put in a sham bid or to refrain from bidding, and has not in any manner, directly or indirectly sought by agreement or collusion or communication or conference, with any person, to fix the bid price of affiant or of any other bidder, or to fix any overhead, profit or cost element of said bid price or of that of any other bidder, or to secure any advantage against El Centro Pueblo Development Corp., Inc. and/or the Housing Authority of the City of Pueblo or any person interested in the proposed Contract; and that all statements in said proposal or bid are true.

Signature of:

Bidder, if the bidder is an individual:_____

Partner, if the bidder is a partnership: _____

Officer, if the bidder is a corporation: _____

Subscribed and sworn to before me this _____

day of _____, 20____

My commission expires _____, 20____

NOTARY _____

General Decision Number: CO190004 05/10/2019 CO4

Superseded General Decision Number: CO20180014

State: Colorado

Construction Type: Residential

Counties: Adams, Arapahoe, Boulder, Broomfield, Denver, Douglas, El Paso, Jefferson, Larimer, Mesa, Pueblo and Weld Counties in Colorado.

RESIDENTIAL CONSTRUCTION PROJECTS (consisting of single family homes and apartments up to and including 4 stories)

Note: Under Executive Order (EO) 13658, an hourly minimum wage of $10.60 for calendar year 2019 applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2015. If this contract is covered by the EO, the contractor must pay all workers in any classification listed on this wage determination at least $10.60 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in calendar year 2019. If this contract is covered by the EO and a classification considered necessary for performance of work on the contract does not appear on this wage determination, the contractor must pay workers in that classification at least the wage rate determined through the conformance process set forth in 29 CFR 5.5(a)(1)(ii) (or the EO minimum wage rate,if it is higher than the conformed wage rate). The EO minimum wage rate will be adjusted annually. Please note that this EO applies to the above-mentioned types of contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but it does not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(2)-(60). Additional information on contractor requirements and worker protections under the EO is available at www.dol.gov/whd/govcontracts.

Modification Number	Publication Date
0	01/04/2019
1	02/01/2019
2	02/22/2019
3	05/10/2019

BRCO0007-007 01/01/2019

ADAMS, ARAPAHOE, BOULDER, BROOMFIELD, DENVER, DOUGLAS AND JEFFERSON COUNTIES

	Rates	Fringes
BRICKLAYER	$ 28.59	8.29

ELEC0012-007 09/01/2018

PUEBLO COUNTY

	Rates	Fringes
ELECTRICIAN (Including Low Voltage Wiring and Installation of Fire Alarms, Security Systems and Communications Systems)		
Electrical contract over $1,000,000	$ 27.70	12.30+3%
Electrical contract under $1,000,000	$ 24.85	12.30+3%

ELEC0068-014 12/01/2018

ADAMS, ARAPAHOE, BOULDER, BROOMFIELD, DENVER, DOUGLAS, JEFFERSON, LARIMER, AND WELD COUNTIES

	Rates	Fringes
ELECTRICIAN (Including Low Voltage Wiring and Installation of Fire Alarms, Security Systems and Communication Systems)	$ 26.51	10.31

ELEC0113-007 06/01/2018

EL PASO COUNTY

	Rates	Fringes
ELECTRICIAN (Including Low Voltage Wiring and Installation of Fire Alarms, Security Systems and Communication Systems)	$ 23.85	13.80

ELEC0969-007 01/01/2019

MESA COUNTY

	Rates	Fringes
ELECTRICIAN (Including Low Voltage Wiring and Installation of Fire Alarms, Security Systems and Communication Systems)	$ 24.80	9.84

* ENGI0009-007 05/01/2018

	Rates	Fringes

Power equipment operators:

Bulldozer	$ 28.25	10.70
Motor Grader: Blade-finish	$ 28.57	10.70
Motor Grader: Blade-rough	$ 28.25	10.70
Roller: Self-propelled all types over 5 tons	$ 28.25	10.70
Roller: Self-propelled rubber tires under 5 tons	$ 27.87	10.70
Scraper: Single bowl including pups 40 cubic yards and tandem bowls and over		
Single bowl including pups 40 cubic yards and tandem bowls and over	$ 28.57	10.70
Scraper: Single bowl under 40 cubic yards	$ 28.40	10.70
Water Wagon	$ 28.25	10.70

IRON0024-001 01/01/2019

	Rates	Fringes
IRONWORKER, STRUCTURAL	$ 29.85	11.42

PAIN0930-001 07/01/2018

	Rates	Fringes
GLAZIER	$ 31.52	10.13

PLUM0003-002 06/01/2018

ADAMS, ARAPAHOE, BOULDER, BROOMFIELD, DENVER, DOUGLAS, JEFFERSON, LARIMER AND WELD COUNTIES

	Rates	Fringes
PLUMBER (Including HVAC Pipe)	$ 23.24	5.35

PLUM0058-011 07/01/2018

EL PASO AND PUEBLO COUNTIES

	Rates	Fringes
PLUMBER/PIPEFITTER (Plumbers include HVAC pipe) (Pipefitters exclude HVAC pipe)	$ 32.75	14.85

Zone 1 - 40 miles and over: $19.85 per hour + $32.00 per day per diem will be paid on projects over 40 miles (Zone 1) measured in practical driving miles by the shortest route, beginning at 5th and Main Streets in Pueblo, Colorado, when the employee stays overnight or drives their own vehicle.

Hazardous Pay: Add $2.20 per hour to $19.85 base rate. Hazardous pay applies to projects at chemical plants, steel mills, cement plants, power generator plants, process piping at manufacturing plants, food processing plants,and all projects which may present a health hazard or serious personal injury.

PLUM0145-005 08/01/2016

MESA COUNTY

	Rates	Fringes
PLUMBER (Plumbers include HVAC pipe) & PIPEFITTERS (exclude HVAC pipe)	$ 26.18	11.52

PLUM0208-002 06/01/2018

ADAMS, ARAPAHOE, BOULDER, BROOMFIELD, DENVER, DOUGLAS, JEFFERSON, LARIMER AND WELD COUNTIES

	Rates	Fringes
PIPEFITTER (Excluding HVAC pipe)	$ 37.55	14.95

SHEE0009-003 07/01/2018

	Rates	Fringes
Sheet metal worker HVAC Duct and Installation of HVAC Systems	$ 34.02	15.90

SUCO2001-002 12/20/2001

	Rates	Fringes
CARPENTER (Excluding drywall hanging/framing, metal stud work and form building/setting)	$ 16.36	1.38
Cement Mason/Concrete Finisher	$ 16.80	
Drywall Finisher/Taper	$ 13.00	
Drywall Hanger/Framer (Including metal stud work)	$ 17.13	2.63
Formbuilder/Formsetter	$ 12.78	1.98
Laborers: Brick Finishers/Tenders	$ 11.25	

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     Common.....................$  8.86
     Concrete/Mason Tenders.....$ 10.00

PAINTER
     (Excludes drywall
     finishing and taping):
     Brush, Roller and Spray.....$ 13.62            3.39

Power equipment operators:
     Backhoe.....................$ 12.98            3.31
     Front End Loader............$ 16.50

ROOFER.........................$ 14.73

Sheet Metal Worker
     All Other Work..............$ 17.30            4.05

SPRINKLER FITTER................$ 18.47            3.74
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WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at www.dol.gov/whd/govcontracts.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (ii)).

The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of "identifiers" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than "SU" or "UAVG" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

Survey Rate Identifiers

Classifications listed under the "SU" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a new survey is conducted.

Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

* an existing published wage determination
* a survey underlying a wage determination
* a Wage and Hour Division letter setting forth a position on a wage determination matter
* a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Regional Office for the area in which the survey was conducted because those Regional Offices have responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

==========

END OF GENERAL DECISION

BID FOR LUMP SUM CONTRACT

EL CENTRO PUEBLO DEVELOPMENT CORP.
201 S. VICTORIA AVENUE, PUEBLO, CO 81003 (719) 542-6741

BID NUMBER:	I.F.B. 19-522-RAD
PROJECT:	Infrastructure & New Construction of 51 Units – Mountain View Townhomes
LOCATION:	Acero & Crawford Avenues, Pueblo, Colorado

Gentlemen:

The undersigned, being familiar with the local conditions affecting the cost of the Work, and having examined the Plans and Specifications with related documents and the site of the proposed Work, and being familiar with all of the conditions surrounding the Work of the proposed project including the availability of materials and labor, hereby proposes to furnish all labor, materials, and supplies, and to deconstruct the project in accordance with the Contract Documents, within the time set forth therein, and at the prices stated below. These prices are to cover all expenses incurred in performing the Work required under the Contract Documents, of which this proposal is a part. The undersigned hereby proposes to complete the **Infrastructure & New Construction – Mountain View Townhomes** located at **Acero & Crawford Avenues, Pueblo, Colorado**, for the sum of:

$ _____ /100 dollars
($ _____).

In submitting this bid, it is understood that the right is reserved by the Owner to reject any and all bids and to waive informalities. If written notice of the acceptance of this bid is mailed, telegraphed, or delivered to the undersigned within **10** days after the opening thereof, or at any time thereafter before this bid is withdrawn, the undersigned agrees to execute and deliver a contract in the prescribed form and furnish the required bond(s)and Certificates of Insurance within **10** days after the contract is presented for signature.

Time for Completion _____ Calendar Days. **(Not to exceed a substantial completion date of (425 calendar days).**

Bidder acknowledges receipt of the addenda(s) _____, if applicable

The bid security which is **5% of the bid amount** is submitted herewith in accordance with the specifications.

Unit Price complete including materials, labor, overhead and profit.

Remove 1’ 0” diameter of pier & rebar $ _____ per foot.

Remove 2’ 0” diameter of pier & rebar $ _____ per foot.

4” concrete infill 3500 psi $ _____ per square foot.

4” thick city sidewalks 4000 psi $ _____ per square foot.

Concrete curb 6” wide x 18” high, (6” in ground, 3500 psi) with one (1) #4 top & bottom

$ _____ per linear foot.

Concrete curb 8” wide x 24” high, (12” in ground, 3500 psi) with one (1) #4 top & bottom

$ _____ per linear foot.

Backfill in open holes – Class VI base compacted to 95% proctor $ _____ per ton.

Clean compacted fill dirt compacted to 90% proctor $ _____ per ton.

Dated this __ day of _____, 2019.

THE BIDDER:

_____

_____
Address

By: _____

ATTEST:

_____
Secretary

(SEAL - if bid is by Corporation)

Signatures: If the Proposal is being submitted by a Corporation, the Proposal should be signed by an Officer, i.e., President or Vice President. The signature of the Officer signing shall be attested to by the Secretary and properly sealed. If the Proposal is being submitted by an individual or a partnership, the Proposal shall so indicate and be properly signed.

BID FOR LUMP SUM CONTRACT

EL CENTRO PUEBLO DEVELOPMENT CORP.
201 S. VICTORIA AVENUE, PUEBLO, CO 81003 (719) 542-6741

BID NUMBER:	I.F.B. 19-522-RAD
PROJECT:	Infrastructure & New Construction of 51 Units – Mountain View Townhomes
LOCATION:	Acero & Crawford Avenues, Pueblo, Colorado

Gentlemen:

The undersigned, being familiar with the local conditions affecting the cost of the Work, and having examined the Plans and Specifications with related documents and the site of the proposed Work, and being familiar with all of the conditions surrounding the Work of the proposed project including the availability of materials and labor, hereby proposes to furnish all labor, materials, and supplies, and to deconstruct the project in accordance with the Contract Documents, within the time set forth therein, and at the prices stated below. These prices are to cover all expenses incurred in performing the Work required under the Contract Documents, of which this proposal is a part. The undersigned hereby proposes to complete the **Infrastructure & New Construction – Mountain View Townhomes** located at **Acero & Crawford Avenues, Pueblo, Colorado**, for the sum of:

$ _____ /100 dollars
($ ___ ___).

In submitting this bid, it is understood that the right is reserved by the Owner to reject any and all bids and to waive informalities. If written notice of the acceptance of this bid is mailed, telegraphed, or delivered to the undersigned within **10** days after the opening thereof, or at any time thereafter before this bid is withdrawn, the undersigned agrees to execute and deliver a contract in the prescribed form and furnish the required bond(s)and Certificates of Insurance within **10** days after the contract is presented for signature.

Time for Completion _____ Calendar Days. **(Not to exceed a substantial completion date of (425 calendar days).**

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Unit Price complete including materials, labor, overhead and profit.

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Remove 2’ 0” diameter of pier & rebar $ _____ per foot.

4” concrete infill 3500 psi $ _____ per square foot.

4” thick city sidewalks 4000 psi $ _____ per square foot.

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Concrete curb 8” wide x 24” high, (12” in ground, 3500 psi) with one (1) #4 top & bottom

$ _____ per linear foot.

Backfill in open holes – Class VI base compacted to 95% proctor $ _____ per ton.

Clean compacted fill dirt compacted to 90% proctor $ _____ per ton.

Dated this __ day of _____, 2019.

THE BIDDER:

_____

_____
Address

By: _____

ATTEST:

_____
Secretary

(SEAL - if bid is by Corporation)

Signatures: If the Proposal is being submitted by a Corporation, the Proposal should be signed by an Officer, i.e., President or Vice President. The signature of the Officer signing shall be attested to by the Secretary and properly sealed. If the Proposal is being submitted by an individual or a partnership, the Proposal shall so indicate and be properly signed.

EXECUTIVE DIRECTOR
Theodore R. Ortiviz

201 S. Victoria Ave., Pueblo, CO 81003-3434
Phone (719) 586-8968 (Voice/TTY) (719) 584-7621 Fax (719) 546-5395

SAMPLE

NOTICE OF AWARD

Contractor: _____
Bid Number: **I.F.B. 19-522-RAD**
Project: **Infrastructure & New Construction of 51 Units – Mountain View Townhomes**
Location: **Acero & Crawford Avenues, Pueblo Colorado**

Date of Notice: _____**, 2019**

The Owner, **Housing Authority of the City of Pueblo**, represented by the undersigned, has considered the bid proposals submitted for the above described project. Your bid proposal has been determined to be in the best interest of the Owner, in the amount of:
$**_____**and /100 Dollars ($).

You are hereby requested to furnish the required Assurance of Completion, and your Certificates of Insurance, all as prescribed in the contract bidding documents, and to execute the Owner-Contractor Agreement attached hereto within **ten (10) days** from the date of this notice.

Failure to execute said agreement and furnish said Assurance of Completion, Insurance Policies and Certificates, within **ten (10) days** from the date of this notice, the Owner shall be entitled to retain the amount of the Bid Security submitted with your Bid for Lump Sum Contract as liquidated damages. In this event, the right is reserved to consider all of your rights arising out of the acceptance of your Bid for Lump Sum Contract as abandoned and to award the work covered by your Bid for Lump Sum Contract to another, to re-advertise the work, or otherwise dispose thereof.

Owner: Mountain View Townhomes Limited Liability Limited Partnership
a Colorado limited liability limited partnership

By:_____
Theodore R. Ortiviz, Secretary of El Centro Pueblo Development Corporation, General Partner

Date: _____

Contractor:
_____

By:_____
Contractor's Name

Date: _____

EXECUTIVE DIRECTOR
Theodore R. Ortiviz

201 S. Victoria Ave., Pueblo, CO 81003-3434
Phone (719) 542-6741 (Voice/TTY) (719) 584-7621 Fax (719) 546-5395

I.F.B. 19-522-RAD
OWNER AND CONTRACTOR AGREEMENT

This **AGREEMENT** is made **this ____** day **of _____ in the year of Two Thousand and Nineteen BETWEEN** the Owner: **Housing Authority of the City of Pueblo** located at 201 S. Victoria Ave., Pueblo, CO 81003 and the Contractor: _____ located at_____.

The Project is for the: **Infrastructure & New Construction of 51 Units – Mountain View Townhomes, Acero & Crawford Avenues, Pueblo, Colorado, dated _____, 2019.**

The Project Architect is: Housing Authority of the City of Pueblo
Its Agents and Employees
201 S. Victoria Avenue
Pueblo, CO 81003

Architect of Record is: Gary Trujillo, Staff Architect
Its Agents and Employees
201 S. Victoria Avenue
Pueblo, CO 81003

The Owner and Contractor agree as set forth below:

ARTICLE 1

THE CONTRACT DOCUMENTS

1.1 The Contract Documents consist of this Agreement, General Conditions of the Contract, Drawings, Specifications, addenda issued prior to execution of this Agreement, Notice of Award, Notice to Proceed, and other documents listed in this Agreement and Modifications issued after execution of this Agreement; these form the Contract, and are as fully a part of the Contract as if attached to this Agreement or repeated herein. The Contract represents the entire and integrated Agreement between the parties hereto and supersedes prior negotiations, representations or agreements, either written or oral. An enumeration of the Contract Documents other than Modifications appears in Article 9.

ARTICLE 2

THE WORK OF THIS CONTRACT

2.1 The Contractor shall execute the entire Work described in the Contract Documents or reasonably inferable by the Contractor as necessary to produce the results intended by the Contract Documents, except to the extent specifically indicated in the Contract Documents to be the responsibility of others.

ARTICLE 3

DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

3.1 The date of commencement is the date from which the Contract Time of Paragraph 3.2 is measured, and shall be the date the Contractor is issued a Notice to Proceed by the Owner.

3.2 The Contractor shall diligently prosecute the Work and achieve Substantial Completion of the entire Work no later than **425 calendar days** after the date of the Notice to Proceed. If the entire Work is not substantially complete within the Contract Time as adjusted by any Change Orders, the Contractor acknowledges that the Owner will suffer damages, which damages shall be difficult to quantify, and shall pay liquidated damages to Owner and not as a penalty the amount of $300.00 for each calendar day beyond the date of Substantial Completion except to the extent additional time has been grated to the Contractor under this Agreement.

ARTICLE 4

CONTRACT SUM

4.1 The Owner shall pay the Contractor in current funds for the Contractor's proper performance of the Contract and the completion of the Work. The Contract Sum of:

_____ and /100 Dollars ($ _____) subject to authorized additions and deductions as provided in the Contract Documents.

4.2 The Contract Sum is based upon the following alternates, if any, which are described in the Contract Documents and are hereby accepted by the Owner.

4.3 Pier unit prices, as listed are as follows:

Remove 1’ 0” diameter of pier & rebar $ _____ per foot.

Remove 2’ 0” diameter of pier & rebar $ _____ per foot.

4” concrete infill 3500 psi $ _____ per square foot.

4” thick city sidewalks 4000 psi $ _____ per square foot.

Concrete curb 6” wide x 18” high, (6” in ground, 3500 psi) with one (1) #4 top & bottom $ _____ per linear foot.

Concrete curb 8" wide x 24" high, (12" in ground, 3500 psi) with one (1) #4 top & bottom $ _____ per linear foot.

Backfill in open holes – Class VI base compacted to 95% proctor $ _____ per ton.

Clean compacted fill dirt compacted to 90% proctor $ _____ per ton.

4.3.1 Unit prices are considered complete and include (1) all materials equipment, labor, delivery, installation, overhead and profit and (2) any other costs or expenses in connection with, or incidental to, the performance of that portion of the Work to which such unit prices apply.

ARTICLE 5

PROGRESS PAYMENTS

5.1 Based upon Applications for Payment including all supporting documentation submitted to the Architect by the Contractor and Certificates for Payment issued by the Architect, the Owner shall make progress payments on account of the Contract Sum to the Contractor as provided below and elsewhere in the Contract Documents.

5.2 The period covered by each application for Payment shall be one calendar month ending on the last day of the month. **Retainage of ten (10%) percent** of the amount of progress payments shall be withheld until completion and acceptance of all work under the Contract.

5.3 Provided an Application for Payment including all supporting documentation is received by the Architect no later than the 5th day of a month, the Owner shall make payment to the Contractor no later than **30** days after receipt of the Application of Payment. If an application for Payment is received by the Architect after the application date fixed above, payment shall be made by the Owner no later than forty five **(45)** days after the Architect receives the Application for Payment.

5.4 Each Application for Payment including all supporting documentation shall be based upon the Schedule of Values submitted by the Contractor in accordance with the Contract Documents. The Schedule of Values shall allocate the entire Contract Sum among the various portions of the Work and be prepared in such form and supported by such data to substantiate its accuracy as the Architect may require. This schedule unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment.

5.5 Applications for Payment shall indicate the percentage of completion of each portion of the work as of the end of the period covered by the Application for Payment. In addition to the other required items, each Application for Payment shall be accompanied by the following, all in a form and substance satisfactory to the Owner:

5.5.1 A current Sworn Statement from the Contractor setting forth all sub-contractors and materialmen with whom the Contractor has subcontracted, the amount of such subcontract,

the amount requested for any sub-contractor or materialman in the Application for Payment and the amount to be paid to the Contractor from such Progress Payment, together with a current, duly executed waiver of mechanics' and materialmen's liens from the Contractor establishing receipt of payment or satisfaction of the payment requested by the Contractor in the current Application for Payment;

5.5.2 Commencing with the second (2nd) Application for Payment submitted by the Contractor, duly executed waivers of mechanic's and materialmen's liens from all sub-contractors, materialmen and, when appropriate, from lower tier sub-contractors, establishing receipt of payment or satisfaction of payment of all amounts requested on behalf of such entities and disbursed prior to submittal by the Contractor of the current Application for Payment, plus sworn statements from all sub-contractors, materialmen and, where appropriate, from lower tier sub-contractors, covering all amounts described in this Paragraph 5.5.2.

5.5.3 Such other information, documentation and materials as the Owner may require.

5.6 Subject to the Provisions of the Contract Documents, the amount of each Progress Payment shall be computed as follows:

5.6.1 Take that portion of the Contract Sum properly allocable to completed Work as determined by multiplying the percentage completion of each portion of the Work by the share of the total Contract Sum allocated to that portion of the Work in the Schedule of Values, less retainage of ten percent (10%). Pending final determination of cost to the Owner of changes in the Work, amounts not in the dispute may be included as provided in subparagraph 7.3.7 of the General Conditions even though the Contract Sum has not yet been adjusted by Change Order.

5.6.2 Add that portion of the Contract Sum properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation in the completed construction (or, if approved in advance by the Owner, suitably stored off the site at a location agreed upon in writing), less retaining of ten percent (10%).

5.6.3 Subtract the aggregate of previous payments made by the Owner, and

5.6.4 Subtract amounts, if any, for which the Architect has withheld or nullified a Certificate for Payment as provided in Paragraph 9.5 of the General Conditions.

5.7 The progress payment amount determined in accordance with Paragraph 5.6 shall be further modified under the following circumstances.

5.7.1 Add, upon Substantial Completion of the Work, a sum sufficient to increase the total payment to one hundred percent 100% of the Contract Sum, less such amounts as the Architect shall determine for incomplete Work and unsettled claims; and

5.7.2 Add, if final completion of the Work is thereafter materially delayed through no fault of the Contractor, any additional amounts payable in accordance with subparagraph 9.10.3 of the General Conditions.

ARTICLE 6

FINAL PAYMENT

6.1 Final payment, constituting the entire unpaid balance of the Contract Sum including the retainage, shall be made by the Owner to the Contractor when (1) the Contract has been fully performed by the Contractor in accordance with the Contract Documents, except for the Contractor's responsibility to correct nonconforming Work as provided in subparagraph 12.2.2 of the General Conditions and to satisfy other requirements, if any, which necessarily survive final payment, and (2) a final Certificate for Payment has been issued by the Architect; such final payment shall be made by the Owner not more than 30 days after the issuance of the Architect's final Certificate for Payment.

ARTICLE 7

MISCELLANEOUS PROVISIONS

7.1 Where reference is made in this Agreement to a provision of the General Conditions or another Contract Document, the reference refers to that provision as amended or supplemented by other provisions of the Contract Documents.

7.2 Payments due and unpaid under the Contract shall bear interest from the date payment is due at the rate as provided by subparagraph 13.6.1 of the General Conditions.

7.3 The Contractor represents and warrants the following to the Owner (in addition to any other representations and warranties contained in the Contract Documents) as an inducement to the Owner to execute the Agreement and the final completion of the Work**;**

a) that it and its sub-contractors are financially solvent, able to pay all debts as they mature and possessed of sufficient working capital to complete the Work and perform all obligations, hereunder;

b) that it is able to furnish the plant, tools, materials, supplies, equipment and labor required to complete the Work and perform its obligations hereunder;

c) that it is authorized to do business in the State of Colorado and properly licensed by all necessary governmental and public and quasi-public authorities having jurisdiction over it and over the Work and the Project;

d) that its execution of this Agreement and its performance thereof is within it’s duly authorized powers;

e) that its duly authorized representative has visited the site of the Project, is familiar with the local and special conditions under which the Work is to be performed and has correlated on-site observations with the requirements of the Contract Documents; and

f) that it possesses a high level of experience and expertise in the business administration, construction, construction management and superintendence of projects of the size, complexity and nature of this particular Project, and that it will perform the Work with the care, skill and diligence of such a contractor.

g) The foregoing warranties are in addition to, and not in lieu of, any and all other liability imposed upon the Contractor by law with respect to the Contractor's duties, obligations and performance hereunder. The Contractor's liability and hereunder shall survive the Owner's final acceptance of and payment for the Work. All representations and warranties set forth in this Agreement, including without limitation, this Paragraph 7.3.1, shall survive the final completion of the Work or the earlier termination of this Agreement.

h) The Contractor acknowledges that the Owner is relying upon the Contractor's skill and experience in connection with the Work called for hereunder.

7.4 Hold Harmless. Contractor agrees to indemnify, defend and hold harmless the Housing Authority of the City of Pueblo, Colorado and their agents, commissioners, and its employees from and against any and all liability, claims, demands, and expenses, including court costs and reasonable attorney fees, on account of any injury, loss or damage which arise out of or are in any manner connected with the work to be performed under this agreement if such injury, loss or damage is caused by the negligent act, error or omission of the Contractor, any Sub-contractor of the Contractor, any material supplier of the Contractor, or any officer, employee or agent of the Contractor. These obligations shall not apply to damages which the Owner shall become liable by final judgment to pay to a third party as the result of the negligence of the Owner.

ARTICLE 8

TERMINATION OR SUSPENSION

8.1 The Contract may be terminated by the Owner or the Contractor as provided in Article 14 of the General Conditions.

8.2 The Work may be suspended by the Owner as provided in Article 14 of the General Conditions.

ARTICLE 9

ENUMERATION OF CONTRACT DOCUMENTS

9.1 The Contract Documents, except for Modifications issued after execution of this Agreement, are enumerated as follows:

9.1.1 The Agreement is this executed Agreement between Owner and Contractor.

9.1.2 The Bidding and Contract Documents of the Contract are those contained in the Project Manual dated **_____, 2019** and are as follows:

BIDDING REQUIREMENTS
Invitation to Bidders
Information for Bidders
Instructions to Bidders
Form of Non-Collusive Affidavit
Davis-Bacon Wage Rates
Bid for Lump Sum Contract

CONTRACT DOCUMENTS
Notice of Award
Owner & Contractor Agreement
Notice to Proceed
General Conditions of the Contract for Construction

This Agreement entered into as of the day and year first written above.

Owner: Mountain View Townhomes Limited Liability Limited Partnership
a Colorado limited liability limited partnership

Contractor: _____

By: _____
Theodore R. Ortiviz, Secretary of El Centro Pueblo Development Corporation, General Partner

By: _____
Contractor's Name

Date: _____ Date: _____

The foregoing instrument was acknowledged before me this _____ day of

_____, 20____ A.D. by Theodore R. Ortiviz and _____

Witness by my hand and official seal

My commission expires _____

_____
Notary Public

EXECUTIVE DIRECTOR
Theodore R. Ortiviz

201 S. Victoria Ave., Pueblo, CO 81003-3434
Phone (719) 586-8968 (Voice/TTY) (719) 584-7621 Fax (719) 546-5395

SAMPLE

NOTICE TO PROCEED

BID NUMBER: **I.F.B. 19-522-RAD**
Project: **Infrastructure & New Construction of 51 Units – Mountain View Townhomes**
Location: **Acero & Crawford Avenues, Pueblo Colorado**

DATE: _____

Contractor Name
Address
City, State, Zip

Dear _____,

Pursuant to the terms of the Contract dated **_____, 2019** for the **Infrastructure & New Construction of 51 Units – Mountain View Townhomes – Acero & Crawford Avenues**, Pueblo, Colorado, Bid Number: **I.F.B. 19-522-RAD**, you are hereby notified to commence work under this Full Notice to Proceed (FNTP).

Payment shall be made in accordance with the approved Schedule of Values provided by the Contractor and may be amended by a Change Order.

Work under this Notice to Proceed shall commence at the start of business on **_____, 2019** and all of the Work under the Contract shall be substantially complete no later than **_____, 2019**, **(425) calendar days** from the date of this Notice to Proceed.

Please acknowledge receipt of this Full Notice to Proceed by signing and dating below.

Very truly yours,

Owner: Mountain View Limited Liability Limited Partnership
a Colorado limited liability limited partnership

Contractor: _____

By: _____ By: _____

Theodore R. Ortiviz, Secretary of El Centro Pueblo Development Corporation, General Partner

Contractor's Name

Date: _____ Date:_____

The foregoing instrument was acknowledged before me this ____ day of _____

_____ A.D. by Theodore R. Ortiviz and _____.

Witness by my hand and official seal

My commission expires _____

Notary Public _____

I.F.B. 19-522-RAD

Infrastructure & New Construction of 51 Units – Mountain View Townhomes
Acero & Crawford Avenues, Pueblo Colorado

TABLE OF CONTENTS

General Conditions for Construction Contracts

GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION

ARTICLE I – GENERAL PROVISIONS

1.1 BASIC DEFINITIONS

1.1.1 THE CONTRACT DOCUMENTS

The Contract Documents consist of the Agreement between Owner and Contractor (hereinafter the Agreement), Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, addenda issued prior to execution of the Contract, other documents listed in the Agreement and Modifications issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a Construction Change Directive or (4) a written order for a minor change in the Work issued by the Architect. Unless specifically enumerated in the Agreement, the Contract Documents do not include other documents such as bidding requirements (advertisement or Invitation to Bid, Instructions to Bidders, sample forms, the Contractor's bid or portions of addenda relating to bidding requirements).

1.1.2 THE CONTRACT

The Contract Documents form the Contract for Construction. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations or agreements, either written or oral. The Contract may be amended or modified only by a Modification. The Contract Documents shall not be construed to create a contractual relationship of any kind (1) between the Architect and Contractor, (2) between the Owner and a sub-contractor or sub-subcontractor or (3) between any persons or entities other than the Owner and Contractor. The Architect shall, however, be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of the Architect's duties.

1.1.3 THE WORK

The term "Work" means the construction and services required by the Contract Documents, whether completed or partially completed, and includes all other labor, materials, equipment and services provided or to be provided by the Contractor to fulfill the Contractor's obligations. The Work may constitute the whole or a part of the Project.

1.1.4 THE PROJECT

The Project is the total construction of which the Work performed under the Contract Documents may be the whole or a part and which may include construction by the Owner or by separate contractors.

1.1.5 THE DRAWINGS

The Drawings are the graphic and pictorial portions of the Contract Documents, wherever located and whenever issued, showing the design, location and dimensions of the Work, generally including plans, elevations, sections, details, schedules and diagrams.

1.1.6 THE SPECIFICATIONS

The Specifications are that portion of the Contract Documents consisting of the written requirements for materials, equipment, construction systems, standards and workmanship for the Work, and performance of related services.

1.1.7 THE PROJECT MANUAL

The Project Manual is the volume usually assembled by the Architect for the Work which may include the bidding requirements, sample forms, Conditions of the Contract and Specifications.

1.2 EXECUTION, CORRELATION AND INTENT

1.2.1 The Contract Documents shall be signed by the Owner and Contractor as provided in the Agreement. If either the Owner or both do not sign all the Contract Documents, the Architect shall identify such unsigned Documents upon request.

1.2.2 Execution of the Contract by the Contractor is a representation that the Contractor has visited the site, become familiar with local and any special conditions under which the Work is to be performed and any special correlated personal observations with requirements of the Contract Documents. The Contractor and each sub-contractor shall evaluate and satisfy themselves as to the conditions and limitations under which the Work is to be performed, including, without limitation (1) the location, condition, layout and nature of the Project site and surrounding areas, (2) generally prevailing climatic conditions, (3) anticipated labor supply and costs, (4) availability and cost of materials, tools and equipment and (5) other similar issues. The Owner assumes no responsibility or liability for the physical condition or safety of the Project site or any improvements located on the Project site. Except as set forth in Paragraph 10.1.2, the Contractor shall be solely responsible for providing a safe place for the performance of the Work. The Owner shall not be required to make any adjustment in either the Contract Sum or Contract Time in connection with any failure by the Contractor or any sub-contractor to comply with the requirements of this Paragraph 1.2.2.

1.2.3 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all; performance by the Contractor shall be required only to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the intended results.

1.2.4 Organization of the Specifications into divisions, sections, and articles, and arrangement of Drawings shall not control the Contractor in dividing the Work among sub-contractors or in establishing the extent of Work to be performed by any trade.

1.2.5 Unless otherwise stated in the Contract Documents, words which have well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings.

1.3 OWNERSHIP AND USE OF ARCHITECT'S DRAWINGS, SPECIFICATIONS, AND OTHER DOCUMENTS

1.3.1 The Drawings, Specifications, and other documents prepared by the Architect are instruments of the Architect's service through which the Work to be executed by the Contractor is described. The Contractor may retain one contract record set. Neither the Contractor nor any sub-contractor, sub-subcontractor or material or equipment supplier shall own or claim a copyright in the Drawings, Specifications and other documents prepared by the Architect, and unless otherwise indicated by the Architect, shall be deemed the author of them and will retain all common law, statutory and other reserved rights, in addition to the copyright. All copies of them, except the Contractor's record set, shall be returned or suitably accounted for to the Architect on request, upon completion of the Work. The Drawings, Specifications and other documents prepared by the Architect, and copies thereof furnished to the Contractor, are for use solely with respect to this Project. They are not to be used by the Contractor or any sub-contractor, sub-subcontractor, or material or equipment supplier or other projects or for additions to this Project outside the scope of the Work without the specific written consent of the Owner and Architect. The Contractor, sub-contractor, sub-subcontractors and material or equipment supplies are granted a limited license to use and reproduce applicable portions of the Drawings, Specifications and other documents prepared by the Architect appropriate to and for use in the execution of their Work under the Contract Documents. All copies made under this license shall bear the statutory copyright notice, if any, shown on the Drawings, Specifications and other documents prepared by the Architect. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with this Project is not be construed as publication in derogation of the Architect’s copyright or other reserved rights.

1.4 CAPITALIZATION

1.4.1 Terms capitalized in these General Conditions include those which are (1) specifically defined, (2) the titles of numbered articles and identified references to Paragraphs, sub-paragraphs and Clauses in the document.

1.5 INTERPRETATION

1.5.1 In the interest of brevity, the Contract Documents frequently omit modifying words such as "all" and "any" and articles such as "the" and "an," but the fact that a modifier or an article is absent from one statement and appears in another is not intended to affect the interpretation of either statement.

ARTICLE 2 - OWNER

2.1 DEFINITION

2.1.1 The Owner is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The term "Owner" means the Owner or the Owner's authorized representative.

2.2 INFORMATION AND SERVICES REQUIRED OF THE OWNER

2.2.1 The Owner shall furnish surveys describing physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the site.

2.2.2 Except for permits and fees which are the responsibility of the Contractor under the Contract Documents, the Owner shall secure and pay for necessary approvals, easements, assessments, and charges required for construction, use or occupancy of permanent structures or for permanent changes in existing facilities.

2.2.3 Information or services under the Owner's control shall be furnished by the Owner with reasonable promptness to avoid delay in orderly progress of the Work.

2.2.4 Unless otherwise provided in the Contract Documents, the Contractor will be furnished, free of charge, such copies of Drawings and Project Manuals as are reasonably necessary for execution of the Work.

2.2.5 The foregoing are in addition to other duties and responsibilities of the Owner enumerated herein and especially those in respect to Article 6 (Construction by Owner or by Separate Contractors), Article 9 (Payments and Completion) and Article 11 (Insurance and Bonds).

2.3 OWNER'S RIGHT TO STOP THE WORK

2.3.1 If the Contractor fails to correct Work which is not in accordance with the requirements of the Contract Documents as required by Paragraph 12.2 or in the Owner's reasonable judgement fails to carry out Work in accordance with the Contract Documents, the Owner, by written order signed personally or by an agent specifically so empowered by the Owner in writing, may order the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, the right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity, except to the extent required by subparagraph 6.1.3.

2.4 OWNER'S RIGHT TO CARRY OUT THE WORK

2.4.1 If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a seven-day period after receipt of written notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may after such seven-day period without prejudice to other remedies the Owner may have, correct such deficiencies. In such case an appropriate Change Order shall be issued deducting from payments then or thereafter due the Contractor the cost of correcting such deficiencies, including compensation for the Architect's additional services and expenses made necessary by such default, neglect or failure. Such action by the Owner and amounts charged to the Contractor are both subject to prior approval of the Architect. If payments then or thereafter due the Contractor are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner.

2.5 EXTENT OF OWNER RIGHTS

2.5.1 The rights stated in this Article 2 and elsewhere in the Contract Documents are cumulative and not in limitation of any rights of the Owner (1) granted in the Contract Documents, (2) at law or (3) in equity.

2.5.2 In no event shall the Owner have control over, charge of, or any responsibility for construction means, methods, techniques, sequences or procedures or for safety precautions and programs in connection with the Work, notwithstanding any of the rights and authority granted the Owner in the Contract Documents.

ARTICLE 3 - CONTRACTOR

3.1 DEFINITION

3.1.1 The Contractor is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The term "Contractor" means the Contractor or the Contractor's authorized representative.

3.2 REVIEW OF CONTRACT DOCUMENTS AND FIELD CONDITIONS BY CONTRACTOR

3.2.1 The Contractor shall carefully study and compare the Contract Documents with each other and with information furnished by the Owner pursuant to subparagraph 2.2.1 and shall at once report to the Architect errors, inconsistencies or omissions discovered. The Contractor shall not be liable to the Owner or Architect for damage resulting from errors, inconsistencies or omissions in the Contract Documents unless the Contractor recognized such error, inconsistency or omission and failed to report it to the Architect. If the Contractor performs any construction activity knowing it involves a recognized error, inconsistency or omission in the Contract Documents without such notice to the Architect, the Contractor shall assume appropriate responsibility for such performance and shall bear the attributable costs for correction.

3.2.2 The Contractor shall take field measurements and verify field conditions and shall carefully compare such field measurements and conditions and other information known to the Contractor with the Contract Documents before commencing activities. Errors, inconsistencies or omissions discovered shall be reported to the Architect at once.

3.2.3 The Contractor shall perform the Work in accordance with the Contract Documents and submittals approved pursuant to Paragraph 3.12.

3.2.4 The Contractor shall satisfy itself as to the accuracy of all grades, elevations, dimensions and locations of the Work. Any errors due to the Contractor's failure to verify all grades, elevations, locations and/or dimensions shall be promptly rectified by the Contractor without any additional cost to the Owner.

3.2.5 Except as to any reported errors, inconsistencies or omissions, and to concealed or unknown conditions defined in Paragraph 4.3.6, the Contractor represents that the Contract Documents are sufficiently complete and detailed for the Contractor to perform the work required to produce the results intended in the Contract Documents and comply with all the requirements of the Contract Documents.

3.3 SUPERVISION AND CONSTRUCTION PROCEDURES

3.3.1 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for and have control over construction means, methods, techniques, sequences and procedures and for coordinating all portions of the Work under the Contract unless Contract Documents give other specific instructions concerning these matters.

3.3.2 The Contractor shall be responsible to the Owner for acts and omissions of the Contractor's employees, sub-contractors and their agents and employees, and any entity or other persons performing portions of the Work.

3.3.3 The Contractor shall not be relieved of obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Architect in the Architect's administration of the Contract, or by tests, inspections or approvals required or performed by persons other than the Contractor.

3.3.4 The Contractor shall be responsible for inspection of portions of Work already performed under this Contract to determine that such portions are in proper condition to receive subsequent Work.

3.4 LABOR AND MATERIALS

3.4.1 Unless otherwise specifically provided in the Contract Documents, the Contractor shall provide and pay for all labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

3.4.2 The Contractor shall enforce strict discipline, safety, and good order among the Contractor's employees and other persons carrying out the Contract. The Contractor shall not permit employment of unfit persons or persons not skilled in tasks assigned to them.

3.5 WARRANTY

3.5.1 The Contractor warrants to the Owner and Architect that materials and equipment furnished under the Contract will be of good quality and new unless otherwise required or permitted by the Contract Documents, that the Work will be free from defects not inherent in the quality required or permitted, and that the Work will conform with the requirements of the Contract Documents. Work not conforming to these requirements, including substitutions not properly approved and authorized may be considered defective. If required by the Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials, and equipment.

3.6 TAXES

3.6.1 City of Pueblo Taxes. The Contractor shall pay all City of Pueblo sales, consumer, use and other similar taxes required by law.

3.6.2 The Contract between the Owner and The Contractor and the Contract between the Contractor and each sub-contractor shall require that the City of Pueblo sales and use tax be paid by the Contractor or sub-contractor on all pursuance of the Contract. The City law requires that the tax be paid on all material built into the building regardless of where purchased.

3.6.3 An amount sufficient to cover the payment of the above taxes must be included in each bid submitted. Contractor shall make certain that all sub-contractors have included these amounts of their bids, and it shall be the duty of the prime Contractor to make certain that all required sales and use taxes are paid by both himself and by his sub-contractors, wherever they may be located.

3.6.4 If materials are purchased outside the limits of the City of Pueblo, Use Tax returns must be filed with the City of Pueblo Finance Department. No Sales Tax License is necessary to make these payments.

3.6.5 The Contractor shall comply with and shall require all his sub-contractors to comply with all of the provisions and amendments of the Act of Congress approved August 14, 1934, known and cited as the "Social Security Act."

3.6.6 The Contractor shall indemnify and save harmless the Owner of and from any and all claims and demands made against him by virtue of failure of the Contractor or any sub-contractors to comply with the provisions of all said laws acts, and/or amendments.

3.6.7 Prepayment of City Sales and Use Tax *(This section applies only to public improvement construction projects over $1,000,000).* The Contractor shall make application for, and prepayment of, City sales and use tax on the estimated percentage basis being forty percent (40%) of the total Project bid as awarded including Base Bid plus those Alternates selected. Application and prepayment shall be made within fourteen (14) days of the date authorized to proceed with construction of the Project as set forth in the Notice to Proceed. All applications and prepayments shall be coordinated directly with City's Division of Sales and Use Tax, Attention: Tax Audit Manager, 1 City Hall Place, Pueblo, Colorado 81003.

3.7 PERMITS, FEES, AND NOTICES

3.7.1 Unless otherwise provided in the Contract Documents, the Contractor shall secure and pay for any permits required by the Pueblo Regional Building Department and any other permits and governmental fees, licenses and inspections necessary for proper execution and completion of the Work.

3.7.1.1 The Contractor shall not include in his bid the cost of the water meter, the tap fee, the setting fee, and any other charges required by the Water Board, to provide the services required.
The Owner shall pay for these fees.

3.7.1.2 The Contractor shall not include in his bid the cost of the gas meter, the tap fee, setting fee, and any other charges required by this utility company to provide the service. The Owner shall pay for these fees.

3.7.1.3 The Contractor shall not include in his bid the charges required by the power company for installation of overhead or underground services shown on the drawings, charges for setting transformers, meters, and/or other
charges relating to this project. The Owner shall pay these fees and charges.

3.7.1.4 Should any laws, codes, ordinances, or regulations be changed during performance of this Contract, the Architect will request in writing a proposal from the Contractor for

making the required changes. Such required changes shall be made only upon written order as required for other changes in Work.

3.7.2 The Contractor shall comply with and give notices required by laws, ordinances, rules, regulations and lawful orders of public authorities bearing on performance of the Work.

3.7.3 It is not the Contractor's responsibility to ascertain that the Contract Documents are in accordance with applicable laws, statutes, ordinances, building codes, and rules and regulations unless such laws, statutes, ordinances, Building Codes and rules and regulations bear upon performance of the Work.

However, if the Contractor observes that portions of the Contract Documents are at variance therewith, the Contractor shall promptly notify the Architect and Owner in writing, and necessary changes shall be accomplished by appropriate Modification.

3.7.4 If the Contractor performs Work knowing it to be contrary to laws, statutes, ordinances, building codes, and rules and regulations without such notice to the Architect and Owner, the Contractor shall assume full responsibility for such Work and shall bear the attributable costs.

3.8 ALLOWANCES

3.8.1 The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents. Items covered by allowances shall be supplied for such amounts and by such persons or entities as the Owner may direct, but the Contractor shall not be required to employ persons or entities against which the Contract makes reasonable objection.

3.8.2 Unless otherwise provided in the Contract Documents:

- **.1** materials and equipment under an allowance shall be selected promptly by the Owner to avoid delay in the Work:
- **.2** allowances shall cover the cost to the Contractor of materials and equipment delivered at the side and all required taxes, less applicable trade discounts;
- **.3** Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum and not in the allowances;
- **.4** whenever costs are more than or less than allowances, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (1) the difference between actual costs and the allowances under Clause 3.8.2.2 and (2) changes in Contractor's costs under Clause 3.8.2.3.

3.9 SUPERINTENDENT

3.9.1 The Contractor shall employ a competent superintendent and necessary assistants who shall continuously be at the Project site during performance of the Work. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor. Important communications shall be confirmed in writing. Other communications shall be similarly confirmed on written request in each case.

3.10 CONTRACTOR'S CONSTRUCTION SCHEDULES

3.10.1 The Contractor, within (5) calendar days of the Notice to Proceed, shall prepare and submit for the Owner's and Architect's information a Contractor's Construction Schedule for the Work. The schedule shall not exceed time limits current under the Contract Documents, shall be revised at appropriate intervals as required by the conditions of the Work and Project, shall be related to the entire Project to the extent required by the Contract Documents, and shall provide for expeditious and practicable execution of the Work.

3.10.2 The Contractor shall prepare and keep current, for the Architect's, approval, a schedule of submittals which is coordinated with the Contractor's Construction Schedule and allows the Architect reasonable time to review submittals.

3.10.3 The Contractor shall conform to the most recent schedules.

3.11 DOCUMENTS AND SAMPLES AT THE SITE

3.11.1 The Contractor shall maintain at the site for the Owner one record copy of the Drawings, Specifications, addenda, Change Orders and other Modifications, in good order and marked currently to record changes and selections made during construction and in addition approved Shop Drawings, Product Data, Samples and similar required submittals. These shall be available to the Architect and shall be delivered to the Architect for submittal to the Owner upon completion of the Work.

3.12 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

3.12.1 Shop Drawings are drawings, diagrams, schedules and other data specially prepared for the Work by the Contractor or a sub-contractor, sub-subcontractor, manufacturer, supplier or distributor to illustrate some portion of the Work.

3.12.2 Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work.

3.12.3 Samples are physical examples which illustrate materials, equipment or workmanship and establish standards by which the Work will be judged.

3.12.4 Shop Drawings, Product Data, Samples and similar submittals are not Contract Documents. The purpose of their submittal is to demonstrate for those portions of the Work for which submittals are required the way the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents. Review by the Architect is subject to the limitations of subparagraph 4.2.7.

3.12.5 The Contractor shall review, approve and submit to the Architect Shop Drawings, Product Data, Samples and similar submittals required by the Contract Documents with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of the Owner or of separate contractors. Submittals made by the Contractor which are not required by the Contract Documents may be returned without action.

3.12.6 The Contractor shall perform no portion of the Work requiring submittal and review of Shop Drawings, Product Data, Samples or similar submittals until the respective submittal has been approved by the Architect. Such Work shall be in accordance with approved submittals.

3.12.7 By approving and submitting Shop Drawings, Product Data, Samples and similar submittals, the Contractor represents that the Contractor has determined and verified materials, field measurements and field construction criteria related thereto, or will do so, and has checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

3.12.8 The Contractor shall not be relieved of responsibility for deviations from requirements of the Contract Documents by the Architect's approval of Shop Drawings, Product Data, Samples or similar submittals unless the Contractor has specifically informed the Architect in writing of such deviation at the time of submittal and the Architect has given written approval to the specific deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples or similar submittals by the Architect's approval thereof.

3.12.9 The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, samples or similar submittals, to revisions other than those requested by the Architect on previous submittals.

3.12.10 Informational submittals upon which the Architect is not expected to take responsive action may be so identified in the Contract Documents.

3.12.11 When professional certification of performance criteria of materials, systems or equipment is required by the Contract Documents, the Architect shall be entitled to rely upon the accuracy and completeness of such calculations and certifications.

3.13 USE OF SITE

3.13.1 The Contractor shall confine operations at the site to areas permitted by law, ordinances, permits and the Contract Documents and shall not unreasonably encumber the site with materials or equipment.

3.13.2 Only materials and equipment which are to be used directly in the Work shall be brought to and stored on the Project site by the Contractor. After equipment is no longer required for the Work, it shall be promptly removed from the Project site. Protection of construction materials and equipment stored at the Project site from weather, theft, damage and all other adversity is solely the responsibility of the Contractor.

3.13.3 Contractor shall ensure that the Work, at all times, is performed in a manner that affords reasonable access, both vehicular and pedestrian, to the site of the Work and all adjacent areas. The Work shall be performed, to the fullest extent reasonably possible, in such a manner that public areas adjacent to the site of the Work shall be free from all debris, building materials and equipment likely to cause hazardous conditions. Without limitations of any other provision of the Contract Documents, Contractor shall use its best efforts to minimize any interference with the occupancy or beneficial use of (1) any areas and

buildings adjacent to the site of the Work or (2) the Building in the event of partial occupancy, as more specifically describe in Paragraph 9.9.

3.13.4 Without prior approval of the Owner, the Contractor shall not permit any workers to use any existing facilities at the Project site, including, without limitation, lavatories, toilets, entrances, and parking areas other than those designated by the Owner.

3.14 CUTTING AND PATCHING

3.14.1 The Contractor shall be responsible for cutting, fitting or patching required to complete the Work or to make its parts fit together properly.

3.14.2 The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the Owner or separate contractors by cutting, patching or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter such construction by the Owner or a separate contractor except with written the Project site from weather, theft, damage and all other adversity is solely the responsibility of the Contractor.

3.15 CLEANING UP

3.15.1 The Contractor shall keep the premises and surrounding area free from accumulation of waste materials or rubbish caused by operations under the Contract. At completion of the Work, the Contractor shall remove from and about the Project waste materials, rubbish, the Contractor's tools, construction equipment, machinery and surplus materials.

3.15.2 If the Contractor fails to clean up as provided in the Contract Documents, the Owner may do so and the cost thereof shall be charged to the Contractor.

3.16 ACCESS TO WORK

3.16.1 The Contractor shall provide the Owner and Architect access to the Work in preparation and progress wherever located.

3.17 ROYALTIES AND PATENTS

3.17.1 The Contractor shall pay all royalties and license fees. The Contractor shall defend suits or claims for infringement of patent rights and shall hold the Owner and Architect harmless from loss on account thereof, but shall not be responsible for such defense or loss thereof, but shall not be responsible for such defense or loss when a particular design, process or product of a particular manufacturer(s) is required by the Contract Documents. However, if the Contractor has reason to believe that the required design, process or product is an infringement of a patent, the Contractor shall be responsible for such loss unless such information is promptly furnished to the Architect.

3.18 INDEMNIFICATION

3.18.1 To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses and expenses, including but not limited to reasonable attorneys' fees and costs, arising out of or resulting from performance of the Work, provided that such claim, damage, loss or expense is attributable to bodily injury,

sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself) including loss of use resulting therefrom, but only to the extent caused by negligent acts, errors, or omissions of the Contractor, a sub-contractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity which would otherwise exist as to a party or person described in this Paragraph 3.18.

3.18.2 In claims against any person or entity indemnified under this Paragraph 3.18 by an employee of the Contractor, a sub-contractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, the indemnification obligation under this Paragraph 3.18 shall not be limited by a limitation on amount or type of damages, compensation or benefits payable by or for the Contractor or a sub-contractor under Workers' Compensation acts, disability benefits acts or other employee benefit acts.

3.18.3 The obligations of the Contractor under this Paragraph 3.18 shall not extend to the liability of the Architect, the Architect's consultants, and agents and employees of any of them arising out of (1) the preparation or approval of maps, drawings, opinions, reports, surveys, Change Orders, designs or specifications, or (2) the giving of or the failure to give directions or instructions by the Architect, the Architect's consultants, and agents and employees of any of them provided such giving or failure to give is the primary cause of the injury or damage.

ARTICLE 4 - ADMINISTRATION OF THE CONTRACT

4.1 ARCHITECT

4.1.1 The Architect is the person lawfully licensed to practice architecture or an entity lawfully practicing architecture identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The term "Architect" means the Architect or the Architect's authorized representative.

4.1.2 Duties, responsibilities and limitations of authority of the Architect as set forth in the Contract Documents shall not be restricted, modified or extended without written consent of the Owner, Contractor and Architect. Consent shall not be unreasonably withheld.

4.1.3 In case of termination of employment of the Architect, the Owner shall appoint an Architect against whom the Contractor makes no reasonable objection and whose status under the Contract Documents shall be that of the former Architect.

4.2 ARCHITECT'S ADMINISTRATION OF THE CONTRACT

4.2.1 The Architect will provide administration of the Contract as described in the Contract Documents, and will be the Owner's representative (1) during construction, (2) until final payment is due and (3) with the Owner's concurrence, from time to time during the correction period described in Paragraph 12.2. The Architect will advise and consult with the Owner. The Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents unless otherwise modified by written instrument in accordance with other provisions of the Contract.

4.2.2 The Architect will visit the site at intervals appropriate to the stage of construction to become generally familiar with the progress and quality of the completed Work and to determine in general if the Work is being performed in a manner indicating that the Work, when completed, will be in accordance with the Contract Documents. However, the Architect will not be required to make exhaustive or continuous on-site inspections to check quality or quantity of the Work. On the basis of on-site observations as an Architect, the Architect will keep the Owner informed of progress of the Work, and will endeavor to guard the Owner against defects and deficiencies in the Work.

4.2.3 The Architect will not have control over or charge of and will not be responsible for construction means, methods, techniques, sequences or procedures, or for safety precautions and programs in connection with the Work, since these are solely the Contractor's responsibility as provided in Paragraph 3.3. The Architect will not be responsible for the Contractor's failure to carry out the Work in accordance with the Contract Documents. The Architect will not have control over or charge of and will not be responsible for acts or omissions of the Contractor, sub-contractors, or their agents or employees, or of any other persons performing portions of the Work.

4.2.4 Communications Facilitating Contract Administration. Except as otherwise provided in the Contract Documents or when direct communications have been specially authorized, the Owner and Contractor shall endeavor to communicate through the Architect. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with sub-contractors and materials suppliers shall be through the Contractor. Communications by and with separate contractors shall be through the Owner.

4.2.5 Based on the Architect's observations and evaluations of the Contractor's Applications for Payment, the Architect will review and certify the amounts due the Contractor and will issue Certificates for Payment in such amounts.

4.2.6 The Architect will have authority to reject Work which does not conform to the Contract Documents. Whenever the Architect considers it necessary or advisable for implementation of the intent of the Contract Documents, the Architect will have authority to require additional inspection or testing of the Work in accordance with subparagraph 13.5.2 and 13.5.3, whether or not such Work is fabricated, installed or completed. However, neither this authority of the Architect nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect to the Contractor, sub-contractors, material and equipment suppliers, their agents or employees, or other persons performing portions of the Work.

4.2.7 The Architect will review and approve or take other appropriate action upon the Contractor‘s submittals such as Shop Drawings, Product Data and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Architect's action will be taken with such promptness as to not unreasonably delay the Work or the activities of the Owner, Contractor or separate contractors, while allowing sufficient time in the Architect's professional judgement to permit adequate review. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities or for substantiating instructions for installation or performance of equipment

or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents.

The Architects review of the Contractor's submittals shall not relieve the Contractor of the obligations under Paragraph 3.3, 3.5, and 3.12. The Architect's review shall not constitute approval of safety precautions or, unless otherwise specifically stated by the Architect, of any construction means, methods, techniques, sequences or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

4.2.8 The Architect will prepare Change Orders and Construction Change Directives, and may authorize minor changes in the Work as provided in Paragraph 7.4.

4.2.9 The Architect will conduct inspections to determine the date or dates of Substantial Completion and the date of final completion, will receive and forward to the Owner for the Owner's review and records written warranties and related Documents required by the Contract and assembled

by the Contractor and will issue a final Certificate for Payment upon compliance with the requirements of the Contract Documents.

4.2.10 If the Owner and Architect agree, the Architect will provide one or more project representatives to assist in carrying out the Architect's responsibilities at the site. The duties, responsibilities and limitations of authority of such project representatives shall be as set forth in an exhibit to be incorporated in the Contract Documents.

4.2.11 The Architect will interpret and decide matters concerning performance under and requirements of the Contract Documents on written request of either the Owner or Contractor. The Architect's response to such requests will be made with reasonable promptness and within any time limits agreed upon. If no agreement is made concerning the time within which interpretations required of the Architect shall be furnished in compliance with this Paragraph 4.2, then delay shall not be recognized on account of failure by the Architect to furnish such interpretations until 15 days after written request is made for them.

4.2.12 Interpretations and decisions of the Architect will be consistent with the intent of and reasonably inferable from the Contract Documents and will be in writing or in the form of drawings. When making such interpretations and decisions, the Architect will not be liable for results of interpretations or decisions so rendered in good faith.

4.2.13 The Architect's decisions on matters relating to aesthetic effect will be final if consistent with the intent expressed in the Contract Documents.

4.3 CLAIMS AND DISPUTES

4.3.1 Definitions. A Claim is a demand or assertion by one of the parties seeking, as a matter of right, adjustment or interpretation of Contract terms, payment of money, extension of time or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in questions between the Owner and Contractor arising out of or relating to the Contract. Claims must be made by written notice. The responsibility to substantiate Claims shall rest with the party making the Claim.

4.3.2 Decision of Architect. Claims, including those alleging an error or omission by the Architect, shall be referred initially to the Architect for action as provided in Paragraph 4.4. A decision by the Architect, as provided in subparagraph 4.4.4, shall be required as a condition precedent to litigation of a Claim between the Contractor and Owner as to all such matters arising prior to the date final payment is due, regardless of (1) whether such matters relate to execution and progress of the Work or (2) the extent to which the Work has been completed. The decision by the Architect in response to a Claim shall not be a condition precedent to litigation in the event (1) the position of Architect is vacant, (2) the Architect has not received evidence or has failed to render a decision within agreed time limits, (3) the Architect has failed to take action required under subparagraph 4.4.4 within 30 days after the Claim is made or, (4) 45 days have passed after the Claim has been referred to the Architect.

4.3.3 Time Limits on Contractor Claims. Claims by Contractor must be made within **10** days after Contractor first recognizes the conditions giving rise to the Claim, whichever is later; provided, however, that Contractor shall use its best efforts to furnish the Architect and Owner, as expeditiously as possible, with notice of any Claim once such Claim is recognized, and shall cooperate with the Architect and the Owner in an effort to mitigate the alleged or potential damages, delay or other adverse consequences arising out of the condition which is the cause of such a Claim. Claims must be made by written notice. An additional Claim made after the initial Claim has been implemented by Change Order will not be considered unless submitted in a timely manner.

4.3.4 Continuing Contract Performance. Pending final resolution of a Claim, unless otherwise agreed in writing, the Contractor shall proceed diligently with performance of the Contract and

the Owner shall continue to make payments in accordance with the Contract Documents.

4.3.5 Waiver of Claims: Final Payment. The making of final payment shall constitute a waiver of Claims by the Owner except those arising from:

- **.1** liens, Claims, security interests or encumbrances arising out of the Contract and unsettled;
- **.2** failure of the Work to comply with the requirements of the Contract Documents; or
- **.3** terms of special warranties required by the Contract Documents.

4.3.6 Claims for Concealed or Unknown Conditions. If conditions are encountered at the site which are (1) subsurface or otherwise concealed physical conditions which differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature, which differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, then written notice by the observing party shall be given to the other party promptly before conditions are disturbed and in no event later than 10 days after first observance of the conditions. The Architect will promptly investigate such conditions and, if they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend an equitable adjustment in the Contract Sum or Contract Time, or both. If the Architect determines that

the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall so notify the Owner and Contractor in writing, stating the reasons. Claims by either party in opposition to such determination must be made within 10 days after the Architect has given notice of the decision. If the Owner and Contractor cannot agree on an adjustment in the Contract Sum or Contract Time, the adjustment shall be referred to the Architect for initial determination, subject to further proceeding pursuant to Paragraph 4.4. No adjustment in the Contract Time or Contract Sum shall be permitted, however, in connection with the concealed or unknown condition which does not differ materially from those conditions disclosed or which reasonably should have been disclosed by the Contractor's (1) prior inspections, tests, reviews and/or preconstruction services for the Project, or (2) inspections, tests, reviews, and preconstruction services which the Contractor had the opportunity to make or should have performed in connection with the Project.

4.3.7 Claims for Additional Cost. If the Contractor wishes to make claims for an increase in the Contract Sum, written notice as provided herein shall be given before proceeding to execute the Work. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Paragraph 10.3. If the Contractor believes additional cost is involved for reasons including but not limited to (1) a written interpretation from the Architect, (2) an order by the Owner to stop the Work where the Contractor was not at fault, (3) a written order for a minor change in the Work issued by the Architect, (4) failure of payment by the Owner, (5) termination of the Contract by the Owner, (6) suspension or (7) other reasonable grounds, Claims shall be filed in accordance with the procedure established herein.

4.3.8 Claims for Additional Time

4.3.8.1 If the Contractor wishes to make Claim for an increase in the Contract Time, written notice pursuant to Paragraph 4.3.3 shall be provided. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on the Completion Date of the Work. In the case of continuing delay, only one Claim is necessary.

4.3.8.2 If unusually severe weather conditions are the basis for Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were unusually severe for the period of time and could not have been reasonably anticipated, and that weather conditions had an adverse effect on the scheduled construction to the extent critical path activities were delayed. In the event Contractor establishes that its Completion Date was impacted by unusually severe weather, Contractor shall be entitled to additional time but not compensation.

4.3.9 Injury or Damage to Persons or Property. If either party to the Contract suffers injury or damage to person or property because of an act or omission of the other party, of any of the party's employees or agents, or of others for whose acts such party is legally liable, written notice of such injury or damage, whether or not insured, shall be given to the other party within a reasonable time not exceeding fourteen (14) days after first observance. The notice shall provide sufficient detail to enable the other party to investigate the matter. If a Claim for additional cost or time related to this Claim is to be asserted, it shall be filed as provided in subparagraphs 4.3.7, or 4.3.8.

4.4 RESOLUTION OF CLAIMS AND DISPUTES

4.4.1 The Architect will review Claims and take one or more of the following preliminary actions within fourteen (14) days of receipt of a Claim; (1) request additional supporting data from the claimant, (2) submit a schedule to the parties indicating when the Architect expects to take action, (3) reject the Claim in whole or in part stating the reasons for rejection, (4) recommend approval of the Claim by the other party or (5) suggest a compromise. The Architect may also, but is not obligated to, notify the surety, if any, of the nature and amount of the Claim.

4.4.2 If a claim has been resolved, the Architect will prepare or obtain appropriate documentation.

4.4.3 If a Claim has not been resolved, the Party making the Claim shall, within ten days after the Architect's preliminary response, take one or more of the following actions; (1) submit additional supporting data requested by the Architect, (2) modify the initial Claim or (3) notify the Architect that the initial Claim stands.

4.4.4 If a Claim has not been resolved after consideration of the foregoing and of further evidence presented by the parties or requested by the Architect, the Architect will notify the parties in writing that the Architect's decision will be made within seven days, which decision shall be final and binding on the parties but subject to later resolution as provided herein. Upon expiration of such time period, the Architect will render to the parties the Architect's written decision relative to the Claim, including any change in the Contract Sum or Contract Time or both. If there is a surety and there appears to be a possibility of a Contractor's default, the Architect may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

4.4.5 If Contractor is dissatisfied with any decision made by Architect pursuant to Paragraph 4.4.4, any cause of action based upon that decision, whether in Contract or tort, law or equity, shall be commenced not later than one (1) year after the date of Substantial Completion of the Work. Notwithstanding the foregoing, as to any and all acts or failures to act by the Owner, Contractor shall commence any cause of action, based upon any and all theories, whether in Contract or tort, law or equity, not later than one (1) year after the date of Substantial Completion of the Work.

ARTICLE 5 - SUB-CONTRACTORS

5.1 DEFINITIONS

5.1.1 A sub-contractor is a person or entity who has a direct contract with the Contractor to perform a portion of the Work at the site. The term "sub-contractor" is referred to throughout the contract Documents as if singular in number and means a sub-contractor or an authorized representative of the sub-contractor. The term "sub-contractor" does not include a separate contractor or sub-contractors of a separate contractor, and a person or entity who has a direct contract with the Contractor to supply any material incorporated into the Work.

5.1.2 A sub-subcontractor is a person or entity who has a direct or indirect contract with a sub-contractor to perform a portion of the Work at the site. The term "sub-contractor" is

referred to throughout the Contract Documents as if singular in number and means a sub-subcontractor or an authorized representative of the sub-subcontractor.

5.2 AWARD OF SUBCONTRACTS AND OTHER CONTRACTS FOR PORTIONS OF THE WORK

5.2.1 Unless otherwise stated in the Contract Documents or the bidding requirements, the Contractor, as soon as practicable after award of the Contract, shall furnish in writing to the Owner through the Architect the names of persons or the entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for each principal potion of the Work. The Architect will promptly reply to the Contractor in writing stating whether or not the Owner or the Architect has reasonable objection to any such proposed person or entity. Failure of the Owner or Architect to reply promptly shall constitute notice of no reasonable objection.

5.2.2 The Contractor shall not contract with a proposed person or entity to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not be required to contract with anyone to whom the Contractor has made reasonable objection.

5.2.3 If the Owner or Architect has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner or Architect has no reasonable objection. The Contract Sum shall be increased or decreased by the difference in cost occasioned by such change and an appropriate Change Order shall be issued. However, no increase in the Contract Sum shall be allowed for such change unless the Contractor has acted promptly and responsively in submitting names as required.

5.2.4 The Contractor shall not change a sub-contractor or person or entity previously selected if the Owner or Architect makes reasonable objection to such change.

5.3 SUBCONTRACTUAL RELATIONSHIPS

5.3.1 By appropriate agreement, written where legally required for validity, the Contractor shall require each sub-contractor, to the extent of the Work to be performed by the sub-contractor, to be bound to the Contractor by terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities which the Contractor, by these Documents, assumes toward the Owner and Architect. Each subcontract agreement shall preserve and protect the rights of the Owner and Architect under the Contract Documents with respect to the Work to be performed by the sub-contractor so that subcontracting thereof will not prejudice such rights, and shall allow to the sub-contractor, unless specifically provided otherwise in the subcontract agreement, the benefit of all rights, remedies and redress against the Contractor that the Contractor, by the Contract Documents, has against the Owner. Where appropriate, the Contractor shall require each sub-contractor to enter into similar agreements with sub-subcontractors. The Contractor shall make available to each proposed sub-contractor, prior to the execution of the subcontract agreement, copies of the Contract Documents to which the sub-contractor will be bound, and, upon written request of the sub-contractor, identify to the sub-contractor terms and conditions of the proposed subcontract agreement which may be at variance with the Contract Documents.

Sub-contractors shall similarly make copies of applicable portions of such documents available to their respective proposed sub-subcontractors.

5.4 CONTINGENT ASSIGNMENT OF SUBCONTRACTS

5.4.1 Each subcontract agreement for a portion of the Work is assigned by the Contractor to the Owner provided that:

.1 assignment is effective only after termination of the Contract by the Owner for cause pursuant to
Paragraph 14.2 and only for those subcontract agreements which the Owner accepts by notifying the sub-contractor in writing; and

.2 assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract.

5.4.2 If the Work has been suspended for more than 30 days, the sub-contractor's compensation shall be equitably adjusted.

ARTICLE 6 - CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

6.1 OWNER'S RIGHT TO PERFORM CONSTRUCTION AND TO AWARD SEPARATE CONTRACTS

6.1.1 The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and to award separate contracts in connection with other portions of the Project or other construction or operations on the site under conditions of the Contract identical or substantially similar to these including those portions related to insurance and waiver of subrogation. If the Contractor claims that delay or additional cost is involved because of such action by the Owner, the Contractor shall make such Claim as provided elsewhere in the Contract Documents.

6.1.2 When separate contracts are awarded for different portions of the Project or other construction or operations on the site, the term "Contractor" in the Contract Documents in each case shall mean the Contractor who executes each separate Owner-Contractor Agreement.

6.1.3 The Owner shall provide for coordination of the activities of the Owner's own forces and each separate contractor with the Work of the Contractor, who shall cooperate with them. The Contractor shall participate with other separate contractors and the Owner in reviewing their construction schedules when directed to do so. The Contractor shall make any revisions to the construction schedule and Contract Sum deemed necessary after a joint review and mutual agreement. The construction schedules shall then constitute the schedules to be used by the Contractor, separate contractors and the Owner until subsequently revised.

6.1.4 Unless otherwise provided in the Contract Documents, when the Owner performs construction or operations related to the Project with the Owner's own forces, the Owner shall be deemed to be subject to the same obligations and to have the same rights which apply to the Contractor under the Conditions of the Contract, including, without excluding others, those stated in Article 3, this Article 6 and Articles 10, and 12.

6.2 MUTUAL RESPONSIBILITY

6.2.1 The Contractor shall afford the Owner and separate contractors reasonable opportunity for introduction and storage of their materials and equipment and performance of their activities and shall connect and coordinate the Contractor's construction and operations with theirs as required by the Contract Documents.

6.2.2 If part of the Contractor's Work depends for proper execution or results upon construction or operations by the Owner or a separate contractor, the Contractor shall, prior to proceeding with that portion of the work, promptly report to the Architect apparent discrepancies or defects in such other construction that would render it unsuitable for such proper execution and results. Failure of the Contractor to report shall constitute an acknowledgment that the Owner's or separate contractors' completed or partially completed construction is fit and proper to receive the Contractor's Work, except as to defects not then reasonably discoverable.

6.2.3 Costs caused by delays or improperly timed activities or defective construction shall be borne by the party responsible therefor.

6.2.4 The Contractor shall promptly remedy damage caused by the Contractor to completed or partially completed construction or to property of the Owner or separate contractors as provided in subparagraph 10.2.5.

6.2.5 Claims and other disputes and matters in question between the Contractor and a separate contractor shall be subject to the provisions of Paragraph 4.3 provided the separate contractor has reciprocal obligations.

6.2.6 The Owner and each separate contractor shall have the same responsibilities for cutting and patching as are described for the Contractor in Paragraph 3.14.

6.3 OWNER'S RIGHT TO CLEAN UP

6.3.1 If a dispute arises among the Contractor, separate contractors and the Owner as to the responsibility under their respective contracts for maintaining the premises and surrounding area free from waste materials and rubbish as described in Paragraph 3.15, the Owner may clean up and allocate the cost among those responsible as the Architect determines to be just.

ARTICLE 7 - CHANGES IN THE WORK

7.1 CHANGES

7.1.1 Changes in the Work may be accomplished after execution of the Contract, and without invalidating the Contract, by Change Order, Construction Change Directive, Architect’s Supplemental Instruction (ASI) or order for a minor change in the Work, subject to the limitations stated in this Article 7 and elsewhere in the Contract Documents.

7.1.2 A Change Order shall be based upon agreement among the Owner, Contractor and Architect; a Construction Change Directive requires agreement by the Owner and Architect and may or may not be agreed to by the Contractor; an Architect’s Supplemental Instructions (ASI) for a minor change in the Work may be issued by the Architect alone.

7.1.3 Changes in the Work shall be performed under applicable provisions of the Contract Documents and the Contractor shall proceed promptly unless otherwise provided in the Change Order, Construction Change Directive, Architect's Supplemental Instruction (ASI) for a minor change in the Work. Except as permitted in Paragraph 7.3 and Paragraph 9.7.2, a change in the Contract Sum or the Contract Time shall be accomplished only by Change Order. Accordingly, no course of conduct or dealings between the parties, nor express or implied acceptance of alterations or additions to the Work, and no claim that the Owner has been unjustly enriched by any alteration or addition to the Work, whether or not there is, in fact, any unjust enrichment to the Work, shall be the basis of any claim to an increase in any amounts due under the Contract Documents or a change in any time period provided for in the Contract Documents.

7.1.4 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are so changed in a proposed Change Order or Construction Change Directive that application of such unit prices to quantities of Work proposed will cause substantial inequity to the Owner or Contractor, the applicable unit prices shall be equitably adjusted.

7.2 CHANGE ORDERS

7.2.1 A Change Order is a written instrument prepared by the Architect and signed by the Owner, Contractor and Architect stating their agreement upon all of the following:

- **.1** a change in the Work;
- **.2** the amount of the adjustment in the Contract Sum, if any; and
- **.3** the extent of the adjustment in the Contract Time, if any.

7.2.2 Methods used in determining adjustments to the Contract Sum may include those listed in subparagraph 7.3.3.

7.2.3 Agreement on any Change Order shall constitute a final settlement of all matters relating to the change in the Work, which is the subject of the Change Order, including, but not limited to, all direct and indirect costs associated with such change and any and all adjustments to the Contract Sum, Contract Time, and the construction schedule. In the event a Change Order increases the Contract Sum, Contractor shall include the Work covered by such Change Orders in Applications for Payment as if such Work were originally part of the Contract Documents.

7.3 CONSTRUCTION CHANGE DIRECTIVES

7.3.1 A Construction Change Directive is a written order prepared by the Architect and signed by the Owner and Architect, directing a change in the Work and stating a proposed basis for adjustment, if any, in the Contract Sum or Contract Time, or both. The Owner may by Construction Change Directive, without invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletions or other revisions, the Contract Sum and Contract Time being adjusted accordingly.

7.3.2 A Construction Change Directive shall be used in the absence of total agreement on the terms of a Change Order.

7.3.3 If the Construction Change Directive provides for an adjustment to the Contract Sum, the adjustment shall be based on one of the following methods:

.1 mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;
.2 unit prices stated in the Contract Documents or subsequently agreed upon;
.3 cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or
.4 as provided in subparagraph 7.3.6

7.3.4 Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the Work involved and advise the Architect of the Contractor's agreement or disagreement with the method, if any, provided in the Construction Change Directive for determining the proposed adjustment in the Contract Sum or Contract Time.

7.3.5 A Construction Change Directive signed by the Contractor indicates the agreement of the Contractor therewith including adjustment in Contract Sum and Contract Time or the method for determining them. Such agreement shall be effective immediately and shall be recorded as a Change Order.

7.3.6 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the method and the adjustment shall be determined by the Architect on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, a reasonable allowance for overhead and profit.

In such case, and also under Clause 7.3.3.3, the Contractor shall keep and present, in such form as the Architect may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this subparagraph 7.3.6 shall be limited to the following:

.1 costs of labor, including social security, old age and unemployment insurance, fringe benefits required by agreement or custom, and workers' compensation insurance;
.2 costs of materials, supplies and equipment, including cost of transportation, whether incorporated or consumed;
.3 rental costs of machinery and equipment, exclusive of small tools, whether rented from the Contractor or others. The rental value of the Contractor's own equipment shall not be more than 50% of the fair rental value of such equipment in Pueblo County and in no event shall the aggregate amount charged to the Owner for such equipment exceed 50% of the fair market value of the equipment itself. Fair market value shall be based on the depreciated value of any Contractor owned equipment as shown on Contractor's books. Small tools and consumables shall be included in overhead;
.4 costs of premiums for all bonds and insurance, permit fees, and sales, use or similar taxes related to the Work; however, cost of premiums for all bonds and insurance shall not be added to the construction charges until such changes would total 5% of the original Contract amount.

.5 additional costs of supervision and field office personnel directly attributable to the change.

7.3.7 Pending final determination of cost to the Owner, amounts not in dispute may be included in Applications for Payment. The amount of credit to be allowed by the Contractor to the Owner for a deletion or change which results in a net decrease in the Contract Sum shall be actual net cost as confirmed by the Architect. When both additions and credits covering related Work of substitutions are involved in a change, the allowance for overhead and profit shall be figured on the basis of net increase, if any, with respect to that change.

7.3.8 If the Owner and Contractor do not agree with the adjustment in Contract Time or the method for determining it, the adjustment or the method shall be referred to the Architect for determination.

7.3.9 When the Owner and Contractor agree with the determination made by the Architect concerning the adjustments in the Contract Sum and Contract Time, or otherwise reach agreement upon the adjustments, such agreement shall be effective immediately and shall be recorded by preparation and execution of an appropriate Change Order.

7.4 MINOR CHANGES IN THE WORK

7.4.1 The Architect will have authority to issue an Architect's Supplemental Instruction (ASI) for minor changes in the Work not involving adjustment in the Contract Sum or extension of the Contract Time and not inconsistent with the intent of the Contract Documents. Such changes shall be affected by written order and shall be binding on the Owner and Contractor. The Contractor shall carry out such written orders promptly.

7.4.2 An Architect's Supplemental Instruction (ASI) can only be used to resolve informational issues or make minor changes that do not affect construction cost or construction timeline.

7.4.3 The Architect's Supplemental Instruction (ASI) shall be used in response to the Contractor's Request for Information (RFI).

7.5 AGREED OVERHEAD AND PROFIT RATES

7.5.1 For any adjustments to the Contract Sum which are based on other than the unit prices method, the Contractor agrees to charge, and accept, as payment for overhead and profit, the following percentages of costs attributable to the change in the Work;

- **.1** for the sub-contractor, 12% of the net extra cost of the Work it performs;
- **.2** for the Contractor, 6% of the net extra cost of the Work performed by sub-contractors;
- **.3** for the Contractor, 12% of the net extra cost of the Work it performs with its own forces.

ARTICLE 8 - TIME

8.1 DEFINITIONS

8.1.1 Unless otherwise provided, Contract Time is the period of time, including authorized adjustments, allotted in the Contract Documents for Substantial Completion of the Work.

8.1.2 The date of commencement of the Work shall be the date issued in the Notice to Proceed. The date shall not be postponed by the failure to act of the Contractor or of persons or entities for whom the Contractor is responsible.

8.1.3 The date of Substantial Completion is the date certified by the Architect in accordance with Paragraph 9.8.

8.1.4 The term "day" as used in the Contract Documents shall mean calendar day unless otherwise specifically defined.

8.2 PROGRESS AND COMPLETION

8.2.1 Time limits stated in the Contract Documents are of the essence of the Contract. By executing the Agreement the Contractor confirms that the Contract Time is a reasonable period for performing the Work.

8.2.2 The Contractor shall not knowingly, except by agreement or instruction of the Owner in writing, prematurely commence operations on the site or elsewhere prior to the effective date of insurance required by Article 11 to be furnished by the Contractor. The date of commencement of the work shall not be changed by the effective date of such insurance.

8.2.3 The Contractor shall proceed expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time.

8.3 DELAYS AND EXTENSIONS OF TIME

8.3.1 If the Contractor is delayed at any time in progress of the Work by an act or neglect of the Owner or Architect, or of an employee of either, or of a separate contractor employed by the Owner, or by changes ordered in the Work, or by labor disputes, fire, unusual delay in deliveries, unavoidable casualties or other causes beyond the Contractor's control, or by delay authorized by the Owner, or by other causes which the Architect determines may justify delay, then the Contract Time shall be extended by Change Order, but only to the extent such delay is a critical path delay which will prevent the Contractor from achieving Substantial Completion within the Contract Time and if the performance of the Work is not, was not or would not have been delayed by any other cause for which the Contractor is not entitled to an extension in the Contract Time under the Contract Documents. The Contractor further acknowledges and agrees that adjustments in the Contract Time will be permitted for a delay only to the extent such delay (1) is not caused, or could not have been anticipated, by the Contractor, (2) could not be limited or avoided by the Contractor's timely notice to the Owner of delay and (3) is of a duration not less than one (1) day.

8.3.2 Claims relating to time shall be made in accordance with applicable provisions of Paragraph 4.3.

8.3.3 This Paragraph 8.3 does not preclude recovery of damages for delay by either party under other provisions of the Contract Documents.

8.3.4 No extension of time will be allowed for extra work authorized by the Owner, unless the time of completion is adjusted and agreed to prior to the issuance of Change Order for the extra Work. If any time adjustment is agreed to, it will be so stated in writing on Change Order and accepted by the Owner.

8.3.5 No extension of time will be allowed unless the Contractor shall show that the entire Work of his Contract was or will be delayed for the extension requested.

ARTICLE 9 - PAYMENTS AND COMPLETION

9.1 CONTRACT SUM

9.1.1 The Contract Sum is stated in the Agreement and, including authorized adjustments, is the total amount payable by the Owner to the Contractor for performance of the Work under the Contract Documents.

9.2 SCHEDULE OF VALUES

9.2.1 Upon execution of the Agreement, the Contractor shall submit to the Architect a schedule of values allocated to various portions of the Work, prepared in such form and supported by such data to substantiate its accuracy as the Architect may require. This schedule, unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment.

9.3 APPLICATIONS FOR PAYMENT

9.3.1 At least ten (10) days before the date established for each progress payment, the Contractor shall submit to the Architect an itemized Application for Payment for operations completed in accordance with the schedule of values. Such application shall be notarized, if required, and supported by such data substantiating the Contractor's right to payment as the Owner or Architect may require, such as copies of requisitions from sub-contractors and material suppliers, and reflecting retainage if provided for elsewhere in the Contract Documents.

9.3.1.**1** Such applications may include requests for payment on account of changes in the Work which have been properly authorized by Construction Change Directives but not yet included in Change Orders.

9.3.1.2 Such applications may not include requests for payment of amounts the Contractor does not intend to pay to a sub-contractor or material supplier because of a dispute or other reason.

9.3.2 Unless otherwise provided in the Contract Documents, payments shall be made on account of materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work. If approved in advance by the Owner, payment may similarly be made for materials and equipment suitably stored off the site at a location agreed upon in writing. Payment for materials and equipment stored on or off the site shall be conditioned upon compliance by the Contractor with procedures satisfactory to the Owner to establish the Owner's title to such materials and equipment or otherwise protect the Owner's interest, and shall include applicable insurance, storage and transportation to the site for such materials and equipment stored off the site.

9.3.3 The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment, all Work for which Certificates for Payment have been previously issued and payments received from the Owner shall, to the

best of the Contractor's knowledge, information and belief, be free and clear of liens, claims, security interests, or encumbrances in favor of the Contractor, sub-contractors, material suppliers, or other persons or entities making a claim by reason of having provided labor, materials and equipment relating to the Work.

9.4 CERTIFICATES FOR PAYMENT

9.4.1 The Architect will, within seven days after receipt of the Contractor's Application for Payment, either issue to the Owner a Certificate for Payment, with a copy to the Contractor, for such amount as the Architect determines is properly due, or notify the Contractor and Owner in writing of the Architect's reasons for withholding certification in whole or in part as provided in subparagraph 9.5.1.

9.4.2 The issuance of a Certificate for Payment will constitute a representation by the Architect to the Owner, based on the Architect's observations at the site and the data comprising the Application for Payment, that the Work has progressed to the point indicated. The foregoing representations are subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion, to results of subsequent tests and inspections, to minor deviations from the Contract Documents correctable prior to completion and to specific qualifications expressed by the Architect. The issuance of a Certificate for Payment will further constitute a representation that the Contractor is entitled to payment in the amount certified. However, the issuance of a Certificate for Payment will not be a representation that the Architect has (1) made exhaustive or continuous on-site inspections to check the quality or quantity of the Work, (2) reviewed construction means, methods techniques, sequences or procedures, (3) review copies of requisitions received from sub-contractors and material suppliers and other requested by the Owner to substantiate the Contractor's right to payment or (4) made examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Sum.

9.5 DECISIONS TO WITHHOLD CERTIFICATION

9.5.1 The Architect may decide not to certify payment and may withhold a Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Architect's opinion the representations to the Owner required by subparagraph 9.4.2 cannot be made. If the Architect is unable to certify payment in the amount of the application, the Architect will notify the Contractor and Owner as provided in subparagraph 9.4.1. If the Contractor and Architect cannot agree on a revised amount, the Architect will promptly issue a Certificate for Payment for the amount for which the Architect is able to make such representations to the Owner. The Architect may also decide not to certify payment or, because of subsequently discovered evidence or subsequent observations, may nullify the whole or a part of a Certificate for Payment previously issued, to such extent as may be necessary in the Architect's opinion to protect the Owner from loss because of:

- **.1** defective Work not remedied
- **.2** claims filed or reasonable evidence indicating probable filing of such claims
- **.3** failure of the Contractor to make payments properly to sub-contractors or for labor, materials, or equipment;
- **.4** reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;
- **.5** damage to the Owner or another contractor;

.6 reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay; or

.7 failure in the Owner's reasonable judgement to carry out the Work in accordance with the Contract Documents.

9.5.2 When any of the above reasons for withholding certification are removed, certification will be made for amounts previously withheld.

9.6 PROGRESS PAYMENTS

9.6.1 After the Architect has issued a Certificate for Payment, the Owner shall make payment in the manner and within the time provided in the Contract Documents, and shall so notify the Architect.

9.6.2 The Contractor shall promptly pay each sub-contractor upon receipt of payment from the Owner, out of the amount paid to the Contractor on account of such sub-contractor's portion of the Work, the amount to which said sub-contractor is entitled, reflecting percentage actually retained from payments to the Contractor on account of such sub-contractor's portion of the Work. The Contractor shall, by appropriate agreement with each sub-contractor, require each sub-contractor to make payments to sub-subcontractors in similar manner.

9.6.3 The Architect will, on request, furnish to a sub-contractor, if practicable, information regarding percentages of completion or amounts applied for by the Contractor and action taken thereon by the Architect and Owner on account of portions of the Work done by such sub-contractor.

9.6.4 Neither the Owner nor Architect shall have an obligation to pay or to see to the payment of money to a sub-contractor except as may otherwise be required by law.

9.6.5 Payment to material suppliers shall be treated in a manner similar to that provided in subparagraphs 9.6.2, 9.6.3, and 9.6.4.

9.6.6 A Certificate for Payment, a progress payment, or partial or entire use or occupancy of the Project by the Owner shall not constitute acceptance of Work not in accordance with the Contract Documents.

9.7 FAILURE OF PAYMENT

9.7.1 If the Architect does not issue a Certificate for Payment, through no fault of the Contractor, within seven days after receipt of the Contractor's Application for Payment, or if the Owner does not pay the Contractor within seven days after the date established in the Contract Documents the amount certified by the Architect, then the Contractor may, upon thirty additional days' written notice to the Owner and Architect, stop the Work until payment of the amount owing has been received. The Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shut down delay and start-up which shall be accomplished as provided in Article 7.

9.7.2 If the Owner is entitled to reimbursement or payment from the Contractor under, or pursuant to, the Contract Documents, such payment shall be made promptly upon demand by the Owner. Notwithstanding anything contained in the Contract Documents to the

contrary, if the Contractor fails to promptly make any payment due the Owner, or the Owner incurs any costs and expenses to cure any default of the Contractor or to correct defective Work, the Owner shall have an absolute right to offset such amount against the Contract Sum and may, in the Owner's sole discretion, elect either to: (1) deduct an amount equal to that which the Owner is entitled from any payment then or thereafter due the Contractor from the Owner, or (2) issue a written notice to the Contractor reducing the Contract Sum by an amount equal to that which the Owner is entitled.

9.8 SUBSTANTIAL COMPLETION

9.8.1 Substantial Completion is the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so the Owner can occupy or utilize the Work for its intended use; provided, however, that as a condition precedent to Substantial Completion, the Owner has received all certificates of occupancy and any other permits, approvals, licenses, and other documents from any governmental authority having jurisdiction thereof necessary for the beneficial occupancy of the Project.

9.8.2 When the Contractor considers that the Work, or a portion thereof which the Owner agrees to accept separately, is substantially complete, the Contractor shall prepare and submit to the Architect a comprehensive list of items to be completed or corrected. The Contractor shall proceed promptly to complete and correct items on the list. Failure to include an item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents. Upon receipt of the Contractor's list, the Architect will make a site visit to determine whether the Work or designated portion thereof is substantially complete. If the Architect's observation discloses any item, whether or not included on the Contractor's list, which is not in accordance with the requirements of the Contract Documents, the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item upon notification by the Architect. The Contractor shall then submit a request for another observation by the Architect to determine Substantial Completion. When the Work or designated portion thereof is substantially complete, the Architect will prepare a Certificate of Substantial Completion which shall establish the date of Substantial Completion, shall establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damages to the Work and insurance, and shall fix the time within which the Contractor shall finish all items on the list accompanying the Certificate. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion. The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in such Certificate.

9.8.3 Upon Substantial Completion of the Work or designated portion thereof and upon application by the Contractor and certification by the Architect, the Owner shall make payment, reflecting adjustment in retainage, if any, for such Work or portion thereof as provided in the Contract Documents.

9.9 PARTIAL OCCUPANCY OR USE

9.9.1 The Owner may occupy or use any completed or partially completed portion of the Work at any stage when such portion is designated by separate agreement with the Contractor, provided such occupancy or use is consented to by the insurer as required under subparagraph 11.3.10 and authorized by public authorities having jurisdiction over the Work. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage if any, security, maintenance, heat, utilities, damage to the Work and insurance, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents. When the Contractor considers a portion substantially complete, the Contractor shall prepare and submit a list to the Architect as provided under subparagraph 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. The stage of the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect.

9.9.2 Immediately prior to such partial occupancy or use, the Owner, Contractor, and Architect shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work.

9.9.3 Unless otherwise agreed upon, partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents.

9.10 FINAL COMPLETION AND FINAL PAYMENT

9.10.1 Upon receipt of written notice that the Work is ready for final acceptance and upon receipt of a final Application for Payment, the Architect will promptly make a site visit and, when the Architect finds the Work appears to be acceptable under the Contract Documents and the Contract fully performed, the Architect will promptly issue a final Certificate of Payment stating that to the best of the Architect's knowledge, information and belief, and on the basis of the Architect's observations, the Work appears to have been completed in accordance with terms and conditions of the Contract Documents and that the entire balance found to be due the Contractor and noted in said final Certificate is due and payable. The Architect's final Certificate for Payment will constitute a further representation that conditions listed in subparagraph 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled.

9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect (1) an affidavit that payrolls, bills for materials, and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect and will not be cancelled or allowed to expire until at least 30 days' prior written notice has been given to the Owner, (3) a written statement that the Contractor knows of no substantial reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety, if any, to final payment and (5) if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts, releases and waivers of liens, claims, security interests or encumbrances arising out of the Contract, to

the extent and in such form as may be designated by the Owner. If a sub-contractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such lien. If such lien remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging such lien, including all costs and reasonable attorneys' fees.

9.10.3 If, after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of the Contractor or by issuance of Change Orders affecting final completion, and the Architect so confirms, the Owner shall, upon application by the Contractor and certification by the Architect, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance for Work not fully completed or corrected is less than retainage stipulated in the Contract Documents, and if bonds have been furnished, the written consent of surety to payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Architect prior to certification of such payment. Such payment shall be made under terms and conditions governing final payment, except that it shall not constitute a waiver of claims. The making of final payment shall constitute a waiver of claims by the Owner as provided in subparagraph 4.3.5.

9.10.4 Acceptance of final payment by the Contractor, a sub-contractor or material supplier shall constitute a waiver of claims by that payee except those previously made in writing and identified by that payee as unsettled at the time of final Application for Payment. Such waivers shall be in addition to the waiver described in subparagraph 4.3.5.

ARTICLE 10 - PROTECTION OF PERSONS AND PROPERTY

10.1 SAFETY PRECAUTIONS AND PROGRAMS

10.1.1 The Contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the performance of the Contract.

10.1.2 In the event the Contractor encounters on the site material reasonably believed to be asbestos or polychlorinated biphenyl (PCB) which has not been rendered harmless, the Contractor shall immediately stop Work in the area affected and report the condition to the Owner and Architect in writing. The Work in the affected area shall not thereafter be resumed except by written agreement of the Owner and Contractor if in fact the material is asbestos or polychlorinated biphenyl (PCB) and has not been rendered harmless. The Work in the affected area shall be resumed in the absence of asbestos or polychlorinated biphenyl (PCB), or when it has been rendered harmless, by written agreement of the Owner and Contractor, or in accordance with final determination by the Architect. The term "rendered harmless" shall be interpreted to mean that levels of asbestos and polychlorinated biphenyls are less than any applicable exposure standards set forth in current OSHA regulations. In no event, however, shall the Owner have any responsibility for any substance or material that is brought to the Project site by the Contractor, any sub-contractor, any materialman or supplier or any entity for whom any of them is responsible. The Contractor agrees not to use any fill or other materials to be incorporated into the Work which are hazardous, toxic or comprised of any items that are hazardous or toxic.

10.1.3 The Contractor shall not be required pursuant to Article 7 to perform without consent any Work relating to asbestos or polychlorinated biphenyl (PCB).

10.2 SAFETY OF PERSONS AND PROPERTY

10.2.1 The Contractor shall take reasonable precautions for safety of and shall provide reasonable protection to prevent damage, injury or loss to:

- **.1** employees on the Work and other persons who may be affected thereby;
- **.2** the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody, or control of the Contractor or the Contractor's sub-contractors or sub-subcontractors; and
- **.3** other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures and utilities not designated for removal, relocation or replacement in the course of construction.

10.2.2 The Contractor shall give notices and comply with applicable laws, ordinances, rules, regulations and lawful orders of public authorities bearing on safety of persons or property or their protection from damage, injury or loss.

10.2.3 The Contractor shall erect and maintain, as required by existing conditions and performance of the Contract, reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards, promulgating safety regulations and notifying owners and users of adjacent sites and utilities. The Contractor shall also be responsible at its own expense, for all measures necessary to protect any adjacent property, and any damage to such property shall be promptly repaired by Contractor.

10.2.4 When use or storage of explosives or other hazardous materials or equipment or unusual methods are necessary for execution of the Work,the Contractor shall exercise utmost care and carry on such activities under supervision of properly qualified personnel.

10.2.5 The Contractor shall promptly remedy damage and loss (other than damage or loss insured under property insurance required by the Contract Documents) to property referred to in Clauses 10.2.1.2 and 10.2.1.3 caused in whole or in part by the Contractor, a sub-contractor, a sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible under Clauses 10.2.1.2 and 10.2.1.3, except damage or loss attributable to acts or omissions of the Owner or Architect or anyone directly or indirectly employed by either of them, or by anyone for whose acts either of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Paragraph 3.18.

10.2.6 The Contractor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Owner and Architect.

10.2.7 The Contractor shall not load or permit any part of the construction or site to be loaded so as to endanger its safety.

10.3 EMERGENCIES

10.3.1 In an emergency affecting safety or persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury or loss. Additional compensation or extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Paragraph 4.3 and Article 7.

ARTICLE 11 - INSURANCE AND ASSURANCE OF COMPLETION (BONDS)

11.1 CONTRACTOR'S LIABILITY INSURANCE

11.1.1 The Contractor shall purchase from and maintain in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located such insurance as will protect the Contractor from claims set forth below which may arise out of or result from the Contractor's operations under the Contract and for which the Contractor may be legally liable, whether such operations be by the Contractor or by a sub-contractor or anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable:

.1 claims under worker's compensation, disability benefit and other similar employee benefit acts which are applicable to the Work to be performed;

.2 claims for damages because of bodily injury, occupational sickness or disease, or death of the Contractor's employees.

.3 claims for damages because of bodily injury, sickness or disease or death of any person other than the Contractor's employees;

.4 claims for damages insured by usual personal injury liability coverage which are sustained (1) by a person as a result of an offense directly or indirectly related to employment of such person by the Contractor, or (2) by another person;

.5 claims for damages, other than to the Work itself, because of injury to or destruction of tangible property, including loss of use resulting therefrom;

.6 claims for damages because of bodily injury, death of a person or property damage arising out of ownership maintenance or use of a motor vehicle; and

.7 claims involving contractual liability insurance applicable to the Contractor's obligations under Paragraph 3.18.

11.1.2 The insurance required by subparagraph 11.1.1 and purchased by Contractor shall be written for not less than the limits set forth below, or required by law, whichever is greater. Providing limits of coverage less than as specified and extending the limits through the use of "Umbrella" coverage shall be permitted only with review and approval by the Owner.

.1 Worker's Compensation as required by all applicable State, or other laws including Employer's Liability with a limit of at least $100,000 per individual;

.2 Commercial General Liability including Contractor's Liability, Contingent Liability, Contractual Liability, completed operations, endorsements, and Products Liability all on an occurrence basis with bodily Injury Coverage and Broad Form Property Damage Endorsement. Remove the XC-U exclusion relating to Explosion, Collapse, and Underground Property Damage. Completed Operations Liability shall be kept in force for at least two (2) years after the date of final completion. Limits shall be at least:

Bodily Injury
Each Person …….$1,000,000

Each Occurrence…….$1,000,000
Property Damage
Each Accident.....$500,000
Aggregate.....$500,000 or combined single limit of $1,000,000;

.3 Comprehensive Automobile Liability including non-owned and hired car coverage as well as owned vehicles with limits at least:

Bodily Injury
Each Person.....$1,000,000
Each Occurrence…….$1,000,000
Property Damage
Each Occurrence…….$1,000,000 or combined single limit of $1,000,000;

11.1.3 Certificates of Insurance acceptable to the Owner shall be filed with the Owner within ten (10) days of the Notice to Proceed. These Certificates and the insurance policies required by this Paragraph 11.1 shall contain a provision that coverages afforded under the policies will not be cancelled or allowed to expire until at least 30 days' prior written notice has been given to the Owner. If any of the foregoing insurance coverages are required to remain in force after final payment and are reasonably available, an additional certificate evidencing continuation of such coverage shall be submitted with the final Application for Payment as required by subparagraph 9.10.2. Information concerning reduction of coverage shall be furnished by the Contractor with reasonable promptness in accordance with the Contractor's information and belief.

11.2 OWNER'S LIABILITY INSURANCE

11.2.1 The Owner shall be responsible for purchasing and maintaining the Owner's usual liability insurance. Optionally, the Owner may purchase and maintain other insurance for self-protection against claims which may arise from operations under the Contract. The Contractor shall not be responsible for purchasing and maintaining this optional Owner's liability insurance unless specifically required by the Contract Documents.

11.3 PROPERTY INSURANCE

11.3.1 Unless otherwise provided, the Owner shall purchase and maintain, in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located, property insurance in the amount of the initial Contract Sum as well as subsequent modifications thereto for the entire Work at the site on a replacement cost basis without voluntary deductibles. Such property insurance shall be maintained unless otherwise provided in the Contract Documents or otherwise agreed in writing by all persons and entities who are beneficiaries of such insurance, until final payment has been made as provided in Paragraph 9.10 or until no person or entity other than the Owner has an insurable interest in the property required by this Paragraph 11.3 to be covered, whichever is earlier. This insurance shall include interests of the Owner, Contractor, sub-contractors, and sub-subcontractors in the Work.

11.3.1.1 Property insurance shall be on an all-risk policy form and shall insure against the perils of fire and extended coverage and physical loss or damage including, without duplication of coverage, theft, vandalism, malicious mischief, collapse, falsework, temporary buildings and debris removal including demolition occasioned by enforcement of any

applicable legal requirements, and shall cover reasonable compensation for Architect's services and expenses required as a result of such insured loss. Coverage for other perils shall not be required unless otherwise provided in the Contract Documents. The Owner shall purchase and maintain an Installation Floater Policy providing coverage for the Work. The policy will be written on a replacement cost basis with a 100% co-insurance clause on an "All Risk" basis to include the demolition, renovation, and remodeling. There will be a $1,000 deductible per occurrence on the insurance policy and the Contractor and sub-contractors shall be responsible for payment of this deductible. The policy provides coverage to the Contractor and sub-contractors as their interests appear. However, the Contractor and all sub-contractors are encouraged to purchase their own installation floater which will give them coverage for labor and materials on the portion of their Contract. It is also encouraged that Contractor and all sub-contractors have adequate coverage for their tools and equipment since the Owners have no insurable interest in these items and cannot purchase coverage for them. Any loss on these items is the responsibility of the Contractor.

11.3.1.2 If the Owner does not intend to purchase such property insurance required by the Contract and with all of the coverages in the amount described above, the Owner shall so inform the Contractor in writing prior to commencement of the Work. The Contractor may then effect insurance which will protect the interests of the Contractor, sub-contractors and sub-subcontractors in the Work, and by appropriate Change Order the cost thereof shall be charged to the Owner. If the Contractor is damaged by the failure or neglect of the Owner to purchase or maintain insurance as described above, without so notifying the Contractor, then the Owner shall bear all reasonable costs properly attributable thereto.

11.3.1.3 If the property insurance requires minimum deductibles and such deductibles are identified in the Contract Documents, the Contractor shall pay costs not covered because of such deductibles. If the Owner or insurer increases the required minimum deductibles above the amounts so identified or if the Owner elects to purchase this insurance with voluntary deductible amounts, the Owner shall be responsible for payment of the additional costs not covered because of such increased or voluntary deductibles. If deductibles are not identified in the Contract Documents, the Owner shall pay costs not covered because of deductibles.

11.3.2 Loss of Use Insurance. The Owner, at the Owner's option, may purchase and maintain such insurance as will insure the Owner against loss of use of the Owner's property due to fire or other hazards, however caused.

11.3.3 If the Contractor requests in writing that insurance for risks other than those described herein or for other special hazards be included in the property insurance policy, the Owner shall, if possible, include such insurance, and the cost thereof shall be charged to the Contractor by appropriate Change Order. The Owner waives all rights of action against the Contractor for loss of use of the Owner's property, including consequential losses due to fire or other hazards however caused to the extent (1) of actual recovery of any insurance proceeds under policies obtained pursuant to this Paragraph and (2) permitted by the applicable policies of insurance.

11.3.4 If during the Project construction period the Owner insures properties, real or personal or both, adjoining or adjacent to the site by property insurance under policies separate from those insuring the Project, or if after final payment property insurance is to be

provided on the completed Project through a policy or policies other than those insuring the Project during the construction period, the Owner shall waive all rights in accordance with the terms of subparagraph 11.3.6 for damages caused by fire or other perils covered by this separate property, insurance. All separate policies shall provide this waiver of subrogation by endorsement or otherwise.

11.3.5 Before an exposure to loss may occur, the Owner shall file with the Contractor a certificate of insurance evidencing such insurance coverages required by this Paragraph 11.3. Each policy shall contain all generally applicable conditions, definitions, exclusions and endorsements related to this Project. Each policy shall contain a provision that the policy will not be cancelled or allowed to expire until at least 30 days' prior written notice has been given to the Contractor.

11.3.6 Waivers of Subrogation. If permitted by the Owner's and the Contractor's insurance companies, the Owner and Contractor waive all rights against (1) each other and any of their sub-contractors, sub-subcontractors, agents and employees, each of the other, and (2) the Architect, Architect's consultants, separate contractors describe in Article 6, if any, and any of their sub-contractors, sub-subcontractors, agents employees, for damages caused by fire or other perils to the extent of actual recovery of any insurance proceeds under any property insurance applicable to the Work, except such rights as they have to proceeds of such insurance held by the Owner. The Owner or Contractor, as appropriate, shall require of the Architect, Architect's consultants, separate contractors described in Article 6, if any, and the sub-contractors, sub-subcontractors, agents and employees of any of them, by appropriate agreements, written where legally required for validity, similar waivers each in favor of other parties enumerated herein. The policies shall provide such waivers of subrogation by endorsement or otherwise. A waiver of subrogation shall be effective as to a person or entity even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, did not pay the insurance premium directly, or indirectly, and whether or not the person or entity had an insurable interest in the property damaged.

11.3.7 A loss insured under Owner's property insurance shall be adjusted by the Owner as fiduciary and made payable to the Owner for the insured, as their interest may appear, subject to requirements of any applicable mortgagee clause and of subparagraph 11.3.9. The Contractor shall pay sub-contractors their just shares of insurance proceeds received by the Contractor, and by appropriate agreements, written where legally required for validity, shall require sub-contractors to make payments to their sub-subcontractors in similar manner.

11.3.8 If required in writing by a party in interest, the Owner as fiduciary shall, upon occurrence of an insured loss, give bond for proper performance of the Owner's duties. The cost of required bonds shall be charged against proceeds received. The Owner shall deposit in a separate account proceeds so received, which the Owner shall distribute in accordance with such agreement as the parties in interest may reach, or in accordance with an arbitration award in which case the procedure shall be as provided in paragraph 4.5. If after such loss no other special agreement is made, replacement of damaged property shall be covered by appropriate Change Order.

11.3.9 The Owner shall have power to adjust and settle a loss with insurers.

11.3.10 Partial occupancy or use in accordance with Paragraph 9.9 shall not commence until the insurance company or companies providing property insurance have consented to such partial occupancy or use by endorsement or otherwise. The Owner and the Contractor shall take reasonable steps to obtain consent of the insurance company or companies and shall, without mutual written consent, take no action with respect to partial occupancy or use that would cause cancellation, lapse or reduction of insurance.

11.4 ASSURANCE OF COMPLETION

11.4.1 The successful bidder shall furnish an assurance of completion prior to the execution of any Contract under this solicitation. This assurance may be:

a) a performance and payment bond in a penal sum of 100 percent of the contract price;
b) a separate performance and payment bonds each for 50% or more of the contract price.

11.4.2 The Contractor shall provide a performance and payment bond in a penal sum of 100 percent (100%) of the Contract price. Bonds must be obtained from guarantee or surety companies acceptable to the U.S. government and authorized to do business in the State of Colorado. Individual sureties will not be considered. Each bond shall clearly state the rate of premium and the total amount of premium charged. The current signs for the surety company must be attached to the bond. The effective date of the power of attorney shall not precede the date of the bond shall be on or after the execution date of the Contract.

ARTICLE 12 - UNCOVERING AND CORRECTION OF WORK

12.1 UNCOVERING OF WORK

12.1.1 If a portion of the Work is covered contrary to the Architect's request or to requirements specifically expressed in the Contract Documents, it must, if required in writing by the Architect, be uncovered for the Architect's observation and be replaced at the Contractor's expense without change in the Contract Time.

12.1.2 If a portion of the Work has been covered which the Architect has not specifically requested to observe prior to its being covered, the Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, costs of uncovering and replacement shall, by appropriate Change Order, be charged to the Owner. If such Work is not in accordance with the Contract Documents, the Contractor shall pay such costs unless the condition was caused by the Owner or a separate contractor in which event the Owner shall be responsible for payment of such costs.

12.2 CORRECTION OF WORK

12.2.1 The Contractor shall promptly correct Work rejected by the Architect or failing to conform to the requirements of the Contract Documents, whether observed before or after Substantial Completion and whether or not fabricated, installed or completed. The Contractor shall bear costs of correcting such rejected Work, including additional testing and

inspections and compensation for the Architect's services and expenses made necessary thereby.

12.2.2 If, within one year after the date of Substantial Completion of the Work or designated portion thereof, or after the date for commencement of warranties established under subparagraph 9.9.1 or by terms of an applicable special warranty required by the Contract Documents, any of the Work is not found to be in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of written notice from the Owner to do so unless the Owner has previously given the Contractor a written acceptance of such conditions. This period of one year shall be extended with respect to portions of Work first performed after Substantial Completion by the period of time between Substantial Completion and the actual performance of the work. This obligation under this subparagraph 12.2.2 shall survive acceptance of the Work under the Contract and termination of the Contract. The owner shall give such notice promptly after discovery of the condition.

12.2.3 The Contractor shall remove from the site portions of the Work which are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner.

12.2.4 If the Contractor fails to correct nonconforming Work within a reasonable time, the Owner may correct it in accordance with Paragraph 2.4. If the Contractor does not proceed with correction of such nonconforming Work within a reasonable time fixed by written notice from the Architect, the Owner may remove it and store the salvable materials or equipment at the Contractor's expense. If the Contractor does not pay costs of such removal and storage within ten days after written notice, the Owner may upon ten additional days' written notice sell such materials and equipment at auction or at private sale and shall account for the proceeds thereof, after deducting costs and damages that should have been borne by the Contractor, including compensation for the Architect's services and expenses made necessary thereby. If such proceeds of sale do not cover costs which the Contractor should have borne, the Contract Sum shall be reduced by the deficiency. If payments then or thereafter due the Contractor are not sufficient to cover such amount, the Contractor shall pay the difference to the Owner.

12.2.5 The Contractor shall bear the cost of correcting destroyed or damaged construction, whether completed or partially completed of the Owner or separate contractors caused by the Contractor's correction or removal of Work which is not in accordance with the requirements of the Contract Documents.

12.2.6 Nothing contained in this Paragraph 12.2. shall be construed to establish a period of limitation with respect to other obligations which the Contractor might have under the Contract Documents. Establishment of the time period of one year as described in subparagraph 12.2.2. relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

12.3 ACCEPTANCE OF NONCONFORMING WORK

12.3.1 If the Owner prefers to accept Work which is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, in which case the Contract Sum will be reduced as appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made.

ARTICLE 13 - MISCELLANEOUS PROVISIONS

13.1 GOVERNING LAW

13.1.1 The Contract shall be governed by the Law of the State of Colorado.

13.1.2 Venue of any suit or cause of action under or related to this Contract shall be in Pueblo County, Colorado. Should any section of this Contract be found to be invalid, it is agreed that all other sections shall remain in full force and effect.

13.1.3 The General Contractor selected and under contract will be required to comply with the Employment Eligibility Verification Program (EEVP). The State of Colorado requires that the General Contractor provide the information prescribed in the EEVP. The General Contractor in turn provides HACP with a filled out form verifying that all sub-contractors under contract for this project as well as the General Contractor do not have illegal aliens working for them.

13.2 SUCCESSORS AND ASSIGNS

13.2.1 The Owner and Contractor respectively bind themselves, their partners, successors, assigns and legal representatives to the other party hereto and to partners, successors, assigns and legal representatives of such other party in respect to covenants, agreements and obligations contained in the Contract Documents. Neither party to the Contract shall assign the Contract without written consent of the other. If either party attempts to make such an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

13.3 WRITTEN NOTICE

13.3.1 Written notice shall be deemed to have been duly served if delivered in person to the individual or a member of the firm or entity or to an officer of the corporation for which it was intended, or if delivered at or sent by registered or certified mail to the last business address known to the party giving notice.

13.4 RIGHTS AND REMEDIES

13.4.1 Duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights and remedies otherwise imposed or available by law.

13.4.2 No action or failure to act by the Owner, Architect or Contractor shall constitute a waiver of a right or duty afforded them under the Contract, nor shall such action or failure to

act constitute approval of or acquiescence in a breach thereunder, except as may be specifically agreed in writing.

13.5 TESTS AND INSPECTIONS

13.5.1 Tests, inspections and approvals of portions of the Work required by the Contract Documents or by laws, ordinances, rules, regulations or orders of public authorities having jurisdiction shall be made at an appropriate time. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections and approvals. The Contractor shall give the Architect timely notice of when and where tests and inspections are to be made Architect may observe such procedures. The Owner shall bear costs of tests, inspections or approvals which do not become requirements until after bids are received or negotiations concluded.

13.5.2 If the Architect, Owner or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection or approval not included under subparagraph 13.5.1 the Architect will, upon written authorization from the Owner, instruct the Contractor to make arrangements for such additional testing, inspection or approval by an entity acceptable to the Owner, and the Contractor shall give time of notice to the Architect of when and where tests and inspections are to be made so the Architect may observe such procedures. The Owner shall bear such costs except as provided in subparagraph 13.5.3.

13.5.3 If such procedures for testing, inspection or approval under subparagraph 13.5.1 and 13.5.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, the Contractor shall bear all costs made necessary by such failure including those of repeated procedures and compensation for the Architect's services and expenses.

13.5.4 Required certificates of testing, inspections or approval shall, unless otherwise required by the Contract Documents, be secured by the Contractor and promptly delivered to the Architect.

13.5.5 If the Architect is to observe tests, inspections or approvals required by the Contract Documents, the Architect will do so promptly and, where practicable, at the normal place of testing.

13.5.6 Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work.

13.6 INTEREST

13.6.1 Payments due and unpaid under the Contract Documents shall bear annual interest from the date payment is due at the rate of three (3%) percent above prime as printed in The Wall Street Journal on the date payment is due.

13.7 EQUAL EMPLOYMENT OPPORTUNITY

13.7.1 During performance of this Contract, the Contractor agrees that it shall not discriminate against any employee, applicant for employment of sub-contractor or supplier because of race, color, religion, sex, national origin, or handicap. The Contractor further agrees that it shall take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, color, religion, sex, national origin, or handicap. Such action shall include, but not be limited to, (1) employment, (2) upgrading, (3) demotion, (4) transfer, (5) recruitment or recruitment advertising, (6) layoff or termination, (7) rates of pay or other forms of compensation, and (8) selection for training, including apprenticeship.

13.8 24 CFR PART 135.38 SECTION 3 CLAUSE

13.8.1 All Section 3 covered Contracts shall include the following clauses:

13.8.1.2 The work to be performed under this contract is subject to the requirements of section 3 of the Housing and Urban Development Act of 1968, as amended, 12 U.S.C. 1701u (section 3). The purpose of section 3 is to ensure that employment and other economic opportunities generated by HUD assistance or HUD-assisted projects covered by section 3, shall, to the greatest extent feasible, be directed to low- and very low-income persons, particularly persons who are recipients of HUD assistance for housing.

13.8.1.3 The parties to this contract agree to comply with HUD's regulations in 24 CFR part 135, which implement section 3. As evidenced by their execution of this contract, the parties to this contract certify that they are under no contractual or other impediment that would prevent them from complying with the part 135 regulations.

13.8.1.4 The contractor agrees to send to each labor organization or representative of workers with which the contractor has a collective bargaining agreement or other understanding, if any, a notice advising the labor organization or workers' representative of the contractor's commitments under this section 3 clause, and will post copies of the notice in conspicuous places at the work site where both employees and applicants for training and employment positions can see the notice. The notice shall describe the section 3 preference, shall set forth minimum number and job titles subject to hire, availability of apprenticeship and training positions, the qualifications for each; and the name and location of the person(s) taking applications for each of the positions; and the anticipated date the work shall begin.

13.8.1.5 The contractor agrees to include this section 3 clause in every subcontract subject to compliance with regulations in 24 CFR part 135, and agrees to take appropriate action, as provided in an applicable provision of the subcontract or in this section 3 clause, upon a finding that the subcontractor is in violation of the regulations in 24 CFR part 135. The contractor will not subcontract with any subcontractor where the contractor has notice or knowledge that the subcontractor has been found in violation of the regulations in 24 CFR part 135.

13.8.1.6 The contractor will certify that any vacant employment positions, including training positions, that are filled (1) after the contractor is selected but before the contract is executed, and (2) with persons other than those to whom the regulations of 24 CFR part 135

require employment opportunities to be directed, were not filled to circumvent the contractor's obligations under 24 CFR part 135.

13.8.1.7 Noncompliance with HUD's regulations in 24 CFR part 135 may result in sanctions, termination of this contract for default, and debarment or suspension from future HUD assisted contracts.

13.8.1.8 With respect to work performed in connection with section 3 covered Indian housing assistance, section 7(b) of the Indian Self-Determination and Education Assistance Act (25 U.S.C. 450e) also applies to the work to be performed under this contract. Section 7(b) requires that to the greatest extent feasible (i) preference and opportunities for training and employment shall be given to Indians, and (ii) preference in the award of contracts and subcontracts shall be given to Indian organizations and Indian-owned Economic Enterprises. Parties to this contract that are subject to the provisions of section 3 and section 7(b) agree to comply with section 3 to the maximum extent feasible, but not in derogation of compliance with section 7(b).

13.8.2 The minimum requirement for the ensurement of employment of low and very low-income recipients shall be (10) fulltime positions but not less than 30% of the contractor's aggregate number of new hires whichever is greater. A pool of certified applicants shall be provided to the contractor for employment in the project. Each certified applicant shall have completed a job training and safety program.

13.8.2.1 Contracts. Numerical goals set forth in paragraph (c) of this section apply to contracts awarded in connection with all section 3 covered projects and section 3 covered activities. Each recipient and contractor and subcontractor (unless the contract or subcontract awards do not meet the threshold specified in §135.3(a)(3)) may demonstrate compliance with the requirements of this part by committing to award to section 3 business concerns:

13.8.2.2 At least 10 percent of the total dollar amount of all section 3 covered contracts for building trades work for maintenance, repair, modernization or development of public or Indian housing, or for building trades work arising in connection with housing rehabilitation, housing construction and other public construction; and

13.8.2.3 At least three (3) percent of the total dollar amount of all other section 3 covered contracts.

13.8.3 The parties to this Contract agree to comply with HUD's regulations in 24 CFR part 135, which implement Section 3. As evidenced by their execution of this Contract, the parties to this Contract certify that they are under no contractual or other impediment that would prevent them from complying with the part 135 regulations.

13.8.4 The Contractor agrees to send to each labor organization or representative of workers with which the Contractor has a collective bargaining agreement or other understanding, a notice advising the labor organization or workers representative of the Contractor's commitments under this Section 3 clause, and will post copies to the notice in

conspicuous places at the work site where both employees and applicants for training and employment positions can see the notice. The notice shall describe the Section 3.

13.8.5 The Contractor agrees to include this Section 3 clause in every subcontract subject to compliance with regulations in 24 CFR part 135, and agrees to take appropriate action, as provided in an applicable provision of the subcontract or in this Section 3 clause, upon finding that the sub-contractor is in violation of the regulations in 24 CFR part 135.

The Contractor will not sub-contract with any sub-contractor where the Contractor has notice or knowledge that the sub-contractor has been found in violation of the regulations in 24 CFR part 135.

13.8.6 The Contractor will certify that any vacant employment positions, including training positions, that are filled (1) after the Contractor is selected but before the Contact is executed and (2) with persons other than those to whom the regulations of 24 CFR part 135 require employment opportunities to be directed, were not filled to circumvent the Contractor's obligations under 24 CFR part 135.

13.8.7 Noncompliance with HUD's regulations in 24 CFR part 135 may result in sanctions, termination of this Contract for default, and debarment or suspension from future HUD assisted Contracts.

ARTICLE 13 - MISCELLANEOUS PROVISIONS

13.9 LABOR STANDARDS – DAVIS BACON AND RELATED ACTS – MINIMUM WAGES

This addendum is used for both the Project-Based Voucher HACP Contract and the Project-Based Rental Assistance ("PBRA") HACP Contract under the Rental Assistance Demonstration and is applicable for all construction or repair work on projects that are initiated within eighteen (18) months after the effective date of the HACP contract. For PBRA HACP Contracts, it is "Supplementary" to the General Conditions of the Contract.

13.9.1. HUD-FEDERAL LABOR STANDARDS PROVISIONS

The owner is responsible for inserting the entire text of section 1 of this Addendum in all construction contracts for construction or repair work on the project that is initiated within eighteen (18) months of the effective date of the HACP contract and, if the owner performs any rehabilitation work on the project, the owner must comply with all provisions of section 1. (Note: Sections 1(b) and (c) apply only when the amount of the prime contract exceeds $ 100,000.)

(a)(1)(i) Minimum Wages. All laborers and mechanics employed or working upon the site of the work (or under the United States Housing Act of 1937 or under the Housing Act of 1949 in the construction or development of the project) will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made part hereof regardless of any contractual relationship which may be

alleged to exist between the contractor and such laborers and mechanics. Contributions made or costs reasonably anticipated for bona fide fringe benefits under section l(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of 29 CFR 5.5(a)(1)(iv); also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs, which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in 29 CFR 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided, That the employer's [12514] payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under 29 CFR 5.5(a)(1)(ii) and the Davis-Bacon poster (WH-1321)) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

(ii)(A) Any class of laborers or mechanics which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. HUD shall approve an additional classification and wage rate and fringe benefits therefor only when the following criteria have been met: (1) The work to be performed by the classification requested is not performed by a classification in the wage determination; (2) The classification is utilized in the area by the construction industry; and (3) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(B) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and HUD or its designee agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by HUD or its designee to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, DC 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise HUD or its designee or will notify HUD or its designee within the 30-day period that additional time is necessary.

(C) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and HUD or its designee do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), HUD or its designee shall refer the questions, including the views of all interested parties and the recommendation of HUD or its designee, to the Administrator for determination. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise HUD or its designee or will notify HUD or its designee within the 30-day period that additional time is necessary.

(D) The wage rate (including fringe benefits where appropriate) determined pursuant to subparagraphs (a)(1)(ii)(B) or (C) of this paragraph, shall be paid to all workers performing

work in the classification under this contract from the first day on which work is performed in the classification.

(iii) Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor shall either pay the benefit as stated in the wage determinations or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

(iv) If the contractor does not make payments to a trustee or other third person, the contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program: Provided, That the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside, in a separate account, assets for the meeting of obligations under the plan or program.

(2) Withholding. HUD or its designee shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld from the

contractors under this contract or any other Federal contract with the same prime contractor, or any other Federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee or helper, employed or working on the site of the work (or under the United States Housing Act of 1937 or under the Housing Act of 1949 in the construction or development of the project), all or part of the wages required by the contract, HUD or its designee may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased. HUD or its designee may, after written notice to the contractor, disburse such amounts withheld for and on account of the contractor or subcontractor to the respective employees to whom they are due.

(3)(i) Payrolls and Basic Records. Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work (or under the United States Housing Act of 1937, or under the Housing Act of 1949, in the construction or development of the project). Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section l(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5 (a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section l(b)(2)(B) of the Davis-Bacon Act, the contractor shall maintain records which show that the commitment to provide such benefits

is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

(ii)(A) The contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to HUD or its designee if the agency is a party to the contract, but if the agency is not such a party, the contractor will submit the payrolls to the applicant, sponsor, or owner, as the case may be, for transmission to HUD or its designee. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not

be included on weekly transmittals. Instead the payrolls shall only need to include an individually identifying number for each employee (e.g., the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH-347 is available for this purpose from the Wage and Hour Division Web site at http://www.dol.gov/esa/whd/forms/wh347instr.htm or its successor site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to HUD or its designee if the agency is a party to the contract, but if the agency is not such a party, the contractor will submit them to the applicant, sponsor, or owner, as the case may be, for transmission to HUD or its designee, the contractor, or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to the sponsoring government agency (or the applicant, sponsor, or owner).

(B) Each payroll submitted shall be accompanied by a "Statement of compliance," signed by the contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following: (1) That the payroll for the payroll period contains the information required to be provided under 29 CFR 5.5(a)(3)(ii), the appropriate information is being maintained under 29 CFR 5.5 (a)(3)(i), and that such information is correct and complete; (2) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the [12515] payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in 29 CFR part 3; (3) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

(C) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph (a)(3)(ii)(B) of this section.

(D) The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under section 1001 of Title 18 and section 3801 et seq. of Title 31 of the United States Code.

(iii) The contractor or subcontractor shall make the records required under paragraph (a)(3)(i) of this section available for inspection, copying, or transcription by authorized representatives of HUD or its designee or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to

submit the required records or to make them available, HUD or its designee may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

(4)(i) Apprentices and Trainees. Apprentices. Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship Training, Employer and Labor Services or with a State Apprenticeship Agency recognized by the Office, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Office of Apprenticeship Training, Employer and Labor Services or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event the Office of Apprenticeship Training, Employer and Labor

Services, or a State Apprenticeship Agency recognized by the Office, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(ii) Trainees. Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and

individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(iii) Equal Employment Opportunity. The utilization of apprentices, trainees and journeymen under this part shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR part 30.

(5) Compliance with Copeland Act Requirements. The contractor shall comply with the requirements of 29 CFR part 3 which are incorporated by reference in this Addendum.

(6) Subcontracts. The contractor or subcontractor will insert in any subcontracts the clauses contained in section 1(a)(1) through (11) and such other clauses as HUD or its designee may by appropriate instructions require, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in this section 1(a).

(7) Contract Terminations; Debarment. A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

(8) Compliance with Davis-Bacon and Related Act Requirements. All rulings and interpretations of the Davis-Bacon and related Acts contained in 29 CFR parts 1, 3, and 5 are herein incorporated by reference in this contract.

(9) Disputes Concerning Labor Standards. Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and HUD or its designee, the U.S. Department of Labor, or the employees or their representatives.

(10)(i) Certification of Eligibility. By entering into this Addendum, the contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1) or to be awarded HUD contracts or participate in HUD programs pursuant to 24 CFR part 24.

(ii) No part of this Contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1) or to be awarded HUD contracts or participate in HUD programs pursuant to 24 CFR part 24. [12516]

(iii) The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001.

11. Complaints, Proceedings, or Testimony by Employees. No laborer or mechanic to whom the wage, salary, or other labor standards provisions of this Addendum are applicable shall be discharged or in any other manner discriminated against by the Contractor or any subcontractor because such employee has filed any complaint or instituted or caused to be instituted any proceeding or has testified or is about to testify in any proceeding under or relating to the labor standards applicable under this Addendum to his employer.

(b) Contract Work Hours and Safety Standards Act. The provisions of this paragraph (b) are applicable only where the amount of the prime contract exceeds $ 100,000. As used in this paragraph, the terms "laborers" and "mechanics" include watchmen and guards.

(1) Overtime Requirements. No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.

(2) Violation; Liability for Unpaid Wages; Liquidated Damages. In the event of any violation of the clause set forth in subparagraph (1) of this paragraph, the contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such

contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages.

Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in subparagraph (1) of this paragraph, in the sum of $ 10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in subparagraph (1) of this paragraph.

(3) Withholding for Unpaid Wages and Liquidated Damages. HUD or its designee shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any monies payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other Federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in subparagraph (2) of this paragraph.

(4) Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses set forth in subparagraphs (1) through (4) of this paragraph and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in subparagraphs (1) through (4) of this paragraph.

(c) Health and Safety. The provisions of this paragraph (c) are applicable only where the amount of the prime contract exceeds $ 100,000.

(1) No laborer or mechanic shall be required to work in surroundings or under working conditions which are unsanitary, hazardous or dangerous to his or her health and safety as determined under construction safety and health standards promulgated by the Secretary of Labor by regulation.

(2) The contractor shall comply with all regulations issued by the Secretary of Labor pursuant to 29 CFR part 1926, and failure to comply may result in imposition of sanctions pursuant to the Contract Work Hours and Safety Standards Act, 40 U.S.C. 3701 et seq.

(3) The contractor shall include the provisions of this paragraph in every subcontract so that such provisions will be binding on each subcontractor. The contractor shall take such action with respect to any subcontract as the Secretary of Housing and Urban Development or the Secretary of Labor shall direct as a means of enforcing such provisions.

13.9.2. WAGE AND CLAIMS ADJUSTMENTS

The owner shall be responsible for the correction of all violations under section 1 of this Addendum, including violations committed by other contractors. In cases where there is evidence of underpayment of salaries or wages to any laborers or mechanics (including apprentices and trainees) by the owner or other contractor or a failure by the owner or other

contractor to submit payrolls and related reports, the owner shall be required to place an amount in escrow, as determined by HUD sufficient to pay persons employed on the work covered by the Addendum the difference between the salaries or wages actually paid such employees for the total number of hours worked and the full amount of wages required under this Addendum, as well as an amount determined by HUD to be sufficient to satisfy any liability of the owner or other contractor for liquidated damages pursuant to section 1 of this Addendum. The amounts withheld may be disbursed by HUD for and on account of the owner or other contractor to the respective employees to whom they are due, and to the Federal Government in satisfaction of liquidated damages under section 1.

13.9.3. EVIDENCE OF UNIT(S) COMPLETION; ESCROW

(a) The owner shall evidence the completion of the unit(s) by furnishing the Contract Administrator a certification of compliance with the provisions of sections 1 and 2 of this Addendum, and that to the best of the owner's knowledge and belief there are no claims of underpayment to laborers or mechanics in alleged violation of these provisions of the Addendum. In the event there are any such pending claims to the knowledge of the owner, the Contract Administrator, or HUD, the owner will place a sufficient amount in escrow, as directed by the Contract Administrator or HUD, to assure such payments.

(b) The escrows required under this section and section 2 of this Addendum shall be paid to HUD, as escrowee, or to an escrowee designated by HUD, and the conditions and manner of releasing and approving such escrows shall be approved by HUD.

Article 13.9.4 Employment Eligibility Verification Program (EEVP)

The General Contractor selected and under contract will be required to comply with the Employment Eligibility Verification Program (EEVP). The State of Colorado requires that the General Contractor provide the information prescribed in the EEVP. The General Contractor in turn provides the HACP with a completed form verifying that all sub-contractors under contract for this project as well as the General Contractor do not have illegal aliens working for them.

ARTICLE 14 - TERMINATION OR SUSPENSION OF THE CONTRACT

14.1 TERMINATION BY THE CONTRACTOR

14.1.1 The Contractor may terminate the Contract if the Work is stopped for a period of 60 days through no act or fault of the Contractor or a sub-contractor, sub-subcontractor or their agents or employees or any other persons performing portions of the Work under contract with the Contractor, for any of the following reasons:

.1 issuance of an order of a court or other public authority having jurisdiction;
.2 an act of government, such as declaration of national emergency, making material unavailable;

14.1.2 If one of the above reasons exists, the Contractor may, upon seven additional days' written notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work executed and for proven loss with respect to materials, equipment,

tools, and construction equipment and machinery including reasonable overhead, profit and damages.

14.1.3 If the Work is stopped for a period of 60 days through no act or fault of the Contractor or a sub-contractor or their agents or employees or any other persons performing portions of the Work under contract with the Contractor because the Owner has persistently failed to fulfill the Owner's obligations under the Contract Documents with respect to matters important to the progress of the Work, the Contractor may, upon seven additional days' written notice to the Owner and the Architect, terminate the Contract and recover from the Owner as provided in subparagraph 14.1.2.

14.2 TERMINATION BY THE OWNER FOR CAUSE

14.2.1 The Owner may terminate the Contract if the Contractor:

- **.1** in the Owner's reasonable judgement repeatedly refuses or fails to supply enough properly skilled workers or proper materials:
- **.2** fails to make payment to sub-contractors for materials or labor in accordance with the respective agreements between the Contractor and the sub-contractors;
- **.3** disregards laws, ordinances, or rules, regulations or orders of a public authority having jurisdiction;
- **.4** is guilty of material breach of a provision of the Contract Documents;
- **.5** breaches any warranty made by the Contractor under or pursuant to the Contract Documents;
- **.6** fails to furnish the Owner with assurances satisfactory to the Owner evidencing the Contractor's ability to complete the Work in compliance with all the requirements of the Contract Documents, or
- **.7** fails after commencement of the Work to proceed continuously with the construction and completion of Work for more than ten (10) days, except as permitted under the Contract Documents.

14.2.2 When any of the above reasons exist, the Owner, upon certification by the Architect that sufficient cause exists to justify such action, may without prejudice to any other rights or remedies of the Owner and after giving the Contractor the Contractor's surety, if any, seven days' written notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

- **.1** take possession of the site and of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;
- **.2** accept assignment of subcontracts pursuant to Paragraph 5.4; and
- **.3** finish the Work by whatever reasonable method the Owner may deem expedient.

14.2.3 When the Owner terminates the Contract for one of the reasons stated in subparagraph 14.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished.

14.2.4 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Architect's service and expenses made necessary thereby, such excess shall be paid to the contractor. If such costs exceed the unpaid balance, the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or

Owner as the case may be, shall be certified by the Architect, upon application, and this obligation for payment shall survive termination of the Contract.

14.3 SUSPENSION BY THE OWNER FOR CONVENIENCE

14.3.1 The Owner may, without cause, order the Contractor in writing to suspend, delay or interrupt the Work in whole or in part for such period of time as the Owner may determine.

14.4 OWNER'S TERMINATION FOR CONVENIENCE

14.4.1 The Owner may, at any time, terminate the Contract, in whole or in part, for the Owner's convenience and without cause. Termination by the Owner under this Paragraph shall be by a notice of Termination delivered to the Contractor specifying the extent of termination and the effective date.

14.4.2 Upon such termination, the Contractor shall recover as its sole remedy payment for Work properly performed in connection with the terminated portion of the Work prior to the effective date of termination and for items properly and timely fabricated off the project site, delivered and stored in accordance with the Owner's instructions. The Contractor hereby waives and forfeits all other claims for payment and damages, including, without limitations, anticipated profits.

14.4.3 The Owner shall be credited for (1) payments previously made to the Contractor for the terminated portion of the Work, (2) claims which the Owner has against the Contractor under the Contract and (3) the value of the materials, supplies, equipment or other items that are to be disposed of by the Contractor that are part of the Contract Sum.

END OF SECTION

Home Energy Rating Certificate

Projected Report

Rating Date:
Registry ID: Unregistered
Ekotrope ID: 123Gqox2

EnergyLogic
analysis. insight. answers.

HERS® Index Score:

50

Your home's HERS score is a relative performance score. The lower the number, the more energy efficient the home. To learn more, visit www.hersindex.com

Annual Savings

$636

*Relative to an average U.S. home

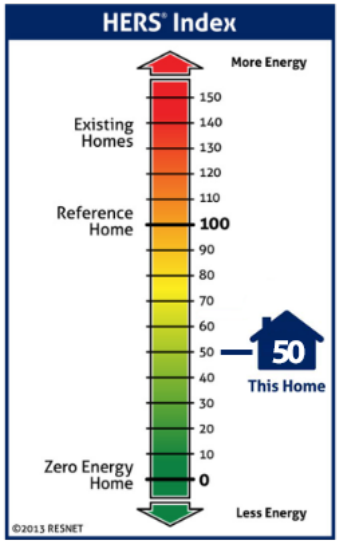
Home:

Pueblo, CO 81004

Builder:
Housing Authority of Pueblo

Your Home's Estimated Energy Use:

	Use [MBtu]	Annual Cost
Heating	15.0	$145
Cooling	0.7	$23
Hot Water	4.6	$44
Lights/Appliances	10.3	$364
Service Charges		$0
Generation (e.g. Solar)	0.0	$0
Total:	**30.6**	**$577**



Home Feature Summary:

Home Type:	Townhouse, end unit
Model:	1 H
Community:	Mountain View Townhomes
Conditioned Floor Area:	687 sq. ft.
Number of Bedrooms:	1
Primary Heating System:	Boiler • Natural Gas • 96 AFUE
Primary Cooling System:	Air Conditioner • Electric • 14.5 SEER
Primary Water Heating:	Boiler • Natural Gas • 0.96 Energy Factor
House Tightness:	3 ACH50
Ventilation:	34.0 CFM • 15.0 Watts
Duct Leakage to Outside:	0 CFM25 (0 / 100 s.f.)
Above Grade Walls:	R-21
Ceiling:	Attic, R-46
Window Type:	U-Value: 0.29, SHGC: 0.3
Foundation Walls:	R-10

This home meets or exceeds the criteria of the following:

Energy Star v3
Energy Star v3.1
2015 International Energy Conservation Code

Rating Completed by:

Energy Rater: Phil Drotar
RESNET ID:9147374

Rating Company: EnergyLogic
PO Box N Berthoud, CO 80513
(970) 556-0839

Rating Provider: EnergyLogic
PO Box N Berthoud, CO 80513
(970) 556-0839

Phil Drotar

Phil Drotar, Certified Energy Rater
Digitally signed: 4/10/19 at 8:39 AM

IECC 2015 Performance Compliance

Property
Pueblo, CO 81004
Model: 1 H
Community: Mountain View Townhor

Reports
Template - Housing Authority of Puel

Organization
EnergyLogic
Phil Drotar

Builder
Housing Authority of Pueblo

Inspection Status
Results are projected

Annual Energy Cost

Design	IECC 2015 Performance	As Designed
Heating	$141	$147
Cooling	$48	$41
Water Heating	$106	$106
SubTotal - Used to determine compliance	**$295**	**$294**
Lights & Appliances	$318	$323
Onsite generation	$0	$0
Total	**$613**	**$617**

Requirements

✓	405.3	Performance-based compliance passes by 0.3%	
⚠	402.4.1.2	Air Leakage Testing	A post construction blower door test is required to verify the air leakage meets the requirement.
✓	402.5	Area-weighted average fenestration SHGC	
✓	402.5	Area-weighted average fenestration U-Factor	
✓	404	Lighting Equipment Efficiency	
✓	R403.6.1	Mechanical Ventilation Efficacy	
✓	Mandatory Checklist	Mandatory code requirements that are not checked by Ekotrope must be met.	
✓	R405.2	Duct Insulation	

Design exceeds requirements for IECC 2015 Performance compliance by 0.3%.

As a 3rd party extension of the code jurisdiction utilizing these reports, I certify that this energy code compliance document has been created in accordance with the requirements of Chapter 4 of the adopted International Energy Conservation Code based on Climate Zone 5. If rating is Projected, I certify that the building design described herein is consistent with the building plans, specifications, and other calculations submitted with the permit application. If rating is Confirmed, I certify that the address referenced above has been inspected/tested and that the mandatory provisions of the IECC have been installed to meet or exceed the intent of the IECC or will be verified as such by another party.

Name: Phil Drotar
Organization: EnergyLogic
Signature: Phil Drotar
Digitally signed: 4/10/19 at 8:39 AM

Energy Code Inspection Checklist

Property
Pueblo, CO 81004
Model: 1 H
Community: Mountain View Townhor

Reports
Template - Housing Authority of Puel

Organization
EnergyLogic
Phil Drotar

Builder
Housing Authority of Pueblo

Inspection Status
Results are projected

General Building Information

Conditioned Area (sq ft)	687
Conditioned Volume (cubic ft)	9,963
Insulated Shell Area (sq ft)	2,827.2

The building energy model in Ekotrope reflects the building assemblies and energy features listed below. Sometimes energy features will change in the field from what has been modeled. The inspection process should identify any changes and ensure that the home continues to meet the applicable energy code.

Slab

☐ Name: crawl floor (687 s.f.)
R-0 perimeter insulation, R-0 under slab insulation.

Framed Floor

None Present

Foundation Wall

☐ Name: Crawl (Exterior Perimeter [ft]: 75, Height Above Grade [ft]: 1, Depth Below Grade [ft]: 3)
R: 10.00
Fully insulated (top to bottom)

Above Grade Wall

☐ Name: AGWx6 (679.6 s.f.)
R-0 continuous insulation, R-21 cavity insulation
Insulation Grade: I

☐ Name: Party (334.3 s.f.)
R-0 continuous insulation, R-21 cavity insulation
Insulation Grade: I

Rim Joist

☐ Name: ambient rim (75 s.f.)
R: 21.00

Energy Code Inspection Checklist

Property
Pueblo, CO 81004
Model: 1 H
Community: Mountain View Townhor

Reports
Template - Housing Authority of Puel

Organization
EnergyLogic
Phil Drotar

Builder
Housing Authority of Pueblo

Inspection Status
Results are projected

Name: party (31.3 s.f.)
R: 19.00

Roof

Name: Flat (720 s.f.)
R-22.75 continuous insulation, R-22.75 cavity insulation
Insulation Grade: I

Opaque Door

Name: Front (20 s.f.)
U: 0.140

Name: Back (20 s.f.)
U: 0.140

Glazing

Name: front (32 s.f.), U: 0.290, SHGC: 0.3, Orientation: SOUTH_EAST

Name: back (36 s.f.), U: 0.290, SHGC: 0.3, Orientation: NORTH_WEST

Skylight

None Present

Mechanical Ventilation

Mechanical ventilation system rated for, and capable of, providing continuous ventilation.
System shall include automatic timing controls.
System type: Exhaust Only, 24 hrs/day, 15 Watts.

Mechanical Equipment

Fuel-fired air distribution (1) • Natural Gas • 100% Heating Load @ 96 AFUE, 100% Hot Water Load @ 0.96 Energy Fact

Air conditioner (2) • Electric • 100% Cooling Load @ 14.5 SEER

Energy Code Inspection Checklist

Property
Pueblo, CO 81004
Model: 1 H
Community: Mountain View Townhor

Reports
Template - Housing Authority of Pueb

Organization
EnergyLogic
Phil Drotar

Builder
Housing Authority of Pueblo

Inspection Status
Results are projected

Air Leakage Control

☐ Test Status: Threshold / Sampled
House is air-sealed as to achieve 498 CFM50 (3.00 ACH50) or less at final blower-door test.

Infiltration Requirements for IECC in Climate Zone 5

2009 IECC Infiltration limit for the design home is 7 ACH50.
2012 IECC Infiltration limit for the design home is 3 ACH50.
2015 IECC Infiltration limit for the design home is 3 ACH50.

Duct Leakage

Duct System 1

Entirely within conditioned space
Tested Post-Construction
Leakage to Outdoors is specified in Ekotrope at 0.0 CFM @ 25Pa
Total Duct Leakage is specified in Ekotrope at 26.0 CFM @ 25Pa

Duct Leakage Code Requirements for IECC

2009 IECC:

Postconstruction Leakage Test: Duct Leakage to Outdoors <= 8 CFM25 / 100 sq ft CFA.
Rough in Test with AHU: Total Duct Leakage <= 6 CFM25 / 100 sq ft CFA.
Rough in Test without AHU: Total Duct Leakage <= 4 CFM25 / 100 sq ft CFA.

2012 IECC and 2015 IECC Prescriptive Path:

Postconstruction Leakage Test: Total Duct Leakage <= 4 CFM25 / 100 sq ft CFA.
Rough in Test with AHU: Total Duct Leakage <= 4 CFM25 / 100 sq ft CFA.
Rough in Test without AHU: Total Duct Leakage <= 3 CFM25 / 100 sq ft CFA.

2015 Performance Path (Cost Compliance):

Leakage testing is required UNLESS all ducts and air handlers are located entirely within the thermal envelope.
There is no pass/fail threshold for duct leakage on the performance path.

Project Notes

Building Specification Summary

Property
Pueblo, CO 81004
Model: 1 H
Community: Mountain View Townhor

Reports
Template - Housing Authority of Puel

Organization
EnergyLogic
Phil Drotar

Builder
Housing Authority of Pueblo

Inspection Status
Results are projected

Building Information

Conditioned Area [sq. ft.]	687.00
Conditioned Volume [cu. ft.]	9,963.00
Thermal Boundary Area [sq. ft.]	2,827.20
Number Of Bedrooms	1
Housing Type	Townhouse, end unit

Rating

HERS Index	50
HERS Index w/o PV	50

Building Shell

Ceiling w/ Attic	R-43 CCF roof deck U-0.02
Vaulted Ceiling	None
Above Grade Walls	2x6 R21 16" OC Fiberglass Batt U-0.05
Found. Walls	R-10 continuous R-10
Framed Floors	None
Slabs	Uninsulated R-0

Windows (largest)	U-Value: 0.29, SHGC: 0.3
Window / Wall Ratio	0.07
Infiltration	3 ACH50
Duct Lkg to Outside	0 CFM25 (0 / 100 s.f.)
Total Duct Leakage	26 CFM25 (Post-Construction)

Mechanical Systems

Heating	Boiler • Natural Gas • 96 AFUE
Cooling	Air Conditioner • Electric • 14.5 SEER
Water Heating	Boiler • Natural Gas • 0.96 Energy Factor
Programmable Thermostat	Yes
Ventilation System	34.0 CFM • 15.0 Watts

Lights and Appliances

Percent Interior LED	100%
Percent Exterior LED	100%
Refrigerator (kWh/yr)	645.0
Dishwasher Efficiency	275 kWh
Ceiling Fan	None

Clothes Dryer Fuel	Electric
Clothes Dryer CEF	2.6
Clothes Washer LER (kWh/yr)	152.0
Clothes Washer Capacity	4.2
Range/Oven Fuel	Electric

Bldg. C, 1 bdrm 1st Floor Unit

Home Energy Rating Certificate

Projected Report

Rating Date:
Registry ID: Unregistered
Ekotrope ID: ILX37652

energyLogic
analysis. insight. answers.

HERS® Index Score:

51

Your home's HERS score is a relative performance score. The lower the number, the more energy efficient the home. To learn more, visit www.hersindex.com

Annual Savings

$637

*Relative to an average U.S. home

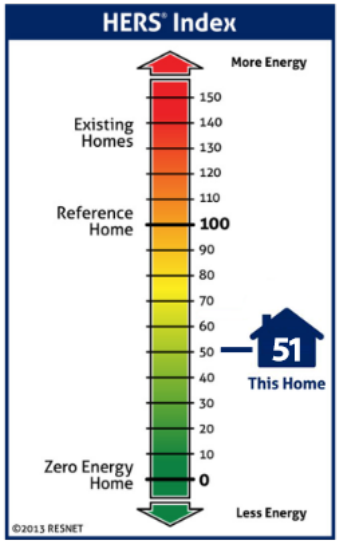
Home:

Pueblo, CO 81004

Builder:
Housing Authority of Pueblo

Your Home's Estimated Energy Use:

	Use [MBtu]	Annual Cost
Heating	15.1	$145
Cooling	0.6	$23
Hot Water	4.6	$44
Lights/Appliances	10.5	$372
Service Charges		$0
Generation (e.g. Solar)	0.0	$0
Total:	**30.8**	**$584**



Home Feature Summary:

Home Type:	Apartment, end unit
Model:	1 Lower
Community:	Mountain View Townhomes
Conditioned Floor Area:	741 sq. ft.
Number of Bedrooms:	1
Primary Heating System:	Boiler • Natural Gas • 96 AFUE
Primary Cooling System:	Air Conditioner • Electric • 14.5 SEER
Primary Water Heating:	Boiler • Natural Gas • 0.96 Energy Factor
House Tightness:	2.5 ACH50
Ventilation:	34.0 CFM • 15.0 Watts
Duct Leakage to Outside:	0 CFM25 (0 / 100 s.f.)
Above Grade Walls:	R-21
Ceiling:	Adiabatic, R-0
Window Type:	U-Value: 0.29, SHGC: 0.3
Foundation Walls:	R-10

This home meets or exceeds the criteria of the following:

Energy Star v3
Energy Star v3.1
2015 International Energy Conservation Code

Rating Completed by:

Energy Rater: Phil Drotar
RESNET ID:9147374

Rating Company: EnergyLogic
PO Box N Berthoud, CO 80513
(970) 556-0839

Rating Provider: EnergyLogic
PO Box N Berthoud, CO 80513
(970) 556-0839

Phil Drotar

Phil Drotar, Certified Energy Rater
Digitally signed: 4/10/19 at 8:47 AM

ekotrope™

Ekotrope RATER - Version:3.1.1.2150

IECC 2015 Performance Compliance

Property
Pueblo, CO 81004
Model: 1 Lower
Community: Mountain View Townhor

Reports
Template - Housing Authority of Puel

Organization
EnergyLogic
Phil Drotar

Builder
Housing Authority of Pueblo

Inspection Status
Results are projected

Annual Energy Cost

Design	IECC 2015 Performance	As Designed
Heating	$141	$146
Cooling	$49	$42
Water Heating	$106	$106
SubTotal - Used to determine compliance	**$296**	**$294**
Lights & Appliances	$325	$329
Onsite generation	$0	$0
Total	**$620**	**$623**

Requirements

✓	405.3	Performance-based compliance passes by 0.6%	
⚠	402.4.1.2	Air Leakage Testing	A post construction blower door test is required to verify the air leakage meets the requirement.
✓	402.5	Area-weighted average fenestration SHGC	
✓	402.5	Area-weighted average fenestration U-Factor	
✓	404	Lighting Equipment Efficiency	
✓	R403.6.1	Mechanical Ventilation Efficacy	
✓	Mandatory Checklist	Mandatory code requirements that are not checked by Ekotrope must be met.	
✓	R405.2	Duct Insulation	

Design exceeds requirements for IECC 2015 Performance compliance by 0.6%.

As a 3rd party extension of the code jurisdiction utilizing these reports, I certify that this energy code compliance document has been created in accordance with the requirements of Chapter 4 of the adopted International Energy Conservation Code based on Climate Zone 5. If rating is Projected, I certify that the building design described herein is consistent with the building plans, specifications, and other calculations submitted with the permit application. If rating is Confirmed, I certify that the address referenced above has been inspected/tested and that the mandatory provisions of the IECC have been installed to meet or exceed the intent of the IECC or will be verified as such by another party.

Name: Phil Drotar
Organization: EnergyLogic
Signature: Phil Drotar
Digitally signed: 4/10/19 at 8:47 AM

Energy Code Inspection Checklist

Property
Pueblo, CO 81004
Model: 1 Lower
Community: Mountain View Townhor

Reports
Template - Housing Authority of Puel

Organization
EnergyLogic
Phil Drotar

Builder
Housing Authority of Pueblo

Inspection Status
Results are projected

General Building Information

Conditioned Area (sq ft)	741
Conditioned Volume (cubic ft)	8,895
Insulated Shell Area (sq ft)	3,127.5

The building energy model in Ekotrope reflects the building assemblies and energy features listed below. Sometimes energy features will change in the field from what has been modeled. The inspection process should identify any changes and ensure that the home continues to meet the applicable energy code.

Slab

☐ Name: crawl floor (741 s.f.)
R-0 perimeter insulation, R-0 under slab insulation.

Framed Floor

None Present

Foundation Wall

☐ Name: Crawl (Exterior Perimeter [ft]: 106.5, Height Above Grade [ft]: 1, Depth Below Grade [ft]: 3)
R: 10.00
Fully insulated (top to bottom)

Above Grade Wall

☐ Name: AGWx6 (852 s.f.)
R-0 continuous insulation, R-21 cavity insulation
Insulation Grade: I

☐ Name: Party (232 s.f.)
R-0 continuous insulation, R-21 cavity insulation
Insulation Grade: I

Rim Joist

☐ Name: ambient rim (106.5 s.f.)
R: 21.00

Energy Code Inspection Checklist

Property
Pueblo, CO 81004
Model: 1 Lower
Community: Mountain View Townhor

Reports
Template - Housing Authority of Puel

Organization
EnergyLogic
Phil Drotar

Builder
Housing Authority of Pueblo

Inspection Status
Results are projected

☐ Name: party (29 s.f.)
R: 19.00

Roof

☐ Name: Flat (741 s.f.)
R-0 continuous insulation, R-0.01 cavity insulation
Insulation Grade: I

Opaque Door

☐ Name: Front (20 s.f.)
U: 0.140

☐ Name: Back (20 s.f.)
U: 0.140

Glazing

☐ Name: front (32 s.f.), U: 0.290, SHGC: 0.3, Orientation: SOUTH_EAST

☐ Name: Copy of front (12 s.f.), U: 0.290, SHGC: 0.3, Orientation: SOUTH_EAST

☐ Name: back (26 s.f.), U: 0.290, SHGC: 0.3, Orientation: NORTH_WEST

Skylight

None Present

Mechanical Ventilation

☐ Mechanical ventilation system rated for, and capable of, providing continuous ventilation.
System shall include automatic timing controls.
System type: Exhaust Only, 24 hrs/day, 15 Watts.

Mechanical Equipment

☐ Fuel-fired air distribution (1) • Natural Gas • 100% Heating Load @ 96 AFUE, 100% Hot Water Load @ 0.96 Energy Fact

Energy Code Inspection Checklist

Property
Pueblo, CO 81004
Model: 1 Lower
Community: Mountain View Townhor

Reports
Template - Housing Authority of Puel

Organization
EnergyLogic
Phil Drotar

Builder
Housing Authority of Pueblo

Inspection Status
Results are projected

☐ Air conditioner (2) • Electric • 100% Cooling Load @ 14.5 SEER

Air Leakage Control

☐ Test Status: Threshold / Sampled
House is air-sealed as to achieve 371 CFM50 (2.50 ACH50) or less at final blower-door test.

Infiltration Requirements for IECC in Climate Zone 5

2009 IECC Infiltration limit for the design home is 7 ACH50.
2012 IECC Infiltration limit for the design home is 3 ACH50.
2015 IECC Infiltration limit for the design home is 3 ACH50.

Duct Leakage

Duct System 1

Entirely within conditioned space
Tested Post-Construction
Leakage to Outdoors is specified in Ekotrope at 0.0 CFM @ 25Pa
Total Duct Leakage is specified in Ekotrope at 30.0 CFM @ 25Pa

Duct Leakage Code Requirements for IECC

2009 IECC:

Postconstruction Leakage Test: Duct Leakage to Outdoors <= 8 CFM25 / 100 sq ft CFA.
Rough in Test with AHU: Total Duct Leakage <= 6 CFM25 / 100 sq ft CFA.
Rough in Test without AHU: Total Duct Leakage <= 4 CFM25 / 100 sq ft CFA.

2012 IECC and 2015 IECC Prescriptive Path:

Postconstruction Leakage Test: Total Duct Leakage <= 4 CFM25 / 100 sq ft CFA.
Rough in Test with AHU: Total Duct Leakage <= 4 CFM25 / 100 sq ft CFA.
Rough in Test without AHU: Total Duct Leakage <= 3 CFM25 / 100 sq ft CFA.

2015 Performance Path (Cost Compliance):

Leakage testing is required UNLESS all ducts and air handlers are located entirely within the thermal envelope.
There is no pass/fail threshold for duct leakage on the performance path.

Project Notes

Building Specification Summary

Property
Pueblo, CO 81004
Model: 1 Lower
Community: Mountain View Townhor

Reports
Template - Housing Authority of Puel

Organization
EnergyLogic
Phil Drotar

Builder
Housing Authority of Pueblo

Inspection Status
Results are projected

Building Information

Conditioned Area [sq. ft.]	741.00
Conditioned Volume [cu. ft.]	8,895.00
Thermal Boundary Area [sq. ft.]	3,127.50
Number Of Bedrooms	1
Housing Type	Apartment, end unit

Rating

HERS Index	51
HERS Index w/o PV	51

Building Shell

Ceiling w/ Attic	None
Vaulted Ceiling	None
Above Grade Walls	2x6 R21 16" OC Fiberglass Batt U-0.05
Found. Walls	R-10 continuous R-10
Framed Floors	None
Slabs	Uninsulated R-0

Windows (largest)	U-Value: 0.29, SHGC: 0.3
Window / Wall Ratio	0.06
Infiltration	2.5 ACH50
Duct Lkg to Outside	0 CFM25 (0 / 100 s.f.)
Total Duct Leakage	30 CFM25 (Post-Construction)

Mechanical Systems

Heating	Boiler • Natural Gas • 96 AFUE
Cooling	Air Conditioner • Electric • 14.5 SEER
Water Heating	Boiler • Natural Gas • 0.96 Energy Factor
Programmable Thermostat	Yes
Ventilation System	34.0 CFM • 15.0 Watts

Lights and Appliances

Percent Interior LED	100%
Percent Exterior LED	100%
Refrigerator (kWh/yr)	645.0
Dishwasher Efficiency	275 kWh
Ceiling Fan	None

Clothes Dryer Fuel	Electric
Clothes Dryer CEF	2.6
Clothes Washer LER (kWh/yr)	152.0
Clothes Washer Capacity	4.2
Range/Oven Fuel	Electric

Home Energy Rating Certificate

Projected Report

Rating Date:
Registry ID: Unregistered
Ekotrope ID: mvoq975L

energyLogic
analysis. insight. answers.

HERS® Index Score:

48

Your home's HERS score is a relative performance score. The lower the number, the more energy efficient the home. To learn more, visit www.hersindex.com

Annual Savings

$673

*Relative to an average U.S. home

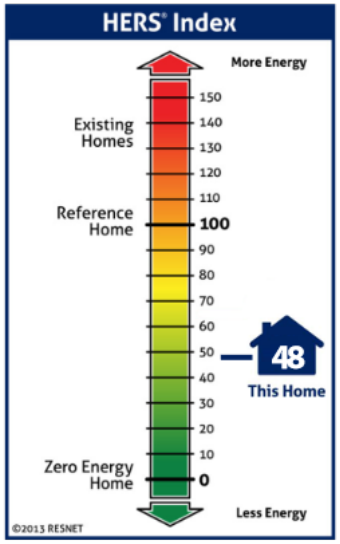
Home:

Pueblo, CO 81004

Builder:
Housing Authority of Pueblo

Your Home's Estimated Energy Use:

	Use [MBtu]	Annual Cost
Heating	11.3	$109
Cooling	1.1	$39
Hot Water	4.5	$43
Lights/Appliances	10.5	$372
Service Charges		$0
Generation (e.g. Solar)	0.0	$0
Total:	**27.4**	**$563**



Home Feature Summary:

Home Type:	Apartment, end unit
Model:	1 upper
Community:	Mountain View Townhomes
Conditioned Floor Area:	741 sq. ft.
Number of Bedrooms:	1
Primary Heating System:	Boiler • Natural Gas • 96 AFUE
Primary Cooling System:	Air Conditioner • Electric • 14.5 SEER
Primary Water Heating:	Boiler • Natural Gas • 0.96 Energy Factor
House Tightness:	3 ACH50
Ventilation:	34.0 CFM • 15.0 Watts
Duct Leakage to Outside:	0 CFM25 (0 / 100 s.f.)
Above Grade Walls:	R-21
Ceiling:	Vaulted Roof, R-36
Window Type:	U-Value: 0.29, SHGC: 0.3
Foundation Walls:	N/A

This home meets or exceeds the criteria of the following:

Energy Star v3
Energy Star v3.1
2015 International Energy Conservation Code

Rating Completed by:

Energy Rater: Phil Drotar
RESNET ID:9147374

Rating Company: EnergyLogic
PO Box N Berthoud, CO 80513
(970) 556-0839

Rating Provider: EnergyLogic
PO Box N Berthoud, CO 80513
(970) 556-0839

Phil Drotar

Phil Drotar, Certified Energy Rater
Digitally signed: 4/10/19 at 8:55 AM

ekotrope™

Ekotrope RATER - Version:3.1.1.2150

IECC 2015 Performance Compliance

Property
Pueblo, CO 81004
Model: 1 upper
Community: Mountain View Townhor

Reports
Template - Housing Authority of Puel

Organization
EnergyLogic
Phil Drotar

Builder
Housing Authority of Pueblo

Inspection Status
Results are projected

Annual Energy Cost

Design	IECC 2015 Performance	As Designed
Heating	$122	$115
Cooling	$60	$57
Water Heating	$105	$105
SubTotal - Used to determine compliance	**$287**	**$278**
Lights & Appliances	$325	$329
Onsite generation	$0	$0
Total	**$612**	**$607**

Requirements

✓	405.3	Performance-based compliance passes by 3.3%	
⚠	402.4.1.2	Air Leakage Testing	A post construction blower door test is required to verify the air leakage meets the requirement.
✓	402.5	Area-weighted average fenestration SHGC	
✓	402.5	Area-weighted average fenestration U-Factor	
✓	404	Lighting Equipment Efficiency	
✓	R403.6.1	Mechanical Ventilation Efficacy	
✓	Mandatory Checklist	Mandatory code requirements that are not checked by Ekotrope must be met.	
✓	R405.2	Duct Insulation	

Design exceeds requirements for IECC 2015 Performance compliance by 3.3%.

As a 3rd party extension of the code jurisdiction utilizing these reports, I certify that this energy code compliance document has been created in accordance with the requirements of Chapter 4 of the adopted International Energy Conservation Code based on Climate Zone 5. If rating is Projected, I certify that the building design described herein is consistent with the building plans, specifications, and other calculations submitted with the permit application. If rating is Confirmed, I certify that the address referenced above has been inspected/tested and that the mandatory provisions of the IECC have been installed to meet or exceed the intent of the IECC or will be verified as such by another party.

Name: Phil Drotar
Organization: EnergyLogic
Signature: Phil Drotar
Digitally signed: 4/10/19 at 8:55 AM

Energy Code Inspection Checklist

Property
Pueblo, CO 81004
Model: 1 upper
Community: Mountain View Townhor

Reports
Template - Housing Authority of Puel

Organization
EnergyLogic
Phil Drotar

Builder
Housing Authority of Pueblo

Inspection Status
Results are projected

General Building Information

Conditioned Area (sq ft)	741
Conditioned Volume (cubic ft)	8,266
Insulated Shell Area (sq ft)	2,846.5

The building energy model in Ekotrope reflects the building assemblies and energy features listed below. Sometimes energy features will change in the field from what has been modeled. The inspection process should identify any changes and ensure that the home continues to meet the applicable energy code.

Slab

None Present

Framed Floor

☐ Name: floor (741 s.f.)
R-0 continuous insulation, R-0 cavity insulation
Insulation Grade: I

Foundation Wall

None Present

Above Grade Wall

☐ Name: AGWx6 (924.5 s.f.)
R-0 continuous insulation, R-21 cavity insulation
Insulation Grade: I

☐ Name: Party (304.5 s.f.)
R-0 continuous insulation, R-21 cavity insulation
Insulation Grade: I

Rim Joist

☐ Name: ambient rim (106.5 s.f.)
R: 21.00

☐ Name: party (29 s.f.)
R: 19.00

Energy Code Inspection Checklist

Property
Pueblo, CO 81004
Model: 1 upper
Community: Mountain View Townhor

Reports
Template - Housing Authority of Puel

Organization
EnergyLogic
Phil Drotar

Builder
Housing Authority of Pueblo

Inspection Status
Results are projected

Roof

☐ Name: Flat (741 s.f.)
R-13 continuous insulation, R-22.75 cavity insulation
Insulation Grade: I

Opaque Door

☐ Name: Front (20 s.f.)
U: 0.140

☐ Name: Back (20 s.f.)
U: 0.140

Glazing

☐ Name: front (32 s.f.), U: 0.290, SHGC: 0.3, Orientation: SOUTH_EAST

☐ Name: Copy of front (12 s.f.), U: 0.290, SHGC: 0.3, Orientation: SOUTH_EAST

☐ Name: back (26 s.f.), U: 0.290, SHGC: 0.3, Orientation: NORTH_WEST

Skylight

None Present

Mechanical Ventilation

☐ Mechanical ventilation system rated for, and capable of, providing continuous ventilation.
System shall include automatic timing controls.
System type: Exhaust Only, 24 hrs/day, 15 Watts.

Mechanical Equipment

☐ Fuel-fired air distribution (1) • Natural Gas • 100% Heating Load @ 96 AFUE, 100% Hot Water Load @ 0.96 Energy Fact

☐ Air conditioner (2) • Electric • 100% Cooling Load @ 14.5 SEER

Energy Code Inspection Checklist

Property
Pueblo, CO 81004
Model: 1 upper
Community: Mountain View Townhor

Reports
Template - Housing Authority of Puel

Organization
EnergyLogic
Phil Drotar

Builder
Housing Authority of Pueblo

Inspection Status
Results are projected

Air Leakage Control

☐ Test Status: Threshold / Sampled
House is air-sealed as to achieve 413 CFM50 (3.00 ACH50) or less at final blower-door test.

Infiltration Requirements for IECC in Climate Zone 5

2009 IECC Infiltration limit for the design home is 7 ACH50.
2012 IECC Infiltration limit for the design home is 3 ACH50.
2015 IECC Infiltration limit for the design home is 3 ACH50.

Duct Leakage

Duct System 1

Entirely within conditioned space
Tested Post-Construction
Leakage to Outdoors is specified in Ekotrope at 0.0 CFM @ 25Pa
Total Duct Leakage is specified in Ekotrope at 30.0 CFM @ 25Pa

Duct Leakage Code Requirements for IECC

2009 IECC:

Postconstruction Leakage Test: Duct Leakage to Outdoors <= 8 CFM25 / 100 sq ft CFA.
Rough in Test with AHU: Total Duct Leakage <= 6 CFM25 / 100 sq ft CFA.
Rough in Test without AHU: Total Duct Leakage <= 4 CFM25 / 100 sq ft CFA.

2012 IECC and 2015 IECC Prescriptive Path:

Postconstruction Leakage Test: Total Duct Leakage <= 4 CFM25 / 100 sq ft CFA.
Rough in Test with AHU: Total Duct Leakage <= 4 CFM25 / 100 sq ft CFA.
Rough in Test without AHU: Total Duct Leakage <= 3 CFM25 / 100 sq ft CFA.

2015 Performance Path (Cost Compliance):

Leakage testing is required UNLESS all ducts and air handlers are located entirely within the thermal envelope.
There is no pass/fail threshold for duct leakage on the performance path.

Project Notes

Building Specification Summary

Property
Pueblo, CO 81004
Model: 1 upper
Community: Mountain View Townhor

Reports
Template - Housing Authority of Puel

Organization
EnergyLogic
Phil Drotar

Builder
Housing Authority of Pueblo

Inspection Status
Results are projected

Building Information

Conditioned Area [sq. ft.]	741.00
Conditioned Volume [cu. ft.]	8,266.00
Thermal Boundary Area [sq. ft.]	2,846.50
Number Of Bedrooms	1
Housing Type	Apartment, end unit

Rating

HERS Index	48
HERS Index w/o PV	48

Building Shell

Ceiling w/ Attic	None
Vaulted Ceiling	R-34 CCF roof deck U-0.03
Above Grade Walls	2x6 R21 16" OC Fiberglass Batt U-0.05
Found. Walls	None
Framed Floors	None
Slabs	None

Windows (largest)	U-Value: 0.29, SHGC: 0.3
Window / Wall Ratio	0.06
Infiltration	3 ACH50
Duct Lkg to Outside	0 CFM25 (0 / 100 s.f.)
Total Duct Leakage	30 CFM25 (Post-Construction)

Mechanical Systems

Heating	Boiler • Natural Gas • 96 AFUE
Cooling	Air Conditioner • Electric • 14.5 SEER
Water Heating	Boiler • Natural Gas • 0.96 Energy Factor
Programmable Thermostat	Yes
Ventilation System	34.0 CFM • 15.0 Watts

Lights and Appliances

Percent Interior LED	100%
Percent Exterior LED	100%
Refrigerator (kWh/yr)	645.0
Dishwasher Efficiency	275 kWh
Ceiling Fan	None

Clothes Dryer Fuel	Electric
Clothes Dryer CEF	2.6
Clothes Washer LER (kWh/yr)	152.0
Clothes Washer Capacity	4.2
Range/Oven Fuel	Electric

Bldgs. A, B, and C - 2 bdrm 2 story Units

Home Energy Rating Certificate

Projected Report

Rating Date:
Registry ID: Unregistered
Ekotrope ID: lLVPB9rv

energyLogic
analysis. insight. answers.

HERS® Index Score:

50

Your home's HERS score is a relative performance score. The lower the number, the more energy efficient the home. To learn more, visit www.hersindex.com

Annual Savings

$774

*Relative to an average U.S. home

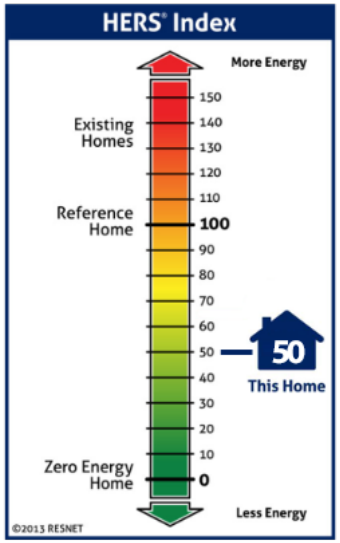
Home:

Pueblo, CO 81004

Builder:
Housing Authority of Pueblo

Your Home's Estimated Energy Use:

	Use [MBtu]	Annual Cost
Heating	14.3	$137
Cooling	1.2	$41
Hot Water	6.5	$62
Lights/Appliances	12.9	$458
Service Charges		$0
Generation (e.g. Solar)	0.0	$0
Total:	**34.9**	**$699**



Home Feature Summary:

Home Type:	Townhouse, inside unit
Model:	2 Middle
Community:	Mountain View Townhomes
Conditioned Floor Area:	1,015 sq. ft.
Number of Bedrooms:	2
Primary Heating System:	Boiler • Natural Gas • 96 AFUE
Primary Cooling System:	Air Conditioner • Electric • 14.5 SEER
Primary Water Heating:	Boiler • Natural Gas • 0.96 Energy Factor
House Tightness:	3 ACH50
Ventilation:	34.0 CFM • 15.0 Watts
Duct Leakage to Outside:	0 CFM25 (0 / 100 s.f.)
Above Grade Walls:	R-21
Ceiling:	Attic, R-40
Window Type:	U-Value: 0.3, SHGC: 0.32
Foundation Walls:	R-10

This home meets or exceeds the criteria of the following:

Energy Star v3
Energy Star v3.1
2015 International Energy Conservation Code

Rating Completed by:

Energy Rater: Phil Drotar
RESNET ID:9147374

Rating Company: EnergyLogic
PO Box N Berthoud, CO 80513
(970) 556-0839

Rating Provider: EnergyLogic
PO Box N Berthoud, CO 80513
(970) 556-0839

Phil Drotar

Phil Drotar, Certified Energy Rater
Digitally signed: 4/9/19 at 8:24 AM

ekotrope™

Ekotrope RATER - Version:3.1.1.2149

IECC 2015 Performance Compliance

Property
Pueblo, CO 81004
Model: 2 Middle
Community: Mountain View Townhor

Reports
Template - Housing Authority of Puel

Organization
EnergyLogic
Phil Drotar

Builder
Housing Authority of Pueblo

Inspection Status
Results are projected

Annual Energy Cost

Design	IECC 2015 Performance	As Designed
Heating	$143	$139
Cooling	$59	$63
Water Heating	$123	$123
SubTotal - Used to determine compliance	**$326**	**$324**
Lights & Appliances	$406	$406
Onsite generation	$0	$0
Total	**$731**	**$730**

Requirements

✓	405.3	Performance-based compliance passes by 0.3%	
⚠	402.4.1.2	Air Leakage Testing	A post construction blower door test is required to verify the air leakage meets the requirement.
✓	402.5	Area-weighted average fenestration SHGC	
✓	402.5	Area-weighted average fenestration U-Factor	
✓	404	Lighting Equipment Efficiency	
✓	R403.6.1	Mechanical Ventilation Efficacy	
✓	Mandatory Checklist	Mandatory code requirements that are not checked by Ekotrope must be met.	
✓	R405.2	Duct Insulation	

Design exceeds requirements for IECC 2015 Performance compliance by 0.3%.

As a 3rd party extension of the code jurisdiction utilizing these reports, I certify that this energy code compliance document has been created in accordance with the requirements of Chapter 4 of the adopted International Energy Conservation Code based on Climate Zone 5. If rating is Projected, I certify that the building design described herein is consistent with the building plans, specifications, and other calculations submitted with the permit application. If rating is Confirmed, I certify that the address referenced above has been inspected/tested and that the mandatory provisions of the IECC have been installed to meet or exceed the intent of the IECC or will be verified as such by another party.

Name: Phil Drotar
Signature: Phil Drotar
Organization: EnergyLogic
Digitally signed: 4/9/19 at 8:24 AM

Energy Code Inspection Checklist

Property
Pueblo, CO 81004
Model: 2 Middle
Community: Mountain View Townhor

Reports
Template - Housing Authority of Puel

Organization
EnergyLogic
Phil Drotar

Builder
Housing Authority of Pueblo

Inspection Status
Results are projected

General Building Information

Conditioned Area (sq ft)	1,015
Conditioned Volume (cubic ft)	12,250
Insulated Shell Area (sq ft)	3,392.2

The building energy model in Ekotrope reflects the building assemblies and energy features listed below. Sometimes energy features will change in the field from what has been modeled. The inspection process should identify any changes and ensure that the home continues to meet the applicable energy code.

Slab

☐ Name: crawl floor (507 s.f.)
R-0 perimeter insulation, R-0 under slab insulation.

Framed Floor

None Present

Foundation Wall

☐ Name: Crawl (Exterior Perimeter [ft]: 57.3, Height Above Grade [ft]: 1, Depth Below Grade [ft]: 3)
R: 10.00
Fully insulated (top to bottom)

Above Grade Wall

☐ Name: AGWx6 (916 s.f.)
R-0 continuous insulation, R-21 cavity insulation
Insulation Grade: I

☐ Name: Party (861 s.f.)
R-0 continuous insulation, R-21 cavity insulation
Insulation Grade: I

Rim Joist

☐ Name: ambient rim (114.5 s.f.)
R: 21.00

Energy Code Inspection Checklist

Property
Pueblo, CO 81004
Model: 2 Middle
Community: Mountain View Townhor

Reports
Template - Housing Authority of Pueb

Organization
EnergyLogic
Phil Drotar

Builder
Housing Authority of Pueblo

Inspection Status
Results are projected

☐ Name: party (89.5 s.f.)
R: 19.00

Roof

☐ Name: Flat (675 s.f.)
R-0 continuous insulation, R-40 cavity insulation
Insulation Grade: I

Opaque Door

☐ Name: Front (20 s.f.)
U: 0.140

☐ Name: Back (20 s.f.)
U: 0.140

Glazing

☐ Name: front (32 s.f.), U: 0.300, SHGC: 0.32, Orientation: EAST

☐ Name: Copy of front (28 s.f.), U: 0.300, SHGC: 0.32, Orientation: EAST

☐ Name: back (35 s.f.), U: 0.300, SHGC: 0.32, Orientation: WEST

Skylight

None Present

Mechanical Ventilation

☐ Mechanical ventilation system rated for, and capable of, providing continuous ventilation.
System shall include automatic timing controls.
System type: Exhaust Only, 24 hrs/day, 15 Watts.

Mechanical Equipment

☐ Fuel-fired air distribution (1) • Natural Gas • 100% Heating Load @ 96 AFUE, 100% Hot Water Load @ 0.96 Energy Fact

Energy Code Inspection Checklist

Property
Pueblo, CO 81004
Model: 2 Middle
Community: Mountain View Townhor

Reports
Template - Housing Authority of Puel

Organization
EnergyLogic
Phil Drotar

Builder
Housing Authority of Pueblo

Inspection Status
Results are projected

☐ Air conditioner (2) • Electric • 100% Cooling Load @ 14.5 SEER

Air Leakage Control

☐ Test Status: Threshold / Sampled
House is air-sealed as to achieve 613 CFM50 (3.00 ACH50) or less at final blower-door test.

Infiltration Requirements for IECC in Climate Zone 5

2009 IECC Infiltration limit for the design home is 7 ACH50.
2012 IECC Infiltration limit for the design home is 3 ACH50.
2015 IECC Infiltration limit for the design home is 3 ACH50.

Duct Leakage

Duct System 1

Entirely within conditioned space
Tested Post-Construction
Leakage to Outdoors is specified in Ekotrope at 0.0 CFM @ 25Pa
Total Duct Leakage is specified in Ekotrope at 42.0 CFM @ 25Pa

Duct Leakage Code Requirements for IECC

2009 IECC:

Postconstruction Leakage Test: Duct Leakage to Outdoors <= 8 CFM25 / 100 sq ft CFA.
Rough in Test with AHU: Total Duct Leakage <= 6 CFM25 / 100 sq ft CFA.
Rough in Test without AHU: Total Duct Leakage <= 4 CFM25 / 100 sq ft CFA.

2012 IECC and 2015 IECC Prescriptive Path:

Postconstruction Leakage Test: Total Duct Leakage <= 4 CFM25 / 100 sq ft CFA.
Rough in Test with AHU: Total Duct Leakage <= 4 CFM25 / 100 sq ft CFA.
Rough in Test without AHU: Total Duct Leakage <= 3 CFM25 / 100 sq ft CFA.

2015 Performance Path (Cost Compliance):

Leakage testing is required UNLESS all ducts and air handlers are located entirely within the thermal envelope.
There is no pass/fail threshold for duct leakage on the performance path.

Project Notes

Building Specification Summary

Property
Pueblo, CO 81004
Model: 2 Middle
Community: Mountain View Townhor

Reports
Template - Housing Authority of Puel

Organization
EnergyLogic
Phil Drotar

Builder
Housing Authority of Pueblo

Inspection Status
Results are projected

Building Information

Conditioned Area [sq. ft.]	1,015.00
Conditioned Volume [cu. ft.]	12,250.00
Thermal Boundary Area [sq. ft.]	3,392.20
Number Of Bedrooms	2
Housing Type	Townhouse, inside unit

Rating

HERS Index	50
HERS Index w/o PV	50

Building Shell

Ceiling w/ Attic	R-40 CCF 24"oc U-0.03
Vaulted Ceiling	None
Above Grade Walls	2x6 R21 16" OC Fiberglass Batt U-0.05
Found. Walls	R-10 continuous R-10
Framed Floors	None
Slabs	Uninsulated R-0

Windows (largest)	U-Value: 0.3, SHGC: 0.32
Window / Wall Ratio	0.05
Infiltration	3 ACH50
Duct Lkg to Outside	0 CFM25 (0 / 100 s.f.)
Total Duct Leakage	42 CFM25 (Post-Construction)

Mechanical Systems

Heating	Boiler • Natural Gas • 96 AFUE
Cooling	Air Conditioner • Electric • 14.5 SEER
Water Heating	Boiler • Natural Gas • 0.96 Energy Factor
Programmable Thermostat	Yes
Ventilation System	34.0 CFM • 15.0 Watts

Lights and Appliances

Percent Interior LED	100%
Percent Exterior LED	100%
Refrigerator (kWh/yr)	645.0
Dishwasher Efficiency	275 kWh
Ceiling Fan	None

Clothes Dryer Fuel	Electric
Clothes Dryer CEF	2.6
Clothes Washer LER (kWh/yr)	487.0
Clothes Washer Capacity	3.2
Range/Oven Fuel	Electric

Bldg. D - 2 bdrm. Type A Access.

Home Energy Rating Certificate

Projected Report

Rating Date:
Registry ID: Unregistered
Ekotrope ID: Vvne9qVd

energyLogic
analysis. insight. answers.

HERS® Index Score:

48

Your home's HERS score is a relative performance score. The lower the number, the more energy efficient the home. To learn more, visit www.hersindex.com

Annual Savings

$790

*Relative to an average U.S. home

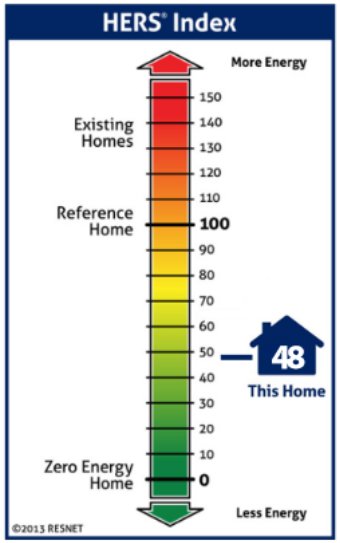
Home:

Pueblo, CO 81004

Builder:
Housing Authority of Pueblo

Your Home's Estimated Energy Use:

	Use [MBtu]	Annual Cost
Heating	16.6	$160
Cooling	1.1	$38
Hot Water	6.4	$61
Lights/Appliances	11.6	$411
Service Charges		$0
Generation (e.g. Solar)	0.0	$0
Total:	**35.6**	**$670**



Home Feature Summary:

Home Type:	Townhouse, end unit
Model:	2 H Bed
Community:	Mountain View Townhomes
Conditioned Floor Area:	833 sq. ft.
Number of Bedrooms:	2
Primary Heating System:	Boiler • Natural Gas • 96 AFUE
Primary Cooling System:	Air Conditioner • Electric • 14.5 SEER
Primary Water Heating:	Boiler • Natural Gas • 0.96 Energy Factor
House Tightness:	3 ACH50
Ventilation:	34.0 CFM • 15.0 Watts
Duct Leakage to Outside:	0 CFM25 (0 / 100 s.f.)
Above Grade Walls:	R-21
Ceiling:	Vaulted Roof, R-46
Window Type:	U-Value: 0.29, SHGC: 0.3
Foundation Walls:	R-10

This home meets or exceeds the criteria of the following:

Energy Star v3
Energy Star v3.1
2015 International Energy Conservation Code

Rating Completed by:

Energy Rater: Phil Drotar
RESNET ID:9147374

Rating Company: EnergyLogic
PO Box N Berthoud, CO 80513
(970) 556-0839

Rating Provider: EnergyLogic
PO Box N Berthoud, CO 80513
(970) 556-0839

Phil Drotar

Phil Drotar, Certified Energy Rater
Digitally signed: 4/10/19 at 9:43 AM

ekotrope™

Ekotrope RATER - Version:3.1.1.2150
The Home Energy Rating Standard Disclosure for this house is available from the rating provider.
This report does not constitute any warranty or guarantee.

IECC 2015 Performance Compliance

Property
Pueblo, CO 81004
Model: 2 H Bed
Community: Mountain View Townhor

Reports
Template - Housing Authority of Puel

Organization
EnergyLogic
Phil Drotar

Builder
Housing Authority of Pueblo

Inspection Status
Results are projected

Annual Energy Cost

Design	IECC 2015 Performance	As Designed
Heating	$177	$165
Cooling	$61	$59
Water Heating	$124	$124
SubTotal - Used to determine compliance	**$362**	**$348**
Lights & Appliances	$363	$364
Onsite generation	$0	$0
Total	**$725**	**$712**

Requirements

✓	405.3	Performance-based compliance passes by 3.8%	
⚠	402.4.1.2	Air Leakage Testing	A post construction blower door test is required to verify the air leakage meets the requirement.
✓	402.5	Area-weighted average fenestration SHGC	
✓	402.5	Area-weighted average fenestration U-Factor	
✓	404	Lighting Equipment Efficiency	
✓	R403.6.1	Mechanical Ventilation Efficacy	
✓	Mandatory Checklist	Mandatory code requirements that are not checked by Ekotrope must be met.	
✓	R405.2	Duct Insulation	

Design exceeds requirements for IECC 2015 Performance compliance by 3.8%.

As a 3rd party extension of the code jurisdiction utilizing these reports, I certify that this energy code compliance document has been created in accordance with the requirements of Chapter 4 of the adopted International Energy Conservation Code based on Climate Zone 5. If rating is Projected, I certify that the building design described herein is consistent with the building plans, specifications, and other calculations submitted with the permit application. If rating is Confirmed, I certify that the address referenced above has been inspected/tested and that the mandatory provisions of the IECC have been installed to meet or exceed the intent of the IECC or will be verified as such by another party.

Name: Phil Drotar
Organization: EnergyLogic
Signature: Phil Drotar
Digitally signed: 4/10/19 at 9:43 AM

Energy Code Inspection Checklist

Property
Pueblo, CO 81004
Model: 2 H Bed
Community: Mountain View Townhor

Reports
Template - Housing Authority of Puel

Organization
EnergyLogic
Phil Drotar

Builder
Housing Authority of Pueblo

Inspection Status
Results are projected

General Building Information

Conditioned Area (sq ft)	833
Conditioned Volume (cubic ft)	12,369
Insulated Shell Area (sq ft)	3,566.9

The building energy model in Ekotrope reflects the building assemblies and energy features listed below. Sometimes energy features will change in the field from what has been modeled. The inspection process should identify any changes and ensure that the home continues to meet the applicable energy code.

Slab

☐ Name: Crawl (833 s.f.)
R-0 perimeter insulation, R-0 under slab insulation.

Framed Floor

None Present

Foundation Wall

☐ Name: Crawl (Exterior Perimeter [ft]: 97.2, Height Above Grade [ft]: 1, Depth Below Grade [ft]: 3)
R: 10.00
Fully insulated (top to bottom)

Above Grade Wall

☐ Name: AGWx6 (881.9 s.f.)
R-0 continuous insulation, R-21 cavity insulation
Insulation Grade: I

☐ Name: Party (359.2 s.f.)
R-0 continuous insulation, R-21 cavity insulation
Insulation Grade: I

Rim Joist

☐ Name: ambient rim (97.2 s.f.)
R: 21.00

Energy Code Inspection Checklist

Property
Pueblo, CO 81004
Model: 2 H Bed
Community: Mountain View Townhor

Reports
Template - Housing Authority of Pueb

Organization
EnergyLogic
Phil Drotar

Builder
Housing Authority of Pueblo

Inspection Status
Results are projected

☐ Name: party (31.8 s.f.)
R: 19.00

Roof

☐ Name: Flat (975 s.f.)
R-22.75 continuous insulation, R-22.75 cavity insulation
Insulation Grade: I

Opaque Door

☐ Name: Front (20 s.f.)
U: 0.140

☐ Name: Back (20 s.f.)
U: 0.140

Glazing

☐ Name: front (16 s.f.), U: 0.290, SHGC: 0.3, Orientation: SOUTH_EAST

☐ Name: Copy of front (12 s.f.), U: 0.290, SHGC: 0.3, Orientation: SOUTH_EAST

☐ Name: back (32 s.f.), U: 0.290, SHGC: 0.3, Orientation: NORTH_WEST

Skylight

None Present

Mechanical Ventilation

☐ Mechanical ventilation system rated for, and capable of, providing continuous ventilation.
System shall include automatic timing controls.
System type: Exhaust Only, 24 hrs/day, 15 Watts.

Mechanical Equipment

☐ Fuel-fired air distribution (1) • Natural Gas • 100% Heating Load @ 96 AFUE, 100% Hot Water Load @ 0.96 Energy Fact

Energy Code Inspection Checklist

Property
Pueblo, CO 81004
Model: 2 H Bed
Community: Mountain View Townhor

Reports
Template - Housing Authority of Puel

Organization
EnergyLogic
Phil Drotar

Builder
Housing Authority of Pueblo

Inspection Status
Results are projected

☐ Air conditioner (2) • Electric • 100% Cooling Load @ 14.5 SEER

Air Leakage Control

☐ Test Status: Threshold / Sampled
House is air-sealed as to achieve 618 CFM50 (3.00 ACH50) or less at final blower-door test.

Infiltration Requirements for IECC in Climate Zone 5

2009 IECC Infiltration limit for the design home is 7 ACH50.
2012 IECC Infiltration limit for the design home is 3 ACH50.
2015 IECC Infiltration limit for the design home is 3 ACH50.

Duct Leakage

Duct System 1

Entirely within conditioned space
Tested Post-Construction
Leakage to Outdoors is specified in Ekotrope at 0.0 CFM @ 25Pa
Total Duct Leakage is specified in Ekotrope at 33.0 CFM @ 25Pa

Duct Leakage Code Requirements for IECC

2009 IECC:

Postconstruction Leakage Test: Duct Leakage to Outdoors <= 8 CFM25 / 100 sq ft CFA.
Rough in Test with AHU: Total Duct Leakage <= 6 CFM25 / 100 sq ft CFA.
Rough in Test without AHU: Total Duct Leakage <= 4 CFM25 / 100 sq ft CFA.

2012 IECC and 2015 IECC Prescriptive Path:

Postconstruction Leakage Test: Total Duct Leakage <= 4 CFM25 / 100 sq ft CFA.
Rough in Test with AHU: Total Duct Leakage <= 4 CFM25 / 100 sq ft CFA.
Rough in Test without AHU: Total Duct Leakage <= 3 CFM25 / 100 sq ft CFA.

2015 Performance Path (Cost Compliance):

Leakage testing is required UNLESS all ducts and air handlers are located entirely within the thermal envelope.
There is no pass/fail threshold for duct leakage on the performance path.

Project Notes

Building Specification Summary

Property
Pueblo, CO 81004
Model: 2 H Bed
Community: Mountain View Townhor

Reports
Template - Housing Authority of Puel

Organization
EnergyLogic
Phil Drotar

Builder
Housing Authority of Pueblo

Inspection Status
Results are projected

Building Information

Conditioned Area [sq. ft.]	833.00
Conditioned Volume [cu. ft.]	12,369.00
Thermal Boundary Area [sq. ft.]	3,566.90
Number Of Bedrooms	2
Housing Type	Townhouse, end unit

Rating

HERS Index	48
HERS Index w/o PV	48

Building Shell

Ceiling w/ Attic	None
Vaulted Ceiling	R-43 CCF roof deck U-0.02
Above Grade Walls	2x6 R21 16" OC Fiberglass Batt U-0.05
Found. Walls	R-10 continuous R-10
Framed Floors	None
Slabs	Uninsulated R-0

Windows (largest)	U-Value: 0.29, SHGC: 0.3
Window / Wall Ratio	0.05
Infiltration	3 ACH50
Duct Lkg to Outside	0 CFM25 (0 / 100 s.f.)
Total Duct Leakage	33 CFM25 (Post-Construction)

Mechanical Systems

Heating	Boiler • Natural Gas • 96 AFUE
Cooling	Air Conditioner • Electric • 14.5 SEER
Water Heating	Boiler • Natural Gas • 0.96 Energy Factor
Programmable Thermostat	Yes
Ventilation System	34.0 CFM • 15.0 Watts

Lights and Appliances

Percent Interior LED	100%
Percent Exterior LED	100%
Refrigerator (kWh/yr)	645.0
Dishwasher Efficiency	275 kWh
Ceiling Fan	None

Clothes Dryer Fuel	Electric
Clothes Dryer CEF	2.6
Clothes Washer LER (kWh/yr)	152.0
Clothes Washer Capacity	4.2
Range/Oven Fuel	Electric

Home Energy Rating Certificate

Projected Report

Rating Date:
Registry ID: Unregistered
Ekotrope ID: Zdm5OJnd

energyLogic
analysis. insight. answers.

HERS® Index Score:

48

Your home's HERS score is a relative performance score. The lower the number, the more energy efficient the home. To learn more, visit www.hersindex.com

Annual Savings

$997

*Relative to an average U.S. home

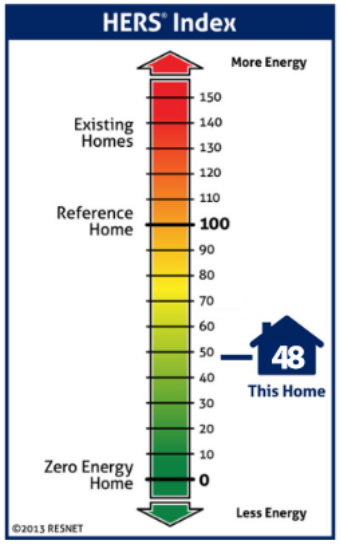
Home:

, CO 81004

Builder:
Housing Authority of Pueblo

Your Home's Estimated Energy Use:

	Use [MBtu]	Annual Cost
Heating	19.3	$186
Cooling	1.3	$46
Hot Water	8.3	$79
Lights/Appliances	14.0	$497
Service Charges		$0
Generation (e.g. Solar)	0.0	$0
Total:	**42.9**	**$808**



Home Feature Summary:

Home Type:	Townhouse, end unit
Model:	3 End
Community:	Mountian View Townhomes
Conditioned Floor Area:	1,276 sq. ft.
Number of Bedrooms:	3
Primary Heating System:	Boiler • Natural Gas • 96 AFUE
Primary Cooling System:	Air Conditioner • Electric • 14.5 SEER
Primary Water Heating:	Boiler • Natural Gas • 0.96 Energy Factor
House Tightness:	3 ACH50
Ventilation:	34.0 CFM • 15.0 Watts
Duct Leakage to Outside:	0 CFM25 (0 / 100 s.f.)
Above Grade Walls:	R-21
Ceiling:	Attic, R-36
Window Type:	U-Value: 0.3, SHGC: 0.32
Foundation Walls:	R-10

This home meets or exceeds the criteria of the following:

Energy Star v3
Energy Star v3.1
2015 International Energy Conservation Code

Rating Completed by:

Energy Rater: Phil Drotar
RESNET ID:9147374

Rating Company: EnergyLogic
PO Box N Berthoud, CO 80513
(970) 556-0839

Rating Provider: EnergyLogic
PO Box N Berthoud, CO 80513
(970) 556-0839

Phil Drotar

Phil Drotar, Certified Energy Rater
Digitally signed: 4/4/19 at 4:34 PM

IECC 2015 Performance Compliance

Property
, CO 81004
Model: 3 End
Community: Mountian View Townhor

Reports
Template - Housing Authority of Puel

Organization
EnergyLogic
Phil Drotar

Builder
Housing Authority of Pueblo

Inspection Status
Results are projected

Annual Energy Cost

Design	IECC 2015 Performance	As Designed
Heating	$193	$189
Cooling	$75	$72
Water Heating	$143	$143
SubTotal - Used to determine compliance	**$411**	**$405**
Lights & Appliances	$445	$441
Onsite generation	$0	$0
Total	**$856**	**$845**

Requirements

✓	405.3	Performance-based compliance passes by 1.6%	
⚠	402.4.1.2	Air Leakage Testing	A post construction blower door test is required to verify the air leakage meets the requirement.
✓	402.5	Area-weighted average fenestration SHGC	
✓	402.5	Area-weighted average fenestration U-Factor	
✓	404	Lighting Equipment Efficiency	
✓	R403.6.1	Mechanical Ventilation Efficacy	
✓	Mandatory Checklist	Mandatory code requirements that are not checked by Ekotrope must be met.	
✓	R405.2	Duct Insulation	

Design exceeds requirements for IECC 2015 Performance compliance by 1.6%.

As a 3rd party extension of the code jurisdiction utilizing these reports, I certify that this energy code compliance document has been created in accordance with the requirements of Chapter 4 of the adopted International Energy Conservation Code based on Climate Zone 5. If rating is Projected, I certify that the building design described herein is consistent with the building plans, specifications, and other calculations submitted with the permit application. If rating is Confirmed, I certify that the address referenced above has been inspected/tested and that the mandatory provisions of the IECC have been installed to meet or exceed the intent of the IECC or will be verified as such by another party.

Name: Phil Drotar
Organization: EnergyLogic
Signature: Phil Drotar
Digitally signed: 4/4/19 at 4:34 PM

Energy Code Inspection Checklist

Property
, CO 81004
Model: 3 End
Community: Mountian View Townhor

Reports
Template - Housing Authority of Puel

Organization
EnergyLogic
Phil Drotar

Builder
Housing Authority of Pueblo

Inspection Status
Results are projected

General Building Information

Conditioned Area (sq ft)	1,276
Conditioned Volume (cubic ft)	16,163
Insulated Shell Area (sq ft)	3,870

The building energy model in Ekotrope reflects the building assemblies and energy features listed below. Sometimes energy features will change in the field from what has been modeled. The inspection process should identify any changes and ensure that the home continues to meet the applicable energy code.

Slab

☐ Name: crawl floor (638 s.f.)
R-0 perimeter insulation, R-0 under slab insulation.

Framed Floor

None Present

Foundation Wall

☐ Name: Crawl (Exterior Perimeter [ft]: 73, Height Above Grade [ft]: 1, Depth Below Grade [ft]: 3)
R: 10.00
Fully insulated (top to bottom)

Above Grade Wall

☐ Name: Frontx6 (352 s.f.)
R-0 continuous insulation, R-21 cavity insulation
Insulation Grade: I

☐ Name: leftx6 (580 s.f.)
R-0 continuous insulation, R-21 cavity insulation
Insulation Grade: I

☐ Name: backx6 (528 s.f.)
R-0 continuous insulation, R-21 cavity insulation
Insulation Grade: I

☐ Name: Party (580 s.f.)
R-0 continuous insulation, R-21 cavity insulation
Insulation Grade: I

Energy Code Inspection Checklist

Property
, CO 81004
Model: 3 End
Community: Mountian View Townhor

Reports
Template - Housing Authority of Puel

Organization
EnergyLogic
Phil Drotar

Builder
Housing Authority of Pueblo

Inspection Status
Results are projected

Rim Joist

- [ ] Name: ambient rim (170.3 s.f.)
  R: 19.00

- [ ] Name: party (67.7 s.f.)
  R: 19.00

Roof

- [ ] Name: Flat (662 s.f.)
  R-13 continuous insulation, R-22.75 cavity insulation
  Insulation Grade: I

Opaque Door

- [ ] Name: Front (20 s.f.)
  U: 0.140

- [ ] Name: Back (20 s.f.)
  U: 0.140

Glazing

- [ ] Name: front (16 s.f.), U: 0.300, SHGC: 0.32, Orientation: WEST

- [ ] Name: Copy of front (32 s.f.), U: 0.300, SHGC: 0.32, Orientation: WEST

- [ ] Name: left (16 s.f.), U: 0.300, SHGC: 0.32, Orientation: NORTH

- [ ] Name: back (35 s.f.), U: 0.300, SHGC: 0.32, Orientation: EAST

Skylight

None Present

Mechanical Ventilation

Energy Code Inspection Checklist

Property
, CO 81004
Model: 3 End
Community: Mountian View Townhor

Reports
Template - Housing Authority of Puel

Organization
EnergyLogic
Phil Drotar

Builder
Housing Authority of Pueblo

Inspection Status
Results are projected

☐ Mechanical ventilation system rated for, and capable of, providing continuous ventilation.
System shall include automatic timing controls.
System type: Exhaust Only, 24 hrs/day, 15 Watts.

Mechanical Equipment

☐ Fuel-fired air distribution (1) • Natural Gas • 100% Heating Load @ 96 AFUE, 100% Hot Water Load @ 0.96 Energy Fact

☐ Air conditioner (2) • Electric • 100% Cooling Load @ 14.5 SEER

Air Leakage Control

☐ Test Status: Threshold / Sampled
House is air-sealed as to achieve 808 CFM50 (3.00 ACH50) or less at final blower-door test.

Infiltration Requirements for IECC in Climate Zone 5

2009 IECC Infiltration limit for the design home is 7 ACH50.
2012 IECC Infiltration limit for the design home is 3 ACH50.
2015 IECC Infiltration limit for the design home is 3 ACH50.

Duct Leakage

Duct System 1

Entirely within conditioned space
Tested Post-Construction
Leakage to Outdoors is specified in Ekotrope at 0.0 CFM @ 25Pa
Total Duct Leakage is specified in Ekotrope at 45.0 CFM @ 25Pa

Energy Code Inspection Checklist

Property
, CO 81004
Model: 3 End
Community: Mountian View Townhor

Reports
Template - Housing Authority of Puel

Organization
EnergyLogic
Phil Drotar

Builder
Housing Authority of Pueblo

Inspection Status
Results are projected

Duct Leakage Code Requirements for IECC

2009 IECC:

Postconstruction Leakage Test: Duct Leakage to Outdoors <= 8 CFM25 / 100 sq ft CFA.
Rough in Test with AHU: Total Duct Leakage <= 6 CFM25 / 100 sq ft CFA.
Rough in Test without AHU: Total Duct Leakage <= 4 CFM25 / 100 sq ft CFA.

2012 IECC and 2015 IECC Prescriptive Path:

Postconstruction Leakage Test: Total Duct Leakage <= 4 CFM25 / 100 sq ft CFA.
Rough in Test with AHU: Total Duct Leakage <= 4 CFM25 / 100 sq ft CFA.
Rough in Test without AHU: Total Duct Leakage <= 3 CFM25 / 100 sq ft CFA.

2015 Performance Path (Cost Compliance):

Leakage testing is required UNLESS all ducts and air handlers are located entirely within the thermal envelope.
There is no pass/fail threshold for duct leakage on the performance path.

Project Notes

Building Specification Summary

Property
, CO 81004
Model: 3 End
Community: Mountian View Townhor

Reports
Template - Housing Authority of Puel

Organization
EnergyLogic
Phil Drotar

Builder
Housing Authority of Pueblo

Inspection Status
Results are projected

Building Information

Conditioned Area [sq. ft.]	1,276.00
Conditioned Volume [cu. ft.]	16,163.00
Thermal Boundary Area [sq. ft.]	3,870.00
Number Of Bedrooms	3
Housing Type	Townhouse, end unit

Rating

HERS Index	48
HERS Index w/o PV	48

Building Shell

Ceiling w/ Attic	R-34 CCF roof deck U-0.03
Vaulted Ceiling	None
Above Grade Walls	2x6 R21 16" OC Fiberglass Batt U-0.05
Found. Walls	R-10 continuous R-10
Framed Floors	None
Slabs	Uninsulated R-0

Windows (largest)	U-Value: 0.3, SHGC: 0.32
Window / Wall Ratio	0.05
Infiltration	3 ACH50
Duct Lkg to Outside	0 CFM25 (0 / 100 s.f.)
Total Duct Leakage	45 CFM25 (Post-Construction)

Mechanical Systems

Heating	Boiler • Natural Gas • 96 AFUE
Cooling	Air Conditioner • Electric • 14.5 SEER
Water Heating	Boiler • Natural Gas • 0.96 Energy Factor
Programmable Thermostat	Yes
Ventilation System	34.0 CFM • 15.0 Watts

Lights and Appliances

Percent Interior LED	100%
Percent Exterior LED	100%
Refrigerator (kWh/yr)	645.0
Dishwasher Efficiency	275 kWh
Ceiling Fan	None

Clothes Dryer Fuel	Electric
Clothes Dryer CEF	2.6
Clothes Washer LER (kWh/yr)	152.0
Clothes Washer Capacity	4.2
Range/Oven Fuel	Electric

Bldg. D - 3 bdrm Type A Access.

Home Energy Rating Certificate

Projected Report

Rating Date:
Registry ID: Unregistered
Ekotrope ID: yL0QJj9d

energyLogic
analysis. insight. answers.

HERS® Index Score:

46

Your home's HERS score is a relative performance score. The lower the number, the more energy efficient the home. To learn more, visit www.hersindex.com

Annual Savings

$957

*Relative to an average U.S. home

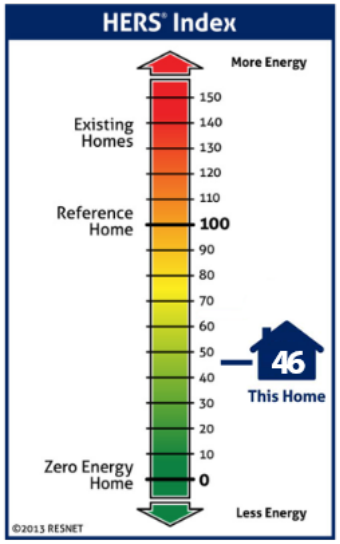
Home:

Pueblo, CO 81004

Builder:
Housing Authority of Pueblo

Your Home's Estimated Energy Use:

	Use [MBtu]	Annual Cost
Heating	15.6	$151
Cooling	1.4	$48
Hot Water	7.9	$75
Lights/Appliances	13.7	$485
Service Charges		$0
Generation (e.g. Solar)	0.0	$0
Total:	**38.5**	**$759**



Home Feature Summary:

Home Type:	Townhouse, inside unit
Model:	3 H Bed
Community:	Mountain View Townhomes
Conditioned Floor Area:	1,182 sq. ft.
Number of Bedrooms:	3
Primary Heating System:	Boiler • Natural Gas • 96 AFUE
Primary Cooling System:	Air Conditioner • Electric • 14.5 SEER
Primary Water Heating:	Boiler • Natural Gas • 0.96 Energy Factor
House Tightness:	3 ACH50
Ventilation:	34.0 CFM • 15.0 Watts
Duct Leakage to Outside:	0 CFM25 (0 / 100 s.f.)
Above Grade Walls:	R-21
Ceiling:	Vaulted Roof, R-46
Window Type:	U-Value: 0.29, SHGC: 0.3
Foundation Walls:	R-10

This home meets or exceeds the criteria of the following:

Energy Star v3
Energy Star v3.1
2015 International Energy Conservation Code

Rating Completed by:

Energy Rater: Phil Drotar
RESNET ID:9147374

Rating Company: EnergyLogic
PO Box N Berthoud, CO 80513
(970) 556-0839

Rating Provider: EnergyLogic
PO Box N Berthoud, CO 80513
(970) 556-0839

Phil Drotar

Phil Drotar, Certified Energy Rater
Digitally signed: 4/10/19 at 9:56 AM

ekotrope™

Ekotrope RATER - Version:3.1.1.2150

IECC 2015 Performance Compliance

Property
Pueblo, CO 81004
Model: 3 H Bed
Community: Mountain View Townhor

Reports
Template - Housing Authority of Puel

Organization
EnergyLogic
Phil Drotar

Builder
Housing Authority of Pueblo

Inspection Status
Results are projected

Annual Energy Cost

Design	IECC 2015 Performance	As Designed
Heating	$168	$153
Cooling	$70	$70
Water Heating	$140	$140
SubTotal - Used to determine compliance	**$378**	**$364**
Lights & Appliances	$433	$429
Onsite generation	$0	$0
Total	**$811**	**$793**

Requirements

✓	405.3	Performance-based compliance passes by 3.9%	
⚠	402.4.1.2	Air Leakage Testing	A post construction blower door test is required to verify the air leakage meets the requirement.
✓	402.5	Area-weighted average fenestration SHGC	
✓	402.5	Area-weighted average fenestration U-Factor	
✓	404	Lighting Equipment Efficiency	
✓	R403.6.1	Mechanical Ventilation Efficacy	
✓	Mandatory Checklist	Mandatory code requirements that are not checked by Ekotrope must be met.	
✓	R405.2	Duct Insulation	

Design exceeds requirements for IECC 2015 Performance compliance by 3.9%.

As a 3rd party extension of the code jurisdiction utilizing these reports, I certify that this energy code compliance document has been created in accordance with the requirements of Chapter 4 of the adopted International Energy Conservation Code based on Climate Zone 5. If rating is Projected, I certify that the building design described herein is consistent with the building plans, specifications, and other calculations submitted with the permit application. If rating is Confirmed, I certify that the address referenced above has been inspected/tested and that the mandatory provisions of the IECC have been installed to meet or exceed the intent of the IECC or will be verified as such by another party.

Name: Phil Drotar
Organization: EnergyLogic
Signature: Phil Drotar
Digitally signed: 4/10/19 at 9:56 AM

Energy Code Inspection Checklist

Property
Pueblo, CO 81004
Model: 3 H Bed
Community: Mountain View Townhor

Reports
Template - Housing Authority of Puel

Organization
EnergyLogic
Phil Drotar

Builder
Housing Authority of Pueblo

Inspection Status
Results are projected

General Building Information

Conditioned Area (sq ft)	1,182
Conditioned Volume (cubic ft)	17,141
Insulated Shell Area (sq ft)	4,151.5

The building energy model in Ekotrope reflects the building assemblies and energy features listed below. Sometimes energy features will change in the field from what has been modeled. The inspection process should identify any changes and ensure that the home continues to meet the applicable energy code.

Slab

☐ Name: Crawl (1,182 s.f.)
R-0 perimeter insulation, R-0 under slab insulation.

Framed Floor

None Present

Foundation Wall

☐ Name: Crawl (Exterior Perimeter [ft]: 82, Height Above Grade [ft]: 1, Depth Below Grade [ft]: 3)
R: 10.00
Fully insulated (top to bottom)

Above Grade Wall

☐ Name: AGWx6 (656 s.f.)
R-0 continuous insulation, R-21 cavity insulation
Insulation Grade: I

☐ Name: Party (605.5 s.f.)
R-0 continuous insulation, R-21 cavity insulation
Insulation Grade: I

Rim Joist

☐ Name: ambient rim (97.2 s.f.)
R: 21.00

Energy Code Inspection Checklist

Property
Pueblo, CO 81004
Model: 3 H Bed
Community: Mountain View Townhor

Reports
Template - Housing Authority of Pueb

Organization
EnergyLogic
Phil Drotar

Builder
Housing Authority of Pueblo

Inspection Status
Results are projected

☐ Name: party (31.8 s.f.)
R: 19.00

Roof

☐ Name: Flat (1,251 s.f.)
R-22.75 continuous insulation, R-22.75 cavity insulation
Insulation Grade: I

Opaque Door

☐ Name: Front (20 s.f.)
U: 0.140

☐ Name: Back (20 s.f.)
U: 0.140

Glazing

☐ Name: front (16 s.f.), U: 0.290, SHGC: 0.3, Orientation: SOUTH_EAST

☐ Name: Copy of front (12 s.f.), U: 0.290, SHGC: 0.3, Orientation: SOUTH_EAST

☐ Name: back (32 s.f.), U: 0.290, SHGC: 0.3, Orientation: NORTH_WEST

Skylight

None Present

Mechanical Ventilation

☐ Mechanical ventilation system rated for, and capable of, providing continuous ventilation.
System shall include automatic timing controls.
System type: Exhaust Only, 24 hrs/day, 15 Watts.

Mechanical Equipment

☐ Fuel-fired air distribution (1) • Natural Gas • 100% Heating Load @ 96 AFUE, 100% Hot Water Load @ 0.96 Energy Fact

Energy Code Inspection Checklist

Property
Pueblo, CO 81004
Model: 3 H Bed
Community: Mountain View Townhor

Reports
Template - Housing Authority of Pueb

Organization
EnergyLogic
Phil Drotar

Builder
Housing Authority of Pueblo

Inspection Status
Results are projected

☐ Air conditioner (2) • Electric • 100% Cooling Load @ 14.5 SEER

Air Leakage Control

☐ Test Status: Threshold / Sampled
House is air-sealed as to achieve 857 CFM50 (3.00 ACH50) or less at final blower-door test.

Infiltration Requirements for IECC in Climate Zone 5

2009 IECC Infiltration limit for the design home is 7 ACH50.
2012 IECC Infiltration limit for the design home is 3 ACH50.
2015 IECC Infiltration limit for the design home is 3 ACH50.

Duct Leakage

Duct System 1

Entirely within conditioned space
Tested Post-Construction
Leakage to Outdoors is specified in Ekotrope at 0.0 CFM @ 25Pa
Total Duct Leakage is specified in Ekotrope at 47.0 CFM @ 25Pa

Duct Leakage Code Requirements for IECC

2009 IECC:

Postconstruction Leakage Test: Duct Leakage to Outdoors <= 8 CFM25 / 100 sq ft CFA.
Rough in Test with AHU: Total Duct Leakage <= 6 CFM25 / 100 sq ft CFA.
Rough in Test without AHU: Total Duct Leakage <= 4 CFM25 / 100 sq ft CFA.

2012 IECC and 2015 IECC Prescriptive Path:

Postconstruction Leakage Test: Total Duct Leakage <= 4 CFM25 / 100 sq ft CFA.
Rough in Test with AHU: Total Duct Leakage <= 4 CFM25 / 100 sq ft CFA.
Rough in Test without AHU: Total Duct Leakage <= 3 CFM25 / 100 sq ft CFA.

2015 Performance Path (Cost Compliance):

Leakage testing is required UNLESS all ducts and air handlers are located entirely within the thermal envelope.
There is no pass/fail threshold for duct leakage on the performance path.

Project Notes

Building Specification Summary

Property
Pueblo, CO 81004
Model: 3 H Bed
Community: Mountain View Townhor

Reports
Template - Housing Authority of Puel

Organization
EnergyLogic
Phil Drotar

Builder
Housing Authority of Pueblo

Inspection Status
Results are projected

Building Information

Conditioned Area [sq. ft.]	1,182.00
Conditioned Volume [cu. ft.]	17,141.00
Thermal Boundary Area [sq. ft.]	4,151.50
Number Of Bedrooms	3
Housing Type	Townhouse, inside unit

Rating

HERS Index	46
HERS Index w/o PV	46

Building Shell

Ceiling w/ Attic	None
Vaulted Ceiling	R-43 CCF roof deck U-0.02
Above Grade Walls	2x6 R21 16" OC Fiberglass Batt U-0.05
Found. Walls	R-10 continuous R-10
Framed Floors	None
Slabs	Uninsulated R-0

Windows (largest)	U-Value: 0.29, SHGC: 0.3
Window / Wall Ratio	0.05
Infiltration	3 ACH50
Duct Lkg to Outside	0 CFM25 (0 / 100 s.f.)
Total Duct Leakage	47 CFM25 (Post-Construction)

Mechanical Systems

Heating	Boiler • Natural Gas • 96 AFUE
Cooling	Air Conditioner • Electric • 14.5 SEER
Water Heating	Boiler • Natural Gas • 0.96 Energy Factor
Programmable Thermostat	Yes
Ventilation System	34.0 CFM • 15.0 Watts

Lights and Appliances

Percent Interior LED	100%
Percent Exterior LED	100%
Refrigerator (kWh/yr)	645.0
Dishwasher Efficiency	275 kWh
Ceiling Fan	None

Clothes Dryer Fuel	Electric
Clothes Dryer CEF	2.6
Clothes Washer LER (kWh/yr)	152.0
Clothes Washer Capacity	4.2
Range/Oven Fuel	Electric

SECTION 01 10 00
SUMMARY

PART 1 GENERAL

1.01 PROJECT

A. Project Name: MOUNTAIN VIEW TOWNHOMES

B. Owner's Name: Housing Authority of the City of Pueblo.

C. Architect's Name: HGF Architects, Inc..

D. The Project consists of the construction of 12 individual buildings with a total 51 dwelling units consisting of one, two, and three bedroom units.

1.02 CONTRACT DESCRIPTION

1.03 WORK BY OWNER

A. Existing Building Demolition: Owner will contract for demolition of the existing structures on site and removal of their foundations. The site will not be backfilled at the removed foundations and will not be filled to existing grade elevation. Work will be completed approximately July 2019..

B. Items noted NIC (Not in Contract) will be supplied and installed by Owner before Substantial Completion. Some items include:

1. Small equipment.

C. Owner will supply and install the following:

D. Owner will supply the following for installation by Contractor :

1.04 OWNER OCCUPANCY

A. Owner intends to occupy the Project upon Substantial Completion.

B. Owner intends to occupy a certain portion of the Project prior to the completion date for the conduct of normal operations.

C. Cooperate with Owner to minimize conflict and to facilitate Owner 's operations.

D. Schedule the Work to accommodate Owner occupancy.

1.05 CONTRACTOR USE OF SITE AND PREMISES

A. Construction Operations: Limited to You gain View Townhomes site as shown in Civil Site Plan Sheet SP01.

1. Locate and conduct construction activities in ways that will limit disturbance to site.

B. Arrange use of site and premises to allow:

1. Owner occupancy.
2. Work by Others.
3. Work by Owner .

C. Provide access to and from site as required by law and by Owner :

1. Emergency Building Exits During Construction: Keep all exits required by code open during construction period; provide temporary exit signs if exit routes are temporarily altered.
2. Do not obstruct roadways, sidewalks, or other public ways without permit.

D. Time Restrictions:

1. Limit conduct of especially noisy exterior work to the hours of 7:00 am to 8:00 pm.

E. Utility Outages and Shutdown:

1. Limit disruption of utility services. When utility disruption is required notify affected residents and coordinate with owner's representative.

2. Limit shutdown of utility services to 2 hours at a time, arranged at least 24 hours in advance with Owner .

3. Prevent accidental disruption of utility services to other facilities.

1.06 **WORK SEQUENCE**

A. Construct Work in stages during the construction period:

B. Coordinate construction schedule and operations with Owner .

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 20 00
PRICE AND PAYMENT PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Procedures for preparation and submittal of applications for progress payments.

1.02 SCHEDULE OF VALUES

A. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit draft to Architect for approval.

B. Forms filled out by hand will not be accepted.

1.03 APPLICATIONS FOR PROGRESS PAYMENTS

A. Payment Period: Submit at intervals stipulated in the Agreement.

B. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit sample to Architect for approval.

C. Forms filled out by hand will not be accepted.

D. Execute certification by signature of authorized officer.

E. Submit one electronic and three hard-copies of each Application for Payment.

END OF SECTION

SECTION 01 21 00
ALLOWANCES

PART 1 GENERAL

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 22 00
UNIT PRICES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. List of unit prices, for use in preparing Bids.

1.02 RELATED REQUIREMENTS

A. Bid for Lump Sum Contract

1.03 COSTS INCLUDED

A. Unit Prices included on the Bid Form shall include full compensation for all required labor, products, tools, equipment, plant, transportation, services and incidentals; erection, application or installation of an item of the Work; overhead and profit.

1.04 UNIT QUANTITIES SPECIFIED

A. Quantities indicated in the Bid Form are for bidding and contract purposes only. Quantities and measurements of actual Work will determine the payment amount.

1.05 MEASUREMENT OF QUANTITIES

A. Measurement methods delineated in the individual specification sections complement the criteria of this section. In the event of conflict, the requirements of the individual specification section govern.

B. Assist by providing necessary equipment, workers, and survey personnel as required.

1.06 SCHEDULE OF UNIT PRICES

A. Item: 1; Remove 1'-0" diameter of pier & rebar: $_____ per foot.

B. Item: 2; Remove 2'-0" diameter of pier & rebar $_____ per foot.

C. Item: 3; 4" concrete infill 3500 psi: $_____ per square foot.

D. Item: 4; 4" thick city sidewalks 4000 psi: $_____ per square foot.

E. Item: 5; Concrete curb 6" wide x 18 high, (6" in ground, 3500 psi) with one (1) #4 top & bottom: $_____ per linear foot..

F. Item: 6; Concrete curb 8" wide x 24 high, (12" in ground, 3500 psi) with one (1) #4 top & bottom: $_____ per linear foot..

G. Item: 7; Backfill open holes - Class VI base compacted to 95% proctor: $_____ per ton.

H. Item 8: Clean compacted fill dirt compacted to 90% proctor: $_____ per ton.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 23 00
ALTERNATES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Description of Alternates.

B. Procedures for pricing Alternates.

1.02 RELATED REQUIREMENTS

A. Document 00 21 13 - Instructions to Bidders: Instructions for preparation of pricing for Alternates.

B. Document 00 43 23 - Alternates Form: List of Alternates as supplement to Bid Form.

C. Document 00 52 00 - Agreement Form: Incorporating monetary value of accepted Alternates.

1.03 ACCEPTANCE OF ALTERNATES

A. Alternates quoted on Bid Forms will be reviewed and accepted or rejected at Owner's option. Accepted Alternates will be identified in the Owner-Contractor Agreement.

B. Coordinate related work and modify surrounding work to integrate the Work of each Alternate.

1.04 SCHEDULE OF ALTERNATES

A. Alternate No. 1 - In the case of the alternative paving option, provide and install asphalt on Tribal Nations Ave and all private streets in lieu of concrete. Concrete will remain in the corner sections between pervious pavers and curb flowline in parallelparking areas. A concrete barrier 6 inches wide will be added between the pervious pavers and asphalt. The edge of the concrete barrier will extend to the edge of the curb gutter in the parallel parking areas. Refer to Site Plan Alternative No.1 in the construction drawings.:

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 25 00
SUBSTITUTION PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Procedural requirements for proposed substitutions.

1.02 RELATED REQUIREMENTS

A. Section 00 21 13 - Instructions to Bidders: Restrictions on timing of substitution requests.

B. Section 00 43 25 - Substitution Request Form - During Procurement: Required form for substitution requests made prior to award of contract (During procurement).

C. Section 00 63 25 - Substitution Request Form - During Construction: Required form for substitution requests made after award of contract (During construction).

D. Section 01 30 00 - Administrative Requirements: Submittal procedures, coordination.

E. Section 01 60 00 - Product Requirements: Fundamental product requirements, product options, delivery, storage, and handling.

F. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions: Restrictions on emissions of indoor substitute products.

1.03 DEFINITIONS

A. Substitutions: Changes from Contract Documents requirements proposed by Contractor to materials, products, assemblies and equipment.

1. Substitutions for Cause: Proposed due to changed Project circumstances beyond Contractor's control.

a. Unavailability.

b. Regulatory changes.

2. Substitutions for Convenience: Proposed due to possibility of offering substantial advantage to the Project.

a. Substitution requests offering advantages solely to the Contractor will not be considered.

1.04 REFERENCE STANDARDS

A. CSI/CSC Form 1.5C - Substitution Request (During the Bidding/Negotiating Stage) Current Edition.

B. CSI/CSC Form 13.1A - Substitution Request (After the Bidding/Negotiating Phase) Current Edition.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

A. A Substitution Request for products, assemblies, materials and equipment constitutes a representation that the submitter:

1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product, equipment, assembly, or system.

2. Agrees to provide the same warranty for the substitution as for the specified product.

3. Agrees to provide same or equivalent maintenance service and source of replacement parts, as applicable.

4. Agrees to coordinate installation and make changes to other work that may be required for the work to be complete, with no additional cost to Owner.
5. Waives claims for additional costs or time extension that may subsequently become apparent.

B. A Substitution Request for specified installer constitutes a representation that the submitter:
   1. Has acted in good faith to obtain services of specified installer, but was unable to come to commercial, or other terms.

C. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents. Burden of proof is on proposer.
   1. Note explicitly any non-compliant characteristics.

D. Content: Include information necessary for tracking the status of each Substitution Request, and information necessary to provide an actionable response.
   1. No specific form is required. Contractor's Substitution Request documentation must include the following:
      a. Project Information:
         1) Official project name and number, and any additional required identifiers established in Contract Documents.
         2) Owner's, Architect's, and Contractor's names.
      b. Substitution Request Information:
         1) Discrete and consecutive Substitution Request number, and descriptive subject/title.
         2) Indication of whether the substitution is for cause or convenience.
         3) Issue date.
         4) Reference to particular Contract Document(s) specification section number, title, and article/paragraph(s).
         5) Description of Substitution.
         6) Reason why the specified item cannot be provided.
         7) Differences between proposed substitution and specified item.
         8) Description of how proposed substitution affects other parts of work.
      c. Attached Comparative Data: Provide point-by-point, side-by-side comparison addressing essential attributes specified, as appropriate and relevant for the item:
         1) Physical characteristics.
         2) In-service performance.
         3) Expected durability.
         4) Visual effect.
         5) Sustainable design features.
         6) Warranties.
         7) Other salient features and requirements.
         8) Include, as appropriate or requested, the following types of documentation:
            (a) Product Data:
            (b) Samples.

(c) Certificates, test, reports or similar qualification data.

(d) Drawings, when required to show impact on adjacent construction elements.

d. Impact of Substitution:

1) Savings to Owner for accepting substitution.

2) Change to Contract Time due to accepting substitution.

E. Limit each request to a single proposed substitution item.

1. Submit an electronic document, combining the request form with supporting data into single document.

3.02 **SUBSTITUTION PROCEDURES DURING PROCUREMENT**

A. Section 00 21 13 - Instructions to Bidders specifies time restrictions for submitting requests for substitutions during the bidding period, and the documents required.

3.03 **SUBSTITUTION PROCEDURES DURING CONSTRUCTION**

A. Architect will consider requests for substitutions only within 15 days after date of Agreement.

B. Submit request for Substitution for Cause within 14 days of discovery of need for substitution, but not later than 14 days prior to time required for review and approval by Architect, in order to stay on approved project schedule.

C. Submit request for Substitution for Convenience immediately upon discovery of its potential advantage to the project, but not later than 14 days prior to time required for review and approval by Architect, in order to stay on approved project schedule.

1. In addition to meeting general documentation requirements, document how the requested substitution benefits the Owner through cost savings, time savings, greater energy conservation, or in other specific ways.

2. Document means of coordinating of substitution item with other portions of the work, including work by affected subcontractors.

3. Bear the costs engendered by proposed substitution of:

a. Owner's compensation to the Architect for any required redesign, time spent processing and evaluating the request.

D. Substitutions will not be considered under one or more of the following circumstances:

1. When they are indicated or implied on shop drawing or product data submittals, without having received prior approval.

2. Without a separate written request.

3. When acceptance will require revisions to the Contract Documents.

3.04 **RESOLUTION**

A. Architect may request additional information and documentation prior to rendering a decision. Provide this data in an expeditious manner.

B. Architect will notify Contractor in writing of decision to accept or reject request.

1. Architect's decision following review of proposed substitution will be noted on the submitted form.

3.05 **ACCEPTANCE**

A. Accepted substitutions change the work of the Project. They will be documented and incorporated into work of the project by Change Order, Construction Change Directive,

Architectural Supplementary Instructions, or similar instruments provided for in the Conditions of the Contract.

3.06 **CLOSEOUT ACTIVITIES**

A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.

B. Include completed Substitution Request Forms as part of the Project record. Include both approved and rejected Requests.

END OF SECTION

SECTION 01 30 00
ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.01 RELATED REQUIREMENTS

A. Section 01 60 00 - Product Requirements: General product requirements.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 ELECTRONIC DOCUMENT SUBMITTAL SERVICE

A. All documents transmitted for purposes of administration of the contract are to be in electronic (PDF, MS Word or MS Excel) format, as appropriate to the document, and transmitted via an Internet-based submittal service that receives, logs and stores documents, provides electronic stamping and signatures, and notifies addressees via email.

1. Besides submittals for review, information, and closeout, this procedure applies to Requests for Interpretation (RFIs), progress documentation, contract modification documents (e.g. supplementary instructions, change proposals, change orders), applications for payment, field reports and meeting minutes, Contractor's correction punchlist, and any other document any participant wishes to make part of the project record.
2. Contractor, Owner and Architect are required to use this service.
3. It is Contractor's responsibility to submit documents in allowable format.
4. Subcontractors, suppliers, and Architect's consultants are to be permitted to use the service at no extra charge.
5. Users of the service need an email address, internet access, and PDF review software that includes ability to mark up and apply electronic stamps (such as Adobe Acrobat, www.adobe.com, or Bluebeam PDF Revu, www.bluebeam.com), unless such software capability is provided by the service provider.
6. Paper document transmittals will not be reviewed; emailed electronic documents will not be reviewed.
7. All other specified submittal and document transmission procedures apply, except that electronic document requirements do not apply to samples or color selection charts.

B. Cost: The cost of the service is to be paid by Contractor; include the cost of the service in the Contract Sum.

C. Submittal Service: Use one of the following:

1. Submittal Exchange (tel: 1-800-714-0024): www.submittalexchange.com/#sle.
2. EADOC LLC (tel: 1-877-305-3844): www.eadocsoftware.com/#sle.
3. Newforma Project Cloud: www.newformaprojectcloud.com/#sle.
4. ProCore: www.procore.com.

D. Training: One, one-hour, web-based training session will be arranged for all participants, with representatives of Architect and Contractor participating; further training is the responsibility of the user of the service.

1. Representatives of Owner are scheduled and included in this training.

E. Project Closeout: Architect will determine when to terminate the service for the project. Contractor is responsible for delivery of archive copies of files to Architect for delivery to the Owner.

3.02 **PRECONSTRUCTION MEETING**

A. Schedule meeting after Notice of Award.

B. Attendance Required:

1. Owner .
2. Architect .
3. Contractor .

C. Agenda:

1. Execution of Owner }-Contractor Agreement.
2. Submission of executed bonds and insurance certificates.
3. Distribution of Contract Documents.
4. Submission of list of subcontractors, list of products, schedule of values, and progress schedule.
5. Designation of personnel representing the parties to Contract, Supervise and build .
6. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
7. Scheduling.

D. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.03 **SITE MOBILIZATION MEETING**

A. Schedule meeting at the Project site prior to Contractor occupancy.

B. Attendance Required:

1. Contractor .
2. Owner .
3. Architect .
4. Special consultants.
5. Contractor's superintendent.
6. Major subcontractors.

C. Agenda:

1. Use of premises by Owner and Contractor .
2. Owner's requirements.
3. Construction facilities and controls provided by Owner .
4. Temporary utilities provided by Owner .
5. Survey and building layout.
6. Security and housekeeping procedures.
7. Schedules.
8. Application for payment procedures.
9. Procedures for testing.
10. Procedures for maintaining record documents.
11. Requirements for start-up of equipment.

12. Inspection and acceptance of equipment put into service during construction period.

D. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect , Owner , participants, and those affected by decisions made.

3.04 **PROGRESS MEETINGS**

A. Schedule and administer meetings throughout progress of the work at maximum weekly intervals.

B. Make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.

C. Attendance Required:

1. Contractor.
2. Owner.
3. Architect, at Pay Application Draw meeting only. Once per month.
4. Contractor's superintendent.
5. Major subcontractors.

D. Agenda:

1. Review minutes of previous meetings.
2. Review of work progress.
3. Field observations, problems, and decisions.
4. Identification of problems that impede, or will impede, planned progress.
5. Review of submittals schedule and status of submittals.
6. Review of RFIs log and status of responses.
7. Review of off-site fabrication and delivery schedules.
8. Maintenance of progress schedule.
9. Corrective measures to regain projected schedules.
10. Planned progress during succeeding work period.
11. Coordination of projected progress.
12. Maintenance of quality and work standards.
13. Effect of proposed changes on progress schedule and coordination.
14. Other business relating to work.

E. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect , Owner , participants, and those affected by decisions made.

3.05 **CONSTRUCTION PROGRESS SCHEDULE**

A. Within 10 days after date of the Agreement, submit preliminary schedule defining planned operations for the first 60 days of work, with a general outline for remainder of work.

B. If preliminary schedule requires revision after review, submit revised schedule within 10 days.

C. Within 20 days after review of preliminary schedule, submit draft of proposed complete schedule for review.

1. Include written certification that major contractors have reviewed and accepted proposed schedule.

D. Within 10 days after joint review, submit complete schedule.

E. Submit updated schedule with each Application for Payment.

3.06 **DAILY CONSTRUCTION REPORTS**

A. Include only factual information. Do not include personal remarks or opinions regarding operations and/or personnel.

B. In addition to transmitting electronically a copy to Owner and Architect, submit two printed copies at weekly intervals.

C. Prepare a daily construction report recording the following information concerning events at Project site and project progress:

1. Date.
2. High and low temperatures, and general weather conditions.
3. List of subcontractors at Project site.
4. List of separate contractors at Project site.
5. Approximate count of personnel at Project site.
    a. Include a breakdown for supervisors, laborers, journeymen, equipment operators and helpers.
6. Major equipment at Project site.
7. Material deliveries.
8. Safety, environmental, or industrial relations incidents.
9. Meetings and significant decisions.
10. Unusual events (submit a separate special report).
11. Stoppages, delays, shortages, and losses. Include comparison between scheduled work activities (in Contractor's most recently updated and published schedule) and actual activities. Explain differences, if any. Note days or periods when no work was in progress and explain the reasons why.
12. Meter readings and similar recordings.
13. Emergency procedures.
14. Directives and requests of Authority(s) Having Jurisdiction (AHJ).
15. Change Orders received and implemented.
16. Testing and/or inspections performed.
17. List of verbal instruction given by Owner and/or Architect.
18. Signature of Contractor's authorized representative.

3.07 **PROGRESS PHOTOGRAPHS**

A. Submit photographs with each application for payment, taken not more than 3 days prior to submission of application for payment.

B. Photography Type: Digital; electronic files.

C. Provide photographs of site and construction throughout progress of work produced by an experienced photographer, acceptable to Architect.

D. In addition to periodic, recurring views, take photographs of each of the following events:

1. Completion of site clearing.
2. Excavations in progress.

3. Foundations in progress and upon completion.
4. Structural framing in progress and upon completion.
5. Enclosure of building, upon completion.
6. Final completion, minimum of ten (10) photos.

E. Take photographs as evidence of existing project conditions as follows:
1. Exterior views.
2. Stored materials.
3. Any utilities or items underground to be covered over..

F. Views:
1. Provide non-aerial photographs from four cardinal views at each specified time, until date of Substantial Completion.
2. Consult with Architect for instructions on views required.
3. Provide factual presentation.
4. Provide correct exposure and focus, high resolution and sharpness, maximum depth of field, and minimum distortion.

G. Digital Photographs: 24 bit color, minimum resolution of 1024 by 768, in JPG format; provide files unaltered by photo editing software.
1. Delivery Medium: Via email and Electronic Document Submittal Service.
2. File Naming: Include project identification, date and time of view, and view identification.
3. PDF File: Assemble all photos into printable pages in PDF format, with 2 to 3 photos per page, each photo labeled with file name; one PDF file per submittal.
4. Hard Copy: Printed hardcopy (grayscale) of PDF file and point of view sketch.

3.08 **REQUESTS FOR INTERPRETATION (RFI)**

A. Definition: A request seeking one of the following:
1. An interpretation, amplification, or clarification of some requirement of Contract Documents arising from inability to determine from them the exact material, process, or system to be installed; or when the elements of construction are required to occupy the same space (interference); or when an item of work is described differently at more than one place in the Contract Documents.
2. A resolution to an issue which has arisen due to field conditions and affects design intent.

B. Whenever possible, request clarifications at the next appropriate project progress meeting, with response entered into meeting minutes, rendering unnecessary the issuance of a formal RFI.

C. Preparation: Prepare an RFI immediately upon discovery of a need for interpretation of the Contract Documents. Failure to submit a RFI in a timely manner is not a legitimate cause for claiming additional costs or delays in execution of the work.
1. Prepare a separate RFI for each specific item.
a. Review, coordinate, and comment on requests originating with subcontractors and/or materials suppliers.
b. Do not forward requests which solely require internal coordination between subcontractors.

2. Prepare using software provided by the Electronic Document Submittal Service.
3. Combine RFI and its attachments into a single electronic file. PDF format is preferred.

D. Reason for the RFI: Prior to initiation of an RFI, carefully study all Contract Documents to confirm that information sufficient for their interpretation is definitely not included.
   1. Include in each request Contractor's signature attesting to good faith effort to determine from the Contract Documents information requiring interpretation.
   2. Unacceptable Uses for RFIs: Do not use RFIs to request the following::
      a. Approval of submittals (use procedures specified elsewhere in this section).
      b. Approval of substitutions (see Section - 01 60 00 - Product Requirements)
      c. Changes that entail change in Contract Time and Contract Sum (comply with provisions of the Conditions of the Contract).
      d. Different methods of performing work than those indicated in the Contract Drawings and Specifications (comply with provisions of the Conditions of the Contract).
   3. Improper RFIs: Requests not prepared in compliance with requirements of this section, and/or missing key information required to render an actionable response. They will be returned without a response, with an explanatory notation.
   4. Frivolous RFIs: Requests regarding information that is clearly indicated on, or reasonably inferable from, the Contract Documents, with no additional input required to clarify the question. They will be returned without a response, with an explanatory notation.

E. Content: Include identifiers necessary for tracking the status of each RFI, and information necessary to provide an actionable response.
   1. Official Project name and number, and any additional required identifiers established in Contract Documents.
   2. Owner's, Architect's, and Contractor's names.
   3. Discrete and consecutive RFI number, and descriptive subject/title.
   4. Issue date, and requested reply date.
   5. Reference to particular Contract Document(s) requiring additional information/interpretation. Identify pertinent drawing and detail number and/or specification section number, title, and paragraph(s).
   6. Annotations: Field dimensions and/or description of conditions which have engendered the request.
   7. Contractor's suggested resolution: A written and/or a graphic solution, to scale, is required in cases where clarification of coordination issues is involved, for example; routing, clearances, and/or specific locations of work shown diagrammatically in Contract Documents. If applicable, state the likely impact of the suggested resolution on Contract Time or the Contract Sum.

F. Attachments: Include sketches, coordination drawings, descriptions, photos, submittals, and other information necessary to substantiate the reason for the request.

G. RFI Log: Prepare and maintain a tabular log of RFIs for the duration of the project.
   1. Indicate current status of every RFI. Update log promptly and on a regular basis.
   2. Note dates of when each request is made, and when a response is received.
   3. Highlight items requiring priority or expedited response.

4. Highlight items for which a timely response has not been received to date.
5. Identify and include improper or frivolous RFIs.

H. Review Time: Architect will respond and return RFIs to Contractor within seven calendar days of receipt. For the purpose of establishing the start of the mandated response period, RFIs received after 12:00 noon will be considered as having been received on the following regular working day.

1. Response period may be shortened or lengthened for specific items, subject to mutual agreement, and recorded in a timely manner in progress meeting minutes.

I. Responses: Content of answered RFIs will not constitute in any manner a directive or authorization to perform extra work or delay the project. If in Contractor's belief it is likely to lead to a change to Contract Sum or Contract Time, promptly issue a notice to this effect, and follow up with an appropriate Change Order request to Owner.

1. Response may include a request for additional information, in which case the original RFI will be deemed as having been answered, and an amended one is to be issued forthwith. Identify the amended RFI with an R suffix to the original number.
2. Do not extend applicability of a response to specific item to encompass other similar conditions, unless specifically so noted in the response.
3. Upon receipt of a response, promptly review and distribute it to all affected parties, and update the RFI Log.
4. Notify Architect within seven calendar days if an additional or corrected response is required by submitting an amended version of the original RFI, identified as specified above.

3.09 **SUBMITTAL SCHEDULE**

A. Submit to Architect for review a schedule for submittals in tabular format.

1. Submit at the same time as the preliminary schedule specified in Section - 01 32 16 - Construction Progress Schedule.
2. Coordinate with Contractor's construction schedule and schedule of values.
3. Format schedule to allow tracking of status of submittals throughout duration of construction.
4. Arrange information to include scheduled date for initial submittal, specification number and title, submittal category (for review or for information), description of item of work covered and role and name of subcontractor.
5. Account for time required for preparation, review, manufacturing, fabrication and delivery when establishing submittal delivery and review deadline dates.
    a. For assemblies, equipment, systems comprised of multiple components and/or requiring detailed coordination with other work, allow for additional time to make corrections or revisions to initial submittals, and time for their review.

3.10 **SUBMITTALS FOR REVIEW**

A. When the following are specified in individual sections, submit them for review:

1. Product data.
2. Design data.
3. Shop drawings.
4. Samples for selection.
5. Samples for verification.

B. Submit to Architect for review for the limited purpose of checking for compliance with information given and the design concept expressed in the contract documents.

C. Samples will be reviewed for aesthetic, color, or finish selection.

D. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record documents purposes described in Section 01 78 00 - Closeout Submittals.

3.11 SUBMITTALS FOR INFORMATION

A. When the following are specified in individual sections, submit them for information:

1. Sustainability design submittals and reports.
2. Certificates.
3. Test reports.
4. Inspection reports.
5. Manufacturer's instructions.
6. Manufacturer's field reports.
7. Other types indicated.

B. Submit for Architect's knowledge as contract administrator or for Owner.

3.12 SUBMITTALS FOR PROJECT CLOSEOUT

A. Submit Correction Punch List for Substantial Completion.

B. Submit Final Correction Punch List for Substantial Completion.

C. When the following are specified in individual sections, submit them at project closeout in compliance with requirements of Section 01 78 00 - Closeout Submittals:

1. Project record documents.
2. Operation and maintenance data.
3. Warranties.
4. Bonds.
5. Other types as indicated.
6. Equipment and appliance manuals

D. Submit for Owner 's benefit during and after project completion.

3.13 NUMBER OF COPIES OF SUBMITTALS

A. Electronic Documents: Submit one electronic copy in PDF format; an electronically-marked up file will be returned. Create PDFs at native size and right-side up; illegible files will be rejected.

B. Samples: Submit the number specified in individual specification sections; one of which will be retained by Architect .

1. After review, produce duplicates.
2. Retained samples will not be returned to Contractor unless specifically so stated.

3.14 SUBMITTAL PROCEDURES

A. General Requirements:

1. Use a single transmittal for related items.

2. Submit separate packages of submittals for review and submittals for information, when included in the same specification section.
3. Sequentially identify each item. For revised submittals use original number and a sequential numerical suffix.
4. Identify: Project; Contractor; subcontractor or supplier; pertinent drawing and detail number; and specification section number and article/paragraph, as appropriate on each copy.
5. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of products required, field dimensions, adjacent construction work, and coordination of information is in accordance with the requirements of the work and Contract Documents.
6. Deliver each submittal on date noted in submittal schedule, unless an earlier date has been agreed to by all affected parties, and is of the benefit to the project.
    a. Upload submittals in electronic form to Electronic Document Submittal Service website.
7. Schedule submittals to expedite the Project, and coordinate submission of related items.
    a. For each submittal for review, allow 15 days excluding delivery time to and from the Contractor.
    b. For sequential reviews involving Architect's consultants, Owner, or another affected party, allow an additional 7 days.
    c. For sequential reviews involving approval from authorities having jurisdiction (AHJ), in addition to Architect's approval, allow an additional 30 days.
8. Identify variations from Contract Documents and product or system limitations that may be detrimental to successful performance of the completed work.
9. Provide space for Contractor and Architect review stamps.
10. When revised for resubmission, identify all changes made since previous submission.
11. Distribute reviewed submittals. Instruct parties to promptly report inability to comply with requirements.
12. Incomplete submittals will not be reviewed, unless they are partial submittals for distinct portion(s) of the work, and have received prior approval for their use.
13. Submittals not requested will not be recognized or processed.

B. Product Data Procedures:
1. Submit only information required by individual specification sections.
2. Collect required information into a single submittal.
3. Submit concurrently with related shop drawing submittal.
4. Do not submit (Material) Safety Data Sheets for materials or products.
5. Submit sustainable design reporting submittals under separate cover.

C. Shop Drawing Procedures:
1. Prepare accurate, drawn-to-scale, original shop drawing documentation by interpreting the Contract Documents and coordinating related work.
2. Do not reproduce the Contract Documents to create shop drawings.

3. Generic, non-project-specific information submitted as shop drawings do not meet the requirements for shop drawings.

D. Samples Procedures:

1. Transmit related items together as single package.
2. Identify each item to allow review for applicability in relation to shop drawings showing installation locations.
3. Include with transmittal high-resolution image files of samples to facilitate electronic review and approval. Provide separate submittal page for each item image.

3.15 SUBMITTAL REVIEW

A. Submittals for Review: Architect will review each submittal, and approve, or take other appropriate action.

B. Submittals for Information: Architect will acknowledge receipt and review. See below for actions to be taken.

C. Architect's actions will be reflected by marking each returned submittal using virtual stamp on electronic submittals.

1. Notations may be made directly on submitted items and/or listed on appended Submittal Review cover sheet.

D. Architect's and consultants' actions on items submitted for review:

1. Authorizing purchasing, fabrication, delivery, and installation:
   a. "Approved", or language with same legal meaning.
   b. "Approved as Noted, Resubmission not required", or language with same legal meaning.
      1) At Contractor's option, submit corrected item, with review notations acknowledged and incorporated.
   c. "Approved as Noted, Resubmit for Record", or language with same legal meaning.
      1) Resubmit corrected item, with review notations acknowledged and incorporated. Resubmit separately, or as part of project record documents.
      2) Non-responsive resubmittals may be rejected.
2. Not Authorizing fabrication, delivery, and installation:
   a. "Revise and Resubmit".
      1) Resubmit revised item, with review notations acknowledged and incorporated.
      2) Non-responsive resubmittals may be rejected.
   b. "Rejected".
      1) Submit item complying with requirements of Contract Documents.

E. Architect's and consultants' actions on items submitted for information:

1. Items for which no action was taken:
   a. "Received" - to notify the Contractor that the submittal has been received for record only.
2. Items for which action was taken:
   a. "Reviewed" - no further action is required from Contractor.

END OF SECTION

SECTION 01 33 29
SUSTAINABLE DESIGN REPORTING

PART 1 GENERAL

1.01 PROJECT GOALS

A. This project has been designed to meet 2015 Enterprise Green Communities for New Construction.

B. Free-standing furniture and furnishings are not included in the Contract.

C. Contractor is not responsible for the application for certification, nor for determination of methods of achieving sustainable design credits unless specifically so indicated.

D. Many of the sustainable design credits can be achieved only through intelligent design of the project and are beyond the control of the Contractor. However, certain credits relate to the products and procedures used for construction. Therefore, the full cooperation of the Contractor and subcontractors is essential to achieving final certification.

E. Contractor shall familiarize himself with the relevant requirements and provide the necessary information and instruction to all subcontractors and installers.

F. Since Contractor and subcontractors may not be familiar with sustainable design requirements, this section includes a summary of the products and procedures intended to achieve sustainable design credits.

1. Some credits are dependent on proper performance by Contractor and subcontractors.

2. Other credits involve quantifying percentages by weight or volume and cost; these require careful recordkeeping and reporting by the Contractor.

3. See Section 07 33 29.01 , 2015 Enterprise Green Communities Crtieria, Workbook and Checklist for more information.

1.02 RELATED REQUIREMENTS

A. Section 01 30 00 - Administrative Requirements: Additional submittal requirements.

B. Section 01 33 29.04 - Material Content Form: Form with checklist for documenting product content, emissions, health effects, sources, and costs.

C. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.

1.03 DEFINITIONS

A. Product Reporting Scope: All products specified in Divisions 2 through 10, 31, and 32, and the following:

1. All paints, coatings, adhesives, and sealants that are used but not specified.

2. Composite wood that is permanently installed but not specified.

3. Plumbing fixtures and trim.

B. Product Reporting Scope: All products in the following product categories, whether specified or not:

1. Interior paints and coatings.

2. Exterior and interior adhesives and sealants, including flooring adhesives.

3. Flooring.

4. Composite wood.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for additional submittal procedures.

B. Sustainable Design Documentation: The scope of required documentation is specified in some individual specification sections; other scope is specified in this section and its related forms only.

C. New Product Documentation: For each new product in the Product Reporting Scope, submit the Material Content Form, with evidence of compliance attached.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 PROCEDURES

A. Submit sustainable design documentation by Contractor, using procedures defined under Submittals for Information in Section 01 30 00.

B. Submit sustainable design documentation to Architect, unless otherwise indicated.

C. Where an item of sustainable design documentation is specified, fill out and submit the appropriate form.

1. Fill out one form for each different brand name product and each different manufacturer of a lot of commodity products.
2. Where required attachments are specified, attach the documentation to the back of the form.
3. Mark each blank with the appropriate information; use "ATT" for items attached; if any item is not relevant use the code "NR"; if any item is not available use the code "NA".

D. Each form must be signed by the entity capable of certifying the information.

1. Certification signatures must be made by an officer of the company.
2. For products, certification must be made by the manufacturer not the supplier.
3. For custom fabricated products, certification by the fabricator is acceptable.

E. Submit the completed forms in accordance with the requirements of Section 01 30 00, as information submittals.

1. Give each form a unique submittal number.
2. Do not combine sustainable design documentation with product data or shop drawing submittals.

3.02 DIVISION 1 - GENERAL REQUIREMENTS

A. Sections that include requirements intended to achieve sustainable design goals are, but are not limited to, the following:

B. Section 01 33 29 - Sustainable Design Reporting: Requirements and procedures for sustainable design documentation.

C. Section 01 33 29.04 - Material Content Form: Form with checklist for documenting product content, emissions, health effects, sources, and costs.

D. Section 01 57 13 - Temporary Erosion and Sediment Control: Preventive measures and remediation.

E. Section 01 57 19 - Temporary Environmental Controls:

1. Basic construction procedures.
2. Testing of air isolation between residential units.

3. Testing of ventilation.

F. Section 01 60 00 - Product Requirements:

1. Definitions of:

a. Reused Products.

b. Recycled Content.

c. Bio-Based content.

d. Sustainably Harvested Wood, which is defined as certified by FSC only.

e. Source Location.

f. Environmental Product Declarations.

g. Health Product Declarations.

h. Cradle-to-Cradle.

i. GreenScreen Chemical Hazard Analysis.

j. Manufacturer's Inventory of Product Content.

G. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions: List of indoor-emissions-restricted products and VOC-content-restricted products, requirements, evidence required, and reporting.

H. Section 01 70 00 - Execution and Closeout Requirements:

I. Section 01 74 19 - Construction Waste Management and Disposal: Requirements for landfill diversion and reporting.

J. Section 01 78 00 - Closeout Submittals: Maintenance and operation manuals for commissioned systems.

K. Section 01 79 00 - Demonstration and Training:

1. Demonstration of commissioned systems and equipment.

2. Training of Owner's personnel.

L. Section 01 91 13 - General Commissioning Requirements.

M. Section 01 91 14 - Commissioning Authority Responsibilities.

3.03 **DIVISION 2 - EXISTING CONDITIONS**

A. Section 02 41 00 - Demolition:

3.04 **DIVISION 3 - CONCRETE**

3.05 **DIVISION 6 - WOOD, PLASTICS, AND COMPOSITES**

A. Note: Definition of sustainably harvested wood is in Section 01 60 00.

B. Section 06 10 00 - Rough Carpentry: Requirement to use sustainably harvested wood.

C. Section 06 15 00 - Wood Decking: Requirement to use sustainably harvested wood.

D. Section 06 17 33 - Wood I-Joists: Requirement to use sustainably harvested wood.

E. Section 06 17 53 - Shop-Fabricated Wood Trusses: Requirement to use sustainably harvested wood.

F. Section 06 18 00 - Glued-Laminated Construction: Requirement to use sustainably harvested wood.

G. Section 06 20 00 - Finish Carpentry: Requirement to use sustainably harvested wood.

3.06 **DIVISION 7 - THERMAL AND MOISTURE PROTECTION**

A. Section 07 84 00 - Firestopping: Emissions-compliant firestopping sealants.

B. Section 07 84 00 - Firestopping: Sealing penetrations in walls, floors, and ceilings between residential units.

C. Section 07 92 00 - Joint Sealants: Sealing penetrations in walls, floors, and ceilings between residential units.

D. Section 07 92 00 - Joint Sealants: Emissions-compliant sealants.

3.07 **DIVISION 8 - OPENINGS**

A. Section 08 80 00 - Glazing: For daylighting and views.

3.08 **DIVISION 9 - FINISHES**

A. Section 09 68 16 - Sheet Carpeting: Carpet complying with CRI Green Label Plus requirements.

B. Section 09 91 23 - Interior Painting: Emissions-compliant interior opaque paints and coatings.

3.09 **DIVISION 11 - EQUIPMENT**

A. Section 11 30 13 - Residential Appliances: Energy Star rated appliances.

3.10 **DIVISION 12 - FURNISHINGS**

A. Section 12 36 00 - Countertops: Requirement to use sustainably harvested wood.

3.11 **DIVISION 22 - PLUMBING**

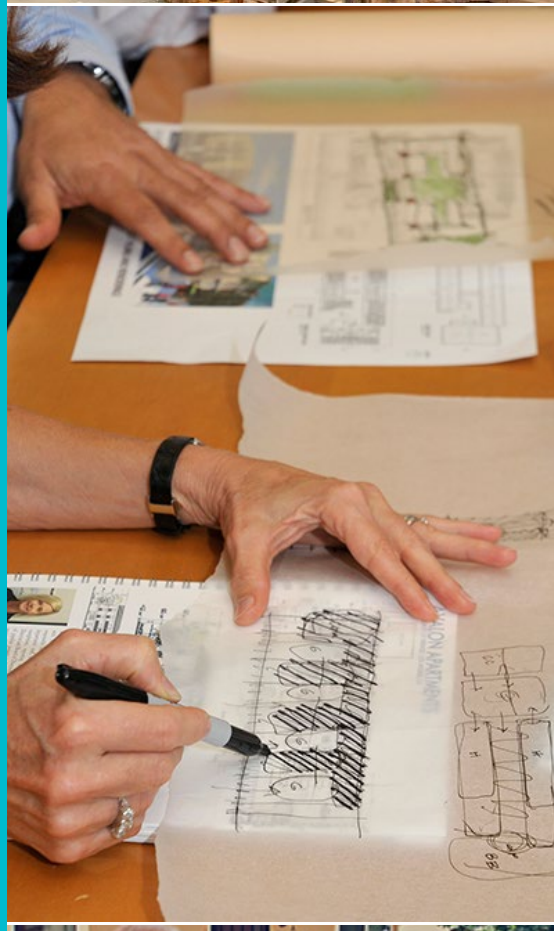
A. Section 22 40 00 - Plumbing Fixtures:

1. WaterSense-labeled water closets, urinals, lavatory faucets, and showerheads.

3.12 **DIVISION 23 - HVAC**

A. Section 23 08 00 - Commissioning of HVAC.

END OF SECTION



2015 ENTERPRISE GREEN COMMUNITIES CRITERIA

Enterprise green communities®

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We also thank the hundreds of developers and project teams now integrating the Enterprise Green Communities Criteria into affordable housing across the country.

Any errors in this document are the sole responsibility of Enterprise Green Communities.

Design: Landesberg Design

Contents

CONTENTS (CONTINUED)

The American Heart Association is proud to serve as a scientific advisor to Enterprise Community Partners, Inc. in support of the 2015 Green Communities Criteria update. With its strong focus on improving the health of low-income families and communities, the Criteria aligns directly with the American Heart Association's mission to build healthier lives, free of cardiovascular diseases and stroke.

The Green Communities Criteria is the leading U.S. standard for the design, construction and operation of healthy, energy efficient and environmentally responsible affordable housing. Since its first release in 2004, the Criteria has played a leading role in advancing the widespread adoption of healthy design and building practices across the affordable housing field and has served as the blueprint for the development and preservation of tens of thousands of affordable homes throughout the country.

At the American Heart Association, we understand that healthy, high-quality affordable housing has the potential to help address some of the most urgent health challenges facing low-income families and communities today. To that end, we have worked with Enterprise to enhance strategies that align with our **Life's Simple 7™ Heart Health Factors** to support healthy families and communities, including promoting physical activity, increasing access to nutritional food and reducing tobacco use in the environment.

The Enterprise Green Communities Criteria supports the American Heart Association's commitment to building a culture of health. Together, we envision low-income Americans living free of cardiovascular diseases and stroke in quality, affordable housing located in healthy, service-enriched communities. We are committed to working with Enterprise to increase awareness and adoption of these standards across the country over the next five years.

Eduardo Sanchez, MD, MPH
Chief Medical Officer for Prevention
American Heart Association

Introduction

Enterprise Green Communities is improving the health and well-being of low-income people by transforming the quality of affordable housing in America. By aligning affordable housing investment strategies with environmentally responsive building practices, Enterprise is leading the national effort to ensure that people living in affordable housing are healthier, spend less money on utilities, and have more opportunities through their connections to transportation, quality food and health care services. The building stock is also improved: **Certified Enterprise Green Communities properties cost less to operate and maintain, use fewer natural resources, generate less waste and contain fewer toxic materials, contributing to a healthier environment**.

The 2015 Enterprise Green Communities Criteria continue our 10-year tradition of capturing the collective experience of affordable housing developers and leading housing and green building organizations and experts. This collaborative approach provides a clear, cost-effective framework for affordable housing. Our commitment to a thorough integrative design process, optimized location and site features, water conservation, energy efficiency, and property operations practices is re-doubled in the 2015 Criteria. And for the first time, we have included thoughtful integration of resilient design features and have expanded our emphasis on residents' health. The Criteria are suitable for all development types, including **New Construction**, **Substantial Rehab**, and **Moderate Rehab** in both multifamily and single-family projects. Where relevant, exemptions based on project location or on development type are identified within each criterion.

The 2015 Enterprise Green Communities Criteria are grouped into the following eight categories:

1. Integrative Design
2. Location + Neighborhood Fabric
3. Site Improvements
4. Water Conservation
5. Energy Efficiency
6. Materials
7. Healthy Living Environment
8. Operations, Maintenance, and Resident Engagement

WHY USE THE CRITERIA?

Consider this: 70% of design decisions are made in the first 10% of a project—a fact that's critically relevant to Enterprise given our commitment to creating healthy and sustainable homes. To maximize time and resources, planning ahead is essential. First, project teams should familiarize themselves with the full Criteria. Then, using a thorough integrative design process, they should consider the goals for the project—and goals for the future residents—when evaluating which criteria to incorporate into their building(s). Taking a human-centered approach to design and development will lead to a comprehensive planning process and a careful selection of materials and technologies that will better meet project aspirations.

Not all of the criteria have directly measurable financial impacts, but these criteria are no less important to meeting a project's mission. Projects will exhibit improved occupant health and well-being through reduced exposure to environmental pollutants, improved connectivity to services and walkable neighborhoods, and good lighting. The benefits extend beyond the occupants to the neighboring community by supporting local community services and activating neighborhood streets, as well as improving water quality and reducing the impact of stormwater run-off on neighboring sewer systems. We suspect that when these benefits are quantified, they will dwarf the energy and water savings benefits we can count today.

Our pipeline includes projects that avoid upfront cost premiums when meeting the Enterprise Green Communities Criteria as compared to standard practice after implementing a robust integrative design approach. And overall, the median incremental cost of complying with the Enterprise Green Communities Criteria tends to be minimal: In an evaluation report from 2012, Enterprise found a median 2% increase to total development cost. The average project analyzed in this study achieved lifetime utility savings that exceed the cost of integrating the Enterprise Green Communities Criteria, with a simple payback of 5.59 years.

DEFINITION OF REHABS

Given that the scope of work on existing buildings can vary widely (from minor repairs to gut rehabs), we have defined two levels of rehabs, to guide project team planning.

A *Substantial Rehab* is defined as a project where the work area exceeds 50% of the aggregate area of the building: an ICC level 3 alteration scope of work.

A *Moderate Rehab* is defined as a project where the work area does not exceed 50% of the aggregate area of the building (the work scope is less than an ICC level 3 alteration), yet is still able to comply with the energy performance requirements of Criterion 5.1.

While Substantial and Moderate Rehabs are defined as specifically as possible above, each project will most likely have more nuance than can be captured here. Please use these definitions as the start of this guidance, strive for the most inclusive level of integrating the Criteria, and note that compliance with the energy performance requirements of Criterion 5.1 often is the factor that places a project in the New Construction pathway (possible for some gut rehabs), Substantial Rehab pathway or Moderate Rehab pathway, or precludes Certification all together.

CERTIFICATION

Enterprise Green Communities Certification is available for any housing project that includes affordable dwelling units. The Certification process provides a means for teams to validate their efforts in successfully incorporating the Criteria into their project and, more important, a guide for development teams to navigate critical details of achieving a green building.

Certification involves a two-step online submission and review process: *PreBuild* and *PostBuild*. Project teams submit their PreBuild application near the end of the design phase, prior to the start of

Online Resources

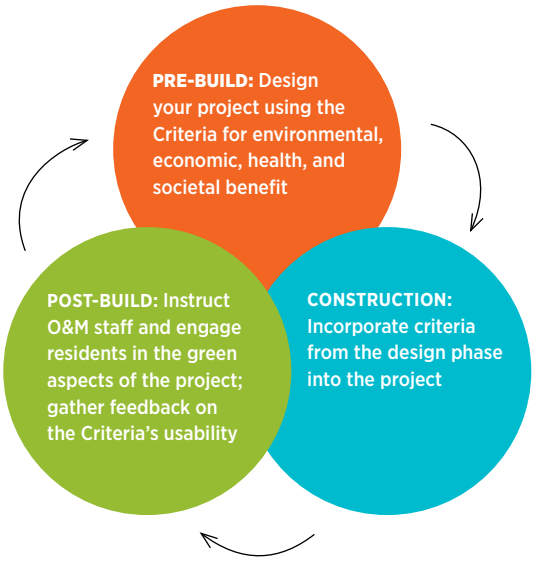
Enterprise Green Communities website: www.enterprisecommunity.org/green

Enterprise Resource Center: www.enterprisecommunity.com/resources

construction. Project teams submit their PostBuild application shortly after the project has received its Certificate of Occupancy. Upon submission of each application, Enterprise Green Communities conducts a thorough review of the materials and provides feedback to the project team as necessary, clearly indicating whether the application was approved or needs further work. Enterprise also provides tools and resources to assist with the design, development and operations of affordable housing projects. Many of these can be found in the Enterprise Resource Center.

All projects must achieve compliance with the mandatory Criteria measures applicable to that construction type. Additionally, New Construction projects must achieve 35 optional points, Substantial Rehab projects must achieve 30 optional points, and Moderate Rehab projects must also achieve 30 optional points. For projects that receive PreBuild and PostBuild approval, Enterprise Green Communities certifies that the Criteria were met in full, and recognizes the project team for their accomplishment.

For a full description of the Enterprise Green Communities certification process, including required parameters for the PreBuild and PostBuild submissions, go to *www.enterprisecommunity.com/solutions-and-innovation/enterprise-green-communities/certification*. If you have questions about Enterpise Green Communities certification, email *certification@enterprisecommunity.org*.



M = MANDATORY
# = OPTIONAL POINTS

2015 Enterprise Green Communities Criteria Checklist

This checklist provides an overview of the technical requirements within the Enterprise Green Communities Criteria. **To achieve Enterprise Green Communities Certification, all projects must achieve compliance with the Criteria mandatory measures applicable to that construction type. Additionally, New Construction projects must achieve 35 optional points, Substantial Rehab projects must achieve 30 optional points, and Moderate Rehab projects must also achieve 30 optional points.**

1. INTEGRATIVE DESIGN

YES NO MAYBE — M

1.1a Goal Setting

Develop an integrative design process that works best for your project team and intentions. At minimum, document:

1. A statement of the overall green development goals of the project and the expected intended outcomes from addressing those goals.
2. A summary of the integrative process that was used to select the green building strategies, systems and materials that will be incorporated into the project.
3. A description of how progress and success against these goals will be measured throughout the completion of design, construction and operation to ensure that the green features are included and correctly installed.

YES NO MAYBE — M

1.1b Criteria Documentation

Create design and construction documentation to include information on implementation of appropriate Enterprise Green Communities Criteria.

YES NO MAYBE — 9

1.1c Designing for Project Performance

Identify how the expected performance of your project compares to the actual performance of other projects in your portfolio and/or community.

YES NO MAYBE — M

1.2a Resident Health and Well-Being: Design for Health

Identify potential resident health factors and design your project to address resident health and well-being by using the matrix provided on pages 22 and 23.

YES NO MAYBE — 12

1.2b Resident Health and Well-Being: Health Action Plan

At pre-design and continuing throughout the project life cycle, collaborate with public health professionals and community stakeholders to assess, identify, implement and monitor achievable actions to enhance health-promoting features of the project and minimize features that could present health risks. Specifically, create a Health Action Plan and integrate the selected interventions and a plan for monitoring and evaluating progress per the full criterion.

YES NO MAYBE — M

1.3a Resilient Communities: Design for Resilience *(New Construction and Substantial Rehab only)*

Given your project building type, location and expected resident population, identify a project characteristic that would most likely impact your project's ability to withstand an unexpected weather event or loss of power. Select at least one criterion from the given list that would help mitigate that impact, and incorporate this within your project plans and design. Include a short narrative providing your rationale for selecting this criterion above the others.

M = MANDATORY
# = OPTIONAL POINTS

INTEGRATIVE DESIGN *(continued)*

YES NO MAYBE 15

1.3b Resilient Communities: Multi-Hazard Risk/Vulnerability Assessment
Carry out a Vulnerabilities Assessment and implement building elements designed to enable the project to adapt to, and mitigate, climate impacts given the project location, building/construction type and resident population.

SUBTOTAL OPTIONAL POINTS

2. LOCATION + NEIGHBORHOOD FABRIC

New Construction: All new construction projects must earn optional points under Criterion 2.8 Access to Public Transportation, **OR** earn 8 optional points through selecting one or more of the following:

- 2.7 Preservation of and Access to Open Space
- 2.9 Improving Connectivity to the Community
- 2.12 Access to Fresh, Local Foods
- 2.13 LEED for Neighborhood Development Certification
- 2.14 Local Economic Development and Community Wealth Creation

YES NO MAYBE M

2.1 Sensitive Site Protection
Do not locate new projects, including buildings, built structures, roads or parking areas, on portions of sites that meet any of the following provisions:

1. Land within 100 feet of wetlands, including isolated wetlands or streams. Maintain or establish riparian buffer using native vegetation where possible. Bike and foot paths are allowed if at least 25 feet from the wetlands boundary.
2. Land on slope greater than 15%.
3. Land with prime soils, unique soils or soils of state significance per USDA designations.
4. Public parkland.
5. Land that is specifically identified as an existing habitat for any species on federal or state threatened or endangered lists.
6. Land that is within the Special Flood Hazard Areas (SFHA) as identified by FEMA on the Flood Insurance Rate Map.

YES NO MAYBE M

2.2 Connections to Existing Development and Infrastructure *(Except for projects located on rural tribal lands, in colonias communities, or in communities with populations of less than 10,000)*
Locate the project on a site with access to existing roads, water, sewers and other infrastructure within or contiguous to (having at least 25% of the perimeter bordering) existing development. Connect the project to the pedestrian grid.

YES NO MAYBE M

2.3 Compact Development
At a minimum, build to the residential density (dwelling units/acre) of the census block group in which your project is located.

YES NO MAYBE 5 or 7

5 pts

2.4 Compact Development
Exceed the residential density (dwelling units/acre) of the census block group in which your project is located. Exceed by 2x for *[5 points]*; exceed by 3x for *[7 points]*.

M = MANDATORY
# = OPTIONAL POINTS

LOCATION + NEIGHBORHOOD FABRIC *(continued)*

YES NO MAYBE — M

2.5 Proximity to Services

Locate the project within a 0.5-mile walk distance of at least four, or a 1-mile walk distance of at least seven, of the listed services. For projects that qualify as Rural/Tribal/Small Town, locate the project within 5 miles of at least four of the listed services.

YES NO MAYBE — M

2.6 Preservation of and Access to Open Space for Rural/Tribal/Small Towns

Set aside a minimum of 10% (minimum of 0.25 acre) of the total project acreage as non-paved open space for use by all residents **OR** locate the project within a 0.25-mile walk distance of dedicated public non-paved open space that is a minimum of 0.75 acres.

YES NO MAYBE — 6 max — 2 pts.

2.7 Preservation of and Access to Open Space

Set aside a percentage of non-paved open space for use by all residents. 20% *[2 points]*; 30% *[4 points]*; 40% + written statement of preservation/conservation policy for set-aside land *[6 points]*.

YES NO MAYBE — 8 or 10 — 8 pts.

2.8 Access to Public Transportation

Locate projects within a 0.5-mile walk distance of transit services combined (bus, rail and/or ferry), constituting at least 60 or more transit rides per weekday, with some type of weekend ride option. *[8 points]*

For projects that qualify as Rural/Tribal/Small Town, locate the project within a 5-mile distance of at least one of the following transit options: 1) vehicle share program; 2) dial-a-ride program; 3) employer vanpool; 4) park-and-ride; or 5) public–private regional transportation. *[8 points]*

For an additional 2 points: Locate the project along dedicated bike trails or lanes that lead to transit services or stations (bus, rail and ferry) within 3 miles.

YES NO MAYBE — 2 to 8 — 1 pt.

2.9 Improving Connectivity to the Community

Improve access to community amenities through at least one of the transit, auto or biking mobility measures listed.

YES NO MAYBE — 5 max

2.10 Passive Solar Heating/Cooling

Design and build with passive solar design, orientation and shading that meet specificed guidelines.

YES NO MAYBE — 4

2.11 Brownfield Site or Adaptive Reuse Building

Rehabilitate an existing structure that was not previously used as housing or locate the project on a brownfield site.

YES NO MAYBE — 6 — 6 pts.

2.12 Access to Fresh, Local Foods

Pursue one of three options to provide residents and staff with access to fresh, local foods, including neighborhood farms and gardens, community-supported agriculture, or proximity to farmers markets.

YES NO MAYBE — 4

2.13 LEED for Neighborhood Development Certification

Locate building(s) in a Stage 2 Pre-Certified or Stage 3 Certified Neighborhood Development.

YES NO MAYBE — 6 max — 2 pts.

2.14 Local Economic Development and Community Wealth Creation

Demonstrate that local preference for construction employment and subcontractor hiring was part of your bidding process *[2 points]* **OR** demonstrate that you achieved at least 20% local employment *[3 points]* **OR** provide physical space for small business, nonprofits, and/or skills and workforce education *[3 points]*.

SUBTOTAL OPTIONAL POINTS

M = MANDATORY
# = OPTIONAL POINTS

3. SITE IMPROVEMENTS

YES NO MAYBE — M

3.1 Environmental Remediation

Conduct an environmental site assessment to determine whether any hazardous materials are present on-site; mitigate any found.

YES NO MAYBE — M

3.2 Erosion and Sedimentation Control *(Except for infill sites with buildable area smaller than one acre)*

Implement EPA's Best Management Practices for Construction Site Stormwater Runoff Control, or local requirements, whichever is more stringent.

YES NO MAYBE — M

3.3 Low-Impact Development

Projects located on greenfields must meet the list of low-impact development criteria.

YES NO MAYBE — M

3.4 Landscaping

If providing plantings, all should be native or adapted to the region, appropriate to the site's soil and microclimate, and none of the new plants is an invasive species. Reseed or xeriscape all disturbed areas.

YES NO MAYBE — M

3.5a Efficient Irrigation and Water Reuse

If irrigation is used, install an efficient irrigation or water reuse system per the guidelines.

YES NO MAYBE — 4 or 8 — 4pts

3.5b Efficient Irrigation and Water Reuse

Install an efficient irrigation system equipped with a WaterSense-labeled weather-based irrigation controller (WBIC) **OR** at least 50% of the site's irrigation should be satisfied by reusing water.

YES NO MAYBE — 4 or 8 — 4pts.

3.6 Surface Stormwater Management

Retain, infiltrate and/or harvest the first 1.0 inch of rain that falls *[4 points]* **OR** as calculated for a 24-hour period of a one-year (1) storm event, so that no stormwater is discharged to drains/inlets. *[8 points]* For both options, permanently label all storm drains and inlets.

YES NO MAYBE — 1 — 1pt.

3.7 Reducing Heat-Island Effect: Paving

Use light-colored, high-albedo materials and/or an open-grid pavement, with a minimum solar reflectance of 0.3, over at least 50% of the site's hardscaped area.

SUBTOTAL OPTIONAL POINTS

4. WATER CONSERVATION

YES NO MAYBE — M

4.1 Water-Conserving Fixtures

Install water-conserving fixtures in all units and any common facilities with the following specifications. *Toilets:* WaterSense-labeled and 1.28 gpf; *Urinals*: WaterSense-labeled and 0.5 gpf; *Showerheads:* WaterSense-labeled and 2.0 gpm; *Kitchen faucets*: 2.0 gpm; *Lav faucets*: WaterSense-labeled and 1.5 gpm

AND for all single-family homes and all dwelling units in buildings three stories or fewer, the static service pressure must not exceed 60 psi.

M = MANDATORY
# = OPTIONAL POINTS

WATER CONSERVATION *(continued)*

YES NO MAYBE 6 max

4.2 Advanced Water Conservation

Reduce water consumption either by installing water-conserving fixtures in all units and all common space bathrooms with the following specifications: *Toilets:* WaterSense-labeled and 1.1 gpf *[1 point]*; *Showerheads*: WaterSense-labeled and 1.5 gpm *[1 point]*; *Kitchen faucets:* 1.5 gpm and *lav faucets:* WaterSense-labeled and 1.0 gpm *[1 point]*

2pts.

OR

Reduce total indoor water consumption by at least 30% compared to the baseline indoor water consumption chart, through a combination of your choosing. *[6 points maximum]*

YES NO MAYBE 4

4.3 Leaks and Water Metering

Conduct pressure-loss tests and visual inspections to determine if there are any leaks; fix any leaks found; and meter or submeter each dwelling unit with a technology capable of tracking water use. Separately meter outdoor water consumption.

YES NO MAYBE 4

4.4 Efficient Plumbing Layout and Design

To minimize water loss from delivering hot water, the hot water delivery system shall store no more than 0.5 gallons of water in any piping/manifold between the hot water source and any hot water fixture.

YES NO MAYBE 6 max

4.5 Water Reuse

Harvest, treat, and reuse rainwater and/or greywater to meet a portion of the project's total water needs: 10% reuse *[3 points]*; 20% reuse *[4 points]*; 30% reuse *[5 points]*; 40% reuse *[6 points]*

YES NO MAYBE 8

4.6 Access to Potable Water During Emergencies

Provide residents with access to potable water in the event of an emergency that disrupts normal access to potable water, including disruptions related to power outages that prevent pumping water to upper floors of multifamily buildings or pumping of water from on-site wells, per one of the three options.

SUBTOTAL OPTIONAL POINTS

5. ENERGY EFFICIENCY

YES NO MAYBE M

5.1a Building Performance Standard *(New Construction: single-family and low-rise multifamily)*

Certify each dwelling unit in the project through the ENERGY STAR New Homes program.

YES NO MAYBE M

5.1b Building Performance Standard *(New Construction: mid-rise and high-rise multifamily, with some exceptions)*

Certify the project through the ENERGY STAR Multifamily High-Rise program (MFHR) **OR** follow the combined MFHR and LEED Commissioning Path outlined in the criterion.

Exception: Multifamily buildings that are four or five stories, in which all dwelling units have their own heating, cooling and hot water systems, should comply with Criterion 5.1a and certify each dwelling unit per ENERGY STAR Certified New Homes.

M = MANDATORY
# = OPTIONAL POINTS

ENERGY EFFICIENCY *(continued)*

YES ● NO ○ MAYBE ○ — M

5.1c Building Performance Standard *(Substantial and Moderate Rehab: single-family and low-rise multifamily)*

For each dwelling unit, achieve a HERS Index score of 85 or less.

Exception: Substantial rehabs of buildings with walls made only of brick/masonry that are three stories or fewer and built before 1980, as well as moderate rehabs of buildings that are three stories or fewer and built before 1980, are permitted to instead achieve a HERS Index score of 100 or less for each dwelling unit.

YES ○ NO ● MAYBE ○ — M

5.1d Building Performance Standard *(Substantial and Moderate Rehab: mid-rise and high-rise)*

Demonstrate that the energy performance of the completed building will be equivalent to ASHRAE 90.1-2010 using an energy model created by a qualified energy services provider per Appendix G.

YES ● NO ○ MAYBE ○ — 5 to 12

5 pts

5.2a Additional Reductions in Energy Use

Design and construct a building that is projected to be at least 5% more efficient than what is required of the project by Criteria 5.1a–d. (Projects receiving points in Criterion 5.2a may not receive points per Criterion 5.2b)

YES ○ NO ● MAYBE ○ — 12

5.2b Advanced Certification: Nearing Net Zero

Certify the project in a program that requires advanced levels of building envelope performance such as PHIUS, Living Building Challenge and/or DOE Zero Energy Ready Home. (Projects receiving points in Criterion 5.2b may not receive points per Criterion 5.2a)

YES ● NO ○ MAYBE ○ — M

5.3 Sizing of Heating and Cooling Equipment

Size and select heating and cooling equipment in accordance with the Air Conditioning Contractors of America (ACCA) Manuals J and S or ASHRAE handbooks.

YES ● NO ○ MAYBE ○ — M

5.4 ENERGY STAR Appliances

If providing appliances, install ENERGY STAR clothes washers, dishwashers and refrigerators. If appliances will not be installed or replaced at this time, specify that, at the time of installation or replacement, ENERGY STAR models must be used.

YES ● NO ○ MAYBE ○ — M

5.5 Lighting

Follow the guidance for high-efficacy lighting controls and other characteristics for all permanently installed lighting fixtures in project dwelling units, common spaces and exterior

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5.6 Electricity Meter

YES ● NO ○ MAYBE ○ — M

New Construction and Substantial Rehab

YES ○ NO ● MAYBE ○ — 6

Moderate Rehab ***(Except for single-room occupancy and designated supportive housing dwelling units)***

Install individual or submetered electric meters for all dwelling units.

YES ○ NO ● MAYBE ○ — 4

5.7a Photovoltaic/Solar Hot Water Ready

Orient, design, engineer, wire and/or plumb the development to accommodate installation of photovoltaic (PV) or solar hot water system in the future.

M = MANDATORY
# = OPTIONAL POINTS

ENERGY EFFICIENCY *(continued)*

YES NO MAYBE — 10 max

5.7b Renewable Energy

Install photovoltaic (PV) panels or other electric-generating renewable energy source to provide a specified percentage of the project's estimated total energy demand or water heating energy demand. *(Projects may earn points through Criterion 5.7b or 5.8b, but not both.)*

	5%	10%	20%	30%	40%
Single-story / Single-family	—	—	6	8	10
2 to 3 stories	—	6	8	10	—
4 stories or more	6	8	10	—	—

YES NO MAYBE — 8

5.8a Resilient Energy Systems: Floodproofing

Conduct floodproofing, including perimeter floodproofing (barriers/shields), of lower floors. Design and install building systems as specified by the full criterion so that the operation of those systems will not be grossly affected in case of a flood.

YES NO MAYBE — 4 to 8

5.8b Resilient Energy Systems: Islandable Power

Provide emergency power through an islandable photovoltaic (PV) system or an efficient and portable generator that will offer at least limited electricity for critical circuits during power outages per one of the three options listed. *(Projects may earn points through Criterion 5.7b or 5.8b, but not both.)*

SUBTOTAL OPTIONAL POINTS

6. MATERIALS

YES NO MAYBE — M

6.1 Low / No VOC Paints, Coatings and Primers

All interior paints and primers must have VOC levels, in grams per liter, less than or equal to the thresholds established by South Coast Air Quality Management District (SCAQMD) Rule 1113.

YES NO MAYBE — M

6.2 Low / No VOC Adhesives and Sealants

All adhesives and sealants (including caulks) must have VOC levels, in grams per liter, less than or equal to the thresholds established by the South Coast Air Quality Management District Rule 1168.

YES NO MAYBE — 3 max — 2 pts.

6.3 Recycled Content Material

Incorporate building materials that are composed of at least 25% post-consumer recycled content or at least 50% post-industrial recycled content. *[1 point]*

Building materials that make up at least 75% of their project component each receive *1 point*.

YES NO MAYBE — 4 max — 3 pts.

6.4 Regional Materials

Use products that were extracted, processed and manufactured within 500 miles of the project for a minimum of 50%, based on cost, of the building materials' value.

Select any or all of these options (each material can qualify for *1 point*):

- Framing materials - optional
- Exterior materials (e.g., siding, masonry, roofing)
- Flooring materials
- Concrete/cement and aggregate material
- Drywall/interior sheathing materials

M = MANDATORY
# = OPTIONAL POINTS

MATERIALS *(continued)*

YES ○ NO ○ MAYBE — 1

6.5 Certified, Salvaged and Engineered Wood Products

1pt.

For at least 25% of all structural wood products, by cost or value, commit to using either FSC-certified, salvaged products or engineered framing materials without urea formaldehyde.

YES ○ NO ○ MAYBE — M

6.6 Composite Wood Products that Emit Low/No Formaldehyde

All composite wood products must be certified as compliant with California 93120 Phase 2 **OR**, if using a composite wood product that does not comply with California 93120 Phase 2, all exposed edges and sides must be sealed with low-VOC sealants, per Criterion 6.2.

YES ○ NO ○ MAYBE — M

6.7a Environmentally Preferable Flooring

Do not install carpets in building entryways, laundry rooms, bathrooms, kitchens/kitchenettes, utility rooms or any rooms built on foundation slabs. Where installed, all carpet products must meet the Carpet and Rug Institute's Green Label or Green Label Plus certification for carpet, pad and carpet adhesives. Any hard surface flooring products must be either ceramic tile or solid unfinished hardwood floors, or meet the Scientific Certification System's FloorScore program criteria (including pre-finished hardwood flooring).

○ YES ● NO ○ MAYBE — 6

6.7b Environmentally Preferable Flooring: Throughout Building

Use non-vinyl, non-carpet floor coverings throughout each building in the project.

YES ○ NO ○ MAYBE — M

6.8 Mold Prevention: Surfaces

Use materials that have durable, cleanable surfaces throughout bathrooms, kitchens and laundry rooms. Materials installed in these rooms should not be prone to deterioration due to moisture intrusion or encourage the growth of mold.

YES ○ NO ○ MAYBE — M

6.9 Mold Prevention: Tub and Shower Enclosures

Use moisture-resistant backing materials such as cement board, fiber cement board or equivalent per ASTM #D3273 behind tub/shower enclosures. Projects using a one-piece fiberglass tub/shower enclosure are exempt from this requirement.

YES ○ NO ○ MAYBE — 12 max

6.10 Asthmagen-Free materials

4pts.

Do not install products that contain ingredients that are known to cause or trigger asthma. Key products to avoid are:

- *Insulation:* Do not use spray polyurethane foam (SPF) or formaldehyde-containing fiberglass batts. *[4 points]*
- *Flooring:* Do not use flexible vinyl (PVC) roll or sheet flooring or carpet-backed with vinyl with phthalates. Do not use fluid applied finish floors. *[4 points]*
- *Wall coverings:* Do not use wallpaper made from vinyl (PVC) with phthalates or site-applied high-performance coatings that are epoxy or polyurethane based. *[4 points]*
- *Composite wood:* Use only ULEF products for cabinetry, subflooring and other interior composite wood uses. *[4 points]*

○ YES ● NO ○ MAYBE — 5

6.11 Reduced Heat-Island Effect: Roofing

Use an ENERGY STAR–certified roofing product for 100% of the roof area **OR** install a "green" (vegetated) roof for at least 50% of the roof area and ENERGY STAR–certified roofing product for the remainder of the roof area.

M = MANDATORY
# = OPTIONAL POINTS

MATERIALS *(continued)*

YES NO MAYBE — M or 6 max

6.12 Construction Waste Management

Commit to following a waste management plan that reduces non-hazardous construction and demolition waste through recycling, salvaging or diversion strategies through one of the three options. Achieve optional points by going above and beyond the requirement.

YES NO MAYBE — 3

6.13 Recycling Storage

Provide separate bins for the collection of trash and recycling for each dwelling unit and all shared community rooms (if applicable).

Additionally, in multifamily buildings, provide at least one easily accessible, permanent and dedicated indoor area for the collection and storage of materials for recycling. In single-family homes, points will be accrued only if curb-side recycling pickup is available.

Collected materials should include, at a minimum, paper, cardboard, glass, metals and plastics.

SUBTOTAL OPTIONAL POINTS

7. HEALTHY LIVING ENVIRONMENT

7.1 Ventilation

YES NO MAYBE — M *New Construction and Substantial Rehab*

YES NO MAYBE — 12 max *Moderate Rehab*

For each dwelling unit, in full accordance with ASHRAE 62.2-2010, install a local mechanical exhaust system in each bathroom *[4 points]*, a local mechanical exhaust system in each kitchen *[4 points]*, and a whole-house mechanical ventilation system *[4 points]*.

For each multifamily building of four stories and more, in full accordance with ASHRAE 62.1-2010, install a mechanical ventilation system for all hallways and common spaces *[3 points]*.

For all project types, in addition to the above requirements:

- All systems and associated ductwork must be installed per manufacturer's recommendations.
- All individual bathroom fans must be ENERGY STAR labeled, wired to turn on with the light switch, and equipped with a humidistat sensor, timer or other control (e.g., occupancy sensor, delay off switch, ventilation controller).
- If using central ventilation systems with rooftop fans, each rooftop fan must be direct-drive and variable-speed with speed controller mounted near the fan. Fans with design CFM 300-2000 must also have an ECM motor.

YES NO MAYBE — M

7.2 Clothes Dryer Exhaust

Clothes dryers must be exhausted directly to the outdoors using rigid-type ductwork (except for condensing dryers, which must be plumbed to a drain).

M = MANDATORY
# = OPTIONAL POINTS

HEALTHY LIVING ENVIRONMENT *(continued)*

YES ○ NO ○ MAYBE — M

7.3 Combustion Equipment

For new construction and rehab projects, specify power-vented or direct vent equipment when installing any new combustion appliance for space or water heating that will be located within the conditioned space.

In Substantial and Moderate Rehabs, if there is any combustion equipment located within the conditioned space for space or water heating that is not power-vented or direct vent and that is not scheduled for replacement, conduct initial combustion safety testing per the given guidelines.

Install one hard-wired carbon monoxide (CO) alarm with battery backup function for each sleeping zone, placed per National Fire Protection Association (NFPA) 720.

YES ○ NO ○ MAYBE — 9 or 11

9 pts.

7.4 Elimination of Combustion Within the Conditioned Space

No combustion equipment may be used for cooking (to include, but not limited to ranges, cooktops, stoves, ovens) as part of the building project *[9 points]* **OR** no combustion equipment may be used as part of the building project *[11 points]*.

YES ○ NO ○ MAYBE — M

7.5 Vapor Retarder Strategies

Install vapor barriers that meet specified criteria appropriate for the foundation type.

YES ○ NO ○ MAYBE — M

7.6 Water Drainage *(For all New Construction projects and those Rehab projects that include replacing particular assemblies called out below)*

Provide drainage of water away from walls, windows and roofs by implementing the list of techniques.

YES ○ NO ○ MAYBE — M

7.7 Mold Prevention: Water Heaters

Provide adequate drainage for water heaters that includes drains or catch pans with drains piped to the exterior of the dwelling.

YES ○ NO ○ MAYBE — M

7.8 Radon Mitigation

For New Construction in EPA Zone 1 areas, install passive radon-resistant features below the slab and a vertical vent pipe with junction box within 10 feet of an electrical outlet in case an active system should prove necessary in the future. For Substantial Rehab projects in EPA Zone 1, test and mitigate per the specified protocols.

○ YES NO ○ MAYBE — M

7.9 Garage Isolation

- Provide a continuous air barrier between the conditioned space and any garage space to prevent the migration of any contaminants into the living space. Visually inspect common walls and ceilings between attached garages and living spaces to ensure that they are air-sealed before insulation is installed.
- Do not install ductwork or air handling equipment in a garage.
- Fix all connecting doors between conditioned space and garage with gaskets or otherwise make substantially airtight with weather stripping.
- Install one hard-wired carbon monoxide (CO) alarm with battery backup function for each sleeping zone of the project, placed per National Fire Protection Association (NFPA) 720.

YES ○ NO ○ MAYBE — M

7.10 Integrated Pest Management

Seal all wall, floor, and joint penetrations with low-VOC caulking or other appropriate nontoxic sealing methods to prevent pest entry.

M = MANDATORY
# = OPTIONAL POINTS

HEALTHY LIVING ENVIRONMENT *(continued)*

YES ● NO ○ MAYBE ○ — 9

7.11a Beyond ADA: Universal Design *(New Construction)*

Design a minimum of 15% of the dwelling units (no fewer than one) in accordance with ICC/ANSI A117.1, Type A, Fully Accessible guidelines. Design the remainder of the ground-floor units and elevator-reachable units in accordance with ICC/ANSI A117.1, Type B.

YES ● NO ○ MAYBE ○ — 7 or 9

7.11b Beyond ADA: Universal Design *(Substantial and Moderate Rehab)*

Design a minimum of 10% of the dwelling units (one, at minimum) in accordance with ICC/ANSI A117.1, Type A, Fully Accessible guidelines. *[7 points]*

For an additional 2 points: Design the remainder of the ground-floor units and elevator-reachable units with accessible unit entrances designed to accommodate people who use a wheelchair.

YES ● NO ○ MAYBE ○ — M

7.12 Active Design: Promoting Physical Activity Within the Building

Situate at least one building stairway per the criterion to encourage use **OR** emphasize at least one strategy inside the building designed to increase frequency and duration of physical activity per the criterion.

YES ○ NO ● MAYBE ○ — 10

7.13 Active Design: Staircases and Building Circulation

A staircase must be accessible and visible from the main lobby as well as visible within a 25-foot walking distance from any edge of lobby. Ensure that no turns or obstacles prevent visibility of or accessibility to the qualifying staircase from the lobby, and that the staircase is encountered before or at the same time as the elevators.

From the corridor, accessible staircases should be made visible by: Providing transparent glazing of at least 10 square feet (1 square meter) at all stair doors or at a side light **OR** providing magnetic door holds on all doors leading to the stairs **OR** removing door enclosures/vestibules.

YES ● NO ○ MAYBE ○ — 9

4 pts.

7.14 Interior and Outdoor Activity Spaces for Children and Adults

Provide an on-site dedicated recreation space with exercise or play opportunities for adults and/or children that is open and accessible to all residents; see criterion for specifics.

YES ○ NO ● MAYBE ○ — M

7.15 Reduce Lead Hazards in Pre-1978 Buildings *(Substantial Rehab)*

Conduct lead risk assessment or inspection to identify lead hazards, then control for these per EPA or state/local laws and requirements.

YES ○ NO ● MAYBE ○ — 10

7.16 Smoke-Free Building

Implement and enforce a no-smoking policy in all common and individual living areas, and within a 25-foot perimeter around the exterior of all residential projects.

SUBTOTAL OPTIONAL POINTS

M = MANDATORY
# = OPTIONAL POINTS

8. OPERATIONS, MAINTENANCE + RESIDENT ENGAGEMENT

YES ○ NO ○ MAYBE — M

8.1 Building Operations & Maintenance (O&M) Manual and Plan *(For all multifamily projects)*

Develop a manual with thorough building operations and maintenance guidance and a complementary plan. The manual and plan should be developed over the course of the project design, development and construction stages, and should include sections/chapters addressing the list of topics.

YES ○ NO ○ MAYBE — M

8.2 Emergency Management Manual *(For all multifamily projects)*

Provide a manual on emergency operations targeted toward operations and maintenance staff and other building-level personnel. The manual should address responses to various types of emergencies, leading with those that have the greatest probability of negatively affecting the project. The manual should provide guidance as to how to sustain the delivery of adequate housing throughout an emergency and cover a range of topics, including but not limited to:

- communication plans for staff and residents
- useful contact information for public utility and other service providers
- infrastructure and building "shutdown" procedures

YES ○ NO ○ MAYBE — M

8.3 Resident Manual

Provide a guide for homeowners and renters that explains the intent, benefits, use and maintenance of their home's green features and practices. The Resident Manual should encourage green and healthy activities per the list of topics.

YES ○ NO ○ MAYBE — M

8.4 Resident and Property Staff Orientation

Provide a comprehensive walk-through and orientation for all residents, property manager(s) and buildings operations staff. Use the appropriate manuals (see Criteria 8.1, 8.2, 8.3) as the base of the curriculum, and review the project's green features, operations and maintenance procedures, and emergency protocols.

YES ○ NO ○ MAYBE — M

8.5 Project Data Collection and Monitoring System: 100% Owner-Paid Utility Accounts; 15% Tenant-Paid Utility Accounts

For rental properties: Collect and monitor project energy and water performance data for 100% of owner-paid utilities and 15% of tenant-paid utilities for at least 5 years. This data must be maintained in a manner that allows staff to easily access and monitor it, enabling them to make informed operations and capital planning decisions. Also allow Enterprise access to this data.

For owner-occupied units: Collect and monitor energy and water performance data in a manner that allows for easy access and review and provides the ability to influence home operations. Also allow Enterprise access to this data.

YES ○ NO ○ MAYBE — 7 or 11

11 pts

8.6 Project Data Collection and Monitoring System: Greater than 15% Tenant-Paid Utility Accounts

Collect and monitor project energy and water performance data for at least 5 years. This data must be maintained in a manner that allows staff to easily access and monitor it, enabling them to make informed operations and capital planning decisions. Also allow Enterprise access to this data. 16–60% of units *[7 points]*; 60–100% of units *[11 points]*.

SUBTOTAL OPTIONAL POINTS

TOTAL OPTIONAL POINTS

INTEGRATIVE DESIGN

A successful integrative design process facilitates the design and development team's achievement of their objectives throughout the project life cycle.

1.1a *Mandatory* Goal Setting

REQUIREMENTS

A successful integrative design process is more art than science. It also is often the determining factor in ultimately achieving a successful project. Develop an integrative design process that works best for your project team and intentions. At minimum, document:

1. A statement of the overall green development goals of the project and the expected intended outcomes from addressing those goals.
2. A summary of the integrative process that was used to select the green building strategies, systems and materials that will be incorporated into the project.
3. A description of how progress and success against these goals will be measured throughout the completion of design, construction and operation to ensure that the green features are included and correctly installed.

RATIONALE

Integrative design is used to maximize project budget and effective solutions with a holistic, comprehensive approach. As a result, it is supported by criteria in all of the other categories. An integrative project delivery process facilitates the design and development team's achievement of green objectives throughout the project life cycle. The outcomes of an integrative project delivery process can include substantially lower development costs and greater health, economic and environmental benefits for residents, property owners and communities.

RECOMMENDATIONS

- Review the Enterprise Green Communities Pre-Development Design Toolkit, Project Management Guide, Green Charrette Toolkit and Green Development Plan (see Resources). These help you set the framework for a meaningful integrative design process for your project. For instance, the Pre-Development Design Toolkit includes a template and a description of creating a project Design Brief (essentially an owner's project requirements [OPR] document) and guidance on how to select the most qualified architect for the project. The Project Management Guide relays the iterative process of how the Enterprise Green Communities Criteria weave throughout a typical project's development timeline. The Green Charrette Toolkit includes sample agendas and facilitator guides.
- Use data from your previous projects as baselines to inform your goals for your current project. For example: Portfolio energy and water consumption per bedroom, health needs assessment data and financial data, including pro-forma assumptions broken down more finely regarding operating expense categories. Measure and share your progress.
- Evaluate your project's compliance with Criteria 1.2a and 1.3a as part of the process you undertake for Criterion 1.1a.

- A charrette is an intensive workshop in which various stakeholders and experts are brought together to address a particular design issue, from a single building to an entire project. The term can also be applied to shorter, focused meetings. Charrette attendance might include participants from the following disciplines or interests:
  - Prospective or current residents, including potential community and/or neighborhood stakeholders
  - Architecture or residential building design
  - Mechanical or energy engineering
  - Building science or performance testing
  - Green building or sustainable design
  - Civil engineering, landscape architecture, habitat restoration or land-use planning
  - General Contractor
  - Building management and maintenance
  - Asset management
  - Planning and building officials with jurisdiction over the project, or city green building reps
  - Funders and key donors
  - Resident services
  - Environmental science
  - Public health

  Green design charrettes can be powerful opportunities to educate and align stakeholders with the goals and objectives of a project and to tap into collective wisdom of the group. In later stages of design development, these large group meetings can be important opportunities to check that the design is on course for the project goals from all perspectives. This is also the opportunity to ensure that lessons learned through maintenance of other projects are woven into design decisions of current projects. Smaller multi-disciplinary teams may also be brought together to analyze and develop integrated solutions to complex design challenges that require multiple perspectives to resolve perceived conflict, between first cost and best practice for example.

- Best practices in documenting the integrative design process required of project teams submitting for Certification also includes a description of which members of the design and development team are responsible for implementing the green features.
- Project performance and durability can be dramatically affected by decisions and processes established during the integrative design phase. Advanced Energy developed the following list of recommendations for project teams to consider during integrative design, based on an evaluation of Enterprise Green Communities projects (for full details, see the Enterprise Green Communities Project Management Guide):
  - Consider adding specific energy consumption thresholds or goals for each project that will be evaluated after project completion.
  - Document your process for approaching and complying with the Criteria for use in your future green projects. Include specific options for complying with Criteria, contact information for useful resources (organizations, websites, product distributors, etc.) and lessons learned.
  - Adjust the scopes of all of the projects in your portfolio to match the Criteria to avoid confusion with changing expectations.

- Add building envelope and mechanical installation details to your plans and specifications for the most critical project components, paying particular attention to: air handler closet air sealing, floor system and band air sealing, party wall air sealing, proper insulation installation, ventilation system installation, and duct sealing with "bucket" mastic. Also provide the construction team with installation guides for the measures above.
- Consider creating incentives for your construction team based on the performance of various building components.
- Add self-verification requirements for your construction team for certain project items that demand proper installation (e.g., testing of water fixtures, testing of bath fans, air sealing of air handler closets). Self-verification for product-based measures (submitting cut-sheets for appropriate paints, carpets, etc.) is most likely unnecessary.

RESOURCES

- Enterprise Green Communities offers a variety of resources to support the integrative design process, particularly the Pre-Development Design Toolkit, Green Charrette Toolkit, Green Development Plan and Project Management Guide. *www.enterprisecommunity.org/resources*
- Enterprise Green Communities maintains a comprehensive registry of qualified green affordable housing technical assistance (TA) providers that are available for support on the design, construction, rehabilitation and operations of green affordable housing. To find a Green TA provider near you, search the list found at *www.greencommunitiesonline.org/tools/resources/technical_assistance.asp*
- Whole Building Design Guide: This website describes the core elements of "whole building design," which includes the combination of an integrative design approach and an integrative team process. This site helps users identify design objectives and organize their processes to meet those objectives. *www.wbdg.org/wbdg_approach.php*
- *The Integrative Design Guide to Green Building: Redefining the Practice of Sustainability.* 7group and Bill Reed (2009). This book provides guidance to building professionals on incorporating integrative design into every phase of a project.

1.1b *Mandatory* Criteria Documentation

REQUIREMENTS

Create design and construction documentation (e.g., plans, details, specifications, subcontractor scopes of work) to include information on implementation of appropriate Enterprise Green Communities Criteria, and other mission-critical design features. Plans and specs should include a performance specification, examples of products that meet the specification, the metrics used to measure compliance and how compliance will be confirmed.

RATIONALE

Projects that explicitly address accountability among project team members and implementation details for Enterprise Green Communities Criteria in design and construction documentation tend to successfully implement the Criteria on-site during the construction phase. The intent of this criterion is for measures selected through Criterion 1.1a to be thoroughly integrated into that design and the construction documents.

RECOMMENDATIONS

Incorporate all Enterprise Green Communities Criteria mandatory and optional measures that the project intends to meet as indicated in the Green Development Plan.

RESOURCES

- Building America's Climate-Specific Guidance: *http://energy.gov/eere/buildings/building-america-climate-specific-guidance* and the Building America Solution Center: *http://energy.gov/eere/buildings/building-america-solution-center* provide residential building professionals with access to expert information on hundreds of high-performance design and construction topics. They include contracting documents and specifications, installation guidance, CAD drawings, "right and wrong" photographs of installation practices and training videos.
- Enterprise Green Communities Single-Family Rehabilitation Specifications, Multifamily Rehabilitation Specifications and Universal Design Specifications for both multifamily and single-family residences include customizable specifications for you to copy, adjust and use for your projects. *www.enterprisecommunity.org/resources*

1.1c *Optional | 9 points* Designing for Project Performance

REQUIREMENTS

Identify how the expected performance of your project compares to the actual performance of other projects in your portfolio and/or community. Performance may be defined in terms of energy consumption or energy use intensity (EUI), water consumption and/or specific resident health indicators, and should explicitly tie into the project goals identified through Criterion 1.1a.

RATIONALE

Portfolio performance tracking enables organizations to better plan and manage their individual properties, comparing one to another. Evaluating projected project performance against the actual performance of a similar stock of buildings enables project teams to make informed design decisions.

RECOMMENDATIONS

- Track projected project performance against actuals for your selected indicators (energy consumption, water consumption, resident health indicators, other).
- Plan, design, construct and operate your projects in a way that demonstrates continually improved project performance.

RESOURCES

- See Resources identified for Criterion 8.5 Project Data Collection and Monitoring.

1.2a *Mandatory*
Resident Health and Well-Being: Design for Health

REQUIREMENTS

Identify potential resident health factors and design your project to address resident health and well-being. Using the matrix on the pages 22 and 23, the project team will:

- Use readily accessible community health data sets and/or community engagement processes and identify at least one relevant Resident Health Campaign *(left-hand column)* for their project.
- Indicate which sources of information were used to select the most relevant Resident Health Campaign *(complete second column)*. These may include specific local and regional health data, insights from community meetings or resident surveys, or reports from local health professionals.
- Identify building design and programming factors that can optimize the health of the residents *(column three)*.
- Incorporate at least one optional criterion *(column four)* associated with the selected Resident Health Campaign(s) into project documents.

RATIONALE

Health and well-being are influenced by a range of factors, including individual genetics and behaviors, social determinants of health, overarching political and economic influences, and, most important for developers and designers, determinants in the built environment. Where you live, work, learn and play impacts health outcomes. Unfortunately, data shows that low-income and certain racial and ethnic minority populations are disproportionately affected by these factors, and often suffer from poor health. Low-income communities often suffer from higher rates of asthma, cardiovascular disease, diabetes, cancer, mental health issues, and injury and death (resulting from violence, substance abuse and transportation-related incidents), relative to higher-resourced surrounding communities. These inequities have an impact on the length and quality of residents' lives, as well as their ability to work, learn and be productive members of society. Project teams can learn more about the connections between the built environment and health outcomes through materials provided in the Resources section of this criterion.

RESIDENT HEALTH CAMPAIGNS AND ASSOCIATED CRITERIA MATRIX

RESIDENT HEALTH CAMPAIGNS	SOURCE(S) OF INFORMATION	BUILDING DESIGNS AND PROGRAMMING THAT INFLUENCE PHYSICAL AND MENTAL HEALTH	RELATED CRITERIA
Injury and Accessibility		• Physical accessibility of the site and building • Mobility • Presence of traffic calming measures • Speed limits • Urbanicity • Social cohesion • Access to health and community services and supports • Fall prevention features such as stair gates, window guards, handrails, grab bars and improved lighting • Safety of bicycle environment, infrastructure and facilities • Outdoor safety and security/crime • Safety of sidewalks and pedestrian environment, infrastructure and facilities • Safety of transit and vehicle environment, infrastructure and facilities • Access to affordable transportation services	**Mandatory Criteria** 2.5 Proximity to Services **Optional Criteria** 2.8 Access to Public Transportation 2.9 Improving Connectivity to the Community 2.13 LEED-ND Certification 7.11a Beyond ADA: Universal Design—New Construction 7.11b Beyond ADA: Universal Design—Substantial and Moderate Rehab
Asthma and Respiratory Health		• Outdoor air quality • Indoor air quality • Indoor humidity and temperature • Mold • Plant allergens • Use of toxic/carcinogenic products (e.g., for cleaning) • Smoking • Access to affordable chronic disease management services and resources • Presence of pests	**Mandatory Criteria** 5.1a–d Building Performance Standard 5.3 Sizing of Heating and Cooling Equipment 6.7a Environmentally Preferable Flooring 7.1 Ventilation 7.2 Clothes Dryer Exhaust 7.5 Vapor Retarder Strategies 7.7 Mold Prevention: Water Heaters 7.10 Integrated Pest Management 8.1 Building O&M Manual and Plan 8.3 Resident Manual **Optional Criteria** 6.5 Certified, Salvaged and Engineered Wood Products 6.7b Environmentally Preferable Flooring: Throughout Building 6.10 Asthmagen-Free Materials 7.16 Smoke-Free Building

RESIDENT HEALTH CAMPAIGNS (CONTINUED)

RESIDENT HEALTH CAMPAIGNS	SOURCE(S) OF INFORMATION	BUILDING DESIGNS AND PROGRAMMING THAT INFLUENCE PHYSICAL AND MENTAL HEALTH	RELATED CRITERIA
Cardiovascular Disease, Diabetes (Type II), and Obesity		• Proximity to essential goods and services (e.g., grocery stores, retail, schools, medical care) • Proximity and access to public transportation • Air temperature (avoidance of extreme heat and cold) • Air quality • Access to safe, affordable places to be active (both indoor and outdoor facilities) • Physical activity rate • Smoking • Access to affordable chronic disease management services and resources • Proximity and access to affordable, healthy food • Healthy food consumption • Walkability	**Mandatory Criteria** 2.5 Proximity to Services 2.6 Preservation of and Access to Open Space for Rural/Tribal/Small Towns 7.12 Active Design: Promoting Physical Activity within the Building **Optional Criteria** 2.7 Preservation of and Access to Open Space 2.8 Access to Public Transportation 2.9 Improving Connectivity to the Community 2.12 Access to Fresh, Local Foods 2.13 LEED-ND Certification 7.13 Active Design: Staircases and Building Circulation 7.14 Interior and Outdoor Activity Spaces for Children and Adults 7.16 Smoke-Free Building
Cancer and Health Outcomes Related to Toxin Exposure (e.g., child development and learning, cognitive function)		• Access to affordable healthy food and water • Exposure to toxins: indoor and outdoor • Indoor and outdoor water quality • Air quality • Access to safe, affordable places to be active • Healthy food consumption • Use of toxic/carcinogenic products (e.g., for cleaning) • Access to affordable health screening and treatment	**Mandatory Criteria** 3.1 Environmental Remediation 6.1 Low/No VOC Paints, Coatings and Primers 6.2 Low/No VOC Adhesives and Sealants 7.10 Integrated Pest Management 7.15 Reduce Lead Hazards in Pre-1978 Buildings (Substantial Rehab) 8.1 Building O&M Manual and Plan 8.3 Resident Manual **Optional Criteria** 2.11 Brownfield Site or Adaptive Reuse Building 2.12 Access to Fresh, Local Foods 3.6 Surface Stormwater Management 6.5 Certified, Salvaged and Engineered Wood Products 7.16 Smoke-Free Building
Mental Health (depression, anxiety, etc.)		• Views of nature (e.g., natural lighting, green spaces) • Noise levels • Crime levels • Access to employment and educational resources • Amount and quality of sleep • Social cohesion • Access to affordable mental health providers	**Mandatory Criteria** 2.5 Proximity to Services 2.6 Preservation of and Access to Open Space for Rural/Tribal/Small Towns **Optional Criteria** 2.7 Preservation of and Access to Open Space for Rural/Tribal/Small Towns 7.14 Interior and Outdoor Activity Spaces for Children and Adults

RECOMMENDATIONS

The following strategies emphasize the connections between physical design and health, as well as the positive health benefits of supportive resident services and programming to promote health education and healthy behaviors. These strategies support consideration of health throughout the life cycle of a project, from initial design to evaluation and monitoring of the project's impacts on health over time.

- Project teams can rely on existing local health data and resources (see examples in the Resources section of this criterion) to identify the most prevalent health challenges affecting the proposed project's surrounding community. Whenever possible, project teams should use neighborhood-level data specific to the communities most likely to be directly affected by the proposed project. Neighborhood-level data may be available, and project teams could consult their local health department (or other local partners, such as hospitals and schools) for available sources. For example, local health departments or nonprofit hospitals and health systems may be able to provide data from community health needs assessments. When neighborhood-level sources are not available, project teams can rely on county-level resources such as the County Health Ranking website (*www.countyhealthrankings.org*) and/or other databases listed within the Resources section of this criterion.
- Conduct community meetings and/or resident surveys to engage and better understand the perspectives of community stakeholders as well as to collect data directly from them regarding the health-related issues that matter most to them. Community stakeholders may include: community members who live in or may be served directly by the project; individuals who live, work or learn in the neighborhood surrounding the project; and those who provide services or programming in the building or in the neighborhood surrounding the project. This may be accomplished by adding health-focused conversations to community meetings already scheduled as part of the project planning and design process. Local public health professionals may also be well-positioned to support project teams in conducting these conversations. Project teams should strive to collect information from a diverse group of community stakeholders to ensure consideration of a range of perspectives. In particular, engagement should focus on including individuals and groups that may be directly affected by the project and/or that may not typically be involved in the planning and design process.
- Consider partnering with local health providers and public health professionals, such as staff from local or state health departments, to identify priority health issues. Public health professionals monitor, address and prevent health concerns at a community or population level, rather than at an individual level. Examples of public health professionals include, but are not limited to, professionals with training or education in fields such as public health and community health. In most communities, the local or state health department is the primary organization that employs public health professionals. However, many colleges and universities have public or community health programs that also employ and train public health professionals. In addition, there is an increasing number of public health nonprofit organizations such as state or regional public health institutes that could help support a project. Examples of local health providers include those who are providing direct care to individuals. This may or may not include people with medical training, such as nurses, physician assistants and physicians.

RESOURCES

Connections between the built environment and health outcomes

Project teams can learn more about the connections between the built environment and health outcomes through resources such as these and others:

- The Robert Wood Johnson Foundation Social Determinants of Health Series provides issue briefs on connections between neighborhoods and health, housing and health, and social factors and health behaviors. *www.rwjf.org/en/search-results.html?cs=content_series%3Awhat-shapes-health&s=0*
- The Build Healthy Places Network provides access to research and best-practice models in connecting community development and health efforts. *www.buildhealthyplaces.org/network_resources/*
- The Urban Land Institute's "Intersections: Health and the Built Environment" report explores the relationships between health and the way buildings and neighborhoods are built. *http://uli.org/report/intersections-health-and-the-built-environment/*
- The Centers for Disease Control and Prevention, Guide to Community Preventive Services summarizes evidence of community-level programs and policies to improve health and prevent disease based on a scientific systematic review process. *www.thecommunityguide.org*
- City of New York. Active Design Guidelines, 2010. *www.nyc.gov/html/doh/downloads/pdf/environmental/active-design-guidelines.pdf*

Neighborhood or community-level health data sets

Some jurisdictions provide readily available health data at the neighborhood level. Here are examples:

- The Baltimore Neighborhood Indicators Alliance: *http://bniajfi.org/*
- San Francisco's Sustainable Communities Index: *www.sustainablecommunitiesindex.org/profiles.php*
- San Francisco Open Data Portal: *https://data.sfgov.org/*
- New York Open Data Portal: *https://data.ny.gov/*; New York City Environmental Tracking and Sustainability Portal*: www.nyc.gov/health/tracking*; and NYC Interactive Health Data: *http://a816-healthpsi.nyc.gov/epiquery/*
- The Boston Indicators Project: *www.bostonindicators.org/indicators/health*
- City of Chicago Public Health Indicators by community: *https://data.cityofchicago.org/Health-Human-Services/Public-Health-Statistics-Selected-public-health-in/iqnk-2tcu*
- Philadelphia Community Health Database: *www.chdbdata.org/*
- Metro Atlanta Health Equity Atlas: *http://atlantaequityatlas.com/* and Neighborhood Nexus: *www.neighborhoodnexus.org/*
- PLAN for a Healthy L.A.: *http://healthyplan.la/the-health-profiles/*
- Minnesota Compass: *www.mncompass.org*

Project teams can also contact local or state health departments to inquire about the availability of neighborhood-level health data. Additionally, project teams can consult the Centers for Disease Control and Prevention's guidance on "Creating a Health Profile of Your Neighborhood." This document outlines the basic steps and provides online resources for creating a neighborhood health profile. *www.cdc.gov/healthyplaces/toolkit/sources_of_health_data.pdf*

- Community Commons: This is an interactive mapping, data and networking tool to support organizations in their efforts to create healthy, sustainable and equitable communities. *www.communitycommons.org*
- County Health Rankings: The County Health Rankings use county-level measures from a variety of state and national data sources to assess and rank the population health of nearly all counties in the U.S. This website allows users to view the rankings and to explore and download data, including statistics on length of life, self-reported general health, and a subset of health influences. *www.countyhealthrankings.org*
- Community Action Partnership: This website provides selected demographic, employment, educational attainment, income, housing, nutrition and health care indicators at the county and state levels and can be summarized using online tables and charts. *www.communityactioncna.org*
- Centers for Disease Control, Field Guide for Community Needs Assessment: This document details the steps of conducting a community needs assessment. *www.cdc.gov/globalhealth/fetp/training_modules/15/community-needs_fguidelines_final_09252013.pdf*
- University of Kansas, Work Group for Community Health and Development, "The Community Toolbox, Chapter 7. Conducting Needs Assessment Surveys": This online toolbox describes the process and provides examples of conducting a needs assessment survey to identify important needs of the community. *http://ctb.ku.edu/en/table-of-contents/assessment/assessing-community-needs-and-resources/conducting-needs-assessment-surveys/main*
- Robert Wood Johnson Foundation—DataHub: This website allows users to customize state-level data on key health and health care topics and visualize facts and figures. *www.rwjf.org/en/research-publications/research-features/rwjf-datahub.html*
- Health Statistics You Can Visualize, Customize & Share, Centers for Disease Control, State and Local Tracking Portals: This website provides links to health and environmental data from 23 states and one city. *http://ephtracking.cdc.gov/showStateTracking.action*
- Centers for Disease Control and Prevention, Behavioral Risk Factor Surveillance System: This is an annual, state-by-state phone survey of self-reported health outcomes used to determine national and state disease rates. *www.cdc.gov/brfss/*
- Johns Hopkins Center for Injury Research and Policy, NYC Department of Health and Mental Hygiene, Society for Public Health Education, Active Design Supplement: Promoting Safety, Version 2, 2013. This document offers design guidelines on increasing safety while also promoting health and physical activity within the built environment. *www.nyc.gov/html/doh/downloads/pdf/environmental/promoting-safety.pdf*
- National Network of Public Health Institutes—Community Health Improvement: This website provides webinars, case studies and resources regarding community health assessments and community health improvement tools and techniques. *www.nnphi.org/program-areas/community-health-improvement*

1.2b *Optional | 12 points*
Resident Health and Well-Being: Health Action Plan

REQUIREMENTS

At pre-design and continuing throughout the project life cycle (design, construction, operations), collaborate with public health professionals and community stakeholders to assess, identify, implement and monitor achievable actions to enhance health-promoting features of the project and minimize features that could present risks to health. As compared to satisfying the requirements of Criterion 1.2a, compliance with this criterion requires a more rigorous association with public health professionals and more robust follow-up actions. Specifically, comply with Step 1 and Step 2 outlined here:

Step 1: Create a Health Action Plan

Purpose

Conduct additional research on resident health factors identified in 1.2a. Using public health data and community input, characterize how the project may impact—both positively and negatively—social, environmental and economic outcomes for residents and, in turn, promote or produce unintended negative consequences for health. Based on the best available evidence, prioritize actions that will protect and promote health in response to these potential social, environmental and economic impacts.

Participants

The primary participants are those on the project team, which will be guided by input from community stakeholders likely to be affected by the project, as well as technical assistance from public health professionals (ideally those with Health Impact Assessment [HIA] expertise). As described in Criterion 1.2a, community stakeholders may include community members who live in or may be served directly by the project; individuals who live, work or learn in the neighborhood surrounding the project; and those who provide services or programming in the building or in the neighborhood surrounding the project. Public health professionals may include those with expertise in public health or community health. Faculty or graduate students of public health programs, and staff of local health departments, public health institutes and/or community-based public health organizations are suggested examples of partners. See Resources for more suggested contacts.

Process

Gather information and solicit feedback regarding critical health aspects affecting the community (including social, environmental and economic factors that impact health). Hold a series of meetings with key stakeholders, including public health professionals and community stakeholders to facilitate collaboration and develop a plan for analyzing the project's potential impacts on health, including:

- Conduct a scoping conversation with public health professionals and community stakeholders to identify the project's potential connections to health. Prior to this scoping conversation, project teams could review and familiarize themselves with the connections between building design, construction and operation; neighborhood characteristics; and health. See the Resources section in Criterion 1.2.a for information about these connections to health.

- Gather evidence (including existing data sources, new qualitative research and/or public hearings, meetings with public health professionals) about the project's potential connections to health and the baseline health of the community groups that could be impacted by the project.
- Outline the distribution of health issues among impacted communities and describe how different groups may be disproportionately impacted by the project (positively and negatively).
- Identify actions that could be taken to enhance health-supportive features of the project and those that could minimize potential health risks. Identify actions that can be taken within the project's design, construction or operation that will promote health equity. As listed in Resources, Promoting Equity Through the Practice of Health Impact Assessment can provide guidance.
- Using the list of actions produced, prioritize actions to protect and promote health in consultation with public health professionals and community stakeholders. In identifying priority actions, project teams and stakeholders should use factors that include the actions' likelihood of having significant effects on health and equity, responsiveness to community concerns, and feasibility of implementation to guide the prioritization process. Teams should consider the extent to which the actions will address health impacts of higher concern as well as the feasibility of implementation (in terms of cost, resources, technical constraints, etc.). Teams should provide a rationale for the selected strategies, as shown in the sample table found in Recommendations.

Products

- A description of key health issues (including social, environmental and economic factors) identified by stakeholders in the scoping conversation for assessing the project's connections to health. See Recommendations for a sample chart that captures this information.
- A description of how engaging public health professionals and community stakeholders informed the list of key health issues to be addressed by this project. Submit separately from sample chart seen in Recommendations.
- List (or asset map) of public health and community stakeholders involved. Submit separately from sample chart seen in Recommendations.
- List of potential actions to protect and promote health. See Recommendations for a sample chart that captures this information.
- List of selected interventions; description of reasons for implementing selected actions and rationale for not selecting the other identified potential interventions for implementation; and summary of how the selected actions may address health equity. See Recommendations for a sample chart that captures this information.

Step 2: Project Implementation and Monitoring

Purpose

Integrate the list of selected interventions and a plan for monitoring and evaluating your progress into the plan for project development.

Process

- Document and demonstrate how the analysis in Step 1 informed building and site design decisions, including modifications that were made in response to the findings and recommended actions that were identified in the information-gathering and health action plan phases.
- Develop a monitoring plan with performance metrics to evaluate the project's impact on resident health throughout the project life cycle (design, construction and operations).

Product

The plan should include:

- A summary of which modifications were made in response to the findings and recommended actions identified in the earlier phases. See Recommendations for a sample chart that captures this information.
- The performance metrics to be monitored. Include design metrics (metrics to determine how well the design team integrated the selected strategies into the project in a manner that will promote positive health outcomes), operations metrics (metrics that can be measured on a routine basis while the building is in operation to determine whether or not the building is performing as intended), and health metrics (metrics regarding resident health factors and, where possible, incidence or prevalence of key health outcomes in the resident and/or community population). See Recommendations for a sample chart that captures this information.
- Specific information on indicators, data sources, frequency, and roles and responsibilities for monitoring different information as per the sample chart in Recommendations in this section.
- Identify the individual or organization responsible for implementing and monitoring the selected strategy as well as the rate of how often the associated performance metrics will be monitored. See Recommendations for a sample chart that captures this information.

RATIONALE

Health Impact Assessments (HIAs) identify the potential effects of a proposed policy, project or program and offer practical options for maximizing health benefits and minimizing health risks. The process outlined in Criterion 1.2b does not include all steps of an HIA, but builds upon core HIA elements to allow project teams to identify and address important health issues. This process facilitates the identification of ways to optimize a project's impacts on the health and engagement of key stakeholders, including public health experts and community stakeholders, throughout the project life cycle through a more cost-effective approach. To learn more about HIA, please reference the National Resource Council guidance on HIAs (see Resources section).

RECOMMENDATIONS

Step 1: Create a Health Action Plan

EXAMPLE OF PARTIAL PRODUCT FOR CRITERION 1.2B, STEP 1:

KEY HEALTH ISSUE AND POPULATION GROUP	POTENTIAL INTERVENTIONS	EXAMPLES OF STRATEGIES	WAS THIS STRATEGY ELECTED? (YES/NO)	IF SELECTED, INDICATE HOW THIS STRATEGY WILL BE IMPLEMENTED	RATIONALE FOR SELECTING OR REJECTING THE EXAMPLE STRATEGY
High incidence of childhood asthma	Eliminate or reduce use of potential asthmagens	Prioritize the specification of hard surface flooring	Yes	Specification of linoleum for kitchens; cork flooring for bedrooms	High-impact strategy in terms of addressing health issue; also a flooring choice that reduces ongoing maintenance and replacement costs. Given the disparities in asthma rates by race, ethnicity and income in our community, this strategy will also help to address health equity.
Above-average prevalence of childhood obesity	Prioritize features that promote physical activity	Street infrastructure improvements to safely accommodate users of all ages, abilities and transportation modes	No	N/A	Our project team does not have the capacity to affect local transportation infrastructure
Above-average prevalence of childhood obesity	Prioritize features that promote physical activity	Playground	Yes	We will be including a 100-square-foot playground as part of our project	This feature will provide a local, safe space for the families living in our development to play and socialize. Otherwise, closest playspace is 2 miles from project; not easily accessible. Given the disparities in childhood obesity rates by race, ethnicity and income in our community, this strategy will also help to address health equity.

Project teams may also want to identify programming features you intend to provide to residents, such as nutritional classes, cooking courses, etc.

Step 2: Implement and Monitor

Definitions

Potential Performance Metrics: List of methods that could be used to evaluate the impact of the selected strategies on the population need.

Design Metrics: Metrics to determine how well the design team, at the design stage, integrated the selected strategies into the project in a manner that will promote positive health outcomes.

Operations Metrics: Metrics that can be measured on a routine basis while the building is in operation to determine whether or not the building is performing as intended.

Health Metrics: Metrics regarding resident health factors and, where possible, incidence or prevalence of key health outcomes in the resident and/or community population.

Selected Performance Metrics: List of the specific Potential Performance Metrics that will be implemented.

Roles, Responsibilities and Responsible Individual(s) and/or Organization(s): List of the roles and responsibilities necessary to measure the Selected Performance Metrics, including the specific individual and/or organization selected to fill that role and/or responsibility. Identify individual(s) or organization(s) that would be accountable to take action if any adverse results are found.

Frequency: The rate of how often the Selected Performance Metrics will be evaluated.

EXAMPLE OF PRODUCT FOR CRITERION 1.2B, STEP 2

INFORMATION IDENTIFIED IN STEP 1			NEW TABLE CELLS IN STEP 2			
POPULATION NEED	**SELECTED INTERVENTION(S)**	**SELECTED STRATEGY**	**POTENTIAL PERFORMANCE METRICS**	**SELECTED PERFORMANCE METRICS**	**RESPONSIBLE INDIVIDUAL(S) AND/OR ORGANIZATION(S)**	**FREQUENCY**
High incidence of childhood asthma	Eliminate or reduce use of potential asthmagens	Specification of linoleum for kitchens, cork flooring for bedrooms, etc.	**Design Metrics** No carpet is specified in the project plans and specs. All flooring materials specified are hard surfaces. **Operations Metrics** Screen indoor air for presence of asthmagens **Health Metrics** Incidence rate of acute asthma events	**Design Metrics** No carpet is specified in the project plans and specs. All flooring materials specified are hard surfaces. **Operations Metrics** Screen indoor air for presence of asthmagens **Health Metrics** Incidence rate of acute asthma events	**Design Metrics** Architect to certify that no carpet was utilized in the project design/ specifications. John Smith, ACME Inc., 123.456.7890 **Operations Metrics** Property manager will engage an IEQ consultant to measure formalde-hyde levels in air once each quarter. Jane Doe, Company Inc., 234.456.5678 **Health Metrics** Housing provider will annually collect self-reported rates of asthma incidents among residents and track them over the life of the project. Or, housing provider will work with local hospital or health system to track and monitor rates of admission and re-admission for asthma incidents. Johnny Rocket, XYZ Company, 456.678.6789	**Design Metrics** To be certified on final plan set before construction start **Operations Metrics** To be measured once each quarter **Health Metrics** Annual survey

EXAMPLE OF PRODUCT FOR CRITERION 1.2B, STEP 2 (CONTINUED)

INFORMATION IDENTIFIED IN STEP 1			NEW TABLE CELLS IN STEP 2			
POPULATION NEED	**SELECTED INTERVENTION(S)**	**SELECTED STRATEGY**	**POTENTIAL PERFORMANCE METRICS**	**SELECTED PERFORMANCE METRICS**	**RESPONSIBLE INDIVIDUAL(S) AND/OR ORGANIZATION(S)**	**FREQUENCY**
Above average prevalence of childhood obesity	Prioritize physical activity promoting features; add outdoor lighting to playgrounds to allow use for more hours; add bike racks and storage	Add lighting to exterior park/ playground areas	**Design Metrics** Specific type of light used **Operations Metrics** Area is well lit during all hours of operation **Health Metrics** Self-reported rates of physical activity among residents; frequency of events/opportunities for physical activity and participation rates in these events; operations staff monitor playground use by keeping tally	**Design Metrics** Specified lighting for park/ playground areas complies with Criterion 5.5 as well as foot candle recommendations **Operations Metrics** Lighting density **Health Metrics** Frequency of events and opportunities for physical activity (e.g., "community field day" or walking groups) and associated participation rates	**Design Metrics** Architect to certify that specs include appropriate lighting fixtures. John Smith, ACME Inc., 123.456.7890 **Operations Metrics** Maintenance technician to measure lighting density once each quarter. Jane Doe, Company Inc., 234.456.5678 **Health Metrics** Residential Services Coordinator Beth Smith 123.456.7890	**Design Metrics** To be certified on final plan set before construction start **Operations Metrics** To be measured once each quarter **Health Metrics** Quarterly tracking of events and number of participants

Transparency

- Share your Step 2 table through the Green Building Information Gateway (*gbig.org*) and the Health Impact Project (*healthimpactproject@pewtrusts.org*).
- Produce an acknowledgment page or letter(s) of support from public health professionals and community stakeholders. Receive documentation from community stakeholders regarding their involvement in the identification and prioritization of actions to protect and promote health (completed in Step 2) and their level of support for the health action plan. Note that project teams need to obtain consent from any community and team members to be listed in the acknowledgments page.
- Note where health-related items have been incorporated into project documentation, including plans and specifications.

RESOURCES

- Data sources for measuring baseline health: Provided in the Resources section of Criterion 1.2a. See also the Human Impact Partners resources listed below.
- The American Planning Association and the National Association of County and City Health Officials webinar, "Planning for Healthy Places with Health Impact Assessments": This online course explains the value of and the steps involved in conducting an HIA. *http://advance.captus.com/Planning/hia2/home.aspx*
- The Mariposa Healthy Living Toolkit: This toolkit provides a guide for assessing the health conditions of residents and identifying opportunities to improve health during community redevelopment projects. *http://mithun.com/special/Mariposa_Healthy_Living_Initiative/*
- Health Impact Project's interactive map of HIAs: This interactive map allows users to sort and analyze data on completed and in-progress HIAs in the U.S. *www.pewtrusts.org/en/projects/health-impact-project*
- The Surgeon General's National Prevention Strategy: Healthy Communities factsheet: This document outlines actions that different organization types can take to support healthy and safe community environments. *www.surgeongeneral.gov/initiatives/prevention/strategy/healthy-safe-environments.pdf*
- Guidance and Best Practices in Stakeholder Participation in HIAs: This document provides recommended strategies for collaborating with stakeholders. *www.pewtrusts.org/en/projects/health-impact-project*
- Promoting Equity through the Practice of HIA: This document highlights strategies for and case examples of promoting equity through Health Impact Assessments. *www.pewtrusts.org/en/~/media/Assets/External-Sites/Health-Impact-Project/PromotingEquityHIA_final.pdf*
- Human Impact Partners: *www.humanimpact.org/capacity-building/hia-tools-and-resources/* Some suggested tools and resources for your use are:
  - *Roles for Collaborators:* This document provides examples of different partners that might be involved in a Health Impact Assessment and their roles.
  - *Rapid HIA Model:* This document provides guidance for conducting a Health Impact Assessment within a short timeline, while maintaining a high level of stakeholder engagement.
  - *Data sources table:* This table outlines data sources that may be useful in a Health Impact Assessment.
- Mithun Cultural Audit Tool: The Cultural Audit attempts to collect diverse community input from a broad constituency and helps to form a more inclusive picture of the community. *http://stage2.mithun.com/projects/type/culturalaudit/*
- National Research Council Improving Health in the United States: The Role of Health Impact Assessment and related brief: These documents provide an overview and a definition of "health impact assessment," examples of methods for analyzing potential health impacts of a project, and best practices for monitoring the project's impacts on health. *www.nap.edu/catalog/13229/improving-health-in-the-united-states-the-role-of-health* and *http://dels.nas.edu/resources/static-assets/materials-based-on-reports/reports-in-brief/Health-Impact-Assessment-Report-Brief-Final.pdf*
- Minimum Elements of Health Impact Assessment (v3): This document describes the essential elements of and standards for a Health Impact Assessment. *http://hiasociety.org/wp-content/uploads/2013/11/HIA-Practice-Standards-September-2014.pdf*

1.3a

Mandatory

Resilient Communities: Design for Resilience

New Construction and Substantial Rehab only

REQUIREMENTS

Given your project building type, location and expected resident population, identify a project characteristic that would most likely impact your project's ability to withstand an unexpected weather event or loss of power. Select at least one of the optional Design for Resilience Criteria listed below that would help mitigate that impact, and incorporate this within your project plans and design. Include a short narrative providing your rationale for selecting this criterion above the others.

Design for Resilience Criteria

1.3b: Resilient Communities: Multi-Hazard Risk/Vulnerability Assessment*
2.10: Passive Solar Heating/Cooling
3.6: Surface Stormwater Management
4.2: Advanced Water Conservation [Must achieve at least 3 points if selecting this criterion]
4.5: Water Reuse [Must achieve at least 3 points if selecting this criterion]
4.6: Access to Potable Water during Emergencies*
5.2a: Additional Reductions in Energy Use
5.2b: Advanced Certification: Nearing Net Zero
5.8a: Resilient Energy Systems: Floodproofing*
5.8b: Resilient Energy Systems: Islandable Power*

*These criteria provide a project with the capacity to respond in the near-term to emergencies. These emergency response items are critical for addressing immediate resiliency needs. The other criteria listed here enhance overall project efficiency and performance, creating a more resilient project in more general terms.

RATIONALE

Per the Resilient Design Institute, resilience is the capacity to adapt to changing conditions and to maintain or regain functionality ("bounce forward") and vitality in the face of stress or disturbance. It is the capacity to bounce back after a disturbance or interruption of some sort. At various levels—individuals, households, communities and regions—through resilience we can maintain livable conditions in the event of natural disasters, loss of power or other interruptions in normally available services. Relative to climate change, resilience involves adaptation to the wide range of regional and localized impacts that are expected with a warming planet: more intense storms, greater precipitations, coastal and valley flooding, longer and more severe droughts in some areas, wildfires, melting permafrost, warmer temperatures and power outages. Resilient design is the intentional design of buildings, landscapes, communities and regions in response to these vulnerabilities.

RECOMMENDATIONS

- Note that while the criteria listed in the table above are those explicitly designed to address resilience, many other criteria are also meaningful in terms of contributing to a project's capacity to withstand a severe interruption. For instance, compliance with optional Criterion 5.7a Photovoltaic/Solar Hot Water Ready would result in a building better prepared to adjust per changing project needs in the future.

- To foster social resilience in a multifamily property, consider co-locating the features listed above. For instance, a community room in a multifamily property could become a hub during an emergency, including postings of community information by management, serving as a gathering spot for neighbors, providing access to potable water during emergencies, being supplied by islandable power systems for critical services, and including charging stations for residents and community members.
- Enterprise's Multifamily Resilience Manual includes more than a dozen strategies and specific guidance for building property resilience in the event of an emergency. Consider incorporating one or more of these measures into your property.

RESOURCES

- Green Building and Climate Resilience: Understanding Impacts and Preparing for Changing Conditions, University of Michigan; U.S. Green Building Council; 2011. This document identifies climate-related vulnerabilities at the regional level and prioritizes design, construction and operation strategies that will increase resilience and facilitate climate adaptation. *www.usgbc.org/Docs/Archive/General/Docs18496.pdf*
- Enterprise's Multifamily Resilience Manual: *www.enterprisecommunity.org/resources*
- Building Resiliency Task Force Full Report, June 2013, Urban Green: Provides resiliency-related recommendations for communities and buildings. *http://issuu.com/urbangreen/docs/brtf_full_report#/freeSignupNamePassword*

1.3b *Optional | 15 points*
Resilient Communities: Multi-Hazard Risk/Vulnerability Assessment

REQUIREMENTS

Carry out a Vulnerabilities Assessment and implement building elements designed to enable the project to adapt to, and mitigate, climate impacts given the project location, building/construction type and resident population. Your Vulnerabilities Assessment should prioritize evaluation of issues (e.g., wildfires, flooding, etc.) identified in the state or county hazard mitigation plan for which your project is located. Implement strategies to address at least the top three risk factors identified for your project. Also ensure that these measures are incorporated in response to Criterion 8.2 Emergency Management Manual.

RATIONALE

Creating affordable housing projects that will perform well during natural disasters requires careful planning. The exercise of assessing vulnerabilities and creating a plan to mitigate appropriate risks will result in greater focus on this issue. Engaging in this exercise during the integrative design process will allow for input from a variety of stakeholders and incorporation of measures that enhance resilience throughout the project design and construction documents.

RECOMMENDATIONS

- Hold a series of facilitated charrettes and community meetings focused explicitly on identifying how the issues identified in your project's state or county hazard mitigation plan apply to your project and your resident population.
- Identify solutions appropriate for your project, evaluate how these strategies overlap with the other criteria selected for your project, and determine best means of implementation.

RESOURCES

- FEMA's hazard mitigation planning resources include a Mitigation Planning Handbook, guidelines for Sustainability in Mitigation Planning, Planning Advisory Service Reports, and examples of Mitigation Activities. *www.fema.gov/hazard-mitigation-planning-resources*
- The National Hazard Mitigation Association (NHMA): Promotes natural hazard risk reduction and climate adaptation through planning, adaptation and mitigation. The NHMA promotes steps to reduce the risk and consequences of natural events with a special emphasis on protecting the most vulnerable populations in our communities. *www.nhma.org*
- The Built Environment Coalition (BEC): Develops analytical approaches, methodologies and tools to help communities and organizations identify opportunities to improve their built environment and make informed decisions on potential investments. *www.builtenvironmentcoalition.org*
- The Federal Alliance for Safe Homes (FLASH): The country's leading consumer advocate for strengthening homes and safeguarding families from natural and manmade disasters. *www.flash.org*
- Metropolitan Washington Council of Governments' climate adaptation planning initiatives report *www.mwcog.org/uploads/pub-documents/pl5cXls20130701111432.pdf*
- Rocky Mountain Land Use Institute: Resource focused on sustainable and adaptive land use and development practices, focused on the western U.S. *www.law.du.edu./index.php/rmlui/about*
- FEMA Building Vulnerability Assessment Checklist may be used as a screening tool for preliminary design vulnerability assessment. *www.fema.gov/media-library-data/20130726-1524-20490-4937/fema452_a.pdf*
- Kaiser Permanente Hazard and Vulnerability Assessment Tool: Naturally Occurring Events is a sample Hazard Vulnerability Analysis Tool: *www.rhpc.us/go/doc/4207/1598819/Hazard-Vulnerability-Analysis*
- California Association of Health Facilities Hazard Vulnerability Worksheet may be used as a template to score and assess your project for potential mitigative actions that can reduce identified vulnerabilities. *www.cahfdownload.com/cahf/dpp/HVA-UHCA.pdf*

LOCATION + NEIGHBORHOOD FABRIC

Locating a project within an existing neighborhood and in close proximity to infrastructure, transportation and services encourages more resource-efficient development of land, reduces development costs, conserves energy and adds to the vitality of the overall community.

INSTRUCTIONS

Guidance for New Construction Projects

Access to reliable transportation networks is critical to ensuring that affordable housing residents are well connected to amenities. To confirm this, all new construction projects must either earn optional points under Criterion 2.8 Access to Public Transportation, or earn 8 optional points through the criteria listed below drawn from Category 2: Location + Neighborhood Fabric.

2.7 Preservation of and Access to Open Space
2.9 Improving Connectivity to the Community
2.12 Access to Fresh, Local Foods
2.13 LEED for Neighborhood Development Certification
2.14 Local Economic Development and Community Wealth Creation

Guidance for Moderate and Substantial Rehab Projects

Moderate and Substantial Rehab projects are exempt from all mandatory measures in the Enterprise Green Communities Category 2: Location + Neighborhood Fabric.

Guidance for Rural/Tribal/Small Towns

Projects that meet one or more of the criteria below qualify for the special Rural/Tribal/Small Towns pathways throughout the Location + Neighborhood Fabric category:

- Projects classified as rural as defined in Section 520 of the Housing Act of 1949 (42 U.S.C. 1490), located within any open country or any town, village, city or place that is not part of or associated with an urban area, and that:
  1. has a population in excess of 2,500 but not in excess of 10,000 if it is rural in character, or
  2. has a population in excess of 10,000 but not in excess of 20,000 and is not contained within a standard metropolitan statistical area
- Projects located on Native American Reservations and land owned by Native Alaskans
- Projects located in colonias communities as defined by HUD and certified by one of the four border states: Texas, New Mexico, Arizona and California
- Projects eligible for funding under USDA Rural Housing Services (RHS) programs

Instructions: Determining USDA RHS funding eligibility

Obtain information on your project site at the USDA Rural Development (RD) web page that identifies USDA RD-eligible areas, as determined by USDA's housing programs: *eligibility.sc.egov.usda.gov/eligibility/welcomeAction.do*

Under "Property Eligibility," select the program type. Once the page refreshes, do one of these things:

1. Enter the project address in the appropriate fields or select a state from the map.
2. Click the "Text Description" button for information on eligibility by state.
3. Click on your county.

2.1 Sensitive Site Protection

Mandatory

See exemptions in Criteria

REQUIREMENTS

Do not locate new projects, including buildings, built structures, roads or parking areas, on portions of sites that meet any of the following provisions:

1. Land within 100 feet of wetlands, including isolated wetlands or streams. Maintain or establish riparian buffer using native vegetation where possible. Bike and foot paths are allowed if at least 25 feet from the wetlands boundary.
2. Land on slope greater than 15%.
3. Land with prime soils, unique soils or soils of state significance per USDA designations.
4. Public parkland.
5. Land that is specifically identified as an existing habitat for any species on federal or state threatened or endangered lists.
6. Land that is within the Special Flood Hazard Areas (SFHA) as identified by FEMA on the Flood Insurance Rate Map.

EXEMPTIONS

- Projects on previously developed sites are exempt from provision 1 above.
- Infill sites are exempt from provisions 2 and 3 above. (See Glossary for detail on what can be classified as an infill site.)
- Infill projects that are designated to meet the American Society of Civil Engineers ASCE 24 Flood Resistant Design and Construction Standard are exempt from provision 6 above.

RATIONALE

Proper site selection avoids damage to or loss of fragile and scarce environmental resources. It also reduces the risk of building damage from flooding, which is likely to be more frequent and more severe with the advent of climate change.

RECOMMENDATIONS

Use federal, state and local lists to identify habitats of potential endangered species and their habitats.

RESOURCES

- U.S. Fish and Wildlife Service, Endangered Species Database: *www.fws.gov/endangered/*
- U.S. Fish and Wildlife Service, National Wetlands Inventory: *www.fws.gov/wetlands/*
- U.S. Department of Energy, Building Technologies Office: Addresses methods that can help to minimize impacts to the site. *www.eere.energy.gov/buildings/info/design/buildingsiting/index.html*
- American Society of Civil Engineers (ASCE), ASCE 24-05 Flood Resistant Design and Construction (2010): *www.fema.gov/media-library/assets/documents/14983?id=3515*

- U.S. Department of Agriculture, Natural Resources Conservation Service's Web Soil Survey: *http://websoilsurvey.nrcs.usda.gov/app/*
- Federal Emergency Management Agency (FEMA), FEMA's Flood Map Service Center: *http://msc.fema.gov/portal*

2.2 *Mandatory* Connections to Existing Development and Infrastructure

Except for projects located on rural tribal lands, in colonias communities or in communities with populations of less than 10,000

REQUIREMENTS

Locate the project on a site that has access to existing roads, water, sewers and other infrastructure within or contiguous to (having at least 25% of the perimeter bordering) existing development.

Connect the project to the pedestrian grid by creating new or enhancing existing sidewalks or other all-weather pathways to link the project to public spaces, open spaces and adjacent development.

Do not build on tracts of land that require installing a septic tank within 1,000 feet or more of the property line of the tract being developed or a sanitary sewer line extension of 2,500 feet or more from the property line of the tract being developed.

RATIONALE

Locating a project within an existing neighborhood and in close proximity to infrastructure encourages more resource-efficient development of land, reduces development costs, conserves energy, adds to the vitality of the overall community, and safeguards a community during significant weather events. Ensuring that pedestrian and cycling infrastructure is included encourages safe, active transportation, which can improve health by significantly increasing daily physical activity.

RECOMMENDATIONS

- Provide enhanced pedestrian crossings at intersections using elements such as curb extensions, medians, crosswalk count-down clocks, daylighting, street treatments (e.g., different color or texture pavement in crosswalks) or sidewalk expansion. On streets with large blocks, consider mid-block pedestrian crossings.
- Dedicated pedestrian and bicycle paths are important even on dead-end streets.
- Design engaging and safe sidewalk experiences appropriate for expected pedestrian flows and uses.

RESOURCES

- NYC Departments of City Planning, Health and Mental Hygiene, and Design and Construction. *Active Design Supplement: Shaping the Sidewalk Experience*, 2013. *www.nyc.gov/html/dcp/pdf/sidewalk_experience/active_design.pdf*
- Task Force on Community Preventive Services. *The Community Guide—What Works to Promote Health*. *www.thecommunityguide.org/pa/environmental-policy/communitypolicies.html*

- Center for Active Design: The Center for Active Design maintains an urban design checklist that includes best practices for sidewalk design to encourage their vibrant use, including features like trees, lighting and wayfinding. *http://centerforactivedesign.org/*
- The Community Preventive Services Task Force, Environmental and Policy Approaches to Increase Physical Activity: Street-Scale Urban Design Land Use Policies. *www.thecommunityguide.org/pa/environmental-policy/streetscale.html*
- Smart Growth America: Complete Streets. *www.smartgrowthamerica.org/complete-streets*

2.3 *Mandatory* Compact Development

REQUIREMENTS

At a minimum, build to the residential density (dwelling units/acre) of the census block group in which your project is located. Find the density of your census block group by typing your project address into the Center for Neighborhood Technology "Residential Density of a Location" calculator found at *http://apps.cnt.org/residential-density*.

Any acreage maintained as open space per Criteria 2.6 and 2.7 may be deducted from total project acreage in terms of determining project density.

In Rural/Tribal/Small Towns that do not have zoning requirements, use the following: Build to a minimum net density of 5 units per acre for single-family houses; 10 units per acre for multifamily buildings, single and two-story; and 15 units per acre for multifamily buildings greater than two-stories.

RATIONALE

Compact development encourages more resource-efficient development of land, reduces project cost, conserves energy and supports demand for other infrastructure such as public transportation and commercial development. Compact development also correlates with walking behavior and physical activity through active transportation. To the extent that communities want to foster safe, active transportation and a healthy lifestyle, compact development is critical to success.

RECOMMENDATIONS

- To determine if your project qualifies as Rural/Tribal/Small Town, reference the Instructions at the beginning of Category 2: Location + Neighborhood Fabric.
- Net density calculations do not include land that is set aside for future building phases or development. For multi-phased projects, the project net density should include only the portion of the parcel that is being used for that particular phase.

RESOURCES

- Congress for the New Urbanism: This nonprofit organization provides tools and resources for promoting walkable, neighborhood-based development as an alternative to sprawl. *www.cnu.org*
- Smart Growth Network: This website outlines smart growth principles, provides a guide through smart growth terms and technical concepts, and hosts a searchable catalog of reports, websites, tools and case studies. *www.smartgrowth.org*

- Urban Land Institute: This nonprofit organization promotes the responsible use of land to enhance the total environment. ULI's online bookstore includes numerous publications regarding compact and higher-density development. *www.uli.org*
- Reconnecting America: This website offers multiple resources providing detailed information about the link between land use, including density, and transit ridership/performance. *www.reconnectingamerica.org*

2.4 Compact Development

Optional | 5 or 7 points

REQUIREMENTS

Exceed the residential density (dwelling units/acre) of the census block group in which your project is located. Find the density of your census block group by typing your project address into the Center for Neighborhood Technology "Residential Density of a Location" calculator found at *http://apps.cnt.org/residential-density/*.

EXCEED THE CNT RESIDENTIAL DENSITY	OPTIONAL POINTS
2x	5 points
3x	7 points

In Rural/Tribal/Small Towns that do not have zoning requirements, build to a minimum net density of 7.5 units per acre for single-family houses; 12 units per acre for multifamily buildings, single and two-story; and 20 units per acre for multifamily buildings greater than two-stories. *[5 points]*

RATIONALE

See Rationale for Criterion 2.3.

RECOMMENDATIONS

See Recommendations for Criterion 2.3.

RESOURCES

See Resources for Criterion 2.3.

2.5 *Mandatory*
Proximity to Services

REQUIREMENTS

- Locate the project within a 0.5-mile walk distance of at least four, or a 1-mile walk distance of at least seven, services.
- Each "service" type may not be counted more than twice. For example, if there are five banks within the required distance, only two may be counted.
- For projects that qualify as Rural/Tribal/Small Town, locate your project within 5 miles of at least four services.

RETAIL	AMENITIES	CIVIC AND COMMUNITY FACILITIES
Supermarket	Bank (with teller hours)	Adult or senior care (licensed)
Other food store with produce	Gym, health club, exercise studio	Child care (licensed)
Farmers market	Hair care	Community or recreation center, potentially including performance space
Clothing store or department store selling clothes	Laundry, dry cleaner	Cultural arts facility (museum, performing arts)
Hardware store	Restaurant, café, diner	Educational facility (including K–12 school, university, adult education center, vocational school, community college)
Pharmacy		Entertainment venue (theater, sports)
Other retail		Government office that serves public on-site
		Place of worship
		Medical clinic or office that treats patients
		Police or fire station
		Post office
		Public library
		Public park
		Social services center

List adapted from the LEED 2009 Neighborhood Development Rating System

RATIONALE

Proximity to neighborhood services, including grocery stores, community centers, health services and some retail shops correlate highly with a physically healthy lifestyle. To the extent that communities want to foster active transportation and a healthy lifestyle, linking housing to the types of destinations listed above is critical to success. Additionally, proximity and access to active recreation facilities such as parks, playgrounds and other exercise amenities are associated with increased physical activity and decreased weight.

Compact development encourages more resource-efficient development of land, reduces project costs and conserves energy. Additionally, it supports demand for other infrastructure such as public transportation and commercial development. Residents with services within a close, safe, accessible physical proximity will fare better during natural disasters in the event of a loss of automobile access or other major events when gasoline and public transportation may be limited.

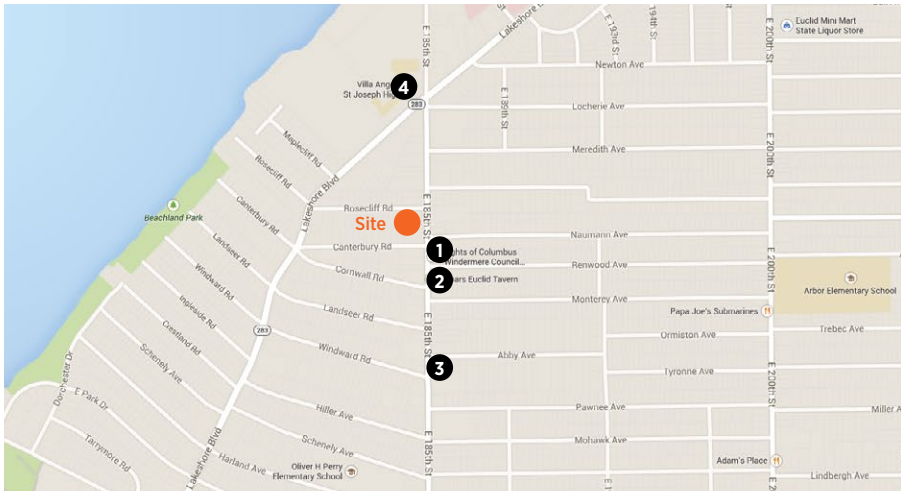
RECOMMENDATIONS

- Use a context map to demonstrate that the center of the site is within the required walk distance of services.
- Walking paths and pedestrian street crossings should be safe and should include sidewalks, crosswalks and signals.

- City, municipal and county governments (e.g., local planning department, health department) can serve as valuable resources to better understand community amenities.

RESOURCES

- Google Maps offers a function to demonstrate walk distance. On Google Maps, go to "Directions" and select "Walk Directions" to obtain this information. *www.google.com/maps*
- To determine if your project qualifies as Rural/Tribal/Small Town, reference the Instructions at the beginning of Category 2: Location + Neighborhood Fabric. Walkscore: *www.walkscore.com/*
- Safe Routes to School National Partnership: This network of more than 300 nonprofit organizations, government agencies, schools and professionals works to advance the Safe Routes to School (SRTS) movement in the United States. SRTS can provide a variety of important benefits to children and their communities, including increasing physical activity, reducing traffic congestion, improving air quality and enhancing neighborhood safety. *www.saferoutespartnership.org/home*
- The National Association of Area Agencies of Aging (n4a): This resource can be used to find aging-in-place service providers in your area. *www.n4a.org/*
- U.S. Department of Health and Human Services, U.S. Administration on Aging, Eldercare Locator: This resource can be used to find home- and community-based service providers in your area. *www.eldercare.gov/*
- Consider using a technology like TransitScreen in your building's common space(s) to provide real-time transportation information to building residents and staff. *http:/transitscreen.com*
- Professor Anne Vernez-Moudon's papers on walkability, College of Built Environments, Department of Architecture, University of Washington. *http://urbdp.be.washington.edu/people/faculty/departmental/profiles/moudon.html*



PROXIMITY TO SERVICES

1. Educational facility (elementary school): < 0.1 mile
2. Pharmacy: < 0.1 mile
3. Hardware: 0.2 mile
4. Educational facility (hIgh school): 0.3 mile

2.6 *Mandatory*
Preservation of and Access to Open Space for Rural/Tribal/Small Towns

REQUIREMENTS

Option 1

Set aside a minimum of 10% (minimum of 0.25 acre) of the total project acreage as non-paved open space for use by all residents.

OR

Option 2

Locate the project within a 0.25-mile walk distance of dedicated public non-paved open space that is a minimum of 0.75 acres.

Note: For either option, land that is set aside for future development cannot be included as open space in these calculations.

RATIONALE

Open space is more than just a land asset for development; it is an amenity that attracts the broader community. Access to safe open space and other natural resources improves quality of life, enhances opportunities for physical activity and social interaction, and provides the opportunity to better understand the importance of the natural environment.

RECOMMENDATIONS

- Create a site plan with total acres and the number of acres of the proposed open space, and a narrative plan for security and maintenance for the preservation of the open space.
- When calculating open space, be sure to deduct buildings, private outdoor areas, streets and roadways from your total site area.
- To determine if your project qualifies as Rural/Tribal/Small Town, reference the Instructions at the beginning of Category 2: Location + Neighborhood Fabric. Design building massings to enhance nearby parks, plazas and open spaces.
- Open spaces should be safe and designed to promote active use by residents. Features such as active bike and walking trails/paths, lighting, seating options, native plantings and recreation facilities to make open space a community amenity. Open spaces should compliment the cultural preferences of the local population and accommodate people of all ages.

RESOURCES

- U.S. Environmental Protection Agency, Smart Growth and Open Space Conservation. *www.epa.gov/smartgrowth/openspace.htm*
- The Trust for Public Land: Creates parks and protects land for people, ensuring healthy, livable communities for generations to come. *www.tpl.org/*
- The Trust for Public Land, ParkScore Index: A rating system developed to measure how well U.S. cities are creating parks. *http://parkscore.tpl.org/*

2.7 *Optional | 6 points maximum*
Preservation of and Access to Open Space

REQUIREMENTS

Set aside a percentage of non-paved open space for use by all residents.

PERCENTAGE OF OPEN SPACE SET ASIDE	NUMBER OF OPTIONAL POINTS
20%	2 points
30%	4 points
40% + submitted written statement of preservation/ conservation policy for set-aside land (for 15 years)	6 points

Green Roofs can be used in open space calculations if the square footage is accessible to all residents.

Land that is set aside for future development cannot be included as open space in these calculations.

RATIONALE

See Rationale for Criterion 2.6.

RECOMMENDATIONS

See Recommendations for Criterion 2.6.

RESOURCES

See Resources for Criterion 2.6.

2.8 *Optional | 8 or 10 points*
Access to Public Transportation

New Construction projects: see Instructions on page 38

REQUIREMENTS

Locate projects within a 0.5-mile walk distance of transit services (bus, rail and/or ferry) combined, constituting at least 60 or more transit rides per weekday, with some type of weekend ride option. *[8 points]*

For projects that qualify as Rural/Tribal/Small Town, locate the project within a 5-mile distance of the following transit options: 1) vehicle share program; 2) dial-a-ride program; 3) employer vanpool; 4) park-and-ride; or 5) public–private regional transportation. *[8 points]*

For an additional [2 points]: Locate the project along dedicated bike trails or lanes that lead to transit services or stations (bus, rail and ferry) within 3 miles.

RATIONALE

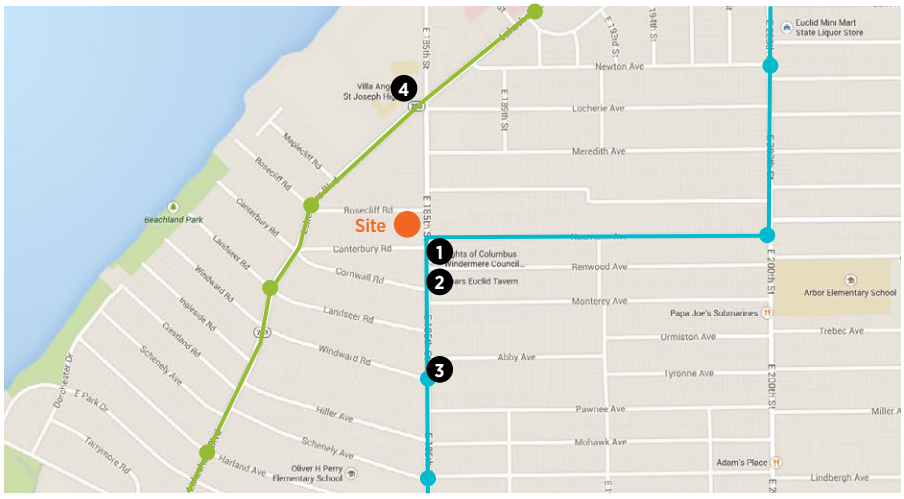
Projects located near transit reduce a resident's need to own a car, thereby eliminating or lowering the costs of auto ownership. Transit use reduces related emissions of air pollutants and carbon dioxide. In addition, locating near high-frequency transit typically allows project residents to access major employment centers, and can provide opportunities for increased physical activity through active transportation, improving health. Bicycle facilities can significantly increase the area served by public transit, as distances too long to walk are often easily accessible by bicycle.

RECOMMENDATIONS

- Use a context map to demonstrate that the center of the site is within the required walk distance of combined transit options that provide an adequate number of rides per weekday.
- Bike lanes are defined as a portion of the roadway that is designated by striping, signage and/or pavement markings for preferential or exclusive use by bicyclists.

RESOURCES

- To determine if your project qualifies as Rural/Tribal/Small Town, reference the Instructions at the beginning of Category 2: Location + Neighborhood Fabric. Google Maps offers a function to demonstrate walk distances and to identify bicycle trail and route maps. On Google Maps, go to "Get Directions" and select "Walking" or "Bicycling," as applicable, to obtain this information. *www.google.com/maps*
- Many cities and counties provide bicycle trail and route maps for free download through their websites.
- Consider using a technology like TransitScreen in your building's common space(s) to provide real-time transportation information to building residents and staff. *http:/transitscreen.com/*
- Reconnecting America: *www.reconnectingamerica.org*
- Victoria Transportation Policy Institute: This independent research organization provides consulting and publicly available research about solutions to emerging transportation issues, such as transportation demand management. *www.vtpi.org*
- Community Transportation Association of America, "Profiles of Innovative Rural Vanpool Programs": This resource describes several exceptional vanpool programs around the country. *web1.ctaa.org/webmodules/webarticles/articlefiles/Profiles_of_Innovative_Rural_Vanpool_Programs.pdf*
- National Association of City Transportation Officials, "Bike Lanes." *http://nacto.org/cities-for-cycling/design-guide/bike-lanes/*



ACCESS TO PUBLIC TRANSPORTATION

- Route 129—40 stops/weekday, 20 stops/weekend day: <0.1 mile from site
- Route 200—60 stops/weekday, 25 stops/weekend day: 0.3 mile from site

2.9 Improving Connectivity to the Community

Optional | 2–8 points

REQUIREMENTS

Improve access to community amenities through at least one of the measures below:

Improving Access

Transit

- Provide residents with discounted transportation passes for a period of at least 12-months. *[2 points]*
- Provide residents with free transportation passes for a period of at least 12-months. *[3 points]*

Auto

- Include car-share services (parking) on property. *[1 point]*
- Provide all eligible residents with discounted car-share memberships for a period of at least 12-months. *[2 points]*
- Provide a minimum of 50% of eligible residents with free car-share memberships for a period of at least 12-months. *[3 points]*

Incentivize Biking Mobility

- Provide outdoor bicycle racks that are accessible for visitors and residents. *[1 point]*
- Provide secure, lockable, sheltered and accessible bicycle storage. Provide one bicycle parking space for every two residential units. Post signage directing residents to bicycle parking areas and programs. *[2 points]*
- Provide bicycles and equipment (e.g., helmets, locks, tire pumps, maintenance equipment) for resident use. *[3 points]*
- Promote use of, and access to, one or more bicycle-share programs within 0.25-mile of the building. Bicycles need to be accessible to occupants at all hours. Maps to the nearest bike station should be posted in a visible location within a common area in the building and included in the Resident Manual (Criterion 8.3). *[1 point]*
- Provide residents with discounted bicycle-share memberships. for a period of at least 12-months *[2 points]*
- Provide residents with free bicycle-share memberships for a period of at least 12-months. *[3 points]*

RATIONALE

Connections to adjacent development and public, open spaces promote recreational walking, biking and other healthy lifestyle choices, as well as promoting alternative means of commuting.

RECOMMENDATIONS

- Pedestrian activity and improved safety should be encouraged when considering opportunities for biking, walking, driving and parking.
- Provide orientation materials and maps to the nearest bus, transit stations and car-share facilities (general orientation materials are acceptable for floating car-share services such as Car2go). Information about these amenities should be posted in a visible location in a common area in the building and included in the Resident Manual (Criteria 8.3).

- Consider including a small amount of credit ($10) for residents to try their local car-share service. Contact the car-share services to see if they would like to offer discount or credit to encourage use.
- Promote designs that encourage slow-speed, low-volume roadways, thereby enhancing walkers' and bikers' safety.
- For ease of use, bicycle storage is ideally incorporated on the ground floor with direct roll-in access that is separate and distinct from automobile access. Push-button doors make roll-in access even more convenient for riders, especially during inclement conditions.
- Provide bicycle storage for staff as well as residents.
- Consider designing the building exterior and massing to encourage physical activity by maximizing variety, detail and continuity on the lower one-to-two floors of the building exterior; by providing multiple entries and maximum transparency; and by incorporating canopies and awnings into building façade.
- Consider using porous pavement for sidewalks and other paved surfaces to reduce stormwater runoff and the distribution of pollutants to streams, rivers and water bodies. Design sidewalks to distribute stormwater to open space for recharge and to prevent flooding.
- Make bicycle and pedestrian routes to parks and public spaces safe and visible.
- Conduct an assessment to determine most likely routes of pedestrian and bicycle use when laying out paved pathways/sidewalks from the project to the surrounding neighborhood. Build the pathways/sidewalks where there is visible evidence of pedestrian and bicycle use.
- To encourage pedestrian activity, minimize addition of mid-block vehicular curb cuts on streets with heavy foot traffic; construct curb extensions along sections of the sidewalk that tend to attract greater pedestrian congestion and that are close to pedestrian crossings.
- Dedicated pedestrian and bicycle paths are important even on dead-end streets.
- Design vehicular driveways and ramps to improve pedestrian safety and encourage walkability.
- Incorporate street furniture such as benches, trash receptacles and bicycle racks to create an active streetscape.
- Install street features that have been shown to effectively calm traffic, including curb extensions, medians, roundabouts and raised speed reducers.

RESOURCES

- NYC Departments of City Planning, Health and Mental Hygiene, and Design and Construction. Active Design Supplement: Shaping the Sidewalk Experience, 2013. *www.nyc.gov/html/dcp/pdf/sidewalk_experience/active_design.pdf*
- Robert Wood Johnson Foundation, Active Living Research. *http://activelivingresearch.org/active-design-supplement-affordable-designs-affordable-housing*
- Task Force on Community Preventive Services, The Community Guide—What Works to Promote Health. *www.thecommunityguide.org/pa/environmental-policy/communitypolicies.html*
- Task Force on Community Preventive Services, The Community Guide—Street-Scale Urban Design Land Use Policies. *www.thecommunityguide.org/pa/environmental-policy/streetscale.html*

2.10 *Optional | 5 points maximum*
Passive Solar Heating/Cooling

REQUIREMENTS

Design and build project with passive solar design, orientation and shading that meets the following guidelines. Documentation must include sun angles and a wall section showing compliance with the project's Climate Zone (see 2012 IECC Climate Zone Map in the *Appendix*), and a site plan indicating true north. Also include documentation of compliance with all guidelines noted below.

PROJECT TYPE	POTENTIAL POINTS	REQUIREMENTS
New Construction: Stand-alone building	5	Meet all guidelines
New Construction: Projects with multiple buildings	2	25% of the homes meet all guidelines
	3	50% of the homes meet all guidelines
	4	75% of the homes meet all guidelines
	5	100% of the homes meet all guidelines
Rehabs: Moderate or Substantial	3	All new windows must comply with the windows guidelines by Climate Zone rehab projects (Guideline 3)
	2	All south-facing elevations must comply with shading guidelines (Guideline 4)

Guidelines

1. *Building orientation:* Elongate the building on an east–west axis with a minimum ratio of width to depth of 2:1 and orient the east–west axis of the building to be within 20 degrees of true east–west.
2. *Glazing:* Climate Zones 1–3: The glazing area on the north- and south-facing façades should be 50% greater than the sum of the glazing areas on the east- and west-facing walls; Climates Zones 4–7: The glazing area on the south-facing façade should be 30% greater than the sum of the glazing areas on the east-, west- and north-facing façades.
3. *Glazing type:* Provide windows with U-values and solar heat gain coefficients (SHGC) by orientation and Climate Zone that meet the requirements in the following table and map.
4. *Shading:* For south-facing windows, follow the shading requirements in the following table and the map in the *Appendix*.

Requirements for Glazing and Shading

To find your Climate Zone, see 2012 IECC Climate Zone Map in the *Appendix*. As of December 10, 2014, those requirements are as listed:

CLIMATE ZONE	U-FACTOR	MINIMUM SOLAR HEAT GAIN COEFFICIENT	PERCENTAGE OF WINDOW THAT NEEDS TO BE SHADED BY JUNE 21
1, 2	0.40	0.25	100%
3, 4 except Marine	0.30	0.27	75%
4 Marine, 5, 6, 7	0.27	Any	50%

Note: Projects must follow the most recent prescriptive path requirements (U-factor, SHGC) of the Department of Energy (DOE) Zero Energy Ready Home National Program at time of product specification.

RATIONALE

The use of passive solar energy through design minimizes reliance on mechanical heating, lowers the cooling load, and provides more residents with access to daylight. Passive solar heating and cooling-load-avoidance strategies become critically important during extended power outages or interruptions in heating fuel.

RECOMMENDATIONS

- Interior spaces requiring the most lighting, heating and cooling should be along the south face of the building.
- Include a narrow floor plate (less than 40 feet), single-loaded corridors and an open floor plan to optimize daylight and natural ventilation.
- Thermal Massing, Climate Zones 2–7
  - Locate a material with high thermal mass on the southern portion of the house where sunlight hits during the heating season.
  - Materials with thermal mass include brick, concrete, stone, water and any other material of a similar high density and specific heat capacity.
  - The thermal mass location must be shown in the schematic wall section of the southern façades.
- Additional potential passive cooling strategies
  - Plant deciduous shade trees at the south façades.
  - Maximize cross ventilation by installing operable windows at the leeward and windward sides of the building.
  - Install reflective roofing or coat existing roofs with reflective elastomeric coatings

RESOURCES

- U.S. Department of Energy, Building Technologies Office, Passive Solar Heating and Cooling. *http://energy.gov/energysaver/articles/tips-passive-solar-heating-and-cooling*
- U.S. Department of Energy, Building Technologies Office, Passive Solar Design Fact Sheet: A part of the department's "Building Toolbox," this site includes tips and techniques for passive solar heating, passive solar cooling, thermal storage and daylighting. *www.buildingscience.com/doctypes/enclosures-that-work/etw-building-profiles*
- 2012 IECC Climate Zones Map: A detailed map that shows Climate Zones zoomed into each state and county as well as the basic 2012 IECC Building Code requirements for each Climate Zone (see the *Appendix*).
- U.S. Department of Energy, National Renewable Energy Laboratory, "Passive Solar Design for the Home," Report #DOE/GO-102001-1105, February 2001. *www.nrel.gov/docs/fy01osti/27954.pdf*
- U.S. Department of Energy, Passive Solar Design. *http://energy.gov/energysaver/articles/passive-solar-home-design*
- U.S. Department of Energy, Cool Roof. *http://energy.gov/energysaver/articles/cool-roofs*
- *Passive Solar Architecture* by David Bainbridge and Ken Haggard, Chelsea Green Publishing, 2011.
- U.S. Department of Energy, Office of Energy Efficiency & Renewable Energy: Zero Energy Ready Home National Program. *www.energy.gov/eere/buildings/zero-energy-ready-home*

2.11 *Optional | 4 points*
Brownfield Site or Adaptive Reuse Building

REQUIREMENTS

To receive credit for adaptive reuse building, rehabilitate an existing structure that was not previously used as housing.

To receive credit for brownfield site development, locate the project on a site for which part or all is documented as contaminated by means of an ASTM E1903-97 Phase II Environmental Site Assessment or a local Voluntary Cleanup Program, or on a site defined as a brownfield by a local, state or federal government agency. Remediate site contamination such that the controlling public authority approves the protective measures and/or cleanup as effective, safe and appropriate for the future use of the site.

RATIONALE

Use of brownfields reduces pressure on undeveloped land. Reuse of existing structures reduces the need for new materials.

RESOURCES

- U.S. Environmental Protection Agency, Brownfields and Land Revitalization: There is information on this site about EPA's Brownfields Program, including the brownfields law, EPA Brownfields Grants, technical tools and resources, and brownfield projects across the country. *www.epa.gov/brownfields/index.html*
- Municipal Research and Services Center of Washington, Infill Development Strategies for Shaping Livable Neighborhoods: This site contains an overview of strategies for encouraging and implementing infill development patterns. *www.mrsc.org/Publications/textfill.aspx*
- Center for Community Progress: This website provides information, resources, tools and assistance to support vacant property revitalization efforts. *www.communityprogress.net*

2.12 *Optional | 6 points*
Access to Fresh, Local Foods

REQUIREMENTS

Option 1: Neighborhood Farms and Gardens *[6 points]*

a) Dedicate permanent and viable growing space and/or related facilities (such as greenhouses) within the project equal or greater in size to 10 square feet per dwelling unit of the project. Provide solar access, fencing, watering systems, garden bed enhancements (such as raised beds), secure storage space for tools and pedestrian access for these spaces. Ensure that the spaces are owned and managed by an entity that includes occupants of the project in its decision-making, such as a community group, homeowners' association or public body.

   Established community gardens outside the project boundary but within a 0.5-mile walk distance of the project's geographic center can satisfy this option if the garden otherwise meets all of the option requirements. Ensure that the gardens are built and maintained in a manner to minimize pests and in keeping with Integrated Pest Management practices. *OR*

b) Dedicate permanent and viable growing space and/or related facilities (such as greenhouses) within the project equal or greater in size to 10 square feet per dwelling unit of the project, and establish an agreement with a local farming operation to farm the land. Ensure in the agreement that at least 50% of the produce is made available for purchase by the project's residents. Provide solar access, fencing, watering systems, garden bed enhancements (such as raised beds) and secure storage space for tools.

OR

Option 2: Community-Supported Agriculture *[6 points]*

Offer a specified location within the project boundaries for delivery of community-supported agriculture (CSA) program shares for residents, project staff and surrounding community members, as appropriate. The working lands supplying the CSA shares must be within 400 miles of the project site, or be within the same state. Shares must be delivered to the specified delivery point on a regular schedule at least twice a month for at least four months of the year.

OR

Option 3: Proximity to Farmers Market *[6 points]*

Locate the project's geographic center within a 0.5-mile walk distance of an existing or planned farmers market that is open or will operate at least once a week for at least five months of the year. Farmers market vendors may sell only items grown within 400 miles of the project site, or from within the same state. A planned farmers market must have firm commitments from farmers and vendors that the market will meet all of the above requirements and be in full operation by the time there is 50% occupancy of the project's dwelling units.

RATIONALE

Access to fresh produce offers healthy food options for residents, and purchase of fresh produce directly from farmers demystifies the cycle of food production. This measure also supports local economic development that increases the economic value and production of farmlands and community gardens. An ability to obtain local food offers important resilience benefits should major U.S. agricultural areas in the Midwest and California be threatened, for instance.

RECOMMENDATIONS

- For projects pursuing Option 1a, consider bringing in an individual or a group (e.g., a master gardener or a garden club) to work with the residents to establish the garden and maintain productivity.
- Encourage fresh food providers, including those who organize farmers markets and run food cooperatives (co-ops), to accept Electronic Benefit Transfer (EBT) and Supplemental Nutrition Assistance Program (SNAP).
- Incorporating cooking classes for residents into your resident engagement program (see Category 8: Operations, Maintenance + Resident Engagement) is an excellent way to incentivize residents to eat healthy and prepare meals with fresh foods.

RESOURCES

- Local Harvest: This website offers a search function to find farmers markets, family farms and other sources of local, sustainably grown food in a given area. *www.localharvest.org*
- U.S. Department of Agriculture, National Agricultural Library, Food and Nutrition Information Center, Community Food Systems: This website links to dozens of publications, programs and other sites. *http://fnic.nal.usda.gov/*
- U.S. Department of Agriculture, Agricultural Marketing Service, "Food Desert": The USDA, Treasury Department and HHS have defined a "food desert" as a census tract with a substantial share of residents who live in low-income areas that have low levels of access to a grocery store or healthy, affordable food retail outlet. Use this resource to determine if your project is located in a food desert. *http://apps.ams.usda.gov/fooddeserts/fooddeserts.aspx*
- Centers for Disease Control and Prevention (CDC), Community Food Assessment: The purpose of a community food assessment (CFA) is to determine the locations and incidence of food deserts—that is, areas with limited access to healthy and fresh food—and inform decision-makers of those areas that need intervention. *www.cdc.gov/healthyplaces/healthtopics/healthyfood/community_assessment.htm*
- Enterprise Community Partners, "Fresh, Local Food Access Toolkit": This toolkit, which is designed to provide step-by-step instructions and resources to implement a fresh food access model that meets the Enterprise Green Communities Access to Fresh, Local Food Criteria, best addresses the needs of your development, and leverages the assets of your organization and neighborhood. *www.enterprisecommunity.com/resources/ResourceDetails?ID=74962.pdf*

2.13 LEED for Neighborhood Development Certification

Optional | 4 points

REQUIREMENTS

Locate building(s) in a LEED for Neighborhood Development project. Demonstrate that the project has earned either Stage 2 Pre-Certified or Stage 3 Certified Neighborhood Development status through LEED for Neighborhood Development at the time of construction completion of your building(s).

RATIONALE

Projects located in LEED for Neighborhood Development Certified Developments have taken steps to minimize the environmental impact of land development practices. LEED for Neighborhood Development is designed to certify exemplary development projects that perform well in terms of smart growth, urbanism and green building.

RESOURCES

U.S. Green Building Council, LEED for Neighborhood Development: This page has links to the LEED-ND rating system, a project checklist and information on certification. *www.usgbc.org/leed#rating*

2.14 *Optional | 6 points maximum*
Local Economic Development and Community Wealth Creation

REQUIREMENTS

Option 1: Local Hiring Preference *[2 points]*

Demonstrate that local preference for construction employment and subcontractor hiring was part of your bidding process, and how it functioned during actual construction. Provide your local preference procurement and subcontractor set-aside.

Note: Indian Preference can be solely that, without a miles-to-project requirement.

OR

Option 2: Local Hiring *[3 points]*

Demonstrate that you achieved at least 20% local employment as a result of your local preference procurement/training plan. Provide proof that subcontractors are local and/or that local crews have members within 10 miles of your project site.

Note: Indian Preference can be solely that, without a miles-to-project requirement.

OR

Option 3: Physical Space for Business, Nonprofits, and/or Skill and Workforce Education *[3 points]*

Provide physical space for business, nonprofits, and/or skills and workforce education. Points can be achieved with documentation of compliance with *one* of the below:

- Providing space to conduct job skills training for building residents and community. This training could focus on a variety of topics, including but not limited to, computer training, resume building, financial skills training or other similar jobs skills training. If training is to be completed with internal staff, provide a 12-month training curriculum and outreach plan. If training is to be completed by a third-party provider, provide evidence of at least a two-year contract for these services. *OR*
- Providing reduced-cost space for educational institutions and/or public education, demonstrated through signed leases. *OR*
- Providing mixed-use space specifically to local/small businesses or nonprofits to accommodate economic development, demonstrated through signed leases. Local and small business must meet prevailing national definitions (i.e., no national chains, even if they are locally owned franchises or registered B Corporations). *OR*
- Asset Development: Providing on-site financial services and asset development to residents and community. This could be through annual tax assistance (e.g. EITC, free tax filing), savings programs (IDAs, financial literacy) or affordable lending (payday loan alternatives). A Community Development Financial Institution (CDFI) office or satellite in the facility would qualify for these points.

RATIONALE

Housing often has the opportunity to act as an economic catalyst within a neighborhood and community. Housing projects offer opportunities to directly enhance the lives of residents when they include physical space that can accommodate various programs for learning, job skill development and other social interactions. Numerous studies have documented the ways in which affordable housing projects have positive economic impacts on their surrounding neighborhoods.

RECOMMENDATIONS

- If providing physical space for business, nonprofits, and/or skill and workforce education, prioritize leasing to tenants that would bolster the building and become neighborhood assets. For instance, if your project has access to bike routes or trails, leasing space to a bicycle workshop or cooperative (co-op) would be one way to promote bicycle use and provide a valuable amenity to residents and the community at large. Innovative bike programming may teach people how to ride bicycles, mentor people through using bicycles safely for everyday needs (e.g., winter biking), let people check out bicycles, teach bicycle maintenance and more.
- Ideally these commercial or educational spaces would have doors or direct access to the pedestrian realm at grade; at the least, they should have visual connections to the public space.

RESOURCES

- Enterprise Community Partners, New Market Tax Credit: NMTC applications factor in number of jobs created, living-wage jobs during and after construction, and can serve as a valuable resource for understanding the impacts of local hiring. *www.enterprisecommunity.com/about-nmtc*
- National Cooperative Highway Research Program: More information on local (city, county) hiring preferences. *http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_LRD_59.pdf*
- Slow Money "Principles for local investment": *https://slowmoney.org/principles*
- 1% for the Planet: Connects businesses, consumers and nonprofits, empowering all of us to drive big, positive change. *http://onepercentfortheplanet.org/*

SITE IMPROVEMENTS

Low-impact design and development principles minimize the site's environmental footprint and lower infrastructure costs associated with stormwater management.

3.1 *Mandatory*
Environmental Remediation

REQUIREMENTS

Determine whether there are any hazardous materials present on-site by conducting either 1) a Phase I Environmental Site Assessment, 2) a Tier II Environmental Review Assessment per HUD funding requirements, 3) an environmental site assessment approved by HUD through the Part 50 or Part 58 process, or 4) an environmental assessment approved by USDA through the 1940-G or 1794 process, and any additional required assessments.

If an environmental site assessment reveals any hazardous materials, mitigate these before proceeding with development.

RATIONALE

The environmental site assessment determines the potential environmental liabilities associated with property acquisition and ownership.

RESOURCES

- HUD, Environmental Review Procedures for Entities Assuming HUD Environmental Responsibilities (24 CFR Part 58 process): *www.hud.gov/offices/pih/ih/codetalk/onap/docs/24cfr58.pdf*
- HUD, Part 50 process: *www.hud.gov/offices/pih/ih/codetalk/docs/24cfr50.pdf*
- USDA, Environmental Review Process, 1794: *www.rurdev.usda.gov/uwp-ea.htm*
- USDA, Environmental Review Process, 1940-G: *www.rurdev.usda.gov/*

3.2 *Mandatory*
Erosion and Sedimentation Control

Except for infill sites with buildable area smaller than one acre

REQUIREMENTS

Implement EPA's Best Management Practices for Construction Site Stormwater Runoff Control, or local requirements, whichever is more stringent.

RATIONALE

Erosion and sedimentation control during site development keeps valuable topsoil on-site and reduces pollution, limits stormwater runoff (especially during storm events), and limits sedimentation associated with construction activities from contaminating local waterways. Soils compacted from construction activities are less able to absorb water, resist plant root penetration and lack the porosity needed for adequate aeration.

RECOMMENDATIONS

Common erosion control measures include:

- Stockpile and protect disturbed topsoil from erosion for reuse.
- Control the path and velocity of runoff with silt fencing or comparable measures.

- Protect on-site storm sewer inlets, streams and lakes with straw bales, silt fencing, silt sacks, rock filters or comparable measures.
- Provide swales to divert surface water from hillsides.
- If soil in a sloped area is disturbed during construction, use tiers, erosion blankets (geotextile mats), compost blankets, filter socks and berms, or some comparable approach, to keep soil stabilized.
- Consider opting for one of the following methods—phasing, seeding, grading, protecting on-site vegetation, directing runoff to on-site depressions, or swales—instead of using silt fencing. Additionally, the measures that are employed should result in no visible off-site discharge.

RESOURCES

- U.S. Environmental Protection Agency, "Construction Site Stormwater Runoff Control." *http://water.epa.gov/polwaste/npdes/swbmp/*
- EnviroCert International, Inc.: Use the Certificant Search on this website to find erosion and sedimentation control professionals in your state. *www.cpesc.net*

3.3 *Mandatory*
Low-Impact Development

Mandatory for projects located on greenfields

REQUIREMENTS

Projects located on greenfields must meet the following low-impact development criteria:

- Retain, infiltrate and/or harvest the first 1.0 inch of rain that falls on the entire site in a 24-hour period. (Option 1 of Criterion 3.6 Surface Stormwater Management).
- Design roadways to be along topographic contours and ridgelines so as to avoid erosion and unnecessary cut and fill.
- Design roadway plans to utilize the minimum necessary pavement required by code, such as narrower roads, minimized parking and thoughtful road layout. Consult with local fire department(s) regarding roadway sizing as needed.
- Design roadway sections with localized retention such as swales, retention basins, plantings and permeable paving to convey, capture, infiltrate and/or reuse stormwater. This can be accomplished in a manner that also complies with Option 2 of Criterion 3.6 Surface Stormwater Management.
- For projects located in Rural/Tribal/Small Towns as defined in Introduction of the Location + Neighborhood Fabric category, do not implement a curb and gutter system. Minimize sidewalks or pathways to one side of the road where people would naturally travel. Projects located in municipalities that require curb and gutter infrastructure for all developments are exempt from this sub-requirement.

RATIONALE

Low-impact design and development principles minimize the site's environmental footprint while helping to control and mitigate stormwater runoff during significant storm events.

RECOMMENDATIONS

- Keep existing trees and vegetation to the extent feasible.
- Best practices include a grade of one-half inch per foot, or approximately a 4% pitch. EPA recommends a 2% pitch (one-quarter inch per foot) for hard surfaces such as patio slabs, walks and driveways.

RESOURCES

- U.S. Environmental Protection Agency, Low-Impact Development: An Integrated Design Approach. *http://water.epa.gov/polwaste/green/upload/lidnatl.pdf*
- U.S. Environmental Protection Agency, Low-Impact Development. *http://water.epa.gov/polwaste/green*

3.4 *Mandatory* Landscaping

REQUIREMENTS

If providing plantings, all (trees, shrubs and groundcover, including grasses) should be native or adapted to the region. All new plants must be appropriate to the site's soil and microclimate, and none should be invasive species. All disturbed areas should be reseeded or xeriscaped.

RATIONALE

Native and adaptive plants are well suited to the climate and provide excellent erosion, sediment, dust and pollution control, and, when carefully sited, plantings can help to control unwanted solar gain (which can be critically important during times of power outages). Native and adaptive plants are more resistant to naturally occurring disease, insects, drought, low levels of nutrients and major storm events, while reducing or eliminating the need for fertilizers, pesticides, herbicides and irrigation.

RECOMMENDATIONS

- Consult a landscape architect or your local arborist in the integrative design process to identify appropriate areas for landscaping and shading.
- Consider "naturescaping," a landscaping strategy that conserves water and reduces runoff while providing habitat for beneficial insects, birds and other wildlife. In areas where water shortages are common, consider "xeriscaping," a landscaping strategy that uses drought-resistant plants to significantly reduce or eliminate the need for irrigation.
- Integrate the landscape plans with the stormwater management plan to provide water and drainage that is complementary with plantings.

- While turf may be appropriate for some landscaping, such as for play areas, it should be minimized wherever possible, except in climates where no irrigation is needed. Non-native turf needs about 35 inches of water per year to thrive, whereas native turf needs much less. Turf grass also requires mowing, and the cumulative effects of electric and gas mowing equipment contribute to the deterioration of local air quality.
- The project team should strive to use only organic and nontoxic fertilizers, pesticides, herbicides, fungicides and pre-emergents.
- Where possible, create at least one walking pathway and seating to encourage pedestrian activity.
- If possible, existing invasives should also be mitigated/removed. Local cooperative extensions often maintain best practices for mitigation.
- Provide visually appealing environments along paths of travel with visually interesting landscaping (e.g., a variety of colors, textures and flowering times).
- Ensure that the expected heights of plants adjacent to pedestrian walkways or seating areas are appropriate to maintain visibility into and out of the corridor in order to facilitate a safe and secure environment.
- If possible, limit turf or high-water-using species to 20% of the total landscape area, as suggested by the City of Santa Monica (Calif.) Landscape Standards.

RESOURCES

- Native Plant Information Network: This site, maintained by the Lady Bird Johnson Wildflower Center, includes a database of native wildflowers, plants and landscapes throughout North America. The website also includes a National Suppliers Directory. *www.wildflower.org/explore/*
- U.S. Environmental Protection Agency, GreenScapes: This "naturescaping" program provides cost-efficient and environmentally friendly solutions for landscaping. Designed to help preserve natural resources and prevent waste and pollution, GreenScapes encourages holistic decisions regarding waste generation and disposal and the associated impacts on land, water, air and energy use. *www.epa.gov/epawaste/conserve/tools/greenscapes/index.htm*
- University of Arizona Cooperative Extension, Xeriscape Plant Listing: *http://ag.arizona.edu/yavapai/anr/hort/xeriscape/*
- USDA National Invasive Species Information Center: As part of the USDA's National Agricultural Library, NISIC serves as a reference gateway to information, organizations and services about invasive species. *www.invasivespeciesinfo.gov/plants/main.shtml*
- USDA Agricultural Cooperative Extension System: Lists of local drought-tolerant plants may be available from local USDA Agricultural Cooperative Extension System offices, as well as through numerous online resources. *www.csrees.usda.gov/Extension/index.html*
- U.S. Forest Service, "Celebrating Wildflowers": This site has extensive information on native gardening, selecting appropriate native plants and invasive plant species, and has basic instructions for restoration and native landscaping projects. *www.fs.fed.us/wildflowers/Native_Plant_Materials/Native_Gardening/index.shtml*
- City of Santa Monica (Calif.) Office of Sustainability and the Environment, Landscape Standards Overview: *www.smgov.net/Departments/OSE/Categories/Landscape/Landscape_Standards_Overview.aspx*

3.5a

Mandatory

Efficient Irrigation and Water Reuse

If irrigation is utilized

REQUIREMENTS

If irrigation is utilized, install an efficient irrigation or water reuse system. These irrigation requirements are mandatory only for permanent landscaping that requires regular irrigation.

An efficient irrigation system must include the following at a minimum:

- a drip irrigation system for landscape planting beds
- separately zoned turf and bedding areas, based on watering needs of turf/plantings
- a timer/controller that activates the valves for each watering zone at the best time of day to minimize evaporative losses while maintaining healthy plants and obeying local regulations and water-use guidance
- a moisture sensor controller or rain delay controller

For all projects, watering tubes for trees are allowed for a period of two years.

RATIONALE

Accurate delivery of water reduces evaporation and eliminates overspray and overwatering. Proper scheduling eliminates fluctuations between wet and dry states that stress plants. These strategies will help to maintain plantings during drought and when outdoor watering restrictions may be in place.

RECOMMENDATIONS

- Follow the WaterSense Criteria for distribution uniformity (DU) of 65% or greater. DU shall be measured on the largest spray-irrigated area during a post-construction audit. This may include conventional rotors, multi-stream rotors or high-efficiency spray heads, but the DU of these spray systems must be verified by third-party tests.
- Consider "naturescaping," a landscaping strategy that conserves water and reduces runoff while providing habitat for beneficial insects, birds and other wildlife. In areas where water shortages are common, consider "xeriscaping," a landscaping strategy that uses drought-resistant plants to significantly reduce or eliminate the need for irrigation.

RESOURCES

- City of Santa Monica (Calif.) Office of Sustainability and the Environment, Landscape Standards Overview. *www.smgov.net/Departments/OSE/Categories/Landscape/Landscape_Standards_Overview.aspx*
- American Society of Landscape Architects (ASLA): ASLA is the national professional association representing landscape architects. Their site provides information about members, products, services, publications and events. *www.asla.org*
- U.S. Environmental Protection Agency, WaterSense: This site provides information on the EPA WaterSense labeling program for water-efficient landscape irrigation products, plus tips and recommendations for water-efficient irrigation. Follow the link to Weather- or Sensor-Based Irrigation Control Technologies for related information on high-efficiency irrigation controllers. *www.epa.gov/watersense/*

- U.S. Environmental Protection Agency, Water-Smart Landscapes: This manual provides information about reducing water consumption through creative landscaping techniques. *www.epa.gov/owm/water-efficiency/docs/water-efficient_landscaping_508.pdf*
- The Irrigation Association, Irrigation Audit Guidelines. *www.irrigation.org/Resources/Audit_Guidelines.aspx*
- American Water Works Association, WaterWiser®: The Water Efficiency Clearinghouse: This clearinghouse provides articles, reference materials and papers on all forms of water efficiency. *www.awwa.org/waterwiser/*
- U.S. Environmental Protection Agency, GreenScapes: This "naturescaping" program provides cost-efficient and environmentally friendly solutions for landscaping. Designed to help preserve natural resources and prevent waste and pollution, GreenScapes encourages holistic decisions regarding waste generation and disposal and the associated impacts on land, water, air and energy use. *www.epa.gov/epawaste/conserve/tools/greenscapes/index.htm*
- University of Arizona Cooperative Extension, Xeriscape Plant Listing. *http://ag.arizona.edu/yavapai/anr/hort/xeriscape/*

3.5b *Optional | 4 or 8 points*
Efficient Irrigation and Water Reuse

If irrigation is utilized

REQUIREMENTS

Projects must meet the mandatory requirement of Criterion 3.5a Efficient Irrigation and Water Reuse, and:

Option 1 *[4 points]*

Design and install an efficient irrigation system equipped with a WaterSense-labeled weather-based irrigation controller (WBIC).

OR

Option 2 *[8 points]*

A minimum of 50% of the site's irrigation should reuse water from one of the following sources:

- treated greywater
- rainwater, collected from the roof or site
- water from a municipal recycled water system

For all projects, watering tubes for trees are allowed for a period of two years.

RATIONALE

See Rationale for Criterion 3.5a.

RECOMMENDATIONS

See Recommendations for Criterion 3.5a.

RESOURCES

See Resources for Criterion 3.5a.

3.6 Surface Stormwater Management

Optional | 4 or 8 points

REQUIREMENTS

Option 1 *[4 points]*

Retain, infiltrate and/or harvest the first 1.0 inch of rain that falls on the entire site in a 24-hour period.

Note: Option 1 is required for all projects built on greenfields, as noted in Criterion 3.3 Low-Impact Development.

OR

Option 2 *[8 points]*

Retain, infiltrate and/or harvest all stormwater, as calculated for a 24-hour period of a one-year storm event, on-site or on adjacent site(s), so that no stormwater is discharged to drains/inlets.

For either option, assure that the project plans and specifications call for permanent labeling of all storm drains or storm inlets to clearly indicate where the drain or inlet leads.

RATIONALE

Reducing or eliminating stormwater runoff through design and management techniques increases on-site filtration, reduces total suspended solids (TSS) and other pollutants from entering waterways, and reduces soil erosion. From a resiliency standpoint, minimizing stormwater runoff and storm sewer flows also helps reduce downstream flooding—an important concern with more intense storms predicted in the future. Water storage and nutrient collection processes reduce the need for irrigation and contribute to forming a healthier ecological community within the landscape.

RECOMMENDATIONS

- This criterion may be met by using a combination of multiple strategies and technologies, as long as there exists the capacity to retain the first 1.0 inch of rainfall that falls on the entire site. Stormwater management strategies could include disconnected downspouts (reducing the amount of water going into the local sewers), permeable paving, swales, retention basins, green roofs, sidewalk planters, xeriscaping and naturescaping. See Criteria 3.4–3.6 for synergistic measures.
- For Option 2, local resources can be used to determine the projected rainfall for a one-year storm event at the project site.
- If a rainwater harvesting and storage strategy is considered in addition to infiltration, check with state and local governments to verify that capture and/or reuse of rainwater is permitted. If not, consider appealing local rules.
- Attempt to make use of innovative, low-impact techniques such as disconnected downspouts, permeable paving, swales, retention basins, rain gardens, green roof, rain barrels and cisterns to convey, capture, infiltrate and/or reuse stormwater.
- Minimize impervious areas (surfaces that do not allow stormwater infiltration), including roofs, driveways, sidewalks and streets, or use porous materials for such areas. Water-permeable materials include pervious interlocking concrete paving blocks, concrete grid pavers, perforated brick pavers and compacted gravel.

- To provide a visual reminder that storm sewer inlets connect to area waterways and groundwater storages, use a plaque, tile, painted or pre-cast message such as "No Dumping. Drains to [name of water source]." If project is unable to label storm inlets due to jurisdictional constraints, the project team must provide documentation.
- Best practices include a grade of one-half inch per foot, or approximately a 4% pitch. EPA recommends a 2% pitch (one-quarter inch per foot) for hard surfaces such as patio slabs, walks and driveways.

RESOURCES

- U.S. Environmental Protection Agency, Storm Drain Marking. *http://water.epa.gov/polwaste/npdes/swbmp/Storm-Drain-Marking.cfm*
- U.S. Environmental Protection Agency, Low-Impact Development: An Integrated Design Approach. *http://water.epa.gov/polwaste/green/upload/lidnatl.pdf*
- U.S. Environmental Protection Agency, Low-Impact Development. *http://water.epa.gov/polwaste/green*
- U.S. Environmental Protection Agency, GreenScapes: This "naturescaping" program provides cost-efficient and environmentally friendly solutions for landscaping. Designed to help preserve natural resources and prevent waste and pollution, GreenScapes encourages holistic decisions regarding waste generation and disposal and the associated impacts on land, water, air and energy use. *www.epa.gov/epawaste/conserve/tools/greenscapes/index.htm*
- University of Arizona Cooperative Extension, Xeriscape Plant Listing. *http://ag.arizona.edu/ yavapai/anr/hort/xeriscape/*
- National Association of Home Builders Research Center ToolBase Services, Permeable Pavement: A resource provided through a partnership with the Department of Housing and Urban Development, the Partnership for Advancing Technology in Housing, and the National Association of Home Builders Research Center, this site provides details, lists of manufacturers, and related information on permeable paving options. *www.toolbase.org/Technology-Inventory/Sitework/permeable-pavement*
- TreePeople: TreePeople is an environmental nonprofit that unites the power of trees, people and nature-based solutions. *www.treepeople.org/*
- *Low Impact Development and Sustainable Stormwater Management*, by Thomas Cahill, John Wiley & Sons, 2012.
- *Porous Pavements: Integrative Studies in Water Management and Land Development*, by Bruce Ferguson, CRC Press, 2005.

3.7 Reducing Heat-Island Effect: Paving

Optional | 1 point

REQUIREMENTS

Use light-colored, high-albedo materials and/or an open-grid pavement, with a minimum solar reflectance of 0.3, over at least 50% of the site's hardscaped area.

RATIONALE

Urban heat islands increase local air temperatures due to the absorption of solar energy by the built environment. Reducing the heat-island effect decreases energy consumption by decreasing loads on cooling systems.

RECOMMENDATIONS

Consider using paving materials that both reduce urban heat-island effect and that are water permeable.

RESOURCES

- U.S. Environmental Protection Agency, Heat Island Effect: This site contains information about heat-island effect, its social and environmental costs, and strategies to minimize its prevalence, including shading and coloration of hardscapes. *www.epa.gov/heatisland*
- Lawrence Berkeley National Laboratory, Heat Island Group: The Lawrence Berkeley National Laboratory conducts research to find, analyze and implement solutions to minimizing heat-island effects. Its current efforts focus on the study and development of more reflective surfaces for roadways and buildings. *http://heatisland.lbl.gov/*

WATER CONSERVATION

Water conservation translates into direct utility savings for residents and building owners and conserves a precious national resource.

4.1 *Mandatory* Water-Conserving Fixtures

REQUIREMENTS

Install water-conserving fixtures in all units and any common facilities with the following specifications:

- *Toilets:* WaterSense-labeled and 1.28 gpf (gallons per flush) or less, including dual-flush toilets and pressure-assisted toilets
- *Urinals:* WaterSense-labeled and 0.5 gpf or less
- *Showerheads:* WaterSense-labeled and 2.0 gpm (gallons per minute) or less
- *Kitchen faucets:* 2.0 gpm or less (WaterSense label not available)
- *Lav faucets:* WaterSense-labeled and 1.5 gpm or less

AND

For all single-family homes and all dwelling units in buildings three stories or fewer:

The static service pressure must not exceed 60 pounds per square inch (psi) (414 kilopascal [kPa]). For units in multifamily buildings, the service pressure within each unit must not exceed 60 psi. Compliance for homes supplied by groundwater wells shall be achieved by use of a pressure tank. Compliance for single-family homes with publicly supplied water may be achieved by one of the following methods:

- Use of a pressure-regulating valve (PRV) downstream of the point of connection. All fixture connections shall be downstream of the PRV.
- Determination that the service pressure at the home is 60 psi or less at the time of inspection and documentation from the public water supplier that service pressure is unlikely to regularly exceed 60 psi at the home on a daily or seasonal basis.

Piping for fire sprinkler systems is excluded from this requirement and should comply with state and local codes and regulations.

RATIONALE

Water conservation translates into direct utility savings for residents and building owners, and lowers infrastructure costs associated with stormwater management and water treatment facilities. Reduced water pressure saves water, conserves energy and helps ensure proper operation of fixtures and appliances.

RECOMMENDATIONS

- Install WaterSense-labeled fixtures. The WaterSense specification sets maximum flow rates of the fixtures listed above. Labeled fixtures also meet key performance attributes to ensure optimal user satisfaction. Note that bathroom sink faucets intended for public use and residential kitchen sink faucets are currently not eligible to earn the WaterSense label.
- Certain existing fixtures, such as bathroom faucets, can be retrofitted with aerators rather than be replaced to reduce water flow to the requisite level. Note that WaterSense-labeled aerators are available and recommended.

- Dual-flush toilets have an average flow rate calculated and provided by the manufacturer. However, if you are not able to locate this information on the packaging, use a 2:1 ratio for low-volume flush to high-volume flush to determine the average flow rate.

  For example, with a dual-flush toilet that has a 0.8 low-volume flush and a 1.6 high-volume flush, the calculation to determine the average would be:

$$\frac{(0.8\,\text{gpf} \times 2) + (1.6\,\text{gpf} \times 1)}{3} = 1.067\,\text{gpf}$$

- For senior projects, consider using single-flush toilets that meet the criterion flow rates rather than dual-flush toilets. Feedback from past Enterprise Green Communities projects suggests that senior populations may be unsure of the dual-flush technology, which may lead to their having difficulty in operating the toilets in an effective and appropriate way.

RESOURCES

- Products and services that have earned the WaterSense label have been certified to be at least 20% more efficient than the baseline, without sacrificing performance. For instance, not all toilets—even high-efficiency toilets—operate equally well. Poor performance can lead to the need for multiple flushes, creating higher than anticipated water consumption. To correct for this, the EPA's WaterSense program certifies toilets that achieve water efficiency and operational effectiveness. Information on WaterSense products and services is available at *www.epa.gov/watersense*.
- Maximum Performance (MaP™) Testing, California Urban Water Conservation Council: The MaP™ testing project was initiated in 2003 to test toilet models' performance. This testing protocol simulates real-world use to help consumers identify high-efficiency toilets that not only save water but also work well. The current MaP testing report provides performance information on 470 toilet models. This site provides access to the complete listings of the tested toilets. *www.map-testing.com*
- WaterSense-labeled new homes are designed to reduce residential water use indoors and out. Find the EPA WaterSense Resource Manual for Building WaterSense® Labeled New Homes here: *www.epa.gov/watersense/docs/newhome_builder_resource_manual508.pdf*

4.2 Advanced Water Conservation

Optional | 6 points maximum

REQUIREMENTS

Reduce water consumption by one of the two following methods:

Option 1 *[3 points maximum]*

Install water-conserving fixtures in all units and all common space bathrooms with the following specifications:

- *Toilets:* WaterSense-labeled and 1.1 gpf (gallons per flush) or less *[1 point]*
- *Showerheads:* WaterSense-labeled and 1.5 gpm (gallons per minute) or less *[1 point]*
- *Kitchen faucets:* 1.5 gpm or less AND *Lav faucets:* WaterSense-labeled and 1.0 gpm or less *[1 point]*

OR

Option 2 *[6 points maximum]*

Reduce total indoor water consumption by at least 30% compared to the baseline indoor water consumption chart below through a combination of fixtures of your choosing.

Calculate and compare your project per-person per-day indoor water consumption to the baseline water consumption chart below [adapted from: LEED for Homes v4, Table 1: Indoor Water Baseline Consumption (per person per day)]. When making your comparison, assume that the baseline project has the same type of fixtures as your project in question. For instance, if your project does not include dishwashers, do not include dishwasher water consumption in your baseline project calculation for comparison.

PERCENTAGE OF REDUCTION IN TOTAL INDOOR WATER CONSUMPTION	NUMBER OF OPTIONAL POINTS
30%	4 points
50%	5 points
70%	6 points

BASELINE INDOOR WATER CONSUMPTION (PER PERSON PER DAY)

FIXTURE	BASELINE FLUSH OR FLOW RATE	ESTIMATED FIXTURE USAGE	ESTIMATED WATER USAGE
Shower (per compartment)	2.5 gpm	6.15 minutes	15.4 gallons
Lav, Kitchen faucet	2.2 gpm	5.0 minutes	11 gallons
Toilet	1.6 gpf	5.05 flushes	8 gallons
Clothes washer	8.4 WF* top loading and 4.7 WF front loading	0.37 cycles @ 3.5 ft^3	13.2 gallons top loading 7.4 gallons front loading
Dishwasher	5.0 gpc standard and 3.5 gpc small	0.1 cycles	0.5 gallons standard and 0.4 gallons small

*WF = Water Factor

RATIONALE

Water conservation translates into direct utility savings for residents and building owners, and lowers infrastructure costs associated with stormwater management and water treatment facilities.

RECOMMENDATIONS

- See Recommendations for Criterion 4.1: Water-Conserving Fixtures.
- Water consumption calculation for example project with 1.5 gpm showerheads, 1.0 gpm lav faucets, 1.5 gpm kitchen faucets, 1.1 gpf toilets, 8.4 WF clothes washers and no dishwashers:

  (1.5 gpm)(6.15 min.) + (1.0 gpm)(5.0 min) 2) + (1.5 gpm)(5.0 min) + (1.1 gpf) (5.05 flushes) + 13.2 gal = 40.475 gal

  compared to a baseline. Calculate a baseline by refering to the proper type of fixtures in the Baseline Indoor Water Consumption chart.

  15.4 gal + 11 gal + 11 gal + 8 gal + 13.2 gal = 58.6 gal

  The proposed project has reduced indoor water consumption per person by 31% compared to the baseline.

RESOURCES

See Resources for Criterion 4.1: Water-Conserving Fixtures.

4.3 *Optional | 4 points* Leaks and Water Metering

REQUIREMENTS

Conduct pressure-loss tests and visual inspections to determine if there are any leaks; fix any leaks found. Visual inspections should include checking for leaks at all accessible, visible water supply connections and valves for water-using fixtures, appliances and equipment.

AND

Meter or submeter each dwelling unit with a technology capable of tracking water use. Also separately meter outdoor water consumption.

For single-family buildings, install a whole-house water meter. Attached single-family homes that are pursuing Enterprise Green Communities Certification may share a whole-building water meter if their irrigation is also commonly metered. Homes that use only well water and are not connected to a municipal water system are exempt from this measure.

For multifamily projects, install a water meter or submeter for each of the project's dwelling units. Alternatively, for multifamily projects with riser-fed systems, install a water meter or submeter for each of the project's risers rather than for each of the project's dwelling units.

RATIONALE

In some cases, leaks may be the largest driver of project water consumption. Properly installed water-using fixtures, equipment and appliances should not leak.

Individual metering or submetering of each unit allows building managers and residents to understand and better manage their water use. Monitoring individual units also enables property managers to more easily identify and manage potential issues such as leaks that might be occurring within a specific unit.

RECOMMENDATIONS

- For single-family homes with only one water supply to the home, the inspector will attach a pressure gauge to an outside faucet, take a reading and then shut off the municipal water supply to the house. After several minutes, the inspector will determine if the pressure has dropped. A loss of pressure indicates an unseen leak. For homes with more than one water supply or without an outdoor faucet, inspectors will attach a pressure gauge to the cold water faucet for the washing machine hookup or other cold water faucet and take the pressure reading. Conducting a pressure-loss test on dwelling units in multifamily buildings will vary based on the plumbing system design. Dwelling units that are supplied through a single line with a shut-off can be tested at any point of use.
- As a first step, when designing the plumbing system for a multifamily building, consider supplying each unit with a single pipe source for the water to facilitate individual unit submetering. This will reduce costs associated with having to install multiple meters for several points of use attached to a single riser pipe.
- Second, choose equipment that is best suited for accurately measuring water use in each unit. Because water use within individual units will fluctuate between low and peak flows, depending on the unit's occupancy and the time of day, positive displacement meters are often the best option. Also, work with the meter manufacturer to select an appropriately sized submeter. It is critical to understand both the building's and the individual units' size, function, fixture types, usage occupancy and peak population in order to select an appropriately sized meter. These statistics determine the minimum and maximum flow rates and will assist in the selection of a properly sized water meter for each unit.
- Follow manufacturers' instructions closely so that proper installation can occur. Improper installation can lead to metering inaccuracies. In general, meters (including submeters for individual units) should be installed in an accessible location to allow for reading and repair. In addition, the meter location should be protected from potential damage. To ensure uniform flow entering and exiting the meter, the meter should be located where there is sufficient length of straight pipe above and below the meter. Also, install a strainer to prevent debris and sediment from entering the meter and causing reading inaccuracies.
- Several options exist for monitoring water use on a per-unit basis. Meters are typically owned by the water purveyor and represent separate accounts. In order to be separately metered, each unit must typically represent a wholly separate plumbing system attached to the main line. Submetering typically involves using smaller meters to monitor the different uses of water under a single account. Several alternative technologies are emerging that give property managers the ability to track water use on a per-unit basis without installing physical meters or submeters for each unit.

RESOURCES

- U.S. EPA conducted a study of multifamily housing that showed submetering reduced water use by 16.4%: *www.aquacraft.com/Projects/submeter.htm*
- American Water Works Association Offers information and articles on submetering: *www.awwa.org*
- California Apartment Association has articles on submetering: *www.caanet.org*
- California Urban Water Conservation Council has articles on submetering: *www.cuwcc.org*
- WaterSense-labeled New Homes: *www.epa.gov/watersense/new_homes/*
- Alliance for Water Efficiency, 2010, "Submetering Introduction." *www.allianceforwaterefficiency.org/submetering.aspx*
- "Water-Meter Selection and Sizing," Timothy A. Smith, April 22, 2008. *www.park-usa.com/skins/park/standard.aspx?elid=71&arl=108*

4.4 *Optional | 4 points*
Efficient Plumbing Layout and Design

REQUIREMENTS

To minimize water loss from delivering hot water, the hot water delivery system shall store no more than 0.5 gallons of water in any piping/manifold between the hot water source and any hot water fixture. To account for the additional water that must be removed from the system before hot water can be delivered, no more than 0.6 gallons of water shall be collected from the hot water fixture before hot water is delivered. Recirculation systems must be demand-initiated. Systems that are activated based solely on a time and/or temperature sensor do not meet this requirement.

RATIONALE

Efficiently designed hot water delivery systems reduce the amount of time it takes hot water to reach a fixture, saving both water and energy. Approximately 10–15% of the energy use associated with the hot water delivery system is wasted in distribution losses, and studies have shown that the average home wastes more than 3,650 gallons of water per year waiting for hot water to arrive at the point of use.

RECOMMENDATIONS

- Effective and efficient distribution of hot water requires a whole-system approach and can be challenging to many builders. Considering the hot water delivery system early in the design phase and carefully following a plumbing design can deliver superior homes and reduced installation costs.
- A hot water distribution system with less stored water in its piping will waste less water and energy. The length of piping between the water heater and each fixture, the pipe diameter and piping material can have a great cumulative impact on the efficiency of hot water delivery.

- Insulation of hot water pipes can improve the efficiency of a hot water distribution system. Insulation of hot water pipes reduces the rate of heat loss and can deliver water that is 2°F to 4°F hotter than uninsulated pipes can. Pipe sleeves made with polyethylene or neoprene foam with thicknesses of either ½ or ¾ inch are the most commonly used insulation. The pipe sleeve inside diameter should match the diameter of the pipe for a close fit. Securing insulation every one or two feet using tape, wire or cable tie will also help to fit insulation close to the pipe. Insulation should be used along the entire length of hot water pipes, including elbows and joints, but should be kept 6 inches away from the flue of gas water heaters. Insulation performs better with an R-value of R-3.0 or greater.
- Consider central core plumbing, and/or multiple stacked central core plumbing layout, locating the water heater very close to hot water fixtures.

RESOURCES

- EPA Hot Water Volume Tool: This editable tool allows project teams to design their plumbing system with a variety of materials to minimize waste in delivery. *http://epa.gov/watersense/excel/hw_volume_tool_v1.xlsm*
- EPA WaterSense-labeled New Homes—Hot Water Delivery Systems. *www.epa.gov/watersense/docs/newhome_builder_resource_manual508.pdf*
- EPA's Guide for Efficient Hot Water Delivery Systems. *www.epa.gov/watersense/docs/hw_distribution_guide.pdf*
- "Hot-Water Distribution Systems Part 1," *Plumbing Systems & Design*, Gary Klein, Mar/Apr 2004.

4.5 Water Reuse

Optional | 6 points maximum

REQUIREMENTS

Harvest, treat and reuse rainwater and/or greywater to meet a portion of the project's water needs.

To achieve optional points, provide the defined percentage of the project's total water needs through rainwater and/or greywater (using either one or a combination of both strategies). Total water needs include all exterior and interior water use.

TOTAL WATER NEEDS SUPPLIED BY RAINWATER AND/OR GREYWATER	NUMBER OF OPTIONAL POINTS
10%	3 points
20%	4 points
30%	5 points
40%	6 points

RATIONALE

Rainwater and greywater reuse strategies reduce the need for municipal water supplies and sewage treatment. This is also an important resilience strategy, as it offers some level of protection against drought or interruptions in water supply.

RECOMMENDATIONS

- Non-potable water recommended for residential application can be provided by harvested rainwater using rain barrels or cisterns or by obtaining reclaimed water from the municipality. Rainwater and reclaimed water do not meet potable water standards, and therefore have limited use applications. These water sources can supply water for non-spray irrigation and other outdoor water needs during periods of drought but are never suitable for human consumption. Proper signage should be displayed on the structure to caution users that the water source is non-potable.
- Rainwater can be harvested from impervious surfaces such as roofs and carried via gutters and downspouts to a storage tank or cistern where it can be treated or filtered for potable uses. Untreated rainwater may be used for non-potable uses.
- Greywater may be stored and treated for non-potable uses such as toilet flushing and irrigation.
- Rainwater and greywater systems are subject to state and local regulations and special requirements. In some jurisdictions, rainwater or greywater systems may not be allowed. Check with your local building code officials for requirements.
- Refer to Criterion 4.2 to calculate total project water consumption.
- Consider striving for rainwater and greywater utilization of at least 20%. In some cases, employing rainwater and greywater harvesting, treatment and reuse can provide for all of a project's water needs.

RESOURCES

- American Water Works Association, WaterWiser®: The Water Efficiency Clearinghouse: This clearinghouse provides articles, reference materials and papers on water recycling, greywater and rainwater reuse. *www.awwa.org/waterwiser/*
- International Living Building Institute, Achieving Water Independence in Buildings: This downloadable publication explains water reuse systems and regulatory barriers, and provides information for those wishing to explore the possibilities of water reuse in buildings and to reform limiting regulation. *ilbi.org/resources/reports/water/oregon*

4.6 *Optional | 8 points*
Access to Potable Water During Emergencies

REQUIREMENTS

Provide residents with access to potable water in the event of an emergency that disrupts normal access to potable water, including disruptions related to power outages that prevent pumping water to upper floors of multifamily buildings or pumping of water from on-site wells. Choose *one* of the following options:

Option 1

In high-rise buildings in which gravity-flow brings water to the building, but on-site electrical pumps are used to pump water to upper floors, provide residents with access to potable water at a location where containers can be filled and brought to apartments. Ensure that this access point is located above flood level and that it may be accessed safely and relatively easily in times of power loss (e.g., a public restroom on a lower floor).

OR

Option 2

Provide stored potable water that can be used during times of emergency totaling 10 gallons per resident per day for a minimum of two days. Note potability as well as storage size and weight considerations.

OR

Option 3

Provide a drilled well with a means for pumping water when the electric grid is down (e.g., hand pump, portable generator serving pump, gravity-flow spring).

RATIONALE

During power outages, access to water for drinking and sanitation needs is often one of the greatest challenges. During a power failure, residential buildings using electric pumps lose their supply of potable water.

RECOMMENDATIONS

- In many cities, gravity pressure typically brings water up to the fifth or sixth floor of taller buildings, with pumps used to deliver water to higher floors. If the power grid fails and backup generators are not connected to water pumps or if they fail, residents should have access to a place in a common room to fill containers with potable water. This could be a centrally accessible corridor or utility closet. Specifics will vary by project.
- In more rural areas that rely on on-site water rather than municipal water, advanced, modern hand pumps can provide a resilient water supply.
- Harvested rainwater or pumped water can be stored on top of buildings, in utility space in buildings or in separate water tanks.

RESOURCES

- NYC Building Resiliency Task Force Report. *http://urbangreencouncil.org/sites/default/files/2013_brtf_fullreport.pdf*
- Enterprise's Multifamily Resilience Manual includes more than a dozen strategies and specific guidance for building property resilience in the event of an emergency, including access to potable water. *www.enterprisecommunity.org/resources*

ENERGY EFFICIENCY

Improvements in building energy performance result in utility cost savings from more efficient heating, cooling, hot water, lights and appliances, which improves residents' comfort, lowers operating costs, and provides environmental benefit.

5.1a

Mandatory

Building Performance Standard

Criteria for NEW CONSTRUCTION of the following project types:

- Single-family detached and attached homes
- Multifamily buildings with four dwelling units or fewer
- Multifamily buildings with three stories or fewer
- Multifamily buildings with up to five stories, where each dwelling unit has its own heating, cooling and hot water system

REQUIREMENTS

Certify each dwelling unit in the project through the ENERGY STAR New Homes program. Use the appropriate specification version of ENERGY STAR New Homes depending on when the project is permitted, when construction will be completed and local ENERGY STAR guidelines. To determine the appropriate specification version for each project: *www.energystar.gov/homes*.

RATIONALE

ENERGY STAR Certified New Homes are independently verified to be energy-efficient and durable. These high-performance homes achieve energy savings in heating, cooling, hot water, lighting and appliance efficiencies, which improve resident comfort, reduce operating costs and decrease greenhouse gas emissions.

RECOMMENDATIONS

- Project teams must engage a certified Home Energy Rating System (HERS) rater to certify any dwelling unit to ENERGY STAR New Homes. We recommend that project teams engage a HERS rater as early in their project design stage as possible. Find a HERS rater here: *www.energystar.gov/partnerlocator*. For additional information: *www.resnet.us/choose-the-right-contractor*
- Review and follow the ENERGY STAR Certified New Homes partnership and training guidelines found at *www.energystar.gov/homes*
- During the design phase, work with the HERS rater to set energy-efficiency goals that comply with ENERGY STAR Certified New Homes. You may either follow a prescriptive path with a pre-determined set of construction details, or you may follow a performance path by creating your own package of compliant measures through modeling completed by the HERS rater. With both paths, you must also incorporate all measures from the Inspection Checklists. After the project team has decided on a compliant energy package, build these measures into the project plans and specs, and work with the HERS rater to create and implement a verification plan throughout construction. Once all measures are found to be compliant for a dwelling unit, the HERS rater will submit for you to receive an ENERGY STAR Certified New Home certificate for the dwelling unit.
- ENERGY STAR Certified New Homes offers a sampling protocol that allows a builder with a large volume of projects to qualify a group of dwelling units to meet ENERGY STAR guidelines based on pre-analysis of building plans and subsequent testing and inspections of a sample set of the dwelling units. For more information on these sampling protocols, see the adopted 2006 Enhancements to National Home Energy Ratings Standards: *www.resnet.us/standards/sampling_standard.pdf*

RESOURCES

- For more information regarding ENERGY STAR Certified New Homes: *www.energystar.gov/homes*
- To identify a Home Energy Rater in your area: *www.energystar.gov/partnerlocator*
- For more information on the sampling protocols: *www.resnet.us/standards/sampling_standard.pdf*

5.1b *Mandatory* Building Performance Standard

Criteria for NEW CONSTRUCTION of the following project types:

- Multifamily buildings with four or five stories wherein each dwelling unit does not have its own heating, cooling and hot water system
- Multifamily buildings with six or more stories

REQUIREMENTS

Option 1

Certify the project through the ENERGY STAR Multifamily High Rise program (MFHR).

OR

Option 2

First, follow either the ENERGY STAR MFHR prescriptive path design details or perform modeling per the ENERGY STAR MFHR performance path to demonstrate that the project will perform at least 15% better than the baseline code designated by the ENERGY STAR MFHR program. For projects in California, this baseline code is 2013 Title 24. For projects outside of California, this baseline code is ASHRAE 90.1 per Appendix G; refer to the latest ENERGY STAR MFHR guidance to determine which version of ASHRAE 90.1 is applicable for your project.

Second, for verification of the above measures, follow the LEED for Homes v4 EA Prerequisite: Minimum Energy Performance Midrise Prescriptive Commissioning Path.

RATIONALE

Buildings meeting the ENERGY STAR Multifamily High Rise program guidelines are designed to be energy-efficient and durable. These high-performance buildings achieve energy savings in heating, cooling, hot water, lighting and appliance efficiencies, which improve resident comfort, reduce operating costs and decrease greenhouse gas emissions.

RECOMMENDATIONS

- Projects participating in the ENERGY STAR MFHR program are designed to perform at least 15% better than ASHRAE 90.1-2007, or 15% better than ASHRAE 90.1-2010 in states that have adopted ASHRAE 90.1-2010/2012 IECC, or 15% better than 2013 Title 24 in California. All MFHR-certified projects must meet initial program requirements and be verified and field-tested according to the ENERGY STAR MFHR Testing and Verification Protocols.
- Review and follow the ENERGY STAR MFHR Certification Process and Training Resources found at *www.energystar.gov/mfhr* if certifying to that program.

- For MFHR certification, partner with ENERGY STAR (*www.energystar.gov/mfhr*) and work with a qualified Licensed Professional to meet program requirements. With the Licensed Professional, design the project to meet program requirements and submit a set of designs and a Project Application to EPA, then construct the project as designed, and test to ensure proper installation by following the ENERGY STAR MFHR Testing and Verification Protocols throughout construction. After the final inspection, the Licensed Professional will submit an As-Built Submittal to EPA. Once approved, EPA will notify the project team that the units in the building have earned the ENERGY STAR.
- If using the ENERGY STAR MFHR Performance Path, to calculate the energy performance target the project team must:
  - Identify a qualified professional who has experience with performing energy modeling per ASHRAE Standard 90.1, Appendix G. In the early design stage, the qualified professional should prepare the energy model and work with the integrative design team to identify cost-effective strategies for meeting the energy performance target.
  - Calculate the baseline building performance rating according to the EPA's Multifamily High Rise Simulation Guidelines building performance rating method, which is based on Appendix G of ANSI/ASHRAE/IESNA Standard 90.1-2007 (with errata but without addenda).
- Appendix G of Standard 90.1 is the method for calculating the baseline and projected energy consumption of a building through the Performance Path. This method includes all energy costs associated with the building project.
  - The baseline building performance standard (5.1b) can only be met through building performance improvements, and not through the addition of electric-generating renewable energy systems. However, other "renewable" technologies, such as solar domestic hot water collectors and geothermal H/AC systems (ground source heat pumps), can be included.

Examples of software that meet ASHRAE 90.1 Appendix G requirements include:

- DOE2
- eQuest
- VisualDOE
- EZDOE
- TRACE
- HAP
- TRNSYS
- EnergyPlus

RESOURCES

- EPA's ENERGY STAR Multifamily High Rise program details, including the prescriptive and performance path guidelines and the testing and verification protocols. *www.energystar.gov/mfhr*
- LEED for Homes v4 EA Prerequisite: Minimum Energy Performance Midrise Prescriptive Commissioning Path. *www.usgbc.org/node/2611843?return=/credits*

5.1c

Mandatory

Building Performance Standard

Criteria for Moderate or Substantial REHABS of the following project types:

- Single-family detached and attached homes
- Multifamily buildings with four dwelling units or fewer
- Multifamily buildings with three stories or fewer
- Multifamily buildings with four or five stories, where each dwelling unit has its own heating, cooling and hot water system

REQUIREMENTS

For each dwelling unit in the project types identified above, achieve a HERS Index score of 85 or less.

The software used for the energy modeling during the design stage and to generate the HERS Index and certificate must be approved by either RESNET or, for projects in California, the California Energy Commission. Any method or strategy, except for electric-generating renewable energy systems, can be implemented to satisfy the targeted minimum energy performance.

Exception: Substantial rehabs of buildings with walls made only of brick/masonry that are three stories or fewer* and built before 1980, as well as moderate rehabs of buildings that are three stories or fewer* and built before 1980, are permitted to instead achieve a HERS Index score of 100 or less for each dwelling unit.

*or four or five stories, where each dwelling unit has its own heating, cooling and hot water system

RATIONALE

Dwelling units rehabilitated to a HERS Index score of 85 will achieve approximately 2009 IECC energy performance levels in heating, cooling, hot water, lighting and appliance efficiencies, which improve resident comfort, reduce operating costs and decrease greenhouse gas emissions. In California, the HERS Index is based on the Title 24 Building Energy Efficiency Standards.

Certain existing buildings undergoing rehabilitation are unable to achieve a HERS Index score of 85 without making drastic changes to the building envelope; these buildings will be permitted to achieve a HERS Index score of 100 (approximately 2006 IECC energy performance levels).

RECOMMENDATIONS

- To achieve a HERS Index score of no more than 85 (or, if applicable, 100) at project completion, we recommend that project teams engage a HERS rater as early in their project design stage as possible. Find a HERS rater here: *www.energystar.gov/partnerlocator*. For additional information: *www.resnet.us/choose-the-right-contractor*
- The HERS rater will be responsible for:
  - creating an energy model during the design stage of the project, with plans and specifications showing the building's projected energy performance
  - conducting a mid-construction pre-drywall thermal enclosure, using the ENERGY STAR version 3 "Thermal Enclosure System Rater Checklist"
  - verifying the final performance of the building with post-construction performance testing, including a blower door and duct blaster test of the home and/or units

RESOURCES

- To identify a Home Energy Rater in your area: *www.energystar.gov/partnerlocator*
- List of software approved by Residential Energy Services Network (RESNET) to generate HERS Index score: *www.resnet.us/professional/programs/energy_rating_software*
- Building Performance Institute, Inc. (BPI): Develops standards for energy-efficiency retrofit work, certifies professional workers, and accredits BPI GoldStar Contractors. *www.bpi.org*
- Residential Energy Services Network (RESNET): A resource where residents can learn about the energy audit and rating process. *www.resnet.us*
- Enterprise Green Communities Single-Family Rehabilitation Specifications: A set of green single-family specifications for insulation, air sealing and other details that can be customized to your project. *www.enterprisecommunity.org/resources*
- U.S. Department of Energy, Air Sealing, Technology Fact Sheet: This fact sheet describes the importance of sealing air leaks and providing controlled ventilation. *apps1.eere.energy.gov/buildings/publications/pdfs/building_america/26290.pdf*
- 2009 IECC Climate Zones Map: A detailed map that shows Climate Zones zoomed into each state and county as well as the basic 2009 IECC Building Code requirements for each Climate Zone. *energycode.pnl.gov/EnergyCodeReqs*
- ENERGY STAR Certified New Homes offers a sampling protocol that allows a builder with a large volume of projects to qualify a group of dwelling units to meet ENERGY STAR guidelines based on pre-analysis of building plans and subsequent testing and inspections of a sample set of the dwelling units. You may apply these protocols to generate the HERS Index score for each dwelling unit undergoing rehab. See the adopted 2006 Enhancements to National Home Energy Ratings Standards: *www.resnet.us/standards/sampling_standard.pdf* and RESNET Guidelines for Multifamily Energy Ratings: *www.resnet.us/professional/standards*

5.1d *Mandatory* Building Performance Standard

Criteria for Moderate or Substantial REHABS of the following project types:

- Multifamily buildings with four or five stories wherein each dwelling unit does not have its own heating, cooling and hot water system
- Multifamily buildings with six or more stories

REQUIREMENTS

Demonstrate that the energy performance of the completed building will be equivalent to ASHRAE 90.1-2010 using an energy model created by a qualified energy services provider according to Appendix G.

This performance requirement shall only be met through building performance improvements, rather than through the addition of electric-generating renewable energy systems. Also, in order to ensure long-term optimal building performance and to better situate a building for withstanding power outages, prioritize envelope improvements over mechanicals and lighting.

Projects in California must use the version of Title 24 under which the project is permitted to calculate the targeted minimum energy performance.

RATIONALE

Buildings rehabilitated to ASHRAE 90.1-2010 energy performance levels achieve energy savings in heating, cooling, hot water, lighting and appliance efficiencies, which improve resident comfort, lower operating costs and decrease greenhouse gas emissions.

RECOMMENDATIONS

- To demonstrate energy performance equivalent to ASHRAE 90.1-2010, contract with an energy services provider. We would recommend that the energy services provider be responsible for:
  - creating an energy model during the design stage of the project, with plans and specifications showing the building's projected energy performance
  - conducting a mid-construction pre-drywall thermal enclosure inspection
  - verifying the final performance of the building with performance testing
- Follow all envelope code requirements of ASHRAE 90.1 2010; otherwise meet the minimum whole building energy performance target that was calculated by the model.
- Appendix G of Standard 90.1-2010 is the method for calculating the baseline and projected energy consumption. This method includes all energy costs associated with the building project.
  - The baseline building performance standard (5.1d) can only be met through building performance improvements, and not through the addition of electric-generating renewable energy systems. However, other "renewable" technologies such as solar domestic hot water collectors and geothermal H/AC systems (ground source heat pumps) can be included.

Examples of software that meet ASHRAE 90.1 Appendix G requirements include:

- DOE2
- eQuest
- VisualDOE
- EZDOE
- TRACE
- HAP
- TRNSYS
- EnergyPlus

RESOURCES

- For more information on ASHRAE 90.1-2010: *www.ashrae.org*
- Enterprise Green Communities Multifamily Rehabilitation Specifications: A set of model green building specifications for Multifamily Rehab projects that includes details on insulation, air sealing and performance testing that can be customized for your project. *www.greencommunitiesonline.org/resources*
- U.S. Department of Energy, Air Sealing, Technology Fact Sheet: This fact sheet describes the importance of sealing air leaks and providing controlled ventilation. *apps1.eere.energy.gov/buildings/publications/pdfs/building_america/26290.pdf*
- California Building Energy Efficiency Standards (Title 24) and compliance manuals: *www.energy.ca.gov/title24/index.html*

5.2a

Optional | 5–12 points

Additional Reductions in Energy Use

REQUIREMENTS

Design and construct a building that is projected to be at least 5% more efficient than what is required of the project by Criteria 5.1a–d:

New Construction, projects following performance path of Criterion 5.1a: 5 optional points for HERS Index score 5 lower than required; additional 1 optional point for each additional 1 point decrease in HERS Index score, up to maximum of 12 total optional points.

New Construction, projects following performance path of Criterion 5.1b: 5 optional points for 5% greater efficiency than required; additional 1 optional point for each additional 1% greater efficiency, up to maximum of 12 total optional points.

Substantial and Moderate Rehab, projects following Criterion 5.1c: 5 optional points for HERS Index score of 5 lower than required; additional 1 optional point for each additional 1 point decrease in HERS Index score, up to a maximum of 12 total optional points.

Substantial and Moderate Rehab, projects following Criterion 5.1d: 5 optional points for 5% greater efficiency than required; additional 1 optional point for each additional 1% great efficiency, up to maximum of 12 total optional points.

These additional reductions in energy use must be captured by energy conservation measures associated with improved building component systems and not through the addition of electric-generating renewable energy systems. See Criterion 5.7b for renewable energy points. Projects following the prescriptive path of Criteria 5.1a–5.1d are not eligible for these points. Projects acquiring points through Criterion 5.2b are not eligible for these points.

RATIONALE

Improvements in building energy performance result in utility cost savings from more efficient heating, cooling, hot water, lights and appliances, which improve residents' comfort, lower operating costs and decrease greenhouse gas emissions. From a resilience standpoint, a highly energy-conserving building envelope will help to ensure that habitable temperatures will be maintained in the event of extended loss of power or interruptions in heating fuel (passive survivability).

RECOMMENDATIONS

Using the baseline energy model created in Criteria 5.1a–5.1d, analyze, identify and adopt energy improvements to achieve additional energy reductions beyond the mandatory levels.

RESOURCES

The DOE Building Technologies Office offers free research publications, tools, webinars and newsletters on cost-effective, energy-efficient building strategies. *www1.eere.energy.gov/buildings/building_america/*

5.2b *Optional | 12 points*
Advanced Certification: Nearing Net Zero

REQUIREMENTS

Certify the project in a program that requires advanced levels of building envelope performance such as PHIUS, Living Building Challenge and/or DOE Zero Energy Ready Home.

Projects acquiring points through this criterion are not eligible for points through Criterion 5.2a.

RATIONALE

These complementary whole building certification programs emphasize strategies that aggressively reduce whole building energy loads, reducing the need to heat and cool, reducing utility bills, reducing associated greenhouse gas emissions, and increasing project capacity to sustain habitability during loss of power.

RECOMMENDATIONS

Each of these programs requires a significant commitment to ensure significant levels of project performance. Begin strategizing how to achieve your project goals through dual certification with these programs as early in the integrative design process as possible.

RESOURCES

- Passive House Institute US (PHIUS): PHIUS is committed to making high-performance passive building the mainstream market standard. A Passive House is a set of design principles and a quantifiable performance standard applied to any building project, producing radically less energy needs, unparalleled comfort and supreme air quality. *www.passivehouse.us* and *www.phaus.org*
- Living Building Challenge Net Zero Energy Building Certification: Net Zero Energy Building Certification is a program operated by the International Living Future Institute using the structure of the Living Building Challenge. Net Zero Energy Building Certification verifies that the building is truly operating as claimed, provides a platform for the building to inform other efforts throughout the world and accelerate the implementation of restorative principles, and celebrates a significant accomplishment and differentiates those responsible for the building's success in this quickly evolving market. *http://living-future.org/netzero*
- DOE Zero Energy Ready Home: The DOE Zero Energy Ready Home is a program that builds upon ENERGY STAR for Homes Version 3, along with proven Building America innovations and best practices. These homes are third-party verified, meet all DOE Zero Energy Ready Home National Program Requirements, and follow provisions from the Consolidated Renewable Energy Ready Home (RERH) checklist for climates with significant solar insulation. *http://energy.gov/eere/buildings/guidelines-participating-doe-zero-energy-ready-home*

5.3 *Mandatory*
Sizing of Heating and Cooling Equipment

REQUIREMENTS

Size and select heating and cooling equipment in accordance with the Air Conditioning Contractors of America (ACCA) Manuals J and S or ASHRAE handbooks.

Note that projects in compliance with Criterion 5.1a automatically meet this Criterion 5.3 by virtue of their ENERGY STAR New Homes certification requirements.

RATIONALE

Appropriately sized equipment can save money, ensure adequate dehumidification and prevent short-cycling that can lead to premature motor default.

RECOMMENDATIONS

- The HVAC contractor generates a Manual J load calculation to determine the heating and cooling loads of a particular project. A room-by-room Manual J is recommended, in order to properly determine room-by-room airflows best suited for the space's associated heating and cooling loads. A Manual S is used to determine which space heating and cooling equipment best match the load of the project calculated per Manual J. The Manual J accounts for factors such as the dwelling unit's solar orientation, window design and insulation R-value, installation quality, and building air leakage. Consult *www.acca.org/standards/software* for a list of software programs reviewed by ACCA to perform Manual J calculations.
- Consider locating heating and cooling equipment and the distribution system within the building envelope in order to reduce thermal distribution losses. Do not locate air handler or ductwork within the garage space (see Criterion 7.9 for more information).

RESOURCES

- Air Conditioning Contractors of America, Manuals J: Residential Load Calculation and Manual S: Residential Equipment Selection. *www.acca.org/standards/*
- Air Conditioning Contractors of America, "HVAC Quality Installation Specification: Residential and Commercial Heating, Ventilating, and Air Conditioning Applications": The site also includes links to various articles and other ANSI and ACCA standards. *www.acca.org/tech*
- California Energy Commission, Procedures for HVAC System Design and Installation: This site provides an overview of good practices for designing and installing the HVAC system, as well as detailed strategies and measures for the "house as a system" approach to construction. *www.energy.ca.gov/efficiency/qualityhomes/procedures.html*
- For additional information on duct sealing details: *www.energystar.gov/index.cfm?c=home_improvement.hm_improvement_ducts*

5.4 *Mandatory*
ENERGY STAR Appliances

If providing appliances

REQUIREMENTS

If providing appliances, install ENERGY STAR clothes washers, dishwashers and refrigerators. If appliances will not be installed or replaced at this time, specify that, at the time of installation or replacement, ENERGY STAR models must be used via Criterion 8.1 Building Operations & Maintenance (O&M) Manual and Plan and Criterion 8.4 Resident and Property Staff Orientation.

RATIONALE

ENERGY STAR products meet strict energy-efficiency criteria set by EPA. These products reduce utility costs and greenhouse gas emissions.

RECOMMENDATIONS

The specifications of the installed appliances should be reflected in the energy modeling building input data report.

RESOURCES

- For bulk orders of ENERGY STAR products, use the web-based purchasing tool "Quantity Quotes": This site connects purchasing groups with suppliers. *www.quantityquotes.net*
- When preparing project specifications, find ENERGY STAR product information, including model numbers and savings calculators: *www.energystar.gov/products/certified-products*

5.5 *Mandatory*
Lighting

REQUIREMENTS

General

For all permanently installed lighting fixtures, install high-efficacy lighting (including compact fluorescent bulbs, LEDs, and T-8 or smaller diameter linear fluorescents) with an efficacy of at least 40 to 60 lumens per watt.

Recessed light fixtures (recessed cans): If recessed light fixtures are used anywhere in the project, install ballasted compact fluorescent fixtures or ENERGY STAR–qualified LED lamps. All recessed light fixtures must be Insulation Contact Air-Tight (ICAT) models.

Common Area Lighting

Non-apartment building spaces must use ballasted compact fluorescents and/or LED bulbs and be controlled by occupancy sensors or automatic bi-level lighting controls.

Emergency Lighting

Any new exit signs shall consume 5 watts or less. Fixtures located above stairwell doors and other forms of egress shall contain a battery backup feature. Photoluminescent exit signs may be used.

Exterior Lighting

100% of outdoor lighting must use fluorescent and/or LED bulbs, and lamps must be ENERGY STAR–certified when that certification is available for the product category.

All exterior lighting must be a Dark-Sky–approved "Friendly Fixture" and have motion sensor controls, integrative photovoltaic cells, photosensors or astronomic time-clock operation.

Note: Exterior emergency lighting and lighting required by code for health and safety purposes are exempt.

RATIONALE

Energy reductions through efficient lighting products contribute to lower utility costs and lower greenhouse gas emissions. Dedicated and screw-based CFLs and linear fluorescent lighting as well as LED lights are an energy-efficient alternative to standard incandescent and T-12 fluorescent lighting. Automatic lighting controls can significantly reduce lighting energy use. Battery backup in emergency lighting features allows for ease of egress during power blackouts.

RECOMMENDATIONS

- Consider incorporating daylighting practices throughout your project. Include controlled admission of natural light as well as a daylight-responsive lighting control system.
- Review ENERGY STAR product and design information regarding fixture and bulb selection and design.
- Incorporate stairwell skylights as a multi-purpose design feature, providing light, egress and ventilation.
- Install occupancy sensors in closets and rooms that will be occupied only intermittently. If installed in restrooms, position occupancy sensors to recognize the presence of someone in a toilet stall.
- Ensure that stairway lighting is consistent with or better than building corridor lighting to encourage use.
- Design outdoor lighting to eliminate light trespass from the project site and to minimize impact on nocturnal environments.
- Design outdoor lighting to meet IES guidelines (Lighting for Exterior Environments, IESNA publication, RP-33-1999).

RESOURCES

- For more information on lighting design and product selection: *www.energystar.gov/lighting*
- The Lighting Research Center: This university-based, independent lighting research and education group provides objective and timely information about lighting technologies and applications, and about human response to light. *www.lrc.rpi.edu/*
- Whole Building Design Guide, Daylighting: *www.wbdg.org/resources/daylighting.php*
- Lamp Recycle lists locations where fluorescent lamps and ballasts may be taken for recycling: *www.lamprecycle.org*
- Illuminating Engineering Society of North America's Recommended Practice Manual: Lighting for Exterior Environments includes lighting design guidelines.
- International Dark-Sky Association (IDA) is a recognized authority on light pollution. Information on Dark-Sky–approved fixtures can be found online at: *www.darksky.org/outdoorlighting*

5.6 Electricity Meter

Mandatory: New Construction and Substantial Rehab
Optional: Moderate Rehab | 6 points

Except for single-room occupancy and designated supportive housing dwelling units

REQUIREMENTS

Install individual or submetered electric meters for all dwelling units.

RATIONALE

Providing information to residents on the cost and usage associated with the electricity consumption in their unit may reduce energy use. Owners being cognizant of per dwelling unit energy consumption can use a proactive operations and maintenance approach, addressing outlier conditions in real-time.

RECOMMENDATIONS

Individual metering and/or submetering should be specified in the Integrative Design stage, tracked through O&M procedures, and shared with residents.

5.7a Photovoltaic/Solar Hot Water Ready

Optional | 4 points

REQUIREMENTS

Orient, design, engineer, wire and/or plumb the development to accommodate installation of photovoltaic (PV) or solar hot water system in the future.

Minimum required south-facing exposure:

- Single-Family and Low-Rise Buildings: 250 aggregated square feet for photovoltaic and 60 aggregated square feet for solar water heating of unobstructed roof area that is oriented within +/– 45 degrees of true south
- Mid- and High-Rise Multifamily Buildings: a minimum of 30% of aggregated unobstructed roof area that is oriented within +/– 45 degrees of true south

If projects plan to install this equipment on the roof, demonstrate that there are still 20 years of useful life in the roof.

RATIONALE

Designing for the future installation of photovoltaics or solar hot water systems allows a building owner the flexibility to transition to increased energy generation through renewable energy sources, as resources become available. Installation of renewable energy systems is a hedge against rising costs for purchased energy.

RECOMMENDATIONS

- At the least, consider designing stand-alone laundry buildings for multifamily properties as solar water heating ready.
- When designing a photovoltaic or solar hot water ready system, include the following in the project plans and specifications (as applicable to each technology):
  - Site map showing that the building(s) have a southern orientation and unobstructed access to sunlight
  - A design schematic of the future solar array, indicating the south face, slope and any rooftop equipment that could obstruct the array
  - The type of roof to be installed (e.g., asphalt, standing seam metal, tile)
  - The future location within the building for the inverter
- For solar hot water, run piping from the designed or current location of the water heater up to the prospective solar hot water collectors.
- Work with an engineer to calculate that the roof can carry the dead load of the solar equipment and withstand the wind loads.
- Determine if the roof has a warranty and if the placement of the solar equipment voids the warranty.
- General Contractor, PV and/or solar hot water contractor must document the information on the roof load, location of conduit and piping, and the potential location of the dash box. GC, PV and solar hot water contractor should provide documentation to building owner and manager.
- Design roof and pluming vents so be installed in a way that does not obstruct future renewable energy system installation.
- The first cost of PV can be high, but grants and subsidies are available in many states.

RESOURCES

- EPA Renewable Energy Ready Homes (RERH): The RERH Specifications were developed by the U.S. Environmental Protection Agency (EPA) to educate builders on how to assess and equip new homes with a set of features that make it easier and less expensive for homeowners to install solar energy systems after the home is constructed. *www.energystar.gov/index.cfm?c=rerh.rerh_index*
- National Renewable Energy Laboratory, "Solar Ready Buildings Planning Guide," NREL Technical Report (NREL/TP-7A2-46078): A paper published by NREL in December 2009 that details design guidelines and checklists for designing solar-ready buildings. *www.nrel.gov/docs/fy10osti/46078.pdf*
- Database of State Incentives for Renewables & Efficiency (DSIRE): DOE and the North Carolina Clean Energy Technology Center developed this database to collect information on state financial and regulatory incentives (e.g., tax credits, grants and special utility rates) designed to promote the application of renewable energy technologies. DSIRE also offers additional features, such as preparing and printing reports that detail the incentives on a state-by-state basis. *www.dsireusa.org*

5.7b

Optional | 10 points maximum

Renewable Energy

REQUIREMENTS

Install photovoltaic (PV) panels or other electric-generating renewable energy source to provide a specified percentage of the project's estimated energy demand. Refer to the table below for the point structure.

	5%	10%	20%	30%	40%
Single-story / Single-family	—	—	6 points	8 points	10 points
2–3 stories	—	6 points	8 points	10 points	—
4 stories or more	6 points	8 points	10 points	—	—

When calculating points for Criterion 5.7b, you may evaluate either the percentage of your project's total energy demand that is satisfied by a renewable energy source or the percentage of your project's water heating energy demand that is satisfied by a renewable energy source. Demonstrate the energy demand in question with the energy model your project team created in compliance with Criterion 5.1. Projects using a prescriptive path for Criterion 5.1 compliance will not be able to obtain points under Criterion 5.7b.

Projects may acquire points through Criterion 5.7b or Criterion 5.8b, but not both.

RATIONALE

Renewable energy reduces environmental impacts such as greenhouse gas emissions that are associated with energy sourced and produced from fossil fuels. Use of on-site renewable energy technologies can also result in energy cost savings.

RECOMMENDATIONS

- To provide a higher percentage of the project's estimated annual energy consumption with electric-generating renewable energy sources, focus on reducing the building's overall energy consumption in Criteria 5.1 and 5.2 with energy-efficiency measures, which are generally more cost-effective and longer lasting than renewables.
- Consider installing solar water heating systems for stand-alone laundry facilities in multifamily projects.
- Evaluate and review your maintenance contract to ensure that it includes all renewable systems and appropriate reviews and protocols for their maintenance, as well as the associated implications of roof-mounted systems.

RESOURCES

- American Solar Energy Society (ASES): A nonprofit organization committed to a sustainable energy economy, ASES accelerates the development and use of solar and other renewable energy resources through advocacy, education, research and collaboration among professionals, policymakers and the public. *www.ases.org*

- Florida Solar Energy Center (FSEC): This is a resource for basic information on types of photovoltaic solar electric systems, sizing, installation and system ratings. FSEC also has an industry resources page that includes its Photovoltaic System Design Course Manual, available at *www.fsec.ucf.edu/en/education/cont_ed/manuals/orderform_pvmanual.htm*
- National Renewable Energy Laboratory (NREL): Photovoltaic research at NREL provides a clearinghouse on all aspects of photovoltaic solar cell systems. *www.nrel.gov/ncpv*
- U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy: This website provides information on renewable energy technologies and energy efficiency. *www.eere.energy.gov*
- DSIRE is the most comprehensive source of information on incentives and policies that support renewables and energy efficiency in the United States. Operated by the North Carolina Clean Energy Technology Center at North Carolina State University, with support from the Interstate Renewable Energy Council, Inc., DSIRE is funded by the U.S. Department of Energy. *www.dsireusa.org*

5.8a *Optional | 8 points*
Resilient Energy Systems: Floodproofing

REQUIREMENTS

Conduct floodproofing, including perimeter floodproofing (barriers/shields), of lower floors.

Design and install building systems in such a way that, in the case of an emergency, the operation of these systems will not be grossly affected:

- Locate any and all central space and water heater equipment above design flood elevations.
- Locate the service disconnect at a readily accessible location above the design flood elevation.
- Locate at least one exit door above the design flood elevation.
- On plan sets, identify water entry points at basements and foundation walls and demarcate all penetrations, wall assemblies and doors/openings to ensure that future renovations do not compromise the integrity of floodproof construction.

RATIONALE

When raising services, equipment and building portions above design flood level is not possible, dry floodproof ("bunkerize") such services and spaces in order to better ensure building service in the case of a major flood event. The first and lower floors of buildings are often at risk because they are below flood level. Any essential building equipment should be located elsewhere, if flooding is a risk. Submersion of electrical utility services to the first point of switch disconnect is a safety concern and can lead to excessive or irreparable damage to both utility and building systems and increase the recovery time for such systems.

RECOMMENDATIONS

- Project teams should, in accordance with Criterion 1.3, identify whether or not floods are of concern for the project in question. If not, it may be wise to choose different optional criteria instead of this one.

- Project teams will need to identify suitable space, with accessible entry, for locating this equipment above design flood elevation.
- See ASCE 24-05 Flood Resistant Design and Construction for further guidance regarding design and placement of building services.

RESOURCES

- Building Resiliency Task Force Full Report, June 2013, Urban Green. *http://issuu.com/urbangreen/docs/brtf_full_report#/freeSignupNamePassword*
- ASCE 24-05 Flood Resistant Design and Construction (2010). *www.fema.gov/media-library/assets/documents/14983?id=3515*
- Flood-Fight Handbook: Preparing for a Flood, 2009 Edition. U.S. Army Corp of Engineers, St. Paul District. *www.wsask.ca/Global/Lakes%20and%20Rivers/Flood%20Watch/Flood%20Fight%20Handbook.pdf*
- Enterprise's Multifamily Resilience Manual includes more than a dozen strategies and specific guidance for building property resilience in the event of an emergency, including floodproofing strategies. *www.enterprisecommunity.org/resources*

5.8b

Optional | 4, 6 or 8 points

Resilient Energy Systems: Islandable Power

REQUIREMENTS

Provide emergency power through an islandable photovoltaic (PV) system or an efficient and portable generator that will offer at least limited electricity for critical circuits during power outages. Size this system to satisfy the common space energy loads of the project.

Option 1 *[8 points]*

With PV systems, install inverters that provide limited access to solar-generated power during outages when the sun is shining.

OR

Option 2 *[6 points]*

Provide a PV system with battery storage and a system to switch to battery backup when the electric grid goes down.

OR

Option 3 *[4 points]*

Allow for the connection of an efficient portable generator to provide reliable power to critical systems in the case of an emergency power outage.

Projects may acquire points through Criterion 5.7b or Criterion 5.8b, but not both.

RATIONALE

With more intense storms, flooding, wildfires and heat waves forecast with climate change, the frequency and duration of power outages may increase. So-called "islandable" electrical systems offer a significant level of resilience in such situations for supplying power to critical building systems.

RECOMMENDATIONS

- Prioritize which electrical equipment will run on backup power so buildings can remain habitable during extended blackouts. Because cogeneration and solar power systems are always in use, they can be more reliable than generators that are turned on only during emergencies. In substantial rehab projects where the installation of a PV system is not feasible, a generator may be used as a backup power source.
- Prioritize emergency systems such as egress lighting, extended life safety systems (fire alarms), water, parking egress, improved habitability for mobility-impaired occupants (elevator car operation), small critical heating and cooling loads, and convenience power for building occupants (charging stations).
- At least one inverter manufacturer was producing a solar inverter in 2014 that allows access to solar-generated electricity when the utility grid is down and the sun is out, and other manufacturers will likely follow suit. Most grid-connected inverters do not function at all when the grid is down.
- A bi-modal solar system that can both feed power into the electric grid (net-metering) and shunt power to and from a battery bank offers great flexibility and resilience (including power at night during power outages).
- Where a permanent connection is being made for a portable generator, a disconnecting means and overcurrent protection should be provided at the point of connection. For a temporary generator hookup, the project should provide easy access to an electrical connection point. Connections shall be administered by qualified people who maintain and supervise the installation.

RESOURCES

- Enterprise Community Partners, Multifamily Resilience Manual includes more than a dozen strategies and specific guidance for building property resilience in the event of an emergency, including backup power strategies. *www.enterprisecommunity.org/resources*
- Database of State Incentives for Renewables & Efficiency (DSIRE): DOE and the North Carolina Clean Energy Technology Center developed this database to collect information on state financial and regulatory incentives (e.g., tax credits, grants and special utility rates) designed to promote the application of renewable energy technologies. DSIRE also offers additional features, such as preparing and printing reports that detail the incentives on a state-by-state basis. *www.dsireusa.org*
- Urban Green, Building Resiliency Task Force Full Report, Backup Power Chapter; June 2013. *http://issuu.com/urbangreen/docs/brtf_full_report#/freeSignupNamePassword*

MATERIALS

Purchasing green materials and recycling and reusing materials whenever possible can improve conditions for resident health, enhance project durability, and reduce waste and disposal costs.

6.1 *Mandatory*
Low / No VOC Paints, Coatings and Primers

REQUIREMENTS

All interior paints and primers must have volatile organic compound (VOC) levels, in grams per liter, less than or equal to the thresholds established by South Coast Air Quality Management District (SCAQMD) Rule 1113. Projects must follow the most recent revision available at time of product specification. For the latest rules: *www.aqmd.gov/home/regulations/rules*.

As of July 1, 2013, SCAQMD Rule 1113 thresholds are listed as:

PAINT TYPE	MAXIMUM VOC LIMIT
Primers and sealers	100 g/L
Coatings, flats and non-flats	50 g/L
Opaque floor coatings	50 g/L
Rust preventative coatings	100 g/L
Clear wood finishes	275 g/L

RATIONALE

Interior paints, coatings and primers may release VOCs, particularly when newly applied. Exposure to individual VOCs and mixtures of VOCs can cause or aggravate health conditions, including allergies, asthma and irritation of the eyes, nose and airways; however, no health-based standards for indoor non-occupational exposure have been set.

RECOMMENDATIONS

Avoid epoxy-based paints, even those that comply with VOC standards, as these contain the chemical Bisphenol A, which was identified by the EPA on March 29, 2010, as a "chemical of concern." *www.epa.gov/oppt/existingchemicals/pubs/ecactionpln.html*.

Products do not have to be certified by the Materials Performance Institute (MPI) or Green Seal to comply with this criterion, but they may be helpful in locating products that do not exceed the maximum VOC levels.

RESOURCES

- The Master Painters Institute (MPI) Green Performance Standard for Paints & Coatings GPS-2-08 list of products: *www.specifygreen.com/APL/Introduction.html*
- Green Seal: Provides information on environmentally preferable products and services. *www.greenseal.org/Home.aspx*

6.2 *Mandatory*
Low/No VOC Adhesives and Sealants

REQUIREMENTS

All adhesives and sealants (including caulks) must have volatile organic compound (VOC) levels, in grams per liter, less than or equal to the thresholds established by the South Coast Air Quality Management District (SCAQMD) Rule 1168. Projects must follow the most recent revision available at time of product specification. For the latest rules: *www.aqmd.gov/home/regulations/rules*.

As of January 7, 2005, SCAQMD Rule 1168 thresholds are listed as:

VOC LIMIT PRODUCT TYPE	(G/L)
Indoor carpet adhesives	50
Carpet pad adhesives	50
Outdoor carpet adhesives	150
Wood flooring adhesives	100
Rubber floor adhesives	60
Subfloor adhesives	50
Ceramic tile adhesives	65
VCT and asphalt tile adhesives	50
Drywall and panel adhesives	50
Cove base adhesives	50
Multipurpose construction adhesives	70
Structural glazing adhesives	100
Single-ply roof membrane adhesives	250
Structural wood member adhesive	140
Architectural sealants, including caulk	250

RATIONALE

Interior adhesives and sealants may release VOCs, particularly when wet. Exposure to individual VOCs and mixtures of VOCs can cause or aggravate health conditions, including allergies, asthma and irritation of the eyes, nose and airways; however, no health-based standards for indoor non-occupational exposure have been set.

RECOMMENDATIONS

- Many construction adhesives are not capable of adhering at temperatures below 40°F. Projects located in cold climates only (Climate Zones 6 and 7, based on IECC 2012) may be exempted from the required low-VOC adhesives and sealants if they prove problematic due to this reason. In this instance, please identify in the project submittal documents if other adhesives and/or sealants were needed and at what stage of construction the project team was unable to use required low-VOC products.

- Avoid epoxy-based caulks and epoxy-based sealants, as these contain Bisphenol A, which was listed on March 29, 2010, by the EPA as a "chemical of concern." *www.epa.gov/oppt/existingchemicals/pubs/ecactionpln.html*

RESOURCES

- U.S. Department of Energy, National Renewable Energy Laboratory, "Weatherize Your Home — Caulk and Weather Strip": *www.nrel.gov/docs/fy01osti/28039.pdf*
- 2012 IECC Climate Zones Map: A detailed map that shows Climate Zones zoomed into each state and county as well as the basic 2012 IECC Building Code requirements for each Climate Zone (see the *Appendix*).

6.3 *Optional | 3 points maximum*
Recycled Content Material

REQUIREMENTS

Use building materials that feature recycled content.

The building material must make up 75% (by weight or cost) of a project component, and must be composed of at least 25% post-consumer recycled content or at least 50% post-industrial recycled content to achieve *1 point*.

The following table provides a sample of project components and example building materials that a team can incorporate for optional points. Each building material that meets the requirements of this criterion is worth *1 point*.

PROJECT COMPONENT	BUILDING MATERIAL (EXAMPLES)
Framing	Wood, concrete, steel, aluminum
Siding or masonry	Wood, metal, masonry
Flooring (non-structural)	Linoleum, cork, bamboo, reclaimed wood, sealed concrete, carpet
Paving	Cement slab (Urbanite)
Roofing	Wood shingles, asphalt shingles, tile, metal
Insulation	Fiberglass batt, cellulose, rigid panel
Sheathing	Plywood, OSB

Note: The list above is a partial list and does not include all possible building materials; mechanical, electrical and plumbing components cannot be included in this calculation.

RATIONALE

Use of building materials with recycled content reduces the negative environmental impact resulting from extraction and processing of virgin materials.

RECOMMENDATIONS

Consider the incorporation of recycled-content building materials from the early stages of project design.

RESOURCES

- Federal Trade Commission, "Guides for the Use of Environmental Marketing Claims," 16 CFR 260: Many commonly used products, such as metals, concrete, masonry, acoustic tile, drywall, carpet, ceramic tile and insulation, are now available with recycled content. *www.ftc.gov/enforcement/rules/rulemaking-regulatory-reform-proceedings/guides-use-environmental-marketing-claims*
- GreenSpec Directory, Building Green: The online GreenSpec Directory lists product descriptions for more than 2,000 environmentally preferable products. *http://greenspec.buildinggreen.com/*
- Pharos Project, Healthy Building Network: The Pharos Project provides health and environmental data about the manufacture, use and end of life of building materials specified in a web-based tool. *www.pharosproject.net*

6.4 Regional Materials

Optional | 4 points maximum

REQUIREMENTS

Use products that were extracted, processed and manufactured within 500 miles of the project for a minimum of 50%, based on cost, of the building materials' value.

Building material types that can qualify for these points include the following (each material can qualify for *1 point*):

- Framing materials
- Exterior materials (e.g., siding, masonry, roofing)
- Flooring materials
- Concrete / cement and aggregate material
- Drywall / interior sheathing materials

Note: Mechanical, electrical and plumbing components cannot be included in this calculation.

RATIONALE

Building materials that are extracted, processed and manufactured locally to the project site minimize the energy embedded in their transportation and contribute to the local economy.

RECOMMENDATIONS

Natural building materials that are approved by HUD or USDA can qualify for points under this measure.

RESOURCES

- GreenSpec Directory, Building Green: The online GreenSpec Directory lists product descriptions for more than 2,000 environmentally preferable products. *http://greenspec.buildinggreen.com/*
- Pharos Project, Healthy Building Network: The Pharos Project provides health and environmental data about the manufacture, use and end of life of building materials specified in a web-based tool. *www.pharosproject.net*

6.5 Certified, Salvaged and Engineered Wood Products

Optional | 1 point

REQUIREMENTS

For at least 25% of all structural wood products, by cost or value, commit to using either:

- Structural wood products certified in accordance with the Forest Stewardship Council
- Salvaged wood products
- Engineered framing materials (note that these may not include urea formaldehyde–based binders (see Criterion 6.2)

$$\frac{\text{Sum of the value of all structural wood products that are certified, salvaged or engineered wood}}{\text{The value of all structural wood products}} = \text{Percentage of total wood products that meet this criterion}$$

RATIONALE

Less than 10% of the old growth forest remains in the United States. The use of salvaged wood and engineered wood products throughout your building for major structural components reduces the need to use old-growth lumber. Forest Stewardship Council–certified wood encourages forestry practices that are environmentally responsible.

RESOURCES

- For help in locating FSC-certified products, fill out the form found at *https://us.fsc.org*. FSC will circulate it to certified companies, and these companies will contact you if they have the desired product(s) available.
- Building Materials Reuse Association: *www.bmra.org*
- Rainforest Alliance, "SmartGuide to Green Building Wood Sources": This site lists U.S. suppliers, manufacturers and distributors of FSC-certified building products. *www.rainforestalliance.org/smartguides*

6.6 Composite Wood Products that Emit Low/No Formaldehyde

Mandatory

REQUIREMENTS

All composite wood products (plywood, OSB, MDF, cabinetry, etc.) must be certified as compliant with California 93120 Phase 2. Or, if using a composite wood product that does not comply with California 93120 Phase 2, all exposed edges and sides must be sealed with low-VOC sealants, per Criterion 6.2.

RATIONALE

Composite wood products using formaldehyde-based binders will emit formaldehyde, which is a volatile organic compound. Symptoms of exposure vary widely and include a host of bodily reactions, including eye, nose and throat irritation, and difficulty breathing. Avoiding products that emit formaldehyde will reduce the quantity of harmful indoor air contaminants.

RECOMMENDATIONS

- Make this requirement part of the specifications for subcontractor submittals. Obtain the manufacturer's specifications to determine whether materials meet this requirement. Seek composite wood products compliant with California 93120 Phase 2. California 93120 is a regulation issued by the California Air Resources Board (CARB) limiting allowable formaldehyde emissions from composite wood products.
- Seek composite wood products with no added formaldehyde-based compounds in the contents. Seek composite wood products with CARB No Added Formaldehyde (NAF) certification.
- If feasible, specify formaldehyde-free hardwood, plywood, particleboard or medium-density fiberboard.

RESOURCES

- In July 2010, the U.S. Congress passed Public Law No: 111–199, the S. 1660: Formaldehyde Standards for Composite Wood Products Act, which updates the Toxic Substances Control Act of 1976 to align with the recent California legislation 93120. More information on Public Law No: 111–199 S.1660 can be found online at *www.govtrack.us/congress/bill.xpd?bill=s111-1660*. A summary of the Toxic Substances Control Act of 1976 can be found online at the EPA's website at *www.epa.gov/lawsregs/laws/tsca.html*.
- The California EPA Air Resources Board, FAQ on Composite Wood Products. *www.arb.ca.gov/toxics/compwood/consumer_faq.pdf*
- The California EPA Air Resources Board approved an Airborne Toxic Control Measure in April 2007 to reduce formaldehyde emissions from composite wood products, including hardwood plywood, medium-density fiberboard and particleboard (Title 17, California Code of Regulations 93120-93120.12, or California 93120). More information can be found at: *www.arb.ca.gov/toxics/atcm/atcm.htm*
- Scientific Certification Systems (SCS): Offers an SCS Indoor Air Advantage + Formaldehyde Free Certification for composite wood products. *www.scscertified.com/products/index.php*

6.7a *Mandatory*
Environmentally Preferable Flooring

REQUIREMENTS

Prohibited Locations

Do not install carpets in building entryways, laundry rooms, bathrooms, kitchens/kitchenettes, utility rooms or any rooms with floors that are in direct contact with the foundation slabs.

Products

Any hard surface flooring products must be either ceramic tile or solid unfinished hardwood floors, or must meet the Scientific Certification System's FloorScore program criteria (including pre-finished hardwood flooring).

All carpet products must meet the Carpet and Rug Institute's Green Label or Green Label Plus certification for carpet, pad and carpet adhesives.

RATIONALE

New carpets, padding and adhesives also release VOCs that may pose health hazards to residents and workers. In addition, carpets trap dust and other allergens. Carpets have a short lifespan (studies suggest 3–5 years), and thus may need frequent replacement. More durable flooring options that last longer and wear better than carpet promote resource conservation through their longevity.

RECOMMENDATIONS

- The use of reclaimed flooring is encouraged, and such flooring need not meet the FloorScore certification. Reclaimed wood flooring should be free of lead-based paint, and tiles should be free of asbestos.
- Throughout the home, consider non-carpet flooring alternatives such as natural linoleum, Forest Stewardship Council (FSC)–certified or salvaged hardwoods, cork, bamboo, ceramic or stone tile, or sealed concrete.
- Make this requirement part of the specifications for subcontractor submittals.

RESOURCES

- The SCS FloorScore program website includes information about the program, as well as a list of certified products that is updated regularly. *www.scscertified.com/iaq/floorscore.html* and *www.rfci.com*.
- The Carpet and Rug Institute maintains a list of manufacturers and products meeting the Green Label Plus standard. *www.carpet-rug.org/CRI-Testing-Programs/Green-Label-Plus.aspx*
- For online comparison of flooring alternatives, see the Healthy Building Network's Pharos Project. *www.pharosproject.net*

6.7b

Optional | 6 points

Environmentally Preferable Flooring: Throughout Building

REQUIREMENTS

Use non-vinyl, non-carpet floor coverings throughout each building in the project.

RATIONALE

Natural and renewable alternative flooring materials have demonstrated environmental benefits, including low levels of volatile organic compounds (VOC) emissions and environmentally friendly production methods. These products are good substitutes for standard products linked with certain health hazards.

RECOMMENDATIONS

- Whenever possible, select resilient flooring that has passed a California 01350 test (FloorScore, CHPS) or NSF/ANSI 332. For California 01350, give highest preference to those that pass the residential version of the test, as the residential test is more stringent.

- Use alternative flooring materials such as natural linoleum, ceramic tile, bamboo, cork or hardwood (especially salvaged wood).
- For basements, leave the slab exposed and stain with low-VOC material rather than providing any floor treatments.

RESOURCES

- GreenSpec Directory, Building Green: The online GreenSpec Directory lists product descriptions for more than 2,000 environmentally preferable products. *http://greenspec.buildinggreen.com/*
- Pharos Project, Healthy Building Network: The Pharos Project provides health and environmental data about the manufacture, use and end of life of building materials specified in a web-based tool. *www.pharosproject.net*
- The U.S. Environmental Protection Agency identified phthalates, a chemical used to make sheet vinyl pliable, as a "chemical of concern" on December 30, 2009. *www.epa.gov/oppt/existingchemicals/pubs/ecactionpln.html*

6.8 *Mandatory* Mold Prevention: Surfaces

REQUIREMENTS

Use materials that have durable, cleanable surfaces throughout bathrooms, kitchens and laundry rooms. Materials installed in these rooms should not be prone to deterioration due to moisture intrusion or encourage the growth of mold.

RATIONALE

The use of durable, cleanable materials in wet areas reduces the potential for damage due to moisture, reduces odors and potentially reduces health hazards to residents. These materials reduce long-term maintenance costs as well.

RECOMMENDATIONS

When possible, avoid using materials such as unsealed grout, which traps and holds moisture and can facilitate mold growth.

RESOURCES

- GreenSpec Directory, Building Green: The online GreenSpec Directory lists product descriptions for more than 2,000 environmentally preferable products. *http://greenspec.buildinggreen.com/*
- GreenGuard Microbial Resistance Listing: *www.greenguard.org/en/CertificationPrograms/listingprograms_copy1/CertificationPrograms_microbialProgram.aspx*

6.9

Mandatory

Mold Prevention: Tub and Shower Enclosures

Except for projects that do not have shower or bathroom work in scope

REQUIREMENTS

Use moisture-resistant backing materials such as cement board, fiber cement board or equivalent per ASTM #D3273 behind tub/shower enclosures. Projects using a one-piece fiberglass tub/shower enclosure are exempt from this requirement.

RATIONALE

The use of moisture-resistant materials in wet areas reduces moisture buildup, diminishing the potential for indoor mold growth that may yield odors and pose health hazards to residents. Proper moisture detailing also improves durability.

RECOMMENDATIONS

When possible, avoid using materials such as unsealed grout, which traps and holds moisture and can facilitate mold growth.

RESOURCES

- American Society for Testing and Materials (ASTM) International: *www.astm.org/*
- GreenGuard Microbial Resistance Listing: *www.greenguard.org/en/CertificationPrograms/listingprograms_copy1/CertificationPrograms_microbialProgram.aspx*

6.10

Optional | 12 points maximum

Asthmagen-Free Materials

REQUIREMENTS

Do not install products that contain ingredients that are known to cause or trigger asthma. Key products to avoid are:

- *Insulation:* Do not use spray polyurethane foam (SPF) or formaldehyde-containing fiberglass batts. *[4 points]*
- *Flooring:* Do not use flexible vinyl (PVC) roll or sheet flooring or carpet backed with vinyl with phthalates. Do not use fluid applied finish floors. *[4 points]*
- *Wall coverings:* Do not use wallpaper made from vinyl (PVC) with phthalates or site-applied high-performance coatings that are epoxy- or polyurethane-based. *[4 points]*
- *Composite wood:* Use only ULEF (Ultra Low Emitting Formaldehyde) or NAF (No Added Formaldehyde) products for cabinetry, subflooring and other interior composite wood uses. *[4 points]*

For all material installation, be sure to closely follow the manufacturer's instructions. Many products require increased ventilation during installation and curing and should be applied/installed only when wearing appropriate safety gear, including, but not limited to, eye protection, respirators, gloves and skin protection. If residents are in place while potentially hazardous materials are being used, take extra precautions. Residents should be moved out of the building during the product application and for the duration of the curing period noted by the manufacturer.

RATIONALE

Research has shown that asthma may be triggered by certain chemicals that are widely used in certain building materials.

- Isocyanates are used in SPF, fluid applied floors and polyurethane high performance coatings.
- Phthalates are used to make PVC/vinyl flexible.
- BADGE, a binder material formed from Bisphenol A and epichlorohydrin, is used to make fluid applied floors and epoxy high-performance paints and other epoxy coatings applied on-site.
- Formaldehyde, a carcinogen, is used in binders for some fiberglass insulation batts and in plywood, particleboard and other composite woods.

RECOMMENDATIONS

- *Insulation:* Alternatives include recycled cotton, cellulose, wool and fiberglass with no binder. The majority of fiberglass insulation manufacturers now offer formaldehyde-free batts.
- *Flooring:* In place of vinyl or other PVC-based resilient flooring, use natural linoleum, rubber, cork, ceramic tile or pre-finished solid wood flooring. If you must use vinyl, ensure that it does not have phthalates. If possible, use a floor system that can feature mechanical attachments (e.g., nails, floating wood flooring) instead of glues. This approach makes flooring easier to recycle in the future.
- *Wall coverings and window treatments:* If you must use vinyl, ensure that it does not have phthalates.
- *Composite wood:* The most common alternative binder for wood is MDI, which is made with isocyanates. MDI is a lower hazard than formaldehyde as it cures more completely in the factory, but use alternative binders instead of MDI where possible. Seek resins that are more than half biobased. Many "soy-based" polyurethanes have only 5–20% soy and are mostly still made with asthma-causing isocyanates.
- Other areas to watch for:
  - PVC roofing membranes use phthalates as well. Use thermoplastic polyolefin (TPO) based roofing instead.
  - Many adhesives are epoxy-based (made with BADGE) or polyurethane-based (made with isocyanates). Minimize large volume usage of adhesives where possible and use lowest VOC types where needed.
  - Avoid furniture made with particleboard and other composite woods made with formaldehyde-based binders.
  - Carpet backings are sometimes made with flexible PVC or polyurethane. Choose carpets with phthalate-free PVC or other thermoplastic backings such as polyethylene or polypropylene. Avoid carpets and interior textiles with perfluorocarbons (PFCs, in particular PFBS and PFHxA).
- Alternatives may not be available for every product, but when possible prioritize those with low VOC content and emissions by receiving indoor air quality (IAQ) certifications that meet or exceed CA 01350 standard for VOC emissions, including SCS Indoor Advantage Gold and GreenGuard Gold or laboratory tests for the CDPH/EHLB Standard Method V1.1–Residential scenario.

RESOURCES

- The Pharos Project is an online building material selection tool that maintains listings of product contents disclosed by manufacturers and supplemented by Healthy Building Network (HBN) staff research, and identifies hazards associated with the contents. Products can be screened for asthmagens. *www.pharosproject.net*
- The Health Product Declaration (HPD) is a standardized format for manufacturer disclosure of product content, emissions and health hazards associated with the content. Manufacturers voluntarily use the format and may distribute it as they do MSDS's or Technical Data Sheets. The Health Product Declaration Collaborative maintains the HPD Standard and a list of tool providers who offer databases of HPDs. *http://hpdcollaborative.org/*
- "Full Disclosure Required: A Strategy to Prevent Asthma through Building Product Selection" is a report by the Healthy Building Network identifying asthmagens that are included as contents in building materials and making recommendations for product improvement. *www.healthybuilding.net/content/research-and-reports*
- The Carpet and Rug Institute maintains a list of manufacturers and products meeting the Green Label Plus standard. *www.carpet-rug.org/CRI-Testing-Programs/Green-Label-Plus.aspx*

6.11 *Optional | 5 points*
Reduced Heat-Island Effect: Roofing

REQUIREMENTS

Option 1

Use an ENERGY STAR–certified roofing product for 100% of the roof area.

OR

Option 2

Install a "green" (vegetated) roof for at least 50% of the roof area and ENERGY STAR–certified roofing product for the remainder of the roof area.

RATIONALE

Urban heat islands increase local air temperatures due to the absorption of solar energy by the built environment. Reducing the heat-island effect decreases energy consumption by decreasing loads on cooling systems, and it enhances resilience by reducing overheating of buildings in the event of power outages when air conditioning cannot operate.

RECOMMENDATIONS

Avoid PVC membrane roofing, which is manufactured using phthalates, a chemical listed on December 30, 2009, by EPA as a "chemical of concern" to human health: *www.epa.gov/oppt/existingchemicals/pubs/ecactionpln.html*

RESOURCES

- Cool Roof Rating Council (CRRC), Directory of Rated Products: CRRC maintains a third-party rating system of radiative properties of roof surfacing materials. *http://coolroofs.org/products/results*

- U.S. Environmental Protection Agency, Heat Island Effect: This site contains information about heat-island effect, its social and environmental costs, and strategies to minimize its prevalence, including shading and coloration of hardscapes. *www.epa.gov/heatisland*
- Lawrence Berkeley National Laboratory, Heat Island Group: The Lawrence Berkeley National Laboratory conducts research to find, analyze and implement solutions to minimizing heat-island effects; its current efforts focus on the study and development of more reflective surfaces for roadways and buildings. *http://eetd.lbl.gov/*

6.12 Construction Waste Management

Mandatory or Optional | 6 points maximum

REQUIREMENTS

Commit to following a waste management plan that reduces non-hazardous construction and demolition waste through recycling, salvaging or diversion strategies.

Mandatory: All projects must select either one pathway in Option 1 (a or b), two pathways in Option 2 (c–h), or one pathway in Option 3 (i or j). No points are accrued for compliance with this mandatory requirement.

Optional: Projects may select additional pathways to accrue optional points. These pathways may be from within a different Option from what the project chose to comply with as mandatory. Not to exceed 6 optional points.

Option 1: Measured by Percentage *(Mandatory: select one)*

a. Provide a waste plan that diverts 50% of the construction waste from the landfill. *[1 point]*
b. Provide a waste plan that diverts 75% of the construction waste from the landfill. *[2 points]*

Option 2: Material Specific *(Mandatory: select two)*

c. Recycle all cardboard. *[1 point]*
d. Recycle all wood. *[1 point]*
e. Recycle all drywall. *[1 point]*
f. Recycle all metals. *[1 point]*
g. Recycle all concrete, brick and asphalt. *[1 point]*
h. Develop and implement a comprehensive efficient framing plan that minimizes all waste by design. *[1 point]*

Option 3: Minimizing Construction Waste — New Construction only *(Mandatory: select one)*

i. Total construction waste to landfill or incinerator <2.5 lbs/SF of building *[1 points]*
j. Total construction waste to landfill or incinerator <1.5 lbs/SF of building *[2 points]*

RATIONALE

Diverting construction debris, and recycling and reusing materials whenever possible, reduces waste and disposal costs. In addition, construction waste management reduces the project's impact on landfills.

RECOMMENDATIONS

- Investigate and document local options for recycling or reusing all anticipated major constituents of the project waste stream, including cardboard packaging and "household" recyclables (e.g., beverage containers).
- Create detailed framing plans or scopes of work and accompanying architectural details for use on the job site. Create a detailed cut list and lumber order prior to construction.
- For projects with limited access to recycling centers, consider waste diversion strategies such as using panelized walls and roof trusses to minimize total materials.
- Consider recycling carpet for rehab projects when carpeting is being removed. The specification language below may be customized and included to determine whether carpet recycling is feasible and cost-effective in your locale.
  - Vendor shall supply a price quote to recycle carpet and carpet components at 100%, 50% and 30% of product tonnage.
  - Property manager shall identify the carpet product and polymer, nylon, polypropylene (which is documented on carpet specification). This will enable the carpet vendor to ascertain the recyclability of the product.
- Some manufacturers of drywall and certain types of ceiling tiles will accept the return of old materials for re-processing.

RESOURCES

- U.S. Environmental Protection Agency, *Waste Management and Recovery: A Field Guide for Residential Remodelers*. *www.epa.gov/osw/conserve/imr/cdm/pubs/remcover.pdf*
- NAHB Research Center, Best Practices for Construction Waste Management: This site includes frequently asked questions, case studies, reports and various links. It includes *A Builder's Field Guide*, which includes guidance for creating a step-by-step construction waste management and recovery plan. *www.toolbase.org/Best-Practices/Construction-Waste/waste-mgmt-field-guide*
- U.S. Environmental Protection Agency, WasteWise Program: This site has information about the WasteWise Building Challenge program, including articles, publications, and various links and resources for more information. *www.epa.gov/wastewise/targeted/challenge/cbres.htm*
- U.S. Environmental Protection Agency, Construction and Demolition Debris: This site includes basic information on construction and demolition debris disposal practices, regional and state programs, publications, and links. *www.epa.gov/epawaste/conserve/imr/cdm/index.htm*
- Construction & Demolition Recycling Association (CDRA): This site includes links to websites on recycling concrete, asphalt roof shingles and drywall, as well as a state-by-state listing of construction waste reusers and recyclers. *www.cdrecycling.org*

6.13 *Optional | 3 points*
Recycling Storage

REQUIREMENTS

Provide separate bins for the collection of trash and recycling for each dwelling unit and all shared community rooms (if applicable).

Additionally, in multifamily buildings provide at least one easily accessible, permanent and dedicated indoor area for the collection and storage of materials for recycling. And in single-family homes, note that points will be accrued only if curb-side recycling pickup is available.

Collected materials should include, at a minimum, paper, cardboard, glass, metals and plastics.

RATIONALE

Recycling prevents usable materials from entering the waste stream. Providing bins within the living space for the separation of recyclables from trash encourages higher rates of recycling. Similarly, a dedicated indoor space for recycling encourages higher adoption rates.

RECOMMENDATIONS

- Ensure that the recycling program has management support.
- Ensure that signage and bin colors are consistent across the project, and with local community norms where applicable.
- Designate an area for recyclable collection and storage that is appropriately sized and located in a convenient area.
- Identify local waste handlers and buyers for glass, plastic, metals, office paper, newspaper, cardboard and organic wastes.
- In multifamily buildings, instruct occupants on recycling procedures through clear and visible signs that include pictures and that are translated into a variety of languages spoken by residents.
- Include the recycling policies and procedures in the Resident Manual (Criterion 8.3).
- Ensure that project staff follow procedures for collecting recyclables for your recycling hauler, and include those procedures in the project maintenance manual.

RESOURCES

- Enterprise Community Partners Resource Center: Enterprise Green Communities hosts a variety of resident engagement tools and trainings, including a module on waste reduction and recycling. Search for "Resident Engagement" at this link: *www.enterprisecommunity.com/resources*
- New York City Department of Sanitation, What to Recycle with Sanitation: New York City's Department of Sanitation maintains a host of good background information on recycling basics. Contact your city/county about local recycling policies and procedures. *www.nyc.gov/html/nycwasteless/html/recycling/recycle_what.shtml*

HEALTHY LIVING ENVIRONMENT

Reducing contaminants and optimizing ventilation improve indoor air quality and project durability, and universal design and active design measures promote physical mobility.

Mandatory: New Construction and Substantial Rehab
Optional: Moderate Rehab | 12 points maximum

7.1 Ventilation

REQUIREMENTS

For each dwelling unit, in full accordance with ASHRAE 62.2-2010, install:

- A local mechanical exhaust system in each bathroom *[4 points if Moderate Rehab]*
- A local mechanical exhaust system in each kitchen *[4 points if Moderate Rehab]*
- A whole-house mechanical ventilation system *[4 points if Moderate Rehab]*

Note: Local exhaust airflow may be credited toward the whole-house ventilation airflow requirement when local exhaust fans are used to provide whole-house mechanical ventilation.

Also, for each multifamily building of four stories or more, in full accordance with ASHRAE 62.1-2010, install:

- A mechanical ventilation system for all hallways and common spaces *[3 points if Moderate Rehab]*

For all project types, in addition to the above requirements:

- All systems and associated ductwork must be installed per manufacturer's recommendations.
- All individual bathroom fans must be ENERGY STAR–labeled, wired to turn on with the light switch, and equipped with a humidistat sensor, timer or other control (e.g., occupancy sensor, delay off switch, ventilation controller).
- If using central ventilation systems with rooftop fans, each rooftop fan must be direct-drive and variable-speed with speed controller mounted near the fan. Fans with design CFM 300-2000 must also have an ECM motor.

Note: For Substantial and Moderate Rehab projects, particularly those of a historic or landmark nature, consult Appendix A of ASHRAE 62.2-2010 for compliance options for ventilation in existing buildings.

RATIONALE

Optimal ventilation improves indoor air quality, contributing to a healthier living environment.

Properly sized and controlled exhaust fans in bathrooms and kitchens remove moisture-laden air, lowering the potential for indoor mold growth that may yield odors, pose health hazards to residents and create durability concerns. Kitchen fans also help remove carbon dioxide and carbon monoxide over fuel-burning appliances and other air contaminants that may be byproducts of cooking. And ENERGY STAR–qualified bathroom fans use 65% less energy on average than standard models and move more air per unit of energy used with less noise. Timers and humidistat sensors help to ensure that fans regularly remove moisture and provide adequate ventilation.

RECOMMENDATIONS

- For climate-specific strategies, consult ASHRAE 62.2-2010 and the Resources below.
- For projects located in humid climates, supplemental dehumidification may be necessary to maintain comfort during times of high ambient relative humidity. Design a system with the capacity to meet ASHRAE requirements, and then provide additional accommodations to adjust the outside air introduced as needed.

- Avoid exceeding ventilation requirements, particularly when using local exhaust. Excessive exhaust may depressurize dwelling units, potentially back-drafting combustion appliances.
- Proper installation of each ventilation system is as critical as its design to its performance. Consult the Resources below for best-practice installation techniques. Also consider testing exhaust fan performance at rough-in: Hold two squares of toilet paper to the exhaust fan. If, when on, the fan can hold these squares, as a rule of thumb you may assume that the fan is pulling 50 CFM. If the fan is not able to hold the squares of toilet paper, examine the fan's installation.
- Placing a single multi-port, in-line fan in each dwelling unit to exhaust air from the kitchen and bathroom(s) is an acceptable ventilation strategy. If utilizing this strategy, in addition to meeting local code requirements for the minimum distance of thru-wall exhaust vents from windows, ensure that the placement of the exhaust grill meets code requirements for kitchen ventilation.
- With continuous, demand-controlled or other centralized ventilation systems, the project team (specifically, the designer, installer and maintenance staff) should ensure that the systems are balanced from unit to unit to meet the requirements of ASHRAE 62.2-2010. Also, consider installing fans with ECM motors for fans designed to exhaust more than 250 CFM.
- Consider the following mechanical controls for introducing outside air:
  - Flow control/butterfly damper to regulate the amount of air introduced through an outside air intake.
  - Shut-off damper (electronic or barometric) to close an outside air intake when the HVAC system is not calling for air.
  - Fan timer/cycler on the HVAC system to regulate the length of time an outside air intake remains open.

RESOURCES

- ASHRAE Standard 62.2-2010: This site provides a viewable version of ASHRAE Standard 62.2-2010. *www.ashrae.org/technology/page/548*
- "Ventilate Right: Ventilation Guide for New and Existing California Homes": This site provides this thorough, user-friendly guide to the intent of installing ventilation systems in accordance with ASHRAE 62.2 as well as best practices in ventilation system design and installation. Equally applicable to projects outside the state of California. *www.resaveguide.lbl.gov*
- Building America Solution Center: This searchable database includes pictorial guides for best practices in ventilation system design and installation. *https://basc.pnnl.gov/resource-guides*
- Building Science Corporation, "Review of Residential Ventilation Technologies": This report reviews current and potential ventilation technologies for residential projects, with particular emphasis on North American climates and construction. *www.buildingscience.com/documents/reports*
- ENERGY STAR: This website describes the advantages of ENERGY STAR–labeled ventilation fans and provides product and manufacturer lists. *www.energystar.gov/index.cfm?c=vent_fans.pr_vent_fans*
- Home Ventilating Institute (HVI), Ventilation Systems and Controls: The HVI provides consumers an assurance of product performance. It also works to increase public awareness of the need for good ventilation and provides resources for selecting the proper ventilation products. *www.hvi.org/* and *www.hvi.org/assets/pdfs/Ventilation_Controls_for_Life-Styles.pdf*

- University of Minnesota, Common Questions about Heat and Energy Recovery Ventilators: This site provides a brief, easy-to-understand overview of heat- and energy-recovery ventilators. *www.extension.umn.edu/distribution/housingandclothing/DK7284.html*

7.2 *Mandatory* Clothes Dryer Exhaust

REQUIREMENTS

Clothes dryers must be exhausted directly to the outdoors using rigid-type ductwork, except for condensing dryers, which must be plumbed to a drain.

RATIONALE

Outdoor venting of clothes dryers substantially reduces air moisture that can lead to mold growth. Outdoor venting also removes odors and allergens from scented detergents and fabric softeners that contain volatile organic compounds (VOCs) from the conditioned space.

RECOMMENDATIONS

- It is important to minimize the length of the duct run to avoid buildup of moisture and particles that can inhibit the flow of air. Rigid duct materials are preferred to help ensure clean ducts and reduced buildup of particles and moisture.
- Locating the dryer on an exterior wall will allow a minimized duct run for the exhaust.

7.3 *Mandatory* Combustion Equipment

REQUIREMENTS

For new construction and rehab projects, specify power-vented or direct-vent equipment when installing any new combustion appliance for space or water heating that will be located within the conditioned space.

In Substantial and Moderate Rehabs, if there is any combustion equipment located within the conditioned space for space or water heating that is not power-vented or direct-vent and that is not scheduled for replacement, conduct initial combustion safety testing. Conduct the combustion safety testing for central systems and for 10% of these individual dwelling unit systems per RESNET or BPI Combustion Safety Test Procedures. Report any deficiencies immediately to the owner or owner's representative in any failed tested system.

Install one hard-wired carbon monoxide (CO) alarm with battery backup function for each sleeping zone, placed per National Fire Protection Association (NFPA) 720.

Projects without any combustion equipment (i.e., space and water heating equipment, cook tops, dryers or any other combustion equipment) and projects with combustion equipment located only in detached utility buildings or open-air facilities are exempt from this measure.

RATIONALE

Direct-vent appliances bring outdoor air through a sealed pipe and help exhaust combustion products directly outdoors through another hard-piped vent. No indoor air is used, so there is very little risk of spillage or back-drafting. Power-vented appliances rely on indoor air, but use a fan to push exhaust products through the flue to the outside. These are much less susceptible to spillage and back-drafting than conventional units.

RECOMMENDATIONS

CO and smoke detectors may be hard wired to the heating and DHW system, thus activating if that equipment malfunctions.

RESOURCES

- U.S. Environmental Protection Agency, Combustion Products and Carbon Monoxide: These two extensive EPA sites describe the sources of carbon monoxide and other combustion gases, their health effects, steps to reduce exposure, and related standards and guidelines, and provide additional resources and links. *www.epa.gov/iaq/combust.html* and *www.epa.gov/iaq/co.html*
- Canada Mortgage and Housing Corporation (CMHC): This site is part of CMHC's "About Your House" series of educational articles. It includes information about combustion gases, the effects of exposure and strategies for limiting exposure. *www.cmhc-schl.gc.ca/en/co/maho/yohoyohe/inaiqu/inaiqu_004.cfm*
- NFPA 720 contains requirements for the performance, installation, operation, inspection, testing and maintenance of CO detection and warning equipment. These requirements address installations of commercial systems and components as well as installations of single- and multiple-station CO alarms and household CO detection systems. *www.nfpa.org/codes-and-standards/document-information-pages?mode=code&code=720*
- Underwriters Laboratories, Product Safety Tips: CO Alarms: This site provides a basic overview of the problems associated with carbon monoxide, as well as tips about purchasing and installing carbon monoxide alarms. *www.ul.com/global/eng/pages/corporate/newsroom/storyideas/carbonmonoxide/tips/*
- U.S. Consumer Product Safety Commission: "Carbon Monoxide Questions and Answers": *www.cpsc.gov/cpscpub/pubs/466.html*
- Building Performance Institute, Combustion Safety Procedures: This site provides a set of guidelines regarding combustion safety when conducting audits and diagnostic testing. *www.bpi.org/tools_downloads.aspx?selectedTypeID=1&selectedID=2*

7.4 Elimination of Combustion Within the Conditioned Space

Optional | 9 or 11 points

REQUIREMENTS

Option 1

No combustion equipment used for cooking (to include, but not limited to, ranges, cooktops, stoves, ovens) as part of the building project. *[9 points]*

OR

Option 2

No combustion equipment used as part of the building project. *[11 points]*

RATIONALE

The process of combustion releases pollutants. Natural gas cooking burners have been shown to emit substantial quantities of pollutants. Eliminating combustion equipment from a building project eliminates the possibility of negative resident and staff health impacts due to exposure to combustion byproducts.

RECOMMENDATIONS

Higher-performance building envelopes with very small heating and cooling loads may be satisfied with high-efficiency electric heat.

RESOURCES

- "Pollutant Exposures from Natural Gas Cooking Burners: A Simulation-Based Assessment for Southern California." Jennifer M. Logue, Neil E. Klepeis, Agnes B. Lobscheid, Brett Singer: Residential natural gas cooking burners (NGCBs) can emit substantial quantities of pollutants, and they are typically used without venting range hoods. *http://ehp.niehs.nih.gov/1306673/*
- "Take Care in the Kitchen: Avoiding Cooking-Related Pollutants." Nate Seltenrich: *http://ehp.niehs.nih.gov/122-a154/* or Environmental Health Perspectives 122:A154–A159: *http://dx.doi.org/10.1289/ehp.122-A154*

7.5 Vapor Retarder Strategies

Mandatory

For all New Construction projects and those Rehab projects with foundation work in scope

REQUIREMENTS

Beneath Concrete Slabs *(including those in basements and crawl spaces)*

- Install a capillary break as follows: 4-inch layer of ½-inch diameter or greater clean aggregate
  OR
  Install a 4-inch uniform layer of sand, overlain with a layer or strips of geotextile drainage matting installed according to the manufacturer's instructions
- Immediately above the capillary break, install at least 6-mil polyethylene sheeting overlapped at least 6 inches at the seams to serve as a vapor retarder in direct contact with the slab above.

Beneath Crawl Spaces

- Install at least 8-mil cross-laminated polyethylene on the crawl floor, extended up at least 12 inches on piers and foundation walls, and with joints overlapping at least 12 inches. The 8-mil and the cross-lamination ensure longevity of the poly.
- Line the likely "high-traffic" areas of the crawl space with foam board, so the polyethylene beneath will not be disturbed.

RATIONALE

Water can migrate through concrete and most other masonry materials. Proper foundation drainage prevents water from saturated soils from being pushed by hydrostatic pressure through small cracks. Vapor retarders and waterproofing materials can greatly reduce the migration of moisture that can occur even in non-saturated soils.

RECOMMENDATIONS

- Where a high water table is anticipated or observed or has been documented in the soil boring report, or where specifically recommended by the geotechnical engineer, provide subsurface drain tile or other drainage system in strict accordance with the geotechnical engineer's or other qualified professional's recommendations to divert underground water away from the structure.
- Ensure that subsequent trades' work does not puncture the vapor retarder.

RESOURCES

- Advanced Energy: Comprehensive design and installation guidelines. *www.crawlspaces.org*
- Building Science Corporation: Features articles on conditioned crawl spaces. *www.buildingscience.com/resources/cond-crawlspaces*
- Building Science Corporation: Guidance regarding design and installation of below-grade walls. *www.buildingscience.com/resources/high-r-value-foundation-assemblies*.
- The Energy & Environmental Building Alliance: This organization provides links to building science topics by climate. *www.eeba.org/resources/climate/index.html*
- U.S. Department of Energy, Office of Energy Efficiency & Renewable Energy, Building America: Free downloads on best building practices. *www1.eere.energy.gov/buildings/building_america/about.html*
- The Partnership for Advanced Technology in Housing: This site has an extensive, searchable resource section with pertinent information about construction solutions. *www.pathnet.org*

7.6 *Mandatory* Water Drainage

For all New Construction projects and those Rehab projects that include replacing particular assemblies called out below

REQUIREMENTS

Provide water drainage away from walls, windows and roofs by implementing the following techniques:

Water Management: Wall Systems

- Provide a continuous housewrap/weather-resistive barrier with sheets lapped shingle-style to prevent bulk water that penetrates the finished exterior cladding system from entering the wall assembly or being introduced through window or door openings or through other penetrations. Alternatively, install a fluid applied weather-resistive barrier in accordance with manufacturer's instructions.
- Flashings at roof/wall intersections and wall penetrations (i.e., plumbing, electrical, vents, HVAC refrigerant lines and the like in addition to windows and doors) must be integrated with the weather-resistive barrier and drainage plane to prevent bulk water from entering the exterior wall assembly.
- Provide a pathway for bulk water that may be behind the exterior cladding system to safely exit the exterior wall assembly. For example, a drainage plane and weep holes for brick-clad structures.

Water Management: Roof Systems

- Install drip edge at entire perimeter of roof.
- At wall/roof intersections, maintain ≥2" clearance between wall cladding and roofing materials, install flashing along the intersection, and use kick-out flashing.

RATIONALE

Diverting water from the project prevents bulk water entry into wall systems, which can contribute to moisture-related problems such as mold and the deterioration of wood and other building materials. Properly installed weather barriers, including flashing and drainage planes, help direct water away from wall cavities.

RECOMMENDATIONS

Ensure that a vapor retarder with an appropriate permeability rating is installed on the correct side of the wall assembly, based on climate considerations and drying potential.

RESOURCES

- U.S. Department of Energy, Building Technologies Office: Free downloads on best building practices. *www1.eere.energy.gov/buildings/building_america/about.html*
- U.S. Environmental Protection Agency, Indoor airPLUS Construction Specifications: Includes detailed construction specifications, several of which are focused on moisture management. *www.epa.gov/indoorairplus/technical/moisture*
- The Energy & Environmental Building Alliance, Water Management Guide: Excellent installation details for weather-resistive barriers and flashing. *www.eeba.org/bookstore/prod-Water_Management_Guide-9.aspx*

7.7 *Mandatory*
Mold Prevention: Water Heaters

REQUIREMENTS

Provide adequate drainage for water heaters that includes drains or catch pans with drains piped to the exterior of the dwelling.

Water heaters should be located in rooms with non–water-sensitive floor coverings. Drain pans should be sloped and corrosion-resistant (e.g., stainless or plastic) with drains at the low point. Condensate lines should be drained to a drainage system, and not just deposited under slab.

Note: Tankless water heaters do not require drains or catch pans with drains piped to the exterior of the building.

RATIONALE

The use of heaters with drains and catch pans prevents moisture problems caused by leakage or overflow. This prevents water from sitting idle, creating excess moisture and allowing mold to germinate.

RECOMMENDATIONS

- Buildings with one or more central water heaters should comply with ASHRAE Standard 188P to assess and manage the risks associated with *Legionella* in building water systems. Private water supplies should be tested to ensure that water does not have biological or chemical contaminants.
- If local code does not permit draining to the exterior of the project, water heaters can be drained directly to the sewer line.

RESOURCES

- American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc., Standard 62.1-2007 User's Manual. *www.techstreet.com/cgi-bin/detail?product_id=1571685*
- International Code Council, "Mold: Tips on Prevention and Control." *www.iccsafe.org/Store/Pages/Product.aspx?id=7310S*
- Canada Mortgage and Housing Corporation's "Fighting Mold": For information on mold identification and remediation in existing homes. *www.cmhc-schl.gc.ca/en/co/maho/yohoyohe/momo/momo_005.cfm*

7.8 *Mandatory*
Radon Mitigation

New Construction and Substantial Rehab

REQUIREMENTS

New Construction

In EPA Zone 1 areas, install passive radon-resistant features below the slab. Also install a vertical vent pipe with junction box within 10 feet of an electrical outlet in case an active system should prove necessary in the future. Use of the following standard is recommended: ANSI-AARST Standard: *Reducing Radon in New Construction: 1 & 2 Family Dwellings and Townhouses*, CCAH-2013.

Substantial Rehab

Substantial Rehab projects located in EPA Zone 1 areas should be tested under the supervision of a radon professional for the presence of radon in accordance with the American Association of Radon Scientists and Technologists' Protocol for Conducting Radon and Radon Decay Product Measurements in Multifamily Buildings (ANSI-AARST MAMF-2012). In time-sensitive situations, consistent with HUD's radon policy, a radon professional may sample a minimum of 25% of randomly selected ground-level dwelling units.

If the radon level is above the EPA action level of 4 pCi/L (pico curies per liter), install radon-reduction measures per ANSI-AARST Provisional Standard: Radon Mitigation Standards for Multifamily Buildings ANSI/AARSTR RMS-MF (PS) 2013 or ASTM E 2121-11: Standard Practice for Installing Radon Mitigation Systems in Existing Low-Rise Residential Buildings.

A radon professional shall have:

- Certification from either the American Association of Radon Scientists and Technologists' (AARST) National Radon Proficiency Program (NRPP) or the National Radon Safety Board (NRSB), and
- Certification/License from the state in which the testing or mitigation work is being conducted, if the state has this requirement.

RATIONALE

Radon is the leading environmental cause of cancer mortality in the United States. Exposure to radon is the second leading cause of lung cancer in the U.S., after smoking. A smoker who is also exposed to radon has a much higher risk of lung cancer. The only way to know if homes have elevated radon levels is to test. Testing is easy and inexpensive, and elevated radon levels can be reliably mitigated, if necessary, with simple, durable and commonly available materials and techniques.

RECOMMENDATIONS

- Elevated levels of radon have been found in homes built in all three zones on EPA's Map of Radon Zones. Consult your state radon program for current information about radon in your area. *www.epa.gov/radon/whereyoulive.html*
- EPA recommends that all homes built with radon-resistant features in EPA Radon Zone 1 pre-emptively include a radon vent fan. EPA also recommends radon-resistant features for homes built in EPA Radon Zones 2 and 3, along with testing for radon prior to occupancy. A radon vent fan should be installed when the test result is 4 pCi/L or more.
- Guidance for underground garages:
  - International Mechanical Code (IMC), which requires 0.75 cfm/sf for garages serving multifamily projects, and ASHRAE Standard 62.1-2010 section 5.15, which encourages maintaining attached garage air pressure at or below adjacent occupiable spaces.
  - If the pressure management strategy is not designed to continually maintain negative pressure in the underground garage space relative to the occupied spaces (i.e., if a timer is used for exhaust fan control), then radon control is not assured. In such situations, use either the radon-resistant New Construction techniques summarized in IAP spec 2.1 (*www.epa.gov/indoorairplus/pdfs/construction_specifications.pdf*) and detailed further in EPA guidance and/or test the occupied space for radon.

  - If the underground garage does not cover the entire foundation (i.e., some living space is directly above a slab or crawlspace), then those portions of the project should be handled per Indoor airPLUS specs.
  - Any mechanical or service closets in the garage area that are connected to the conditioned enclosure should be aggressively sealed between the garage and the conditioned space.
- For projects located on brownfields or proximate to industrial operations that are not in EPA Zone 1, consider testing for radon to determine if elevated levels exist on-site. If the radon level is elevated above 4 pCi/L (pico curies per liter), install radon-reduction measures.

RESOURCES

- U.S. Environmental Protection Agency. *www.epa.gov/radon/zonemap.html*. Or contact your state radon coordinator through the state health office to determine if your project is located in a Zone 1 radon area. *www.epa.gov/radon/whereyoulive.html*
- U.S. Environmental Protection Agency, "Protocols for Radon and Radon Decay Product Measurements in Homes." *www.epa.gov/radon/pdfs/homes_protocols.pdf*
- National Center for Healthy Housing, "Radon-Resistant Construction: Low-Rise Multi-Family Housing." *www.nchh.org/Training/Green-and-Healthy-Housing.aspx*
- U.S. Environmental Protection Agency, "Building Radon Out." 2006 (#EPA/402-K-01-002). *www.epa.gov/radon/pdfs/buildradonout.pdf*
- U.S. Environmental Protection Agency, "Standard Practice for Installing Radon Mitigation Systems in Existing Low-Rise Residential Buildings." *www.epa.gov/radon/pubs/mitstds.html*
- American Lung Association, Radon Fact Sheet: This is a general overview of the health risks associated with radon exposure. *www.lungusa.org/healthy-air/home/resources/radon.html*
- Washington State, Extension Energy Program, "Builder's Field Guide": Chapter 2 of this field guide provides tips, procedures and schematics for understanding how to mitigate radon risks during new construction. *www.energy.wsu.edu/Documents/Builders_Field_Guide-2006.pdf*
- ASTM E 2121-11 Standard Practice for Installing Radon Mitigation Systems in Existing Low-Rise Residential Buildings. *www.astm.org/Standards/E2121.htm*
- ASTM E 1465-08a Standard Practice for Radon Control Options for the Design and Construction of New Low-Rise Residential Buildings. *www.astm.org/Standards/E1465.htm*
- ANSI-AARST Provisional Standard: *Radon Mitigation Standards for Multifamily Buildings* ANSI/AARSTR RMS-MF (PS) 2013. *www.aarst.org/bookstore.shtml*
- ANSI-AARST Standard: *Reducing Radon in New Construction: 1&2 Family Dwellings and Townhouses*, CCAH-2013. *www.aarst.org/bookstore.shtml*
- ANSI-AARST Standard: *Protocols for Conducting Radon and Radon Decay Product Measurements in Multifamily Buildings*, MAMF 2012. *www.aarst.org/bookstore.shtml*
- AARST Standard: *Protocols for Radon Measurements in Homes*, MAH September 2005. *www.aarst.org/bookstore.shtml*

7.9 *Mandatory* Garage Isolation

REQUIREMENTS

- Provide a continuous air barrier between the conditioned space and any garage space to prevent the migration of contaminants into the living space. Visually inspect common walls and ceilings between attached garages and living spaces to ensure that they are air-sealed before insulation is installed.
- Do not install ductwork or air handling equipment in a garage.
- Fix all connecting doors between conditioned space and garage with gaskets, or otherwise make substantially airtight with weather stripping.
- Install one hard-wired carbon monoxide (CO) alarm with battery backup function for each sleeping zone of the project, placed per National Fire Protection Association (NFPA) 720.

RATIONALE

Carbon monoxide inhalation can be dangerous to human health. The air barrier and air sealing will help prevent carbon monoxide migration from the garage to the living space, and the CO alarm will help ensure that residents are alerted in the case of accidental accumulation of the gas.

RECOMMENDATIONS

Refer to ASHRAE 62.2 for garage contaminant isolation measures.

RESOURCES

- National Institute of Standards and Technology, "Air and Pollutant Transport from Attached Garages to Residential Living Spaces." This report provides an overview of the major issues, as well as a review of relevant scientific studies and a series of field studies. *www.fire.nist.gov/bfrlpubs/build03/art068.html*
- The Energy & Environmental Building Alliance, "Builder's Guide" series for specific North American climate zones: Cold Climates, Mixed-Humid Climates, Hot-Humid Climates, and Hot-Dry & Mixed-Dry Climates, by Joseph Lstiburek, Ph.D., P.Eng. Building Science Press: Refer to the discussion and construction details regarding air sealing and connected garages. *www.eeba.org/bookstore/cat-Builders_Guides-4.aspx*
- EPA Indoor airPLUS Construction Specifications. *www.epa.gov/indoorairplus/pdfs/construction_specifications.pdf*

7.10 *Mandatory* Integrated Pest Management

REQUIREMENTS

Design for easy inspection of all pest-prone areas (interior and exterior), and engineer slabs and foundations to minimize pest entry.

Seal all wall, floor and joint penetrations with low-VOC caulking or other appropriate nontoxic sealing methods (window screens, door sweeps, escutcheon plates, elastomeric sealants) to prevent pest entry. Use rodent- and corrosion-proof screens (e.g., copper or stainless steel mesh or rigid

metal cloth) for openings greater than ¼-inch. Also pay close attention to sealing off entry points under kitchen and bathroom sinks.

During all future repair work by building staff, utilities and contractors should reseal these areas once repair or installation work is completed.

RATIONALE

Incorporating pest prevention in the design of new buildings and in retrofits for existing buildings increases the durability of the building and, in the end, saves time and money by proactively taking steps to prevent conditions that attract pests. Sealing of cracks and penetrations will minimize entry points for pests such as rodents and cockroaches. Exposure to allergens from pests is linked with asthma and respiratory issues. Rodents may also carry diseases. Avoiding unnecessary pesticides, improving resident housekeeping, and promptly responding to pest problems and conditions that contribute to pests will reduce the chemicals needed to treat pests and will keep homes pest-free longer than a routine chemical treatment program.

RECOMMENDATIONS

- Refer to Maintenance and Resident Manuals (Criteria 8.1 and 8.3) for complementary practices.
- Plan exterior surfaces, lighting, drainage and landscaping to minimize the attractiveness of the site to pests.
- Preventative pest management work should be completed in conjunction with air sealing. Project teams should work with an air sealing contractor and a pest management professional to ensure that IPM strategies are part of the scope.
- Rehabilitation of an existing building provides the opportunity to address physical barriers that make handling garbage difficult. Engage with residents and building maintenance staff to identify and correct problems with the collection and storage of waste (e.g., inadequate space in trash rooms, narrow stairs, improper signage, unsafe access to exterior trash receptacles, etc.).

RESOURCES

- "Pest Prevention by Design: Authoritative Guidelines for Building Pests Out of Structures," San Francisco Department of the Environment. *www.sfenvironment.org/download/pest-prevention-by-design-guidelines*
- "How to Control Pests Safely: Getting Rid of Cockroaches and Mice," New York City Department of Health and Mental Hygiene, under the header "Guide to Safe Pest Control in the Home." *www.nyc.gov/html/doh/html/pest/pest3.shtml*
- The National Center for Healthy Housing, Integrated Pest Management in Affordable Housing: This webpage has resources dedicated to IPM in affordable housing, including model RFPs and contract language for greener pest control, case studies and training. *http://nchh.org/Training/IntegratedPestManagement.aspx*
- "Integrated Pest Management: A Guide for Affordable Housing." *www.stoppests.org/Guide*
- "Pest Prevention Opportunities During Renovation Work" factsheet, New York City Department of Health and Mental Hygiene, Healthy Homes Program, 2014. *www.nyc.gov/html/doh/downloads/pdf/pest/pestcontrol-during-renovation.pdf*

7.11a *Optional | 9 points*
Beyond ADA: Universal Design—New Construction

REQUIREMENTS

Design a minimum of 15% of the dwelling units (no fewer than one) in accordance with ICC/ANSI A117.1, Type A, Fully Accessible guidelines. Design the remainder of the ground-floor units and elevator-reachable units in accordance with ICC/ANSI A117.1, Type B.

RATIONALE

Universal Design has been defined as "the design of products and environments to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design [The Center for Universal Design (1997)]." As applied to residential projects, the principles of Universal Design anticipate and plan for a greater diversity of residents' abilities and needs, both today and in the future, thereby supporting and facilitating both safety and independence for all residents, including older adults, children and individuals with mobility, visual, cognitive or other impairments.

What do we mean by "Beyond ADA"?

As a framework for design, Universal Design is distinct from the goals of accessible or "barrier-free" design. More important, it is also distinct from legally mandated accessibility requirements. Local and federal accessibility laws and regulations provide a base for Universal Design, but define only a minimum level of performance to serve people with disabilities. Furthermore, these laws focus overwhelmingly on requirements for wheelchair users, largely overlooking the broader spectrum of physical, sensory and cognitive disabilities that are far more representative of demographic realities in the United States today.

In referencing "Beyond ADA," we mean to encourage broader thinking beyond the legally mandated accessibility requirements.

RECOMMENDATIONS

- Universal Design features should be considered during the integrative design process and for a maximum percentage of units, if not 100%.
- Make streets and paths universally accessible.
- Create paths that are smooth and sufficiently wide, and that have curb cuts—at street crossings and entry points—and turning radii adequate for a wheelchair or walker.
- Create paths with auditory crossing signals, adequate crossing times, clear signage, visible access ramps, median refuge islands, and connections to walking, cycling and public transit routes.
- Support physical activity among children with disabilities by making parks and playground features accessible for both children and their caregivers.

RESOURCES

- For more information about the ICC/ANSI A117.1 standard: *webstore.ansi.org/RecordDetail.aspx?sku=ICC%2FANSI+A117.1-2003* and *www.iccsafe.org/store/Pages/Product.aspx?id=9033X03#longdesc*
- The Center for Universal Design (1997). The Principles of Universal Design, Version 2.0. Raleigh, N.C.: North Carolina State University. *www.ncsu.edu/ncsu/design/cud/index.htm*

- 2012 Enterprise Green Communities Single and Multifamily Universal Design Specifications. *www.enterprisecommunity.com/resources*
- Mayor's Office for People with Disabilities, New York City Inclusive Design Guidelines. *www.nyc.gov/html/mopd/html/home/home.shtml*

7.11b

Optional | 7 or 9 points

Beyond ADA: Universal Design—Substantial and Moderate Rehab

REQUIREMENTS

Design a minimum of 10% of the dwelling units (one, at minimum) in accordance with ICC/ANSI A117.1, Type A, Fully Accessible guidelines. *[7 points]*

For an additional 2 points: Design the remainder of the ground-floor units and elevator-reachable units with accessible unit entrances designed to accommodate people who use wheelchairs.

RATIONALE

See Rationale for Criterion 7.11a: Beyond ADA: Universal Design—New Construction.

RECOMMENDATIONS

See Recommendations for Criterion 7.11a: Beyond ADA: Universal Design—New Construction.

RESOURCES

See Resources for Criterion 7.11a: Beyond ADA: Universal Design—New Construction.

7.12

Mandatory

Active Design: Promoting Physical Activity Within the Building

REQUIREMENTS

Option 1: Stairs

Provide at least one building stairway for everyday travel between floors, whether in the form of a grand staircase or fire stairs. Provide access to and from all floors via the staircase. Place point-of-decision signage at building entrance and corridor intersections to promote stair use for health and other benefits. Ensure that stairway lighting is consistent with, or better than, building corridor lighting to encourage use.

OR

Option 2: Pathways

For buildings without stairs, or in an instance when using stairs may be hazardous, incorporate at least one strategy inside the building designed to increase frequency and duration of physical activity. Elements such as natural light along pathways, designated resting areas (seating), grab bars, informational displays about walking paths within the building, incremental distance markers, and/or thoughtfully placed exercise equipment in visible and easily accessible shared areas can improve the duration and frequency of physical activity. Include a narrative describing your selection process and how your selected strategy will increase frequency and duration of physical activity.

RATIONALE

Physical inactivity increases the risk of many chronic diseases and conditions, including obesity, hypertension, heart disease, stroke, some cancers and Type 2 diabetes. Two minutes of stair climbing daily burns enough calories to prevent annual average weight gain. Common stairs also encourage social interactions and improve mental health. Climbing 20–34 floors of stairs per week (~3–5 floors per day) is associated with a reduced stroke risk of 29%, and climbing 100–150 floors of stairs per week is associated with a 10–20% decrease in all-cause mortality.

For those residents for whom stairway travel may be dangerous due to their limited functional mobility, other key design considerations may positively influence their level of physical activity. In these instances, building design measures that increase either frequency or duration of physical activity are encouraged.

RECOMMENDATIONS

- Consider bi-level lighting that increases lighting once residents access the stairs and reduces lighting to minimum code levels when not in use. This also provides energy benefits.
- Stairwell finish should provide a pleasant experience to encourage stair use by able-bodied people.
- Focus on stairs rather than elevators as the principal means of vertical travel for those who are able to climb the stairs.
- In high-rise buildings, provide an integrated vertical circulation system that incorporates stair use for travel between adjacent floors, so that elevators are used primarily for vertical travel of four floors or more.
- Consider programming elevators so they do not return to the ground floor and do not rest in the open position when not in use.
- While maintaining at least one (or more if required by code) ADA-accessible elevator to all floors, consider installing skip-stop elevators, where appropriate for the building.

RESOURCES

- City of New York. Active Design Guidelines, 2010. *www.nyc.gov/html/doh/downloads/pdf/environmental/active-design-guidelines.pdf*
- New York City Stair Prompt. *www.nyc.gov/html/doh/downloads/pdf/tcny/takethestairs.pdf*
- Robert Wood Johnson Foundation, Active Living Research. *http://activelivingresearch.org/active-design-supplement-affordable-designs-affordable-housing*
- Centers for Disease Control and Prevention, Healthier Worksite Initiative: Motivational Signs. *www.cdc.gov/nccdphp/dnpao/hwi/toolkits/stairwell/motivational_signs.htm*
- Task Force on Community Preventive Services. The Community Guide—What Works to Promote Health. *www.thecommunityguide.org/pa/environmental-policy/podp.html*
- OCAD University, Georgia Institute of Technology, NYC Department of Health and Mental Hygiene. Active Design Supplement: Affordable Designs for Affordable Housing, 2013. *www.nyc.gov/html/doh/downloads/pdf/environmental/affordable-designs.pdf*
- Stair use for cardiovascular disease prevention. *www.centreepic.org/files/pdf/Recherche/2009_Meyer_P_Stair_Use_4_CV_diz_prev.pdf*

7.13 *Optional | 10 points*

Active Design: Staircases and Building Circulation

Applicable for projects with stairs

REQUIREMENTS

A staircase must be accessible and visible from the main lobby as well as visible within a 25-foot walking distance from any edge of the lobby. Ensure that no turns or obstacles prevent visibility of or accessibility to the qualifying staircase from the lobby, and that the staircase is encountered before or at the same time as the elevators.

From the corridor, accessible staircases should be made visible by:

- Providing transparent glazing of at least 10 square feet (1 square meter) at all stair doors or at a side light

  OR

- Providing magnetic door holds on all doors leading to the stairs

  OR

- Removing door enclosures/vestibules

RATIONALE

Physical inactivity increases the risk of many chronic diseases and conditions, including obesity, hypertension, heart disease, stroke, some cancers and Type 2 diabetes. Two minutes of stair climbing daily burns enough calories to prevent annual average weight gain. Common stairs also encourage social interactions and improve mental health. Climbing 20–34 floors of stairs per week (~3–5 floors per day) is associated with a reduced stroke risk of 29%, and climbing 100–150 floors of stairs per week is associated with a 10–20% decrease in all-cause mortality.

RECOMMENDATIONS

- Provide daylighting at each floor/roof level of the stair(s) using windows and/or skylights of at least 8 square feet (1 square meter) in size.
- Incorporate permanent artwork, murals and/or music into the stair environment.
- Incorporate natural ventilation into the stair environment.
- Highlight interesting views, such as prospects onto nature or outdoor gathering areas.
- Integrate the stair with the principal areas of orientation and travel within the building.

RESOURCES

- City of New York. Active Design Guidelines, 2010. *www.nyc.gov/html/doh/downloads/pdf/environmental/active-design-guidelines.pdf*
- Robert Wood Johnson Foundation, Active Living Research. *http://activelivingresearch.org/active-design-supplement-affordable-designs-affordable-housing*
- Johns Hopkins Center for Injury Research and Policy, NYC Department of Health and Mental Hygiene, Society for Public Health Education, Active Design Supplement: Promoting Safety, Version 2, 2013. This document offers design guidelines on increasing safety while also promoting health and physical activity within the built environment. *www.nyc.gov/html/doh/downloads/pdf/environmental/promoting-safety.pdf*

7.14 Interior and Outdoor Activity Spaces for Children and Adults

Optional | 9 points

REQUIREMENTS

Provide an on-site dedicated recreation space with exercise or play opportunities for adults and/or children that is open and accessible to all residents. The space must be at least 400 square feet (37 square meters), include adult exercise and/or children's play equipment for a minimum of 5–10% of building occupants, and ensure minimum operational hours for use of 10 hours/day at least 3 days/week. Complementary resident engagement strategies may promote outdoor play, exercise, gardening or other physical activity.

RATIONALE

Physical inactivity increases the risk of many chronic diseases and conditions, including obesity, hypertension, heart disease, stroke, some cancers and Type 2 diabetes. Child play and adult exercise reduce the risks of obesity, improve mental health and encourage social interactions. Improving access to places for physical activity can result in a 25% increase in the number of people who exercise at least 3 times per week.

RECOMMENDATIONS

- Provide a physical activity room with exercise equipment and indoor activity spaces for use by residents; post and maintain consistent hours of operation. Open this facility at convenient times (before/after traditional work hours), at least 10 hours per day.
- Locate children's active play areas adjacent to adult exercise spaces, allowing parents to exercise and simultaneously watch over their children at play.
- Design a courtyard, garden, terrace or roof that can serve as outdoor space for children's play and/or adult activities. When designing outdoor spaces, include permanent ground markings to indicate dedicated areas for sports, children's play and adult exercise, and to promote increased active play/exercise.
- Provide a designated outdoor physical activity space for adults.
- In the design of parks and playgrounds, create a variety of climate environments to facilitate activity in different seasons and weather conditions. Provide shaded areas as well as areas that are open to sunlight.
- Locate physical activity spaces in a centrally visible location in the building to help increase awareness and use of these spaces, as well as a sense of safety and security.
- Provide lights on sidewalks and active play areas to extend opportunities for physical activity into the evening.
- Provide views to the outdoors from physical activity/play rooms.

RESOURCES

- City of New York. Active Design Guidelines, 2010. *www.nyc.gov/html/doh/downloads/pdf/environmental/active-design-guidelines.pdf*
- Robert Wood Johnson Foundation, Active Living Research. *http://activelivingresearch.org/active-design-supplement-affordable-designs-affordable-housing*
- OCAD University, Georgia Institute of Technology, NYC Department of Health and Mental Hygiene. Active Design Supplement: Affordable Designs for Affordable Housing, 2013. *www.nyc.gov/html/doh/downloads/pdf/environmental/affordable-designs.pdf*
- Johns Hopkins Center for Injury Research and Policy, NYC Department of Health and Mental Hygiene, Society for Public Health Education, Active Design Supplement: Promoting Safety, Version 2, 2013. This document offers design guidelines on increasing safety while also promoting health and physical activity within the built environment. *www.nyc.gov/html/doh/downloads/pdf/environmental/promoting-safety.pdf*
- Task Force on Community Preventive Services. The Community Guide—What Works to Promote Health. *www.thecommunityguide.org/pa/environmental-policy/improvingaccess.html*
- Caring for our children: National health and safety performance standards; Guidelines for early care and education programs. 3rd edition. American Academy of Pediatrics, American Public Health Association, National Resource Center for Health and Safety in Child Care and Early Education. *http://nrckids.org*

7.15 *Mandatory*
Reduce Lead Hazards in Pre-1978 Buildings

Substantial rehab on buildings constructed before 1978

REQUIREMENTS

Conduct lead risk assessment or inspection to identify lead hazards. Control identified lead hazards using lead abatement or interim controls, using lead-safe work practices that minimize and contain dust. Follow EPA or state and/or local laws and requirements, where applicable. Alternatively, follow standard lead treatments defined by HUD as a series of hazard reduction measures designed to reduce all lead-based paint hazards in a dwelling unit without the benefit of a risk assessment or other evaluation (25 CFR 34.110).

RATIONALE

Exposure to lead dust, lead in soil and deteriorated lead-based paint poses significant risks to young children (<6 years) and pregnant women, affecting long-term neurological development, IQ and learning issues. In rare cases, extreme lead exposure can result in death. Opportunities exist to control lead hazards in pre-1978 buildings as part of renovation projects.

RECOMMENDATIONS

- Replace windows that have deteriorated lead-based paint with energy-efficient windows.
- With the exception of paint that is tested and found not to contain lead-based paint in accordance with 40 CFR 745.82(a), follow renovation requirements of 40 CFR 745 Subpart E and correct the underlying cause of deterioration.

- Perform dust lead clearance testing at the conclusion of renovation work; compare against EPA dust lead clearance standards.
- Remove or cover lead-contaminated soil so that it is inaccessible to children. For gardening, use raised beds with lead-free soil.

RESOURCES

- Find information from the EPA about lead abatement, inspection and risk assessment, as well as find accredited firms, here: *www2.epa.gov/lead/evaluating-and-eliminating-lead-based-paint-hazards*
- Find information from HUD about lead-safe work practices here: *www.hud.gov/offices/lead*

7.16 Smoke-Free Building

Optional | 10 points

REQUIREMENTS

Implement and enforce a no-smoking policy in all common and individual living areas, and within a 25-foot perimeter around the exterior of all residential projects. Lease language must prohibit smoking in these locations and specify that it is a violation of the lease to smoke. The no-smoking restriction applies to all owners, tenants, guests and service people. The use of e-cigarettes is prohibited wherever smoking is prohibited.

RATIONALE

Secondhand smoke is the third leading cause of preventable death in this country. Air filtration and ventilation systems do not eliminate the health hazards caused by secondhand smoke. Smoke from one unit may seep through the cracks, be circulated by a shared ventilation system or otherwise enter the living space of another. In addition to the negative health effects, smoking significantly increases fire hazards and increases cleaning and maintenance costs.

RECOMMENDATIONS

- If implementing a no-smoking policy in an occupied building, plan on a 6–8 month resident engagement effort. Excellent resources exist—see below.
- If working with a new or an unoccupied building, all building marketing materials should clearly state the smoke-free policy. Project owners and managers should inform residents that they are prohibited from smoking in or around the property. This information should be incorporated into the Resident Manual as well as manuals for building management and maintenance staff (see Criteria 8.1 and 8.2).
- A designated outdoor smoking area should be provided as an alternative arrangement for those who smoke or vape. Design this area to be as attractive as possible, and provide shelter from the elements in order to encourage smokers to smoke in this location rather than inside the building or within the 25-foot–perimeter no-smoking buffer area.
- Provide suitable receptacles in the designated outdoor smoking area for the disposal of cigarette butt litter. Ensure that the receptacles are inside the project line and do not encroach into public space.

RESOURCES

- National Center for Healthy Housing, "Reasons to Explore Smoke-Free Housing Fact Sheet." *www.nchh.org/Training/Green-and-Healthy-Housing.aspx*
- American Lung Association, Air Quality in the Home: This site includes an entire section devoted to indoor air quality in the home. Choose "Air Quality" at the bottom of the screen and then click "Indoor Air Quality" and "Air Quality in the Home" to find numerous articles and educational pieces about maintaining a healthy indoor environment. *www.lungusa.org*
- U.S. Environmental Protection Agency, Indoor Air Quality Division: This site has numerous resources related to indoor air quality in homes, including reports and web links. *www.epa.gov/iaq*
- HUD Smoke-Free Housing Tool Kit: *http://portal.hud.gov/hudportal/HUD?src=/smokefreetoolkits1*
- Capital District Tobacco-Free Coalition: *www.smokefreecapital.org*
- New York City Department of Health's Smoke-Free Housing Resources: *www.nyc.gov/html/doh/html/environmental/smoke-free-housing.shtml*
- Michigan Smoke-Free Apartments: *www.mismokefreeapartments.org*
- Smoke-Free Housing Coalition of Maine: *www.smokefreeforme.org*
- Minnesota Smoke-Free Housing: *www.mnsmokefreehousing.org*
- Smoke-Free Environments Law Project: *www.tcsg.org/sfelp/home.htm*
- Tobacco Technical Assistance Consortium: *www.ttac.org*
- Online record of LISC webinar: "Going Smoke Free: Best Practices of Multifamily Housing Owners & Managers": *www.lisc.org/content/publication/detail/21022*

OPERATIONS, MAINTENANCE + RESIDENT ENGAGEMENT

Educational materials and orientations help educate residents and staff on green features that were designed to deliver health, economic and environmental benefits, as well as their role in realizing those benefits in their own lives.

8.1 *Mandatory*
Building Operations & Maintenance (O&M) Manual and Plan

For all multifamily projects

REQUIREMENTS

Develop a manual with thorough building operations & maintenance guidance and a complementary plan. The manual and plan should be developed over the course of the project design, development and construction stages and should include sections/chapters addressing the following topics:

- Operations & maintenance guidance for all mechanical and electrical equipment and appliances (building level and dwelling unit level)
- HVAC specifications, and operations & maintenance schedules
- Operations, maintenance and replacement guidance for any other specialized systems (e.g., solar photovoltaics, solar water heating, ground source heating, microgrid) within the project
- Location of mechanical, electrical, gas and water-system turnoffs
- Lighting equipment specifications and replacement guidance
- Landscaping and hardscaping specifications and maintenance plan, including any specific instructions for community gardens or growing spaces
- Green cleaning product specifications and cleaning schedules
- Pest control guidelines, referencing the Integrated Pest Management strategies developed in Criterion 7.10
- Building accessibility for residents, including security and safety protocols, whether by leaving doors unlocked, by using a security device such as a card key, or by other measures
- Maintenance of active recreation and play spaces (e.g., playgrounds, ground markings, exercise equipment) for adults, youth and children
- Information on how energy and water information will be collected and reviewed to ensure that the project is meeting performance goals (see Criteria 1.1c, 8.5 and 8.6)
- An occupancy turnover plan that describes the dwelling unit turnover process, including all materials that are frequently replaced at turnover and the process for educating the residents about proper use and maintenance of all building systems

RATIONALE

Regular building Operations & Maintenance (O&M) practices using green methods minimizes building maintenance needs and utility consumption, and provides a healthy, safe and durable living environment for residents. Developing a building O&M manual and complementary plan throughout the project design, development and construction stages allows the project team to properly customize these documents with the input of project installers.

RECOMMENDATIONS

Begin creating a thorough and well-developed O&M manual and plan well before construction completion. Work with designers, systems installers and operations staff to assemble critical information and schedules for best-practice operations and maintenance strategies.

Prior to, and while the project is under construction:

During the design process, keep a running list of how maintenance and landscaping teams and residents may need to be involved with the building in order to ensure that it will perform as intended. Once the project team has completed the integrative design process (see Category 1), amend templates of O&M documents with project-specific information for maintenance staff and residents. By working in this manner, the building O&M manual and plan will be informed by the development process and completed by the time the project is ready for occupancy.

- Identify the senior management position(s) with oversight responsibility for O&M and the job roles responsible for producing, managing and/or implementing the manual and plan.
- Ensure that the building performance goals/requirements that were established for the project during integrative design will be included in the O&M manual and plan.
- Create a knowledge-transfer plan to ensure that accurate as-built information is captured during construction, start-up and commissioning, and integrated into the O&M manual and plan (e.g., if possible, create a video of the commissioning agent or system installer showing key maintenance checks to use when training staff).
- Discuss your building O&M training plan to ensure that responsible staff will be up to speed on the operation of the building prior to turnover and occupancy.
- Develop a succession plan to ensure that important information is retained from departing staff and transferred to new staff. This could include an exit interview checklist, maintenance log review, etc.

As construction nears completion and into operations:

Finalize your building O&M manual and plan. Clearly identify key operations and maintenance activities, assign those activities to a person/job role and establish a schedule to verify that maintenance is performed.

To enhance your O&M manual and plan, include:

- Account information on your energy and water performance tracking software. Identify who will monitor this account and at what interval, and what procedures will take place if irregularities are discovered.
- HVAC maintenance plans. Develop a maintenance schedule for HVAC systems, and include assignments of key tasks to specific job roles. Create a system to track when/what maintenance tasks were completed.
- Information on lighting equipment, including specs for replacement bulbs and a maintenance strategy for when to replace inaccessible fixtures (e.g., what percentage of bulbs/diodes can fail in any one lamp pylon before you install replacements).
- Location of mechanical, electrical, gas and water-system turnoffs.

- Irrigation system maintenance plans. Develop a periodic visual inspection of functions (since irrigation systems are often scheduled to operate when O&M staff are off duty).
- Landscaping and hardscapes (paved surfaces) review protocols. Develop an inspection schedule of landscaping and paving, and assign key tasks to specific job roles.
- Green cleaning products and cleaning schedules. Specify products, vendors, schedule and assignments of key tasks to specific job roles. Create a system to track when actions are completed.
- A written Integrated Pest Management policy (see Criterion 7.10) aimed at preventing pests and addressing conditions conducive to pests. Repair and maintain structures and grounds to minimize pest-related conditions. Develop resident guidelines related to pesticide use, housekeeping and prompt reporting of pest problems, such as cockroaches, rodents and bed bugs. Ensure that anyone applying pesticides is licensed and working under a scope that includes IPM provisions.
- If the project is utilizing recycled water (greywater), design and institute a policy that requires biodegradable soaps, cleaners and other products if they are going to be flushed down the drains.
- Video-record installers of mechanical systems explaining best practices for regular maintenance and strategies to address common system problems. Use this video as part of your maintenance staff training.
- Provide maintenance staff with local information for handling hazardous waste, including where to recycle fluorescent and compact fluorescent lighting (CFLs).

RESOURCES

- Enterprise Green Communities, Building Maintenance Manual Templates in Information Resources: *www.enterprisecommunity.com/resources/ResourceDetails?ID=63995.doc*
- San Francisco Department of the Environment, "Pest Prevention by Design: Authoritative guidelines for designing pests out of structures": *www.ipminstitute.org/school_ipm_2015/Pest_Prevention_by_Design.pdf*
- For language on residential IPM policy, the University of Minnesota offers the following resource: *www.entomology.umn.edu/cues/em/index.html*
- National Center for Healthy Housing, "Healthy Homes Maintenance Checklist": *www.nchh.org/Portals/0/Contents/Maintenance_Checklist2009.pdf*
- Stewards of Affordable Housing for the Future (SAHF), Multifamily Energy and Water Management Toolkit: This toolkit (including checklists, worksheets and resources) helps improve energy and water management, reduce costs and spending, and minimize environmental impacts over the long-term, while helping to preserve affordable properties. *www.sahfnet.org/energytoolkit.html*
- Federal Energy Management Program (FEMP) Operations & Maintenance Best Practices: A Guide to Achieving Operational Efficiency: *www1.eere.energy.gov/femp/pdfs/omguide_complete.pdf*
- ENERGY STAR Maintenance Checklist: *www.energystar.gov/index.cfm?c=heat_cool.pr_maintenance*
- ASHRAE Guideline 1.4P: 2014—Published Guideline Procedures for Preparing Facility Systems Manuals provides procedures for producing a Systems Manual as a resource for training, operations, maintenance and upgrading of facilities. *www.eeperformance.org/uploads/8/6/5/0/8650231/systemsmanualsgdl1_4-201x_chair_approved.pdf*

- ASHRAE Guideline 32-2012—Sustainable, High-Performance Operations and Maintenance offers guidance for operating and maintaining buildings with goals of sustainability and high performance in mind. *www.ashrae.org/resources--publications/bookstore/guideline-32-2012*
- ASHRAE Training for O&M: *www.ashrae.org/education--certification/self-directed-or-group-learning/fundamentals-of-building-operation-maintenance-and-management*
- GPRO Operations & Maintenance Essentials provides tools for building professionals to transition from conventional to sustainable operations. *http://gpro.org/courses/ome/*

8.2 *Mandatory* Emergency Management Manual

For all multifamily projects

REQUIREMENTS

Provide a manual on emergency operations targeted toward operations and maintenance staff and other building-level personnel. The manual should address responses to various types of emergencies, leading with those that have the greatest probability of negatively affecting the project. The manual should provide guidance as to how to sustain the delivery of adequate housing throughout an emergency and cover a range of topics including but not limited to:

- communication plans for staff and residents to use in the event of an emergency
- useful contact information for public utility and other service providers
- infrastructure and building "shutdown" procedures

Emergency Management Manuals should be responsive to information generated from successful completion of Criterion 1.3a Resilient Communities: Design for Resilience and, if applicable, Criterion 1.3b Resilient Communities: Multi-Hazard Risk/Vulnerability Assessment.

This information should be readily available to all building residents, staff and visitors.

RATIONALE

In the event of an emergency, time is of the essence. Creating and socializing a plan for building managers and residents before an emergency occurs increases the likelihood that disturbances due to the emergency (whether it be flooding, earthquake, power outages or another disturbance) can be appropriately mitigated.

RECOMMENDATIONS

- Emergency Maintenance Manuals should be updated annually (at a minimum) in both digital and hard-copy formats, and located in a well-marked location.
- Reviewing and updating all Emergency Maintenance Manuals should be built into the job description and performance requirements of staff members.
- Consider having staff trained in first aid, cardiopulmonary resuscitation (CPR) and the use of automated external defibrillators (AEDs), and include information about these resources within the Emergency Management Manual.

RESOURCES

- Enterprise Disaster Response Staffing Plan: *www.enterprisecommunity.org/resources*
- "Ready" is a public service campaign designed to education and empower Americans to prepare for and respond to emergencies, including natural and man-made disasters. The goal of the campaign is to get the public involved and ultimately to increase the level of basic preparedness across the nation. *www.ready.gov*
- Federal Emergency Management Agency (FEMA): *www.fema.gov*
- American Red Cross: *www.redcross.org*
- Seattle Office of Emergency Management provides many valuable resources, including a Resident Disaster Recovery Booklet translated into several languages. They can be accessed online at: *www.seattle.gov/emergency/publications*
- Urban Green, Building Resiliency Task Force Report, Chapter 4: Better Planning, June 2013. *http://urbangreencouncil.org/sites/default/files/2013_brtf_summaryreport_0.pdf*

8.3 *Mandatory* Resident Manual

REQUIREMENTS

Provide a guide for homeowners and renters that explains the intent, benefits, use and maintenance of their home's green features and practices. The Resident Manual should encourage green and healthy activities.

A range of topics should be discussed. Those topics should include, but are not limited to:

- a routine maintenance plan, outlining responsibilities of residents and maintenance staff, as applicable
- operations and maintenance guidance for all lights, appliances and fixtures (e.g., dual-flush toilets) (Criteria 4.1, 4.2, 5.1a–d, 5.4, 5.5)
- HVAC operation
- location of electrical, mechanical, gas and water-system turnoffs
- interior finish materials, including paints, caulks and flooring (Criteria 6.1, 6.2, 6.7a, 6.7b, 6.8, 6.9, 6.10)
- paving materials and landscaping (Criterion 3.4)
- recycling and waste management (Criteria 6.12 and 6.13)
- pest control (Criterion 7.10)
- interior Active Design features (e.g., stairwells) and signage (Criteria 7.12, 7.13, 7.14)
- information on community connectivity amenities, including transportation, car-share, bike-share and other accessibility features (Criterion 2.5, 2.8, 2.9)
- community garden and other fresh food resources (Criterion 2.12)

- special health considerations if recycled water (greywater) is used indoors (e.g., do not drink from the toilet in emergency situations)
- energy and water consumption information (Criteria 8.5 and 8.6)
- if applicable, procedures to contact building management in the case of a building-related problem
- green cleaning guidelines
- any other systems that are part of the home

RATIONALE

Education on the operations and maintenance of the home will allow residents to fully realize the environmental, health and economic benefits that green housing offers.

RECOMMENDATIONS

- When developing your Resident Manual and engagement information, be sure to include the fun factor: Graphics, images, videos and social media information make your material more fun and engaging, and in turn make them more useful.
- During the design process, keep a running list of how maintenance and landscaping teams and residents may need to be involved with the building in order to ensure that it will perform as intended. Once the project team has completed the integrative design process (see Category 1), amend templates of the O&M documents and Resident Manual with project-specific information. By working in this manner, these documents will be informed by the development process and completed by the time the project is ready for occupancy.
- Develop an Integrated Pest Management policy (in conjunction with Criterion 7.10) and, as part of that, develop resident guidance related to pesticide use, housekeeping and prompt reporting of pest problems with cockroaches, rodents and bed bugs. Ensure that anyone applying pesticides is licensed and working under a scope that includes IPM provisions.
- Provide residents with information about local transportation options by including maps, public transit schedules, car and bike-share programs, and the building's bicycle amenities.
- Provide residents with maps of neighborhood locations for physical activity and healthy food amenities, including farmers markets, community gardens, walking trails, parks, playgrounds and exercise facilities.
- Amplify the impact of residents having access to fresh food (through gardening spaces or other means) by hosting cooking classes so that they can learn how to use their produce to make healthy meals.
- Consider labeling trash, recycling and composting receptacles throughout the building: Trashcan becomes "landfill" can and is made visually distinct from recycling containers through the use of consistent colors.
- Provide residents with two radon test kits designed for 48-hour exposure or radon meters, and include instructions for use and follow-up action per EPA's Indoor airPLUS program.
- Provide residents with local information for handling household hazardous waste, including compact fluorescent bulbs (CFLs).
- Provide residents with the building's smoking policy (Criterion 7.17).

- If the project is utilizing greywater, design and institute a policy that requires biodegradable soaps, cleaners and any other product types that are going to be flushed down the drains.
- Consider including ENERGY STAR "Best Practices" information in the Resident Manual. Select a product type, click on "Buying Guidance," and scroll down to the bottom of the page to select "Best Practices" products.
  - For washers and dryers: *www.energystar.gov/index.cfm?c=clotheswash.clothes_washers_performance_tips*
  - For refrigerators: *www.energystar.gov/index.cfm?c=refrig.pr_best_practices_refrigerators*
  - For dishwashers: *www.energystar.gov/index.cfm?c=dishwash.pr_best_practices*
  - For additional best practices on ENERGY STAR products: *www.energystar.gov/index.cfm?c=products.pr_find_es_products*

RESOURCES

- Enterprise Community Partners Resource Center: Enterprise Green Communities hosts a variety of resident engagement tools, trainings and sample manuals. Search for "Resident Engagement" at this url: *www.enterprisecommunity.com/resources*
- Connecticut Department of Environmental Protection, "A Green Home Is a Healthy Home": This is a simple brochure with a readable layout and good presentation. *www.ct.gov/deep/lib/deep/p2/individual/healthyhome.pdf*
- Home Energy Resource MN: This site provides information for homeowners on maintaining their home. It includes seasonal checklists and step-by-step instructions for general maintenance, as well as special instructions for new home buyers on maintaining their home during its first year. *www.homeenergyresourcemn.org/index.aspx*
- Canada Mortgage and Housing Corporation, "Fighting Mold—Tenant's Guide to Mold." Information on mold identification and remediation in existing homes. *www.tenants.bc.ca/ckfinder/userfiles/files/Fighting%20Mold.pdf*

8.4 *Mandatory* Resident and Property Staff Orientation

REQUIREMENTS

Provide a comprehensive walk-through and orientation for all residents, property manager(s) and buildings operations staff. Use the appropriate manuals (see Criteria 8.1–8.3) as the base of the curriculum, and review the project's green features, operations and maintenance procedures, and emergency protocols.

For all rental properties, walk-throughs and orientations with residents, property managers and building operations staff should take place annually, at a minimum. For home-ownership properties, walk-throughs and orientations should take place at sale.

RATIONALE

An orientation to the building and community helps educate residents, property manager(s) and building operations staff about the green features that were designed to deliver health, economic and environmental benefits, as well as their role in realizing those benefits in their own lives and the lives of future residents. Without an orientation to the information included in the guides created through Criteria 8.1–8.3, that valuable information may not be put to use, and the project's long-term goals may not be met. Given the frequency of resident and staff turnover in apartments, annual orientations to this information will help to ensure that all occupants are enabled to live and work in the building.

RECOMMENDATIONS

- During Property Management and Resident Services staff trainings, focus on how the features of the building function and are maintained, and how those features help the residents: providing comfort, protecting health, saving money, conserving resources, and also better stewardship of the environment. It is important for all staff to understand how the building and systems were designed to operate so that issues can be identified and addressed promptly.
- Resident orientations should focus on engaging occupants in the process of both creating and maintaining a green and healthy environment as well as increasing resident awareness of on-site and nearby physical activity and healthy food amenities. Engagement orientations should be tailored to residents and their needs (e.g., families, seniors) and educate residents on how to operate key features and building resources (e.g., recycling, thermostats, fans, lighting) and explain why certain building elements/features/materials were selected (e.g., less carpet in favor of smooth flooring improves indoor air quality). This thorough resident orientation will lead to collective improved outcomes, such as how resident behavior affects energy, water and materials use as well as health outcomes. The orientation should also stress the important role that tenants play in reporting building-related problems so that issues can be addressed in a timely fashion.
- Consider providing residents with a green, healthy living packet, including green cleaning materials, healthy recipes, recycling information and important contacts in case of any problems.
- Engage residents at regular intervals (e.g., move-in, 3 months, 1 year, then annually) that coincide with existing tenant engagement to check in on behaviors and the potential need for assistance.
- Provide residents with local information for handling household hazardous waste, including compact fluorescent bulbs (CFLs).
- Educate residents and staff on building protocols for what to do in the case of an evacuation. Consider providing key staff and key residents with additional training and "go-bags" so that they can help residents during an emergency.

8.5 *Mandatory*
Project Data Collection and Monitoring System: 100% Owner-Paid Utility Accounts, 15% Tenant-Paid Utility Accounts

REQUIREMENTS

For rental properties, collect and monitor project energy and water performance data for 100% of owner-paid utilities and 15% of tenant-paid utilities for at least 5 years. This data must be maintained in a manner that allows staff to easily access and monitor it, enabling them to make informed operations and capital planning decisions. Also allow Enterprise access to this data.

For owner-occupied units, residents shall collect and monitor their energy and water performance data in a manner that allows for easy access and review, and that provides the ability to influence home operations. Also allow Enterprise access to this data.

RATIONALE

A data-collection and monitoring system allows project owners, on-site staff and residents to understand project performance. This information should be used to influence future retrofit and repair work, as well as to identify day-to-day performance issues as they arise. If an issue is identified, appropriate actions can be taken to maximize project durability, cost savings and health benefits associated with the green goals of the project.

RECOMMENDATIONS

- Make resident utility release(s) an opt-out, rather than an opt-in, component of lease-up to provide property management with access to utility data for benchmarking/tracking. This data will allow maintenance staff to proactively identify poorly performing systems and identify other comfort issues that often go unreported, leading to major systems failure.
- Ensure that the training for residents and building maintenance staff includes information on how to effectively use the data-collection, monitoring and reporting system.
- Inquire if your utility provider has a landlord portal. If so, building owners may gain access to tenant utility data through the utility at lease-up. Alternatively, inquire if your utility provider participates in the Green Button Challenge, a growing initiative which allows utility data transparency. *www.energy.gov/data/green-button*
- Whole-project energy monitoring systems (also known as smart meters) can help reduce energy consumption. Check to see if your local utility providers provide financial incentives for these.

RESOURCES

- Portfolio Manager Quick Reference Guide for Multifamily Housing: Portfolio Manager is a free, online, interactive energy management tool that allows you to measure and track your building's energy and water consumption, identify investment priorities, and verify improvements over time. Multifamily housing communities can use Portfolio Manager to track weather-normalized energy use intensity (EUI), energy costs, greenhouse gas emissions and water consumption. *www.energystar.gov/ia/business/multifam_housing/QRG_Multifamily_Housing.pdf*
- Private, fee-based, benchmarking and utility tracking tools are available. Among others, these include: WegoWise: *www.wegowise.com*; Energy Score Cards: *www.energyscorecards.com*; eGauge: *www.egauge.net*

8.6

Optional | 7 or 11 points

Project Data Collection and Monitoring System: Greater than 15% Tenant-Paid Utility Accounts

REQUIREMENTS

Collect and monitor project energy and water performance data for at least 5 years. This data must be maintained in a manner that allows staff and/or residents to easily access and monitor it, enabling them to make informed operations and capital planning decisions. Also allow Enterprise access to this data.

PERCENTAGE OF UNITS	POINTS
16–60%	7 points
60–100%	11 points

RATIONALE

See Rationale for Criterion 8.5.

RECOMMENDATIONS

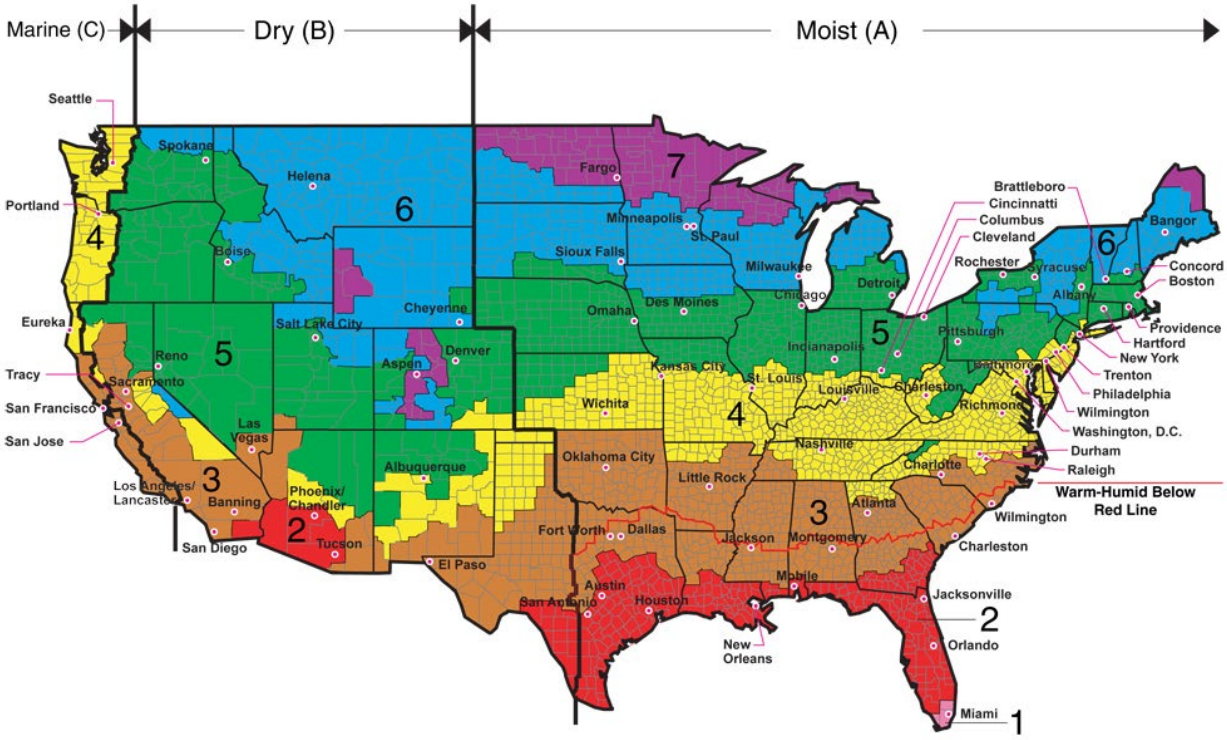
See Recommendations for Criterion 8.5.

RESOURCES

See Resources for Criterion 8.5.

APPENDIX

2012 IECC CLIMATE ZONE MAP



Zone 1 includes Hawaii, Guam, Puerto Rico and the Virgin Islands

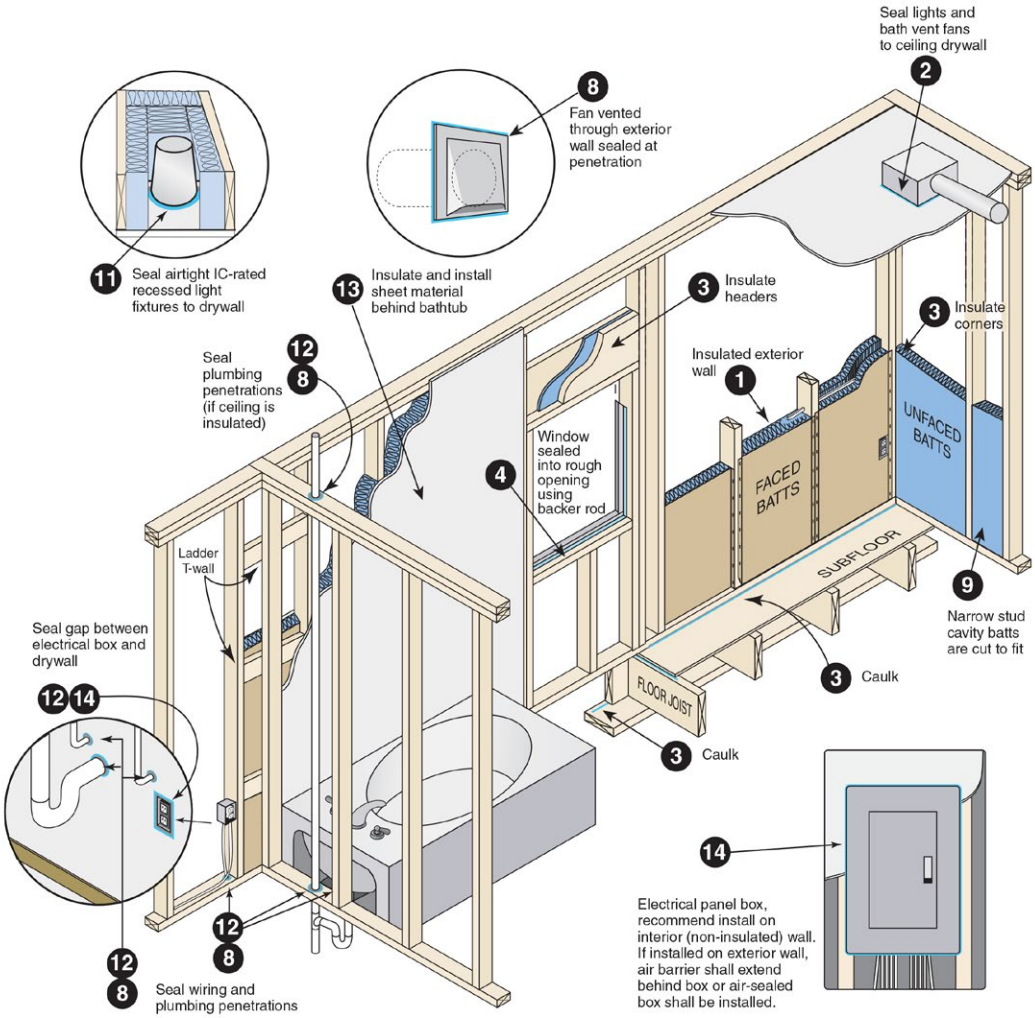
Alaska is Zone 7, except for the following boroughs in Zone 8: Bethel, Dellingham, Fairbanks, North Star, Nome North Slope, Northwest Arctic, Southeast Fairbanks, Wade Hampton and Yukin-Koyukuk

AIR BARRIER AND INSULATION INSPECTION COMPONENT GUIDE

NO.	COMPONENT	CRITERIA
1	Air barrier and thermal barrier	• Exterior thermal envelope insulation for framed walls is installed in substantial contact and continuous alignment with building envelope air barrier. • Breaks or joints in the air barrier are filled or repaired. • Air-permeable insulation is not used as a sealing material. • Air-permeable insulation is inside of an air barrier.
2	Ceiling/attic	• Air barrier in any dropped ceiling/soffit is substantially aligned with insulation, and any gaps are sealed. • Attic access (except unvented attic), knee wall door or pull down stair is sealed.
3	Walls	• Corners and headers are insulated. • Junction of foundation and sill plate is sealed.
4	Windows and doors	• Space between window/door jambs and framing is sealed.
5	Rim joists	• Rim joists are insulated and include an air barrier.
6	Floors (including above-garage and cantilevered floors)	• Insulation is installed to maintain permanent contact with underside of subfloor decking. Air barrier is installed at any exposed edge of insulation.
7	Crawl space walls	• Insulation is permanently attached to walls. • Exposed earth in unvented crawl spaces is covered with Class I vapor retarder with overlapping joints taped.
8	Shafts, penetrations	• Duct shafts, utility penetrations, knee walls and flue shafts opening to exterior or unconditioned space are sealed.
9	Narrow cavities	• Batts in narrow cavities are cut to fit, or narrow cavities are filled by sprayed/blown insulation.
10	Garage separation	• Air sealing is provided between the garage and conditioned spaces.
11	Recessed lighting	• Recessed light fixtures are air tight, IC rated and sealed to drywall. • Exception—fixtures in conditioned space.
12	Plumbing and wiring	• Insulation is placed between outside and pipes. • Batt insulation is cut to fit around wiring and plumbing, or sprayed/blown insulation extends behind piping and wiring.
13	Shower/tub on exterior wall	• Showers and tubs on exterior walls have insulation and an air barrier separating them from the exterior wall.
14	Electrical/phone box on exterior walls	• Air barrier extends behind boxes, or air sealed-type boxes are installed.
15	Common wall	• Air barrier is installed in common wall between dwelling units.
16	HVAC register boots	• HVAC register boots that penetrate building envelope are sealed to subfloor or drywall.
17	Fireplace	• Fireplace walls include an air barrier.

This document is intended solely to help graphically demonstrate the air leakage provisions of section 402.4 of the 2009 IECC. It does not cover all airsealing locations or techniques. Other code provisions may be applicable as well.

AIR SEALING KEY POINTS



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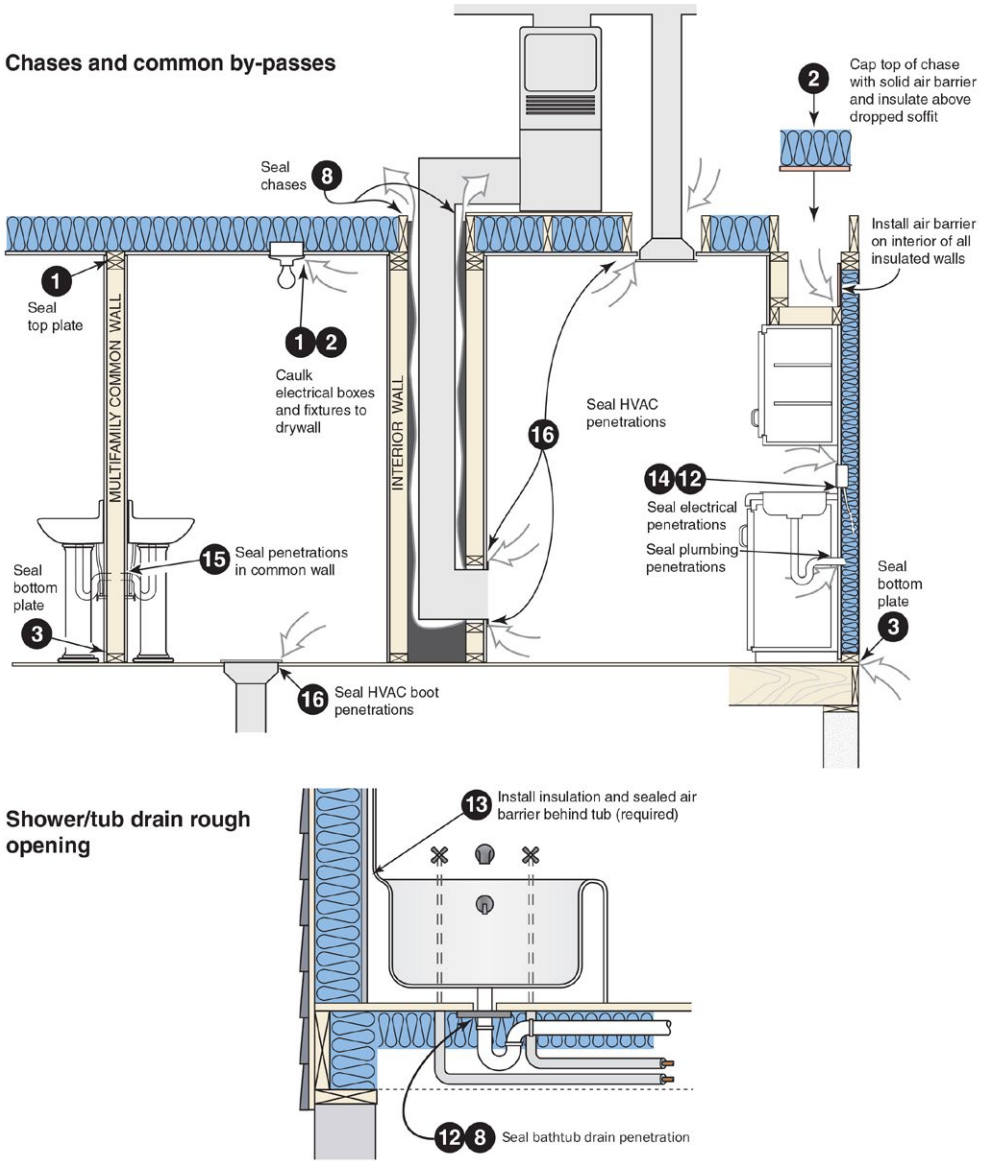
AIR SEALING KEY POINTS (CONTINUED)



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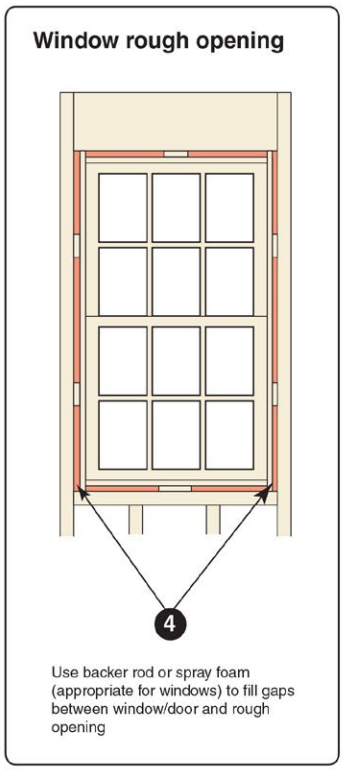
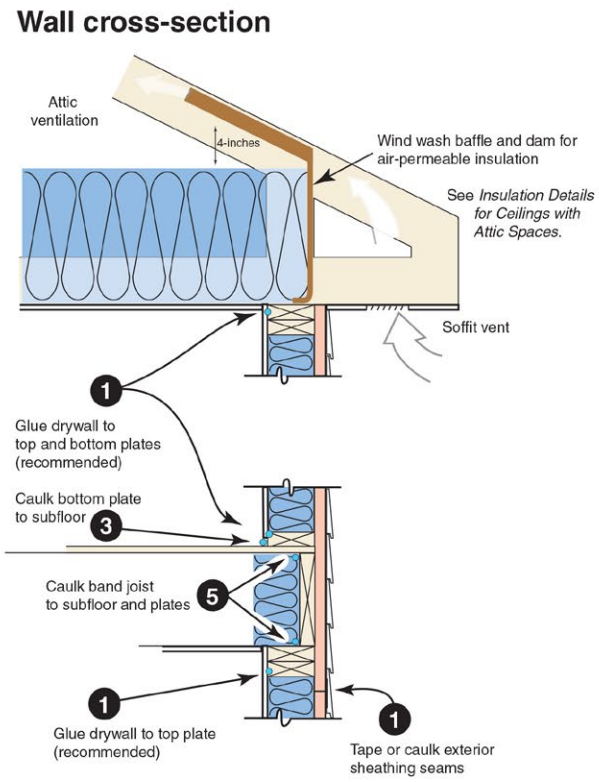
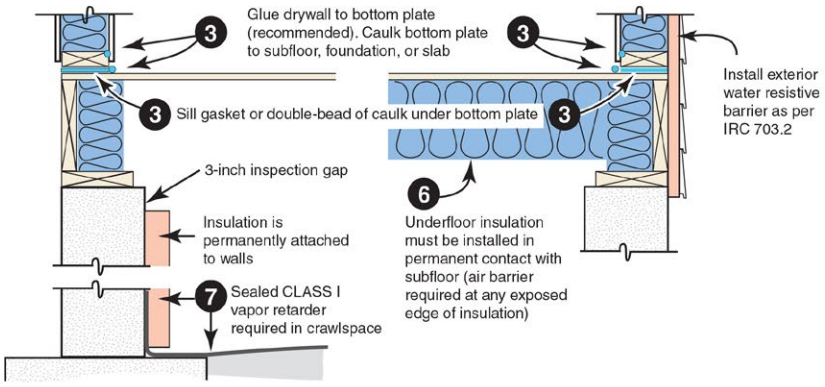
AIR SEALING KEY POINTS (CONTINUED)







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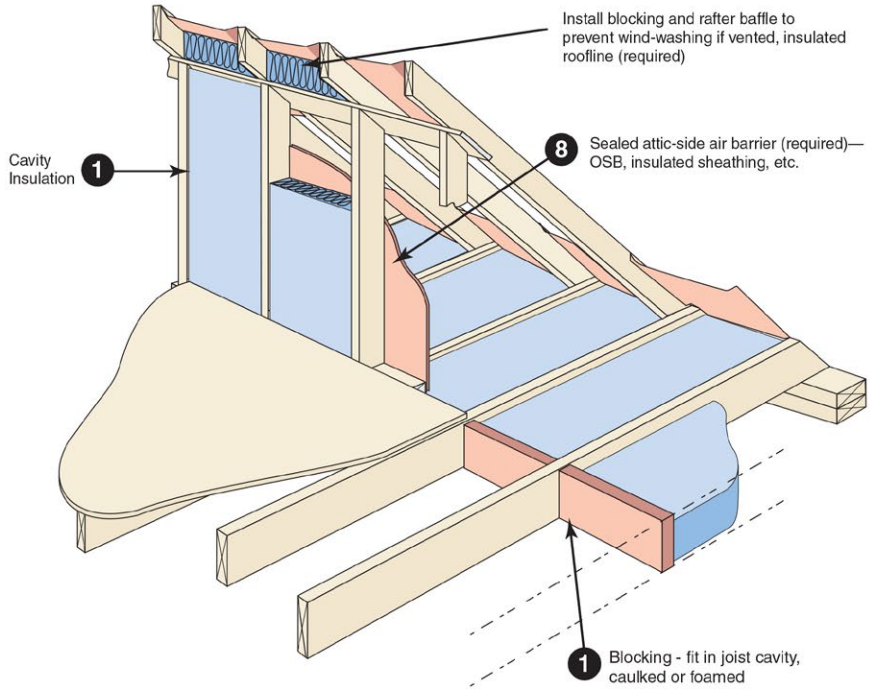
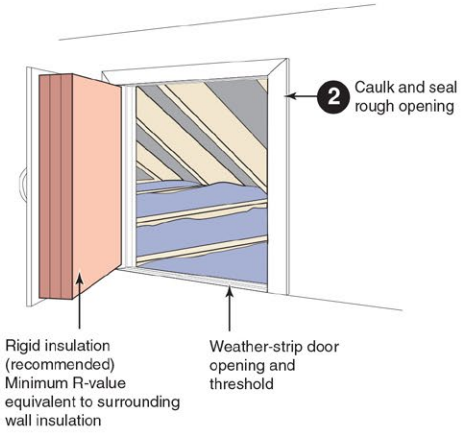
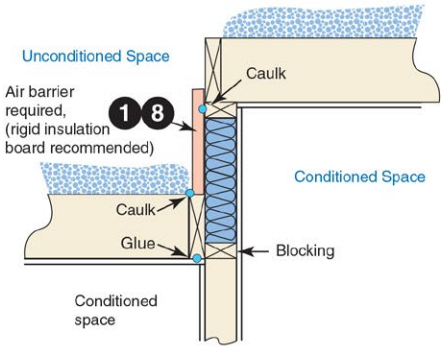
AIR SEALING KEY POINTS (CONTINUED)



Attic knee-walls



Two-level attic



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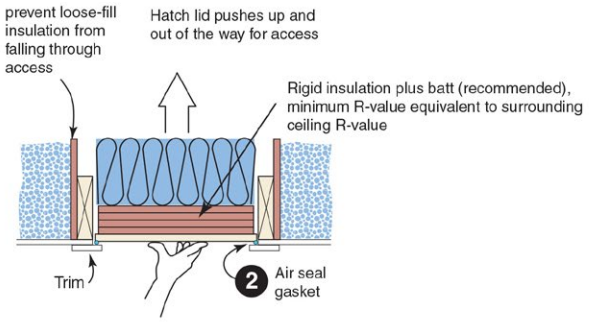
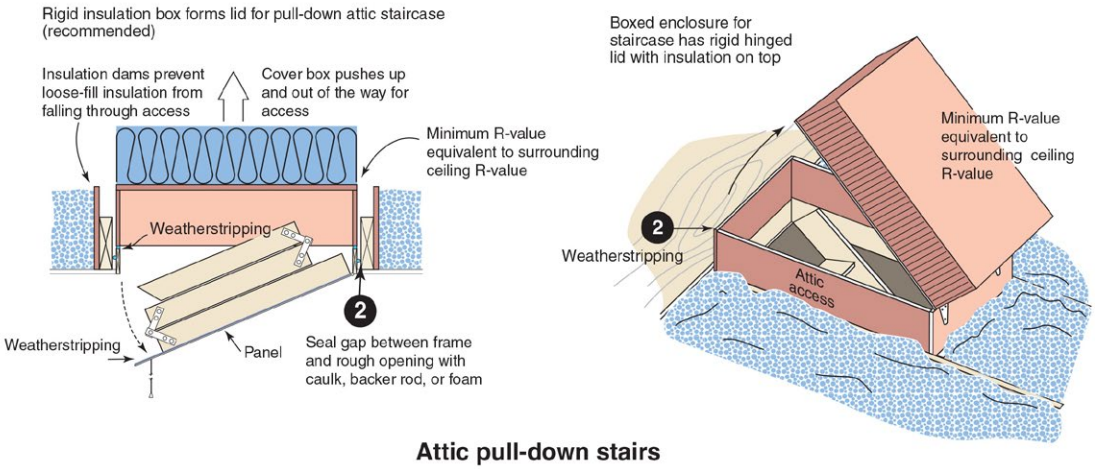
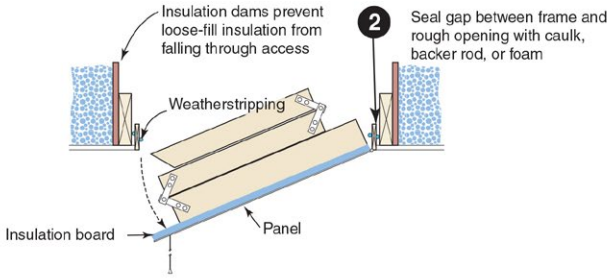
AIR SEALING KEY POINTS (CONTINUED)



Attic pull-down stairs



Attic pull-down stairs



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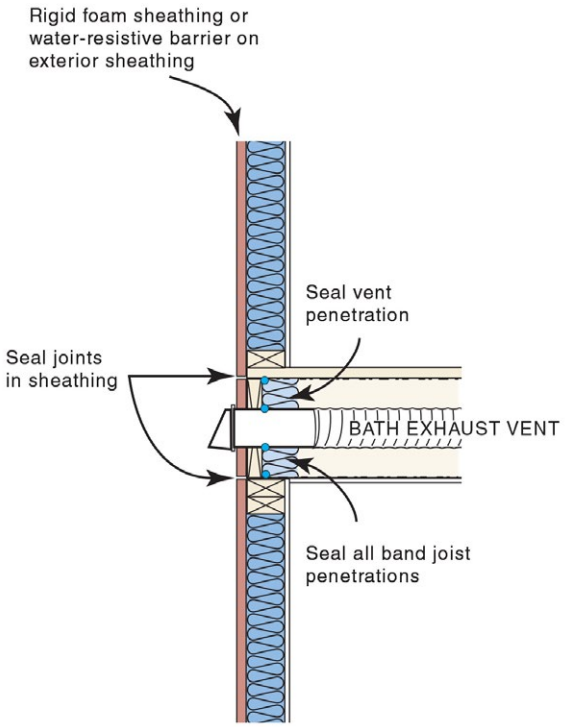
AIR SEALING KEY POINTS (CONTINUED)

Multifamily

1. Cap and seal all chases, including chases for grouped utility lines and radon vents.
2. Seal penetrations in mechanical closet, including penetrations for the:
   - supply plenum
   - outside air ventilation
   - refrigerant line
   - plumbing
   - electrical
   - gas fuel
3. Seal band area at exterior sheathing side and all penetrations through band.
4. Air-seal at drywall finishing for any wall adjacent to stairwell or elevator. Air-seal this gap at every change in floor level.
5. Seal miscellaneous clustered penetrations through building envelope (e.g., refrigerant lines).



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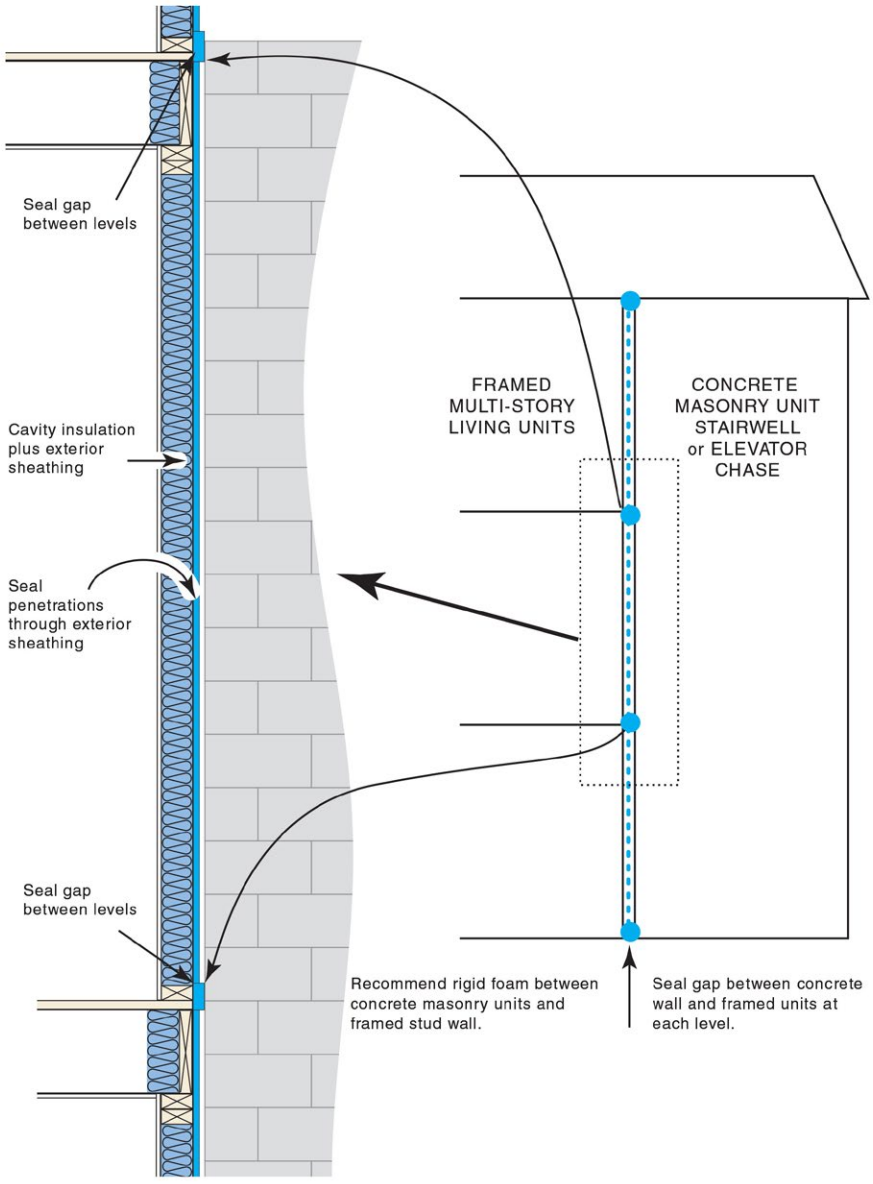
AIR SEALING KEY POINTS (CONTINUED)

Multifamily



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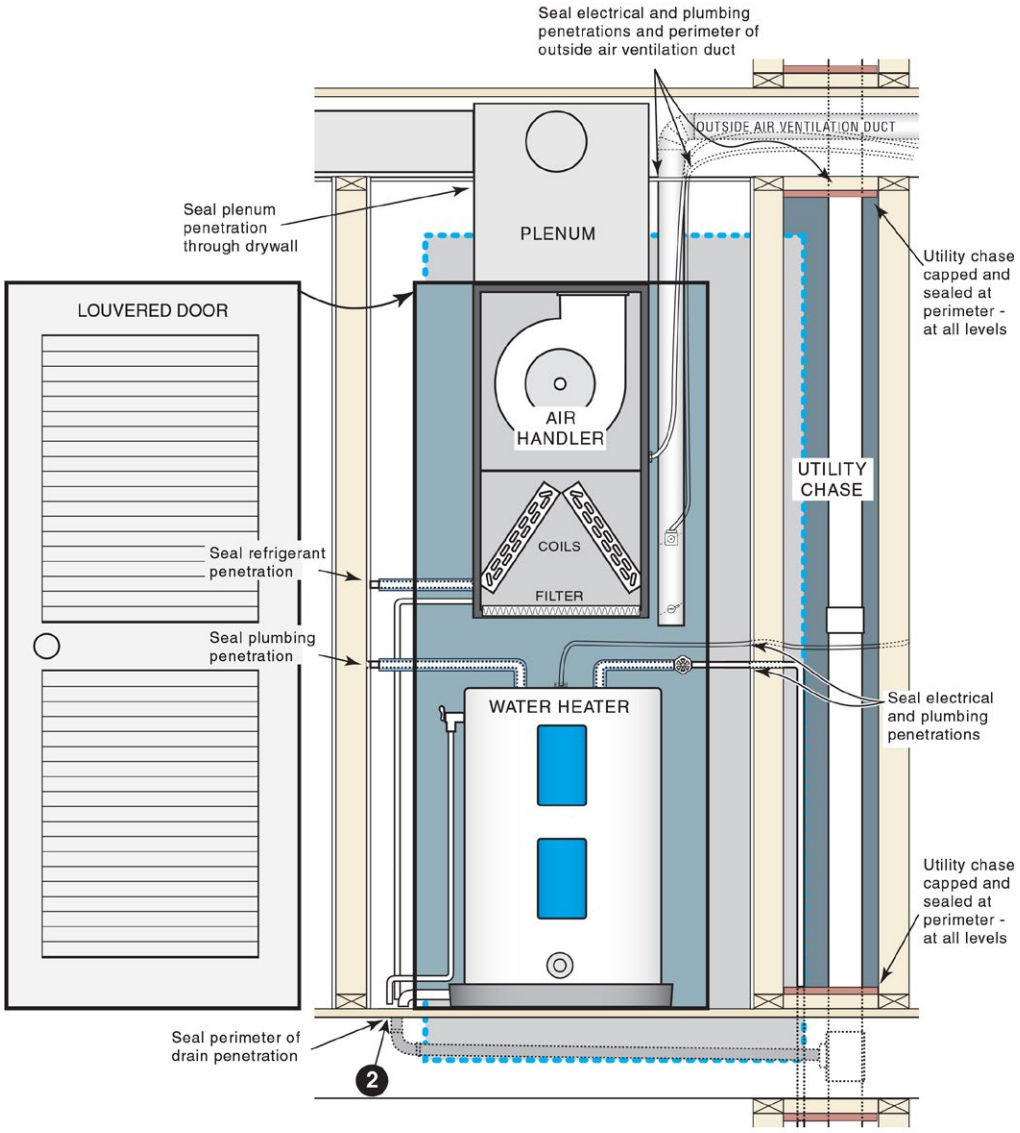
AIR SEALING KEY POINTS (CONTINUED)

Mechanical closet



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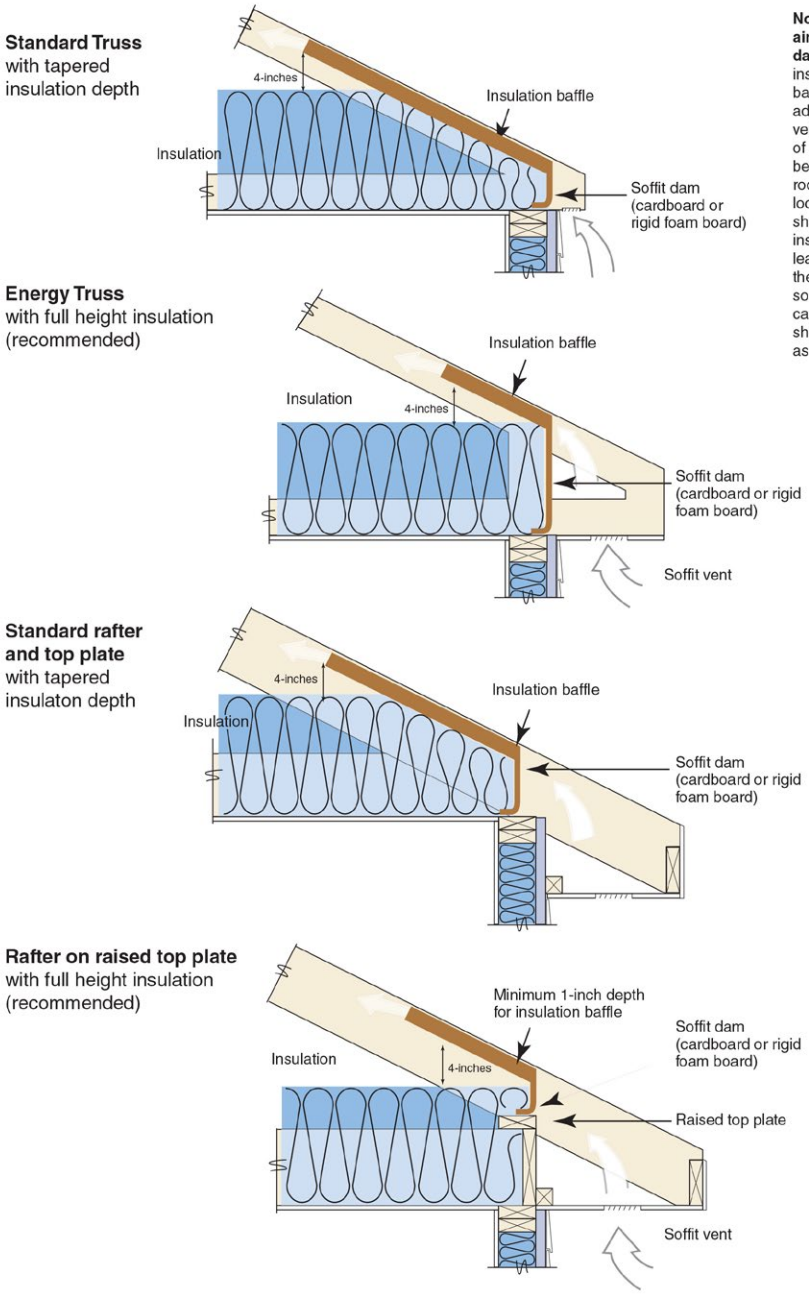
AIR SEALING KEY POINTS (CONTINUED)

Roof and truss



Note: Wind wash baffle and air-permeable insulation dam. For air permeable insulation in vented attics, baffles shall be installed adjacent to soffit and eave vents. A minimum of a 1-inch of space shall be provided between the insulation and the roof sheathing and at the location of the vent. The baffle shall extend over the top of the insulation inward until it is at least 4 inches vertically above the top of the insulation. Any solid material such as cardboard or thin insulating sheathing shall be permissible as the baffle.

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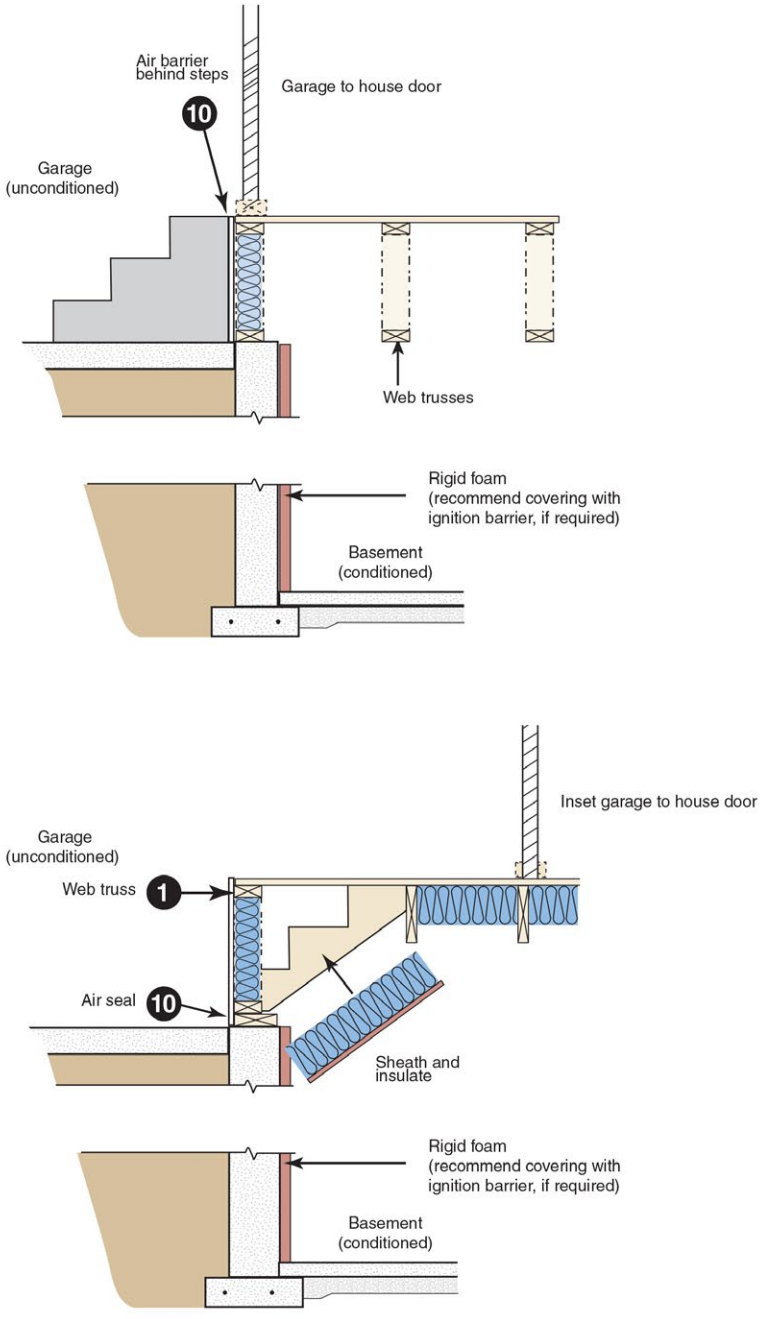
AIR SEALING KEY POINTS (CONTINUED)

Garage



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Glossary

Websites listed were last accessed December 9, 2014. Please note that some of the links below may require subscriptions to access content.

Active Design: An approach to the development of buildings, streets and neighborhoods that uses architecture and urban planning to make daily physical activity and healthy foods more accessible and inviting.

Adaptive plant species: A non-native plant species that performs similarly to a native species in a particular region, state, ecosystem and habitat, and that 1) can survive temperature/weather extremes in the microclimate; 2) requires little irrigation or fertilization, once established; 3) is resistant to local pests and diseases; and 4) does not displace other plants, as invasives do.

Adaptive reuse building: An existing building that is being renovated to accommodate a new use, e.g., rehabilitating an old school for use as housing.

Air barrier: Air barriers are systems of materials designed and constructed to control airflow between a conditioned space and an unconditioned space. The air barrier system is the primary air enclosure boundary that separates indoor (conditioned) air and outdoor (unconditioned) air. In multi-unit/townhouse/apartment construction, the air barrier system also separates the conditioned air from any given unit and adjacent units. *www.buildingscience.com/documents/digests/bsd-104-understanding-air-barriers*

ASHRAE (American Society of Heating, Refrigerating and Air-Conditioning Engineers) Standard 62.1 and 62.2-2010: ANSI/ASHRAE Standards 62.1 and 62.2 are the recognized standards for ventilation system design and acceptable IAQ. *www.ashrae.org/standards-research--technology*

ASHRAE Standard 90.1: Provides the minimum requirements for energy-efficient design of most buildings, except low-rise residential buildings. It offers, in detail, the minimum energy-efficient requirements for design and construction of new buildings and their systems, new portions of buildings and their systems, and new systems and equipment in existing buildings, as well as criteria for determining compliance with these requirements.

Berm: A sloped wall or embankment, typically constructed of earth, hay bales or timber framing, used to prevent inflow or outflow of material into or out of an area. *www.epa.gov/OUST/pubs/tum_appx.pdf*

Building Performance Institute (BPI): A national standards development and credentialing organization for residential energy-efficiency retrofit work that provides training through a network of affiliate organizations, individual certifications, company accreditations and quality assurance programs.

California 01350: A Special Environmental Requirements standard specification developed by the state of California to cover key environmental performance and public health considerations for building projects. Contains guidelines for energy, materials, water efficiency, indoor air quality (IAQ), nontoxic performance standards for cleaning and maintenance products, and sustainable site planning and landscaping considerations, among other measures. *www.calrecycle.ca.gov/greenbuilding/specs/section01350/*

CFM (cubic feet per minute): A standard unit of measurement for airflow that indicates how many cubic feet of air are passing through a fixed point per minute.

Charrette: An intense work session that brings together a diverse group of housing professionals as well as funders, policymakers, health practitioners and community stakeholders to integrate sustainable green design principles into affordable housing developments before schematic designs are complete. A charrette sets the stage for a clear vision of project goals and individual responsibilities, but not necessarily final design decisions. *www.enterprisecommunity.com/resources/ResourceDetails?ID=67598.pdf*

Colonias community: Any identifiable community in the U.S.–Mexico border regions of Arizona, California, New Mexico and Texas that is determined to be a colonia on the basis of objective criteria, including lack of a potable water supply, inadequate sewage systems, and a shortage of decent, safe and sanitary housing. The border region means the area within 150 miles of the U.S.–Mexico border, excluding Metropolitan Statistical Areas with populations exceeding one million (according to the National Affordable Housing Act of 1990, Section 916).

Common area: An area available for use by more than one person, including rental or sales offices, entrances, hallways, shared activity or leisure rooms, resident services areas, and laundry rooms.

CSA (Community-Supported Agriculture): A community of individuals who pledge support to a farm operation so that the farmland becomes the community's farm, with the growers and consumers providing mutual support and sharing the risks and benefits of food production. Typically, members of the farm or garden pledge in advance to cover the anticipated costs of the farm operation and the farmer's salary. In return, they receive shares in the farm's bounty throughout the growing season. Members also share in the risks of farming, including poor harvests due to unfavorable weather or pests. *www.nal.usda.gov/afsic/pubs/csa/csadef.shtml*

Compost blanket: A layer of loosely applied compost or composted material that is placed on the soil in disturbed areas to control erosion and retain sediment resulting from sheet-flow runoff. *http://water.epa.gov/polwaste/npdes/swbmp/Construction-Site-Stormwater-Run-Off-Control.cfm*

CO (carbon monoxide): A colorless, odorless and tasteless gas that greatly affects indoor air quality. Because it is impossible to see, taste or smell the toxic fumes, CO can kill you before you are aware that it is in your home. At lower levels of exposure, CO causes mild effects that are often mistaken for the flu. These symptoms include headaches, dizziness, disorientation, nausea and fatigue. *www.epa.gov/iaq/co.html*

Dial-a-ride program: A privately or publicly operated program that provides an on-demand ride service, requiring passengers to call ahead to reserve a ride. These programs usually provide connections between different transportation systems and/or employment centers.

Distribution uniformity: A measure of the evenness of irrigation water coverage over a defined area. *www.epa.gov/WaterSense/docs/home_finalspec508.pdf*

Dwelling unit: A single unit providing the complete independent living facilities for one or more people, including permanent provisions for living, sleeping, eating, cooking and sanitation. From Addendum J to ASHRAE 62.2-2010, found online at: *www.ashrae.org/standards-research--technology/standards-addenda*

ECM (electronically commutated motor): Also known as brushless DC motors, ECMs are synchronous motors that are powered by a DC electric source via an integrated inverter/switching power supply that produces an AC electric signal. Used, for example, in HVAC equipment that uses electricity efficiently, particularly at lower speeds.

Emissivity: A unitless measure describing the relative ability of a surface to emit radiation energy ranging from 0.00 (minimum radiation of heat) to 1.00 (maximum radiation of heat). More reflective materials have a lower emissivity.

Employer vanpool: A program in which 5 to 15 people (over the age of 16) ride together to and from work. The vanpool may be public or private, but must carry all passengers more than half the distance to work to qualify. Vanpools may be employer-operated, sponsored by transit agencies, or administered by third-party operators.

ENERGY STAR: A voluntary labeling program designed to identify and promote energy-efficient products to reduce greenhouse gas emissions. Introduced by the EPA in 1992, ENERGY STAR also offers an accepted national standard for certifying new residential construction projects. *www.energystar.gov*

Engineered wood products: Wood building materials manufactured by gluing particles, fibers or veneers to increase strength. For the purposes of Criterion 6.5 Certified, Salvaged and Engineered Wood Products, Green Communities considers prefabricated and precut wood products as "engineered wood products." *www.astm.org/SNEWS/JUNE_2003/yeh_jun03.html*

Entryway: Threshold separating the indoor space from the outdoor space.

Environmental site assessment: An investigation of the site's conditions often performed before acquisition of a property to satisfy the due-diligence requirements of a property transaction.

Erosion blankets or geotextile mats: Porous fabrics used for a variety of purposes, including separators, reinforcement, filtration and drainage, and erosion control. *http://water.epa.gov/polwaste/npdes/swbmp/Construction-Site-Stormwater-Run-Off-Control.cfm*

Filter sock: A mesh tube filled with composted material that is placed perpendicular to sheet-flow runoff to control erosion and retain sediment in disturbed areas. *http://water.epa.gov/polwaste/npdes/swbmp/Construction-Site-Stormwater-Run-Off-Control.cfm*

Formaldehyde: A chemical used widely by industry to manufacture building materials and numerous household products. Formaldehyde is also a byproduct of combustion and certain other natural processes, and thus may be present in substantial concentrations both indoors and outdoors. Health effects include eye, nose and throat irritation; wheezing and coughing; fatigue; skin rash; and severe allergic reactions. High levels of exposure may cause some types of cancer. *www.epa.gov/iaq/formaldehyde.html*

Slab: One type of foundation, with many variations (monolithic slabs, floating slabs, rat slabs, in conjunction with a basement, etc.), that may be above, at or below grade. Wood frame crawl foundations are an alternative to slabs.

Greenfield: A previously undeveloped parcel of land.

Green roof: A planted roof that reduces stormwater runoff. *www.epa.gov/heatisland/mitigation/greenroofs.htm*

Greywater: Wastewater produced from baths and showers, clothes washers and lavatories. Greywater gets its name from its cloudy appearance and from its status as being neither fresh (as in potable water) nor heavily contaminated (as in blackwater from toilet waste). *www.epa.gov/watersense/outdoor/rainwater_reuse.html*

HERS Index (Home Energy Rating System Index): A scoring system established by the Residential Energy Services Network (RESNET) in which a home built to the specifications of the HERS Reference Home (based on the 2006 International Energy Conservation Code) achieves a HERS Index score of 100, while a net zero energy home achieves a HERS Index score of 0. The lower a home's HERS Index score, the more energy-efficient it is in comparison to the HERS Reference Home. Each 1-point decrease in the HERS Index score corresponds to a 1% reduction in energy consumption compared to the HERS Reference Home; thus a home with a HERS Index score of 85 is 15% more energy-efficient than the HERS Reference Home, and a home with a HERS Index score of 80 is 20% more energy-efficient.

Health Impact Assessment (HIA): A systematic process that uses an array of data sources and analytic methods and considers input from stakeholders to determine the potential effects of a proposed policy, plan, program or project on the health of a population and the distribution of those effects within the population. An HIA provides recommendations on monitoring and managing those effects. *www.pewtrusts.org/en/projects/health-impact-project/health-impact-assessment*

Home Energy Rating: An analysis of a home's construction through plans and on-site inspections. Based on the home's plans, the Home Energy Rater uses an energy-efficiency software package to perform an energy analysis of the home's design. This analysis yields a projected, pre-construction HERS Index. Upon completion of the plan review, the rater will work with the builder to identify the energy-efficiency improvements needed to ensure that the house will meet ENERGY STAR performance guidelines. The rater then conducts on-site inspections, typically including a blower door test (to test the tightness of the dwelling unit envelope) and a duct leakage test (to test the tightness of the ducts). Results of these tests, along with inputs derived from the plan review, are used to generate the HERS Index score for the home.

IECC (International Energy Conservation Code): A model building energy code created by the International Code Council to set a minimum standard for energy efficiency; updated on a three-year schedule. *www.iccsafe.org/*

Infill site: A site with 75% of its perimeter bordering existing development or roads and with access to existing infrastructure.

Integrative design: A design approach that brings together at an early stage in project planning all the members of the building stakeholder community, and the technical planning, design and construction team (including green building consultants such as the green rater, mechanical engineer/energy expert and others) to look at the project objectives, building materials, systems and assemblies from many different perspectives. This approach is a deviation from the typical planning and design process of relying on the expertise of specialists who work in their respective specialties somewhat isolated from each other. *www.enterprisecommunity.com/resources/ResourceDetails?ID=67598.pdf*

Intermittent rate: Ventilation that stops and starts at regular intervals (i.e., the opposite of continuous ventilation).

LED (light-emitting diode): Energy-efficient light technologies that produce less initial heat per lumen, consume less energy, and last longer than conventional incandescent and fluorescent lights.

Low-impact development: A strategy of site design where the goal is to restore the natural, pre-developed ability of an urban site to absorb stormwater. *http://water.epa.gov/polwaste/green/*

Maintained solar reflectance: A measure of a material's ability to maintain its initially rated solar reflectance. Products are tested over a period of three years.

Manual D: Manual prepared by the Air Conditioning Contractors of America (ACCA) on designing residential duct systems. *www.acca.org/technical-manual/manual-d/*

Manual J: Manual prepared by ACCA on determining heating and cooling loads of residential structures. *www.acca.org/technical-manual/manual-j/*

Manual S: Manual prepared by ACCA on selecting residential heating and cooling equipment to match the heating and cooling loads of residential structures. *www.acca.org/technical-manual/manual-s/*

Moderate rehabilitation: A project that does not fully expose the structure and envelope of the building and/or does not include replacement or improvement of two or more major systems of the building, yet is still able to comply with the energy performance requirements of at least one iteration of Criterion 5.1.

Native plant species: A plant species that occurs naturally in a particular region, state, ecosystem and habitat without direct or indirect human actions. *web4.audubon.org/bird/at_home/PlantNativeSpecies.html*

Naturescaping: A method of landscaping that reduces water use, energy consumption and chemical needs by using climate-appropriate plants and maintenance techniques.

Non-buildable land: Land that is not economically feasible to be developed, such as easements, utility fall zones, unsuitable soil, steep grades, water features, wetlands or natural preserves.

Open space: Undeveloped land that is permanently set aside for public use. Open space may be used as community open space or preserved as green space, and includes parcels in conservation easement or land trust, park or recreation areas, and community gardens.

Permeable paving: A porous cover system that encourages groundwater recharge and infiltration. *www.epa.gov/oaintrnt/stormwater/pavers.htm* and *www.epa.gov/greeningepa/stormwater/best_practices.htm*

Phenol-formaldehyde: A resin used in the manufacture of composite wood products primarily for outdoor use, including softwood plywood and flake or oriented strand board. Composite wood products that contain phenol-formaldehyde generally emit formaldehyde at lower rates than those containing urea formaldehyde resin. *www.epa.gov/iaq/formaldehyde.html*

Photocell: A light-sensitive device that detects ambient light and controls exterior fixtures accordingly.

Photovoltaics: Composite materials that convert sunlight directly into electrical power.

Post-consumer waste: Materials or finished products that have served their intended use and so have been diverted or recovered from waste destined for disposal.

Post-industrial waste (also called pre-consumer waste): Materials generated in manufacturing and converting processes such as manufacturing scrap and trimmings and cuttings.

Public–private regional transportation: Private company offering public transit services through a public funding stream, based on a regular schedule and permanent stops.

Radon: A colorless, odorless and tasteless gas that greatly affects indoor air quality. According to the EPA, radon exposure is the second leading cause of lung cancer in the United States. *www.epa.gov/radon*

Recessed light fixture (recessed can): A luminaire that is installed into an opening in the ceiling or wall.

Resilience: The capacity to adapt to changing conditions and to maintain or regain functionality and vitality in the face of stress or disturbance. Relative to climate change, resilience involves adaptation to the wide range of regional and localized impacts that are expected with a warming planet: more intense storms, greater precipitation, coastal and valley flooding, longer and more severe droughts in some areas, wildfires, melting permafrost, warmer temperatures, and power outages. *www.resilientdesign.org/*

Resilient flooring: Flooring products in which the wearing surface is non-textile, including but not limited to rubber, polymeric and linoleum. *www.nsf.org/services/by-industry/sustainability-environment/sustainability-standards-protocols/floor-coverings/*

RESNET (Residential Energy Services Network): A national not-for-profit membership corporation that is a recognized standards-making body for building energy-efficiency rating and certification systems in the United States. *www.resnet.us*

Retention basin: A shallow impoundment, sometimes referred to as a "wet detention pond," designed to capture and retain stormwater runoff during storm events. *http://water.epa.gov/scitech/wastetech/upload/2002_06_28_mtb_wetdtnpn.pdf*

Road section: The cross-section through a street, with particular attention paid to the width of the street and its hydrology. Carefully planned road sections can decrease the amount of impervious surfaces and improve the overall stormwater management for the project site. More information can be found in the document "Low-Impact Development Design Strategies: An Integrated Design Approach," found at *http://water.epa.gov/polwaste/green/*

Rock filter (or filter berm): A permanent or temporary stone structure installed to serve as a sediment-filtering device in drainage ways. Allows a pool to form in an excavated or natural depression, where sediment can settle. The pool is then dewatered through the gravel rock dam. *http://water.epa.gov/polwaste/npdes/swbmp/Construction-Site-Stormwater-Run-Off-Control.cfm*

Silt fencing: A temporary fabric barrier surrounding a site to control stormwater runoff. *http://water.epa.gov/polwaste/npdes/swbmp/Construction-Site-Stormwater-Run-Off-Control.cfm*

Silt sacks: Tube-shaped erosion-control devices. *http://water.epa.gov/polwaste/npdes/swbmp/Construction-Site-Stormwater-Run-Off-Control.cfm*

Solar hot water system: Captures, converts and transfers heat from direct and indirect sunlight to heat an auxiliary water tank and provide hot water for a building's occupants.

Solar reflectance (or albedo): A measure of a material's ability to reflect sunlight (including the visible, infrared and ultraviolet wavelengths) on a scale of 0 to 1. A solar reflectance value of 0.0 indicates that the surface absorbs all solar radiation, and a 1.0 solar reflectance value represents total reflectivity.

Solar south: A measurement of the sun's true position based on its path across the sky. It is different from magnetic south, which is taken from a compass reading. Methods for calculating solar south include the solar noon method or a compass using a magnetic declination chart to correct for magnetic declination.

Static service pressure: The pipeline or municipal water supply pressure when water is not flowing.

Straw bale: A bound block of straw and organic material used to control stormwater runoff. *http://water.epa.gov/polwaste/npdes/swbmp/Construction-Site-Stormwater-Run-Off-Control.cfm*

Substantial rehabilitation: A project that includes the replacement and/or improvement of at least two major systems of the building, including its envelope. Major building systems include roof structures, wall or floor structures, foundations, plumbing, heating and air conditioning, and electrical systems. The building envelope is defined as the air barrier and thermal barrier separating exterior from interior space.

Supportive housing dwelling units: Permanent housing with attached intensive services targeted to populations that have special needs, including people who are currently or formerly homeless; those with serious, chronic mental health issues; people in various stages of recovery from substance abuse; people with HIV/AIDS, or physical or developmental disabilities; the formerly incarcerated, the frail elderly, homeless or emancipated youth, and victims of domestic violence; and other groups that would not be able to live independently and maintain housing without intensive support.

Swales: Shallow grass-covered hydraulic conveyance channels that help to slow runoff and facilitate infiltration. *www.epa.gov/greeningepa/stormwater/best_practices.htm*

T8 fixture: A fixture made up of a tubular fluorescent bulb and an electronic ballast, both operating with a higher efficacy than traditional tubular fluorescent design technology, such as the T12 bulb and magnetic ballast.

Tiers: Earthen embankments that reduce erosion by slowing, collecting and redistributing surface runoff to stable outlets that increase the distance of overland runoff flow. *http://water.epa.gov/polwaste/npdes/swbmp/Construction-Site-Stormwater-Run-Off-Control.cfm*

Title 24: The building energy performance standards for the state of California. *www.energy.ca.gov/title24/*

Transit ride: A scheduled stop along a defined route of one form of public transportation (bus, rail or ferry).

Universal Design: The design of products and environments to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design. The principles of Universal Design are as follows: 1) equitable use, 2) flexibility in use, 3) simple and intuitive use, 4) perceptible information, 5) tolerance for error, 6) low physical effort and 7) size and space for approach and use. *www.ncsu.edu/ncsu/design/cud/about_ud/udprinciplestext.htm*

Urea-formaldehyde: A toxic resin created from formaldehyde that causes similar side effects. Composite wood products made for indoor use, such as particleboard, hardwood plywood paneling and medium-density fiberboard, often contain this resin. *www.epa.gov/iaq/formaldehyde.html*

Vapor retarder: The International Residential Code (IRC) defines vapor retarders as Class I, II or III based on how permeable they are to water vapor—the lower the permeability, the less water vapor that will pass through the vapor retarder.

Class I: Very low permeability vapor retarders—rated at 0.1 perms or less. Sheet polyethylene (visqueen) or unperforated aluminum foil (FSK) are Class I vapor retarders.

Class II: Low permeability vapor retarders—rated greater than 0.1 perms and less than or equal to 1.0 perms. The kraft facing on batts qualifies as a Class II vapor retarder.

Class III: Medium permeability vapor retarders—rated greater than 1.0 perms and less than or equal to 10 perms. Latex and enamel paint qualify as Class III vapor retarders.

For additional information, visit NAIMA at: *www.naima.org/insulation-knowledge-base/residential-home-insulation/insulation-and-vapor-retarders.html*

Vehicle share program: A private system in which a company or a group of individuals share vehicles on a reservation basis and pay for the use on the basis of time or mileage. Programs that qualify under Criterion 2.8 Access to Public Transportation must have an established formal agreement among participants.

Ventilation: The process of supplying outdoor air to, or removing air from, a dwelling by natural or mechanical means. Such air may or may not have been conditioned.

VOCs (volatile organic compounds): A large group of carbon-based chemicals that easily evaporate at room temperature. *www.epa.gov/iaq/voc.html*

Walk distance: The distance a pedestrian must travel between origins and destinations without obstruction, in a safe and comfortable environment on a continuous network of sidewalks, all-weather-surface footpaths, crosswalks or equivalent pedestrian facilities. Any crossing of a street with speeds at or greater than 30 miles per hour requires controlled crossing (e.g., a stop sign or stop light).

Water factor: The quotient of the total weighted per-cycle water consumption divided by the capacity of the clothes washer. Lower numbers indicate more efficient use of water.

Watershed: The area of land where all of the water that is under it or drains off of it goes into the same place. *http://water.epa.gov/type/watersheds/whatis.cfm*

Weather-based irrigation controller (WBIC): An automated "thermostat for your sprinkler system" that operates your irrigation system based on local weather, landscape conditions and plant watering needs. *www.epa.gov/watersense/docs/irrigation_controller_rpt_minireport_508.pdf*

Weekend ride options: A public transit option of either bus, rail or ferry service. Employer-assisted vanpools and dial-a-ride programs are examples of qualifying weekend service.

Well-being: Well-being includes the presence of positive emotions and moods (e.g., contentment, happiness), the absence of negative emotions (e.g., depression, anxiety), satisfaction with life, fulfillment and positive functioning. In simple terms, well-being can be described as judging life positively and feeling good.

Xeriscaping: A method of landscaping aimed at reducing or eliminating excess water from irrigation by using drought-tolerant plants. *www.epa.gov/greeningepa/glossary.htm#xeriscaping*

Enterprise Green Communities
10 G Street NE, Suite 580
Washington, DC 20002
800.624.4298

www.enterprisecommunity.org/green
www.enterprisecommunity.org

GREEN COMMUNITIES INTENDED METHODS WORKSHEET

Project Name		Developer Name	Housing Authority of the City of Pueblo
Project Location	Acero & Sprague Avenues, Pueblo, Colorado 81004	Developer Contact	Gary L. Trujillo

INTENDED METHODS WORKSHEET: This worksheet identifies how the project team intends to incorporate the Mandatory and an adequate number of Optional Criteria into the development.

This worksheet must be filled out and submitted electronically with the preliminary application, Carryover application, and Final application in the appropriate section(s) below.

INSTRUCTIONS for Preliminary Applications:

1) Provide a description of how the item will be implemented under column D ("Describe how Criterion will be implemented") for each of the Mandatory criterion and the Optional criteria being pursued; select a description from the drop-down menu or provide a narrative description where requested.

2) If the project is requesting a waiver of any criteria, please indicate on the " ***Waivers and Workarounds*** " tab and provide an explanation.

3) Indicate the number of optional points being pursued by completing column E ("Intended Points") using the drop-down menu.

INSTRUCTIONS for Carryover Applications:

1) Indicate in column F by marking an 'X' in the cell if the criterion plan has changed from what was described in the preliminary application; then provide a description on the " ***Waivers and Workarounds*** " tab.

2) If the project is requesting a waiver of any criteria, please indicate on the " ***Waivers and Workarounds*** " tab and provide an explanation.

3) Intended points in column H will populate automatically from Development Plan tab.

INSTRUCTIONS for Final Applications:

1) Indicate if Criterion is still being met by selecting "Yes" or "No" from the drop-down menu in column I.

2) If "No" is selected or any item has changed from the Carryover application, provide an explanation on the " ***Waivers and Workarounds*** " tab.

3) Indicate the number of optional points achieved by the project in column J ("Achieved Points") using the drop-down menu.

4) If the project is requesting a waiver of any criteria, please indicate on the " ***Waivers and Workarounds*** " tab and provide an explanation.

1: INTEGRATIVE DESIGN		Preliminary Application		Carryover Application		Final Application	
Criteria Item		Describe how Criterion will be implemented by selecting from the drop-down menu or providing a narrative description, where indicated.	Intended Points (select from drop-down menu)	Please indicate with a 'X' if the criterion plan has changed since preliminary application, and provide a description on the "Waivers and Workarounds" tab.	Intended Points (will populate from Development Plan)	Please indicate if Criterion is still being met? If 'No' was selected or any item has changed from the Carryover application, provide an explanation on the "Waivers and Workarounds" tab.	Achieved Points (select from drop-down menu)
1.1a	Goal Setting	##########	**M**		M		**M**
1.1b	Criteria Documentation	The project team will create design and construction documentation (i.e. plans, details, and specifications) to include information on implementation of appropriate Enterprise Green Communities Criteria	**M**		M		**M**
1.1c	Designing for Project Performance	Identify how the expected performance of your project compares to the actual performance of other projects in your portfolio and/or community. (Brief narrative attached)	**0**		0		**0**
1.2a	Resident Health and Well-Being: Design for Health	##########	**M**		M		**M**
1.2b	*Resident Health and Well-Being: Heal Action Plan*	##########	**0**		0		**0**

1.3a	Resilient Communities: Design for Resilience (New Construction & Substantial Rehab Only)	3.6: Surface Stormwater Management	**M**		M		**M**
1.3b	Resilient Communities: Multi-Hazard Risk/Vulnerability Assessment		**0**		0		**0**
			0 **Intended Points**		0 Intended Points		**0** **Achieved Points**

2: LOCATION + NEIGHBORHOOD FABRIC		**Preliminary Application**		**Carryover Application**		**Final Application**	
	Criteria Item	Describe how Criterion will be implemented by selecting from the drop-down menu or providing a narrative description, where indicated.	Intended Points (select from drop-down menu)	Please indicate with a 'X' if the criterion plan has changed since preliminary application, and provide a description on the "Waivers and Workarounds" tab.	Intended Points (will populate from Development Plan)	Please indicate if Criterion is still being met? If 'No' was selected or any item has changed from the Carryover application, provide an explanation on the "Waivers and Workarounds" tab.	Achieved Points (select from drop-down menu)
2.1	Sensitive Site Protection	Do not locate new projects, including buildings, built structures,roads or parking areas, on portions of sites that meet any of the following provisions: 1) Land within 100 feet of wetlands, including isolated wetlands or streams. Maintain or establish riparian buffer using native vegetation where possible. Bike and foot paths are allowed if at least 25 feet from the wetlands boundary; 2)Land on slope greater than 15%; 3) Land with prime soils, unique soils or soils of state significance per USDA designations; 4) Public parkland; 5) Land that is specifically identified as an existing habitat for any species on federal or state threatened or endangered lists; and 6) Land that is within the Special Flood Hazard Areas (SFHA) as identified by FEMA on the Flood Insurance Rate Map.	**M**		M		**M**

2.2	Connections to Existing Development and Infrastructure *(New Construction only, except for projects located on rural tribal lands, in colonias communities, or in communities of population less than 10,000)*	The project is located on a site with access to existing roads, water, sewers, and other infrastructure within or contiguous (having at least 25% of the perimeter bordering) to existing development, connected to the pedestrian grid.	**M**		M		**M**
2.3	Compact Development (the density calculation meets the census block group) which your project is located	At a minimum, build to the residential density (dwelling units/acre) of the census block group in which your project is located. Find the density of your census block group by typing your project address into the Center for Neighborhood Technology see page 41 of the 2015 EGC Criteria Manual	**M**		M		**M**
2.4	Compact Development (the density calculation exceeds the census block group - 5 or 7 points)	If the density of the project exceeds the census block group density by 2X= 5 points. If the density of the project exceeds the census block group density by 3X=7 points.	**5**		0		**0**
2.5	Proximity to Services (Locate the project within the distance of the number of services specified on the table on page 43 of the 2015 EGC Criteria Manual)	The project is located within 0.5-mile walk distance of at least 4 services, or a 1-mile walk distance of at least 7 services. Each service type has not be counted more than twice. For Rural/Tribal/Small Town, the project is within 5 miles of 4 services.	**M**		M		**M**
2.6	Preservation of and Access to Open Space for Rural/Tribal/Small Towns	The project has a set aside of a minimum 10% (minimum of .25 acres) of the total project acreage as non-paved open space for use by all residents	**M**		M		**M**
2.7	Preservation of and Access to Open Space (6 points max)	Set aside a percentage of non-paved open space for use by all residents. 20% (2 points); 30% (4 points); 40% with written statement of preservation/conservation policy set-aside land.	**2**		0		**0**
2.8	Access to Public Transportation (8 or 10 points)	Locate projects within a 0.5-mile walk distance of transit services, constituting at least 60 or more transit rides per weekday, with some type of weekend ride option (8 points). For projects that qualify as Rural/Tribal/Small town, locate the project within a 5-mile distance of at least one of the following: Vehicle share program, dial-a-ride program, employer vanpool, park-and-ride or public-private transportation (8 points). For additional points: Locate the project along dedicated bike trails/lanes that lead to transit services/stations within 3 miles.	**8**		0		**0**
2.9	Improving Connectivity to the Community (2 to 8 points)	Provide a brief narritive that summarizes Incentivize Biking Mobility (See page 48 of the EGC Criteria Manual)	**1**		0		**0**
2.10	Passive Solar Heating/Cooling refer to pages 50-51 of the 2015 EGC Criteria Manual (5 points max)		**0**		0		**0**
2.11	Brownfield or Adaptive Reuse Building		**0**		0		**0**
2.12	Access to Fresh, Local Foods	The project will meet the requirements of Option 1: Neighborhood Farms and Gardens	**6**		0		**0**
2.13	LEED for Neighborhood Development certification		**0**		0		**0**
2.14	Local Economic Development and Community Wealth Creation (6 points max)	Demonstrate local preference for construction employment and subcontractor hiring was part of your bidding process (2 point)	**2**		0		**0**
			24 **Intended Points**		0 Intended Points		**0** **Achieved Points**

3: SITE IMPROVEMENTS		Preliminary Application		Carryover Application		Final Application	
	Criteria Item	Describe how Criterion will be implemented by selecting from the drop-down menu or providing a narrative description, where indicated.	Intended Points (select from drop-down menu)	Please indicate with a 'X' if the criterion plan has changed since preliminary application, and provide a description on the "Waivers and Workarounds" tab.	Intended Points (will populate from Development Plan)	Please indicate if Criterion is still being met? If 'No' was selected or any item has changed from the Carryover application, provide an explanation on the "Waivers and Workarounds" tab.	Achieved Points (select from drop-down menu)
3.1	Environmental Remediation : Conduct an environmental site assesment to determine whether any hazardous materials are present		**M**		M		**M**
3.2	Erosion and Sedimentation Control *(Except for infill sites with buildable area smaller than one acre)*	I will implement EPA's BMP for erosion construction site storm water runoff control, or local requirements, whichever is more stringent including the recommendations found on pages 58 and 59 of the EGC Criteria Manual	**M**		M		**M**
3.3	Low Impact Development: Mandatory for projects located on greenfields (See page 59-60 of the EGC Criteria Manual		**M**		M		**M**
3.4	Landscaping		**M**		M		**M**
3.5a	Efficient Irrigation and Water Reuse	If irrigation is utilized I agree to follow the requirements and recommendations found on pages 62 and 63 of the EGC Criteria Manual	**M**		M		**M**
3.5b	Efficient Irrigation and Water Reuse - if irrigation is utilized (4 or 8 points)	I agree to follow the 3.5 mandatory criteria and select option #1 found on page 63 of the EGC Criteria Manual	**4**		0		**0**
3.6	Surface Stormwater Management (4 or 8 points)	I plan to retain, infiltrate and/or harvest the first 1.0 inch of rain that falls and to label all drains and inlets.	**4**		0		**0**
3.7	Reducing Heat-Island Effect: Paving	I plan to use light-colored, high-albedo materials and/or and open-grid pavement, with a minimum solar reflectance of 0.3, over at least 50% of the site's hardscaped area.	**1**		0		**0**
			9 **Intended Points**		**0** Intended Points		**0** **Achieved Points**

4: WATER CONSERVATION		Preliminary Application		Carryover Application		Final Application	
	Criteria Item	Describe how Criterion will be implemented by selecting from the drop-down menu.	Intended Points (select from drop-down menu)	Please indicate with a 'X' if the criterion plan has changed since preliminary application, and provide a description on the "Waivers and Workarounds" tab.	Intended Points (will populate from Development Plan)	Please indicate if Criterion is still being met? If 'No' was selected or any item has changed from the Carryover application, provide an explanation on the "Waivers and Workarounds" tab.	Achieved Points (select from drop-down menu)
4.1	Water-Conserving Fixtures	I will use toilets: WaterSense-labeled at 1.28 gpf or less, urinals: WaterSense-labeled at 0.5 gpf or less, Showerheads: WaterSense-labeled at 2.0 gpm or less, kitchen faucets at 2.0 gpm or less, and Lav faucets: WaterSense-labeled at 1.5 gpm and for all single-family and all dwelling units in the buildings three stories or fewer, the static pressure will not exceed 60 psi.	M		M		M
4.2	Advanced Water Conservation -Two options for reducing water consumption (6 points max)	Option 1- Reduce water consumption by installing water conserving fixtures in all units and common space bathrooms (see specifications on page 70 of the EGC Criteria Manual)	2		0		0
4.3	Leaks and Water Metering		0		0		0
4.4	Efficient Plumbing Layout and Design	I agree to minimize water loss from delivering hot water, and the hot water delivery system will store no more than 0.5 gallons of water in any piping/manifold between the hot water source and any hot water fixture and to follow all of the requirements and recommendations found on pages 73 and 74 of the EGC Criteria Manual	0		0		0
4.5	Water Reuse **This measure has been removed for 2017; rainwater reuse is only applicable for single family residence or multi-family residence with 4 or fewer units. Gray water is not yet permitted**		--		--		--
4.6	Access to Potable Water During Emergencies (Choose one of the three options found on pages 75-76 of the EGC Criteria Manual (8 points)		0		0		0
			2 Intended Points		0 Intended Points		0 Achieved Points

5: ENERGY EFFICIENCY		Preliminary Application		Carryover Application		Final Application	
	Criteria Item	Describe how Criterion will be implemented by selecting from the drop-down menu or providing a narrative description, where indicated.	Intended Points (select from drop-down menu)	Please indicate with a 'X' if the criterion plan has changed since preliminary application, and provide a description on the "Waivers and Workarounds" tab.	Intended Points (will populate from Development Plan)	Please indicate if Criterion is still being met? If 'No' was selected or any item has changed from the Carryover application, provide an explanation on the "Waivers and Workarounds" tab.	Achieved Points (select from drop-down menu)
5.1a	Building Performance Standard: Single family attached and detached & Multifamily with four dwelling units or fewer, 3 stories or fewer, with up to five stories, where each dwelling unit has its own heating, cooling and hot water system. See pages 78 & 79 of the 2015 EGC Criteria Manual *(New Construction only)*	The project will meet the criterion through Xcel Energy's, Energy Design Assistance Program AND obtain Energy Star New Homes Certification	**M**		M		**M**
5.1b	Building Performance Standard: Multifamily, 4 stories or more. See pages 79 & 80 of the 2015 EGC Criteria Manual *(New Construction Only)*	The Project will follow Xcel Energy Design Assistance (EDA) AND obtian Energy Star MFHR Certification OR The Project will follow Xcel Energy Design Assistance (EDA) AND obtain LEED for Homes v4 EA Prerequisite: Minimum Energy Performance Midrise Prescriptive	**M**		M		**M**
5.1c	Building Performance Standard: Single family & Multifamily, 3 stories or fewer *(Substantial and Moderate Rehab)*		**M**		M		**M**
5.1d	Building Performance Standard: Multifamily, 4 stories or more *(Substantial and Moderate Rehab)*		**M**		M		**M**
5.2a	Additional Reductions in Energy Use (Can earn from 5 to 12 points)	I will design and construct a building that is projected to be at least 5% more efficient than what is required of the project by 5.1a-d per page 84 of the 2015 EGC Criteria Manual	**5**		0		**0**
5.2b	Advanced Certification: Nearing Net Zero (12 points)		**0**		0		**0**
5.3	Sizing of Heating and Cooling Equipment and Ducts	Heating and cooling equipment will be sized in accordance with the ACCA manual, Parts J and S, or ASHRAE handbooks (Note: that if the project is in compliance with 5.1a it automatically meets this Criterion)	**M**		M		**M**
5.4	ENERGY STAR Appliances	The project will install Energy Star-rated clothes washers, dishwashers, and refrigerators	**M**		M		**M**
5.5	Lighting	Follow the guidance for high efficacy lighting controls and other characteristics for all permanently installed lighting fixtures in project dwelling units, common spaces and exterior (pages 87 & 88 of the 2015 EGC Criteria Manual)	**M**		M		**M**
5.6	Electricity Meter (except for single-occupancy & designated supportive housing dwelling units)	Individual or sub-meters will be installed in all dwelling units	**M**		0		**M**
5.7a	Photovoltaic / Solar Hot Water Ready		**0**		0		**0**

5.7b	Renewable Energy (10 points max)	2-3 stories;10%,20%,30%,	**6**		0		**0**
5.8a	Resilient Energy Systems: Floodproofing (8 points)		**0**		0		**0**
5.8b	Resilient Energy Systems: Islandable Power - 3 Options (4, 6, or 8 points)		**0**		0		**0**
			11 Intended Points		**0 Intended Points**		**0 Achieved Points**

6: MATERIALS BENEFICIAL TO THE ENVIRONMENT		**Preliminary Application**		**Carryover Application**		**Final Application**	
	Criteria Item	Describe how Criterion will be implemented by selecting from the drop-down menu or providing a narrative description, where indicated.	Intended Points (select from drop-down menu)	Please indicate with a 'X' if the criterion plan has changed since preliminary application, and provide a description on the "Waivers-Workarounds-Changes" tab.	Intended Points (will populate from Development Plan)	Please indicate if Criterion is still being met? If 'No' was selected or any item has changed from the Carryover application, provide an explanation on the "Waivers and Workarounds" tab.	Achieved Points (select from drop-down menu)
6.1	Low / No VOC Paints, Coatings and Primers	All interior paints and primers in grams per liter, less than or equal to the thresholds established by South Coast Air Quality Management District (SCAQMD) Rule 1113 as required on page 96 of the 2015 EGC Criteria Manual	**M**		M		**M**
6.2	Low / No VOC Adhesives and Sealants	All adhesives and sealants (including caulks) must have volatile organic compound (VOC) levels, in grams per liter, less than or equal to the thresholds established by the South Coast Air Quality Management District (SCAQMD) Rule 1168 and the requirements found on pages 97 & 98 of the 2015 EGC Criteria Manual	**M**		M		**M**
6.3	Recycled Content Material (3 points max) List Materials on Notes Intended Methods Tab	Use building materials that feature recycled content refer to pages 98-99 in the EGC Criteria Manual for building material and project components to be incorporated for optional points	**2**				**0**
6.4	Regional Materials (4 points max) List Material on Notes Intended Methods Tab	The project will use products that are extracted, processed, and manufactured within 500 miles of the project for a minimum of 50%, based on cost, of the building materials' value. Refer to page 99 of the 2015 EGC Criteria Manual for a selection of options.	**3**		0		**0**
6.5	Certified, Salvaged and Engineered Wood Products (1 point)	The project will use wood products of at least 25% by cost that are engineered framing materials that do not include urea formaldehyde-based binders (see Criterion 6.2)	**1**		0		**0**
6.6	Composite Wood Products that Emit Low / No Formaldehyde	All composite wood products must be certified as compliant with California 93120 Phase 2 OR, if using a composite wood product that does not comply with California 93120 Phase 2, all exposed edges and sides must be sealed with low-VOC sealants, per Criterion 6.2	**M**		M		**M**
6.7a	Environmentally Preferable Flooring	Any carpet, pad and adhesive will not be installed in entryways, laundry rooms, bathrooms, kitchens/kitchenettes, utility rooms, or any rooms of ground-connected floors. Any carpet products will meet Green Label or Green Label Plus certification. Any hard surface flooring products will be either ceramic tile, unfinished hardwood floors, or in compliance with the FloorScore program criteria	**M**		M		**M**
6.7b	Environmentally Preferable Flooring: Throughout Building (6 points)		**0**		0		**0**
6.8	Mold Prevention: Surfaces	To use material that have durable, cleanable surfaces throughout bathrooms, kitchens, and laundry rooms not prone to deterioration due to moisture intrusion or that encourage mold growth	**M**		M		**M**
6.9	Mold Prevention: Tub and Shower Enclosures	To use Moisture-resistent backing materials such as cement board, fiber cement board, or equivalent per ASTM #D3273 behind tub/shower enclosures.	**M**		M		**M**

6.10	Asthmagen-Free Materials (12 points max) Specify which asthmagen-free materials to be used used on the Notes Intended Methods worksheet	Will qualify for a max of 12 points by not installing products that contain ingredients that are known to cause or trigger asthma an will avoid: Insulation (spray polyurethane foam SPF or formadehyde-containing fiberglass batts (4 points); Flooring: flexible vinyl PVC roll or sheet flooring or carpet backed with vinyl with phthalates or use fluid applied finish floors (4 points); Wall Coverings: wallpaper made from vinyl PVC with phtalates or site-applied high-performance coatings that are epoxy- or polyurethane-based (4 points) or Composite Wood: will use only ULEF (Ultra Low Emitting Formadehyde) or NAF (No added Formadelhyde) products for cabinetry, subflooring and othe interior composite wood uses (4 points)	**4**		0		**0**
6.11	Reduced Heat-Island Effect: Roofing (5 points)		**0**		0		**0**
6.12	Construction Waste Management		**0**		0		**0**
6.13	Recycling Storage (3 points)		**0**		0		**0**
			8 **Intended Points**		0 **Intended Points**		**0** **Achieved Points**

7: HEALTHY LIVING ENVIRONMENT		**Preliminary Application**		**Carryover Application**		**Final Application**	
	Criteria Item	Describe how Criterion will be implemented by selecting from the drop-down menu or providing a narrative description, where indicated.	Intended Points (select from drop-down menu)	Please indicate with a 'X' if the criterion plan has changed since preliminary application, and provide a description on the "Waivers-Workarounds-Changes" tab.	Intended Points (will populate from Development Plan)	Please indicate if Criterion is still being met? If 'No' was selected or any item has changed from the Carryover application, provide an explanation on the "Waivers and Workarounds" tab.	Achieved Points (select from drop-down menu)
7.1	Ventilation *(New Construction and Substantial Rehab; Moderate Rehab is optional - Mandatory + up to 12 points max)*	For each dwelling in full accordance with ASHRAE 62.2.2010, install: local mechanical exhaust system in each bathroom (4 points if Moderate Rehab); local mechanical exhaust system in each kitchen (4 points if Moderate Rehab); Whole house mechanical ventilation system (4 points if Moderate Rehab). Also for each multifamily building of four stories or more, in full accordance with ASHRAE 62.1-2010, in additon describe which options have been selected and note their corresponding points (up to a max of 12 points) found on pages 111-113 of the 2015 EGC Criteria Manual.	**0**		0		**0**
7.2	Clothes Dryer Exhaust	All clothes dryers will exhaust directly to the outdoors using rigid-type duct work, except for condensing dryers, which must be plumbed to a drain.	**M**		M		**M**
7.3	Combustion Equipment	For new construction and rehab projects, which specifies power-vented or direct-vent equipment when installing any new combustion appliance for space or water heating that will be located within conditioned space. Or if in Substantial Rehab and Moderate Rehab, if there is any combustion equipment located within the conditioned space or water heating that is not power-vented or direct-vent and that is not scheduled for replacement, conduct initial combustion safety testing. Also conduct combustion safety testing for central systems and for 10% of these individual dwelling unit systems per RESNET or BPI Combustion Safety Test Procedures. Report any deficiencies immediately in any failed tested system. Also indicate how the project will follow the other requirements as found on pages 113-114 of the 2015 EGC Criteria Manual	**M**		M		**M**
7.4	Elimination of Combustion Within the Conditioned Space	No combustion equipment is going to be used for cooking in the project (including, but not limited to ranges, cooktops, stoves, ovens) as part of the building project (for 9 points)	**9**		0		**0**
7.5	Vapor Retarder Strategies (New Construction and Rehab Projects with foundation work in scope)	Install vapor barries that meet specified criteria appropriate for the foundation type refer to pages 115-116 in the EGC Criteria Manual	**M**		M		**M**

	7.6	Water Drainage *(New Construction and Rehab projects replacing assemblies called out in Criterion only)*	Provide drainage of water away from walls, windows and roofs by implementing the list of techniques listed on page 117 of the EGC Criteria Manual	**M**		M		**M**
	7.7	Mold Prevention: Water Heaters	All water heaters will be installed with catch pans and drains piped to the exterior of the dwelling and with water heaters located in rooms with non-water sensitive floor coverings. Also pans should be sloped and corrosion-resistant (e.g., stinless or plastic) with drains at the low point with condensate lines drained to drainage system, and not just deposited under slab. Note: Tankless water heaters do not require drains or catch pans with drains piped to the extrior of the building.	**M**		M		**M**
	7.8	Radon Mitigation *(New Construction and Substantial Rehab only)*	For New construction in EPA Zone 1 areas, install passive radon-resistant features below the slab and a vertical vent pipe with junction box within 10 feet of an electrical outlet in case an active system should prove necessary in the future. For Substantial Rehab projects in EPA Zone 1, test and mitigate per th specified protocols, refer to pages 118-199 in the EGC Criteria Manual	**M**		M		**M**
	7.9	Garage Isolation	The project does not have an attached garage	**M**		M		**M**
	7.10	Integrated Pest Management	Seal all wall, floor, and joint penetrations with low-VOC caulking or other appropriate nontoxic sealing methods to prevent pest entry	**M**		0		**M**
*	**7.11a**	Beyond ADA: Universal Design (New Construction)		**0**		0		**0**
*	**7.11b**	Beyond ADA: Universal Design (Substantial and Moderate Rehab)		**0**		0		**0**
*	**7.12**	Active Design: Promoting Physical Activity Within the Building	Situate at least one building stairway per the requirements found on pages 124 & 125 of the 2015 EGC Criteria Manual to encourage use.	**M**		M		**M**
	7.13	Active Design: Staircases and Building Circulation (Select an option for 10 points)		**0**		0		**0**
	7.14	Interior and Outdoor Activity Spaces for Children and Adults	**Provide an on-site dedicated Recreation space with play opportunities for children that is open and accessible to all residents per criterion found on pages 127 & 128 of the 2015 EGC Criteria Manual**	**9**		0		**0**
	7.15	Reduce Lead Hazards in Pre-1978 Buildings *(Substantial Rehab on buildings constructed before 1978 only)*	The project is new construction	**M**		M		**M**
	7.16	Smoke-Free Building		**0**		0		**0**
				18 **Intended Points**		**0** Intended Points		**0** **Achieved Points**

8: OPERATIONS, MAINTENANCE + RESIDENT ENGAGEMENT		Preliminary Application		Carryover Application		Final Application	
	Criteria Item	Describe how Criterion will be implemented by selecting from the drop-down menu or providing a narrative description, where indicated.	Intended Points (select from drop-down menu)	Please indicate with a 'X' if the criterion plan has changed since preliminary application, and provide a description on the "Waivers and Workarounds" tab.	Intended Points (will populate from Development Plan)	Please indicate if Criterion is still being met? If 'No' was selected or any item has changed from the Carryover application, provide an explanation on the "Waivers and Workarounds" tab.	Achieved Points (select from drop-down menu)
8.1	Building Operations & Maintenance Manual *(all multifamily projects)*	Develop a manual with thorough building operations and maintenance guidance and a complementary plan. The manual and plan should be developed over the course of the project design, development and construction stages, and should include sections/chapters addressing the list of topics found on pages 132 - 135 of the EGC Criteria Manual	M		M		M
8.2	Emergency Management Manual *(For all multifamily projects)*	Provide a manual on emergency operations targeted toward operations and maintenance staff and other building-level personnel. The manual should address responses to various types of emergencies, leading with those that have the greatest probability of negatively affecting the project. The manual should provide guidance as to how to sustain the delivery of adequate housing throughout an emergency and cover a range of topics, including but not limited to: Communication plans for staff and residents; Useful contact information for public utility and other service providers; Infrastructure and building "shutdown" procedures refer to pages 135 - 136 in the EGC Criteria Manual	M		M		M
8.3	Resident Manual	Provide a guide for homeowners and renters that explains the intent, benefits, use and maintenance of their home's green features and practices. The Resident Manual should encourage green and healthy activities per the list of topics found on pages 136 -138 of the EGC Criteria Manual	M				
8.4	Resident and Property Manager Orientation	Provide a comprehensive walk-through and orientation for all residents, property manager(s) and buildings operations staff. Use the appropriate manuals (see Criteria 8.1, 8.2, 8.3) as the base of the curriculum, and review the project's green features, operations and maintenance procedures, and emergency protocols found on pages 138-139 of the EGC Criteria Manual	M		M		M
8.5	Project Data Collection and Monitoring System: 100% Owner-Paid Utility Accounts; 15% Tenant-Paid Utility Accounts. (Please note CHFA has elected to make 8.5 optional pending further review).	The project will work with Enterprise to collect and monitor energy, water, and if possible healthy living environments data for a minimum of 5 years refer to page 140 in the EGC Criteria Manual	0		M		M
8.6	Project Data Collection and Monitoring System: Greater than 15% Tenant-Paid Utility Accounts (7 or 11 points)	**Collect and monitor project energy and water performance data for at least 5 years. This data must be maintained in a manner that allows staff to easily access and monitor it, enabling them to make informed operations and capital planning decisions. Also allow Enterprise access to the data for 16-60% of the units for (7 points)**	11		0		0
			11 Intended Points		0 Intended Points		0 Achieved Points
		TOTAL INTENDED POINTS	83	TOTAL INTENDED POINTS	0	TOTAL ACHIEVED POINTS	0

SECTION 01 33 29.04
MATERIAL CONTENT FORM

PROJECT NAME: MOUNTAIN VIEW TOWNHOMES; NO.: I.F.B. 19-522-RAD.

1.01 **APPLICABLE SPECIFICATION SECTION NUMBER(S) _____**

1.02 **PRODUCT NAME: _____ (BRAND NAME, MODEL NUMBER, ETC.)**

1.03 **MANUFACTURER NAME: _____ WWW._____**

1.04 **SOURCE LOCATION: _____ (IF PROCESSED AT MULTIPLE LOCATIONS, ATTACH A DESCRIPTION; SEE SECTION 01 60 00)**

PRODUCT CONTENT

2.01 **TOTAL WEIGHT: _____ POUNDS PER _____ (UNIT).**

2.02 **ENVIRONMENTAL PRODUCT DECLARATION (EPD) _____ IS ATTACHED OR _____ IS NOT AVAILABLE.**

2.03 _____ **% SOLID WOOD, WOOD CHIP, AND WOOD FIBER CONTENT, BY WEIGHT.**

A. ____ Product is FSC-trademarked.

B. ____ FSC Chain-of-Custody certificate number is _____

C. ____ SFI Certified ____ ATFS Certified ____ SFM Certified.

2.04 _____ **% OTHER BIO-BASED CONTENT, BY WEIGHT; SOURCED FROM A SAN-CERTIFIED FARM.**

2.05 _____ **% STEEL CONTENT, BY WEIGHT.**

A. ____ Steel Mill Source is: _____

B. ____ Mill letter describing mill process and typical re-used steel content is attached.

2.06 _____ **% PRE-CONSUMER (POST-INDUSTRIAL) RECYCLED CONTENT, BY WEIGHT, OTHER THAN STEEL.**

2.07 _____ **% POST-CONSUMER RECYCLED CONTENT, BY WEIGHT, OTHER THAN STEEL.**

2.08 _____ **ZERO LEAD CONTENT.**

2.09 _____ **ZERO ASBESTOS CONTENT.**

2.10 _____ **ZERO INTENTIONALLY ADDED METHYLENE CHLORIDE OR PERCHLOROETHYLENE (PAINTS AND COATINGS).**

2.11 _____ **ZERO INTENTIONALLY ADDED CADMIUM (PAINTS AND COATINGS).**

EMISSIONS AND HEALTH

3.01 **HEALTH PRODUCT DECLARATION (HPD) _____ IS ATTACHED OR _____ IS NOT AVAILABLE.**

3.02 _____ **FORMALDEHYDE: COMPLYING WITH CARB COMPOSITE WOOD REGULATION FOR ULEF OR NO ADDED FORMALDEHYDE RESIN.**

3.03 _____ **LOW-EMITTING MATERIAL MEETING REQUIREMENTS OF CAL (CDPH SM), PRIVATE OFFICE SCENARIO.**

3.04 **WET-APPLIED PRODUCTS:**

3.05 _____ **VOC CONTENT MEETING SCAQMD RULE 1113.**

3.06 _____ **VOC CONTENT: MEETING CARB 2007, SCM FOR ARCHITECTURAL COATINGS.**

3.07 _____ **VOC CONTENT MEETS SCAQMD RULE 1168.**

3.08 _____ **OTHER VOC CONTENT TEST REPORT; SEE SECTION 01 33 29 - SUSTAINABLE DESIGN REPORTING.**

CERTIFIED BY: (MANUFACTURER)

4.01 _____ **DOCUMENTATION OF ALL CLAIMS MADE ABOVE IS ATTACHED.**

4.02 **PRINT NAME:**_____

4.03 **SIGNATURE:**_____

4.04 **TITLE:** _____ **(OFFICER OF COMPANY), DATE:** _____

END OF SECTION

SECTION 01 40 00
QUALITY REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Submittals.

B. Quality assurance.

C. References and standards.

D. Testing and inspection agencies and services.

E. Contractor's construction-related professional design services.

F. Contractor's design-related professional design services.

G. Control of installation.

H. Mock-ups.

I. Tolerances.

J. Manufacturers' field services.

K. Defect Assessment.

1.02 RELATED REQUIREMENTS

A. Section 01 21 00 - Allowances: Allowance for payment of testing services.

1.03 REFERENCE STANDARDS

A. ASTM C1021 - Standard Practice for Laboratories Engaged in Testing of Building Sealants 2008 (Reapproved 2014).

B. ASTM C1077 - Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation 2017.

C. ASTM C1093 - Standard Practice for Accreditation of Testing Agencies for Masonry 2015a, with Editorial Revision (2016).

D. ASTM D3740 - Standard Practice for Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction 2012a.

E. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection 2018.

F. ASTM E543 - Standard Specification for Agencies Performing Nondestructive Testing 2015.

G. ASTM E699 - Standard Specification for Agencies Involved in Testing, Quality Assurance, and Evaluating of Manufactured Building Components 2016.

H. IAS AC89 - Accreditation Criteria for Testing Laboratories 2017.

1.04 DEFINITIONS

A. Contractor's Quality Control Plan: Contractor's management plan for executing the Contract for Construction.

B. Contractor's Professional Design Services: Design of some aspect or portion of the project by party other than the design professional of record. Provide these services as part of the Contract for Construction.

1. Design Services Types Required:

a. Construction-Related: Services Contractor needs to provide in order to carry out the Contractor's sole responsibilities for construction means, methods, techniques, sequences, and procedures.

b. Design-Related: Design services explicitly required to be performed by another design professional due to highly-technical and/or specialized nature of a portion of the project. Services primarily involve engineering analysis, calculations, and design, and are not intended to alter the aesthetic aspects of the design.

C. Design Data: Design-related, signed and sealed drawings, calculations, specifications, certifications, shop drawings and other submittals provided by Contractor, and prepared directly by, or under direct supervision of, appropriately licensed design professional.

1.05 **CONTRACTOR'S CONSTRUCTION-RELATED PROFESSIONAL DESIGN SERVICES**

A. Coordination: Contractor's professional design services are subject to requirements of project's Conditions for Construction Contract.

B. Provide such engineering design services as may be necessary to plan and safely conduct certain construction operations, pertaining to, but not limited to the following:

1. Temporary sheeting, shoring, or supports.
2. Temporary scaffolding.
3. Temporary bracing.
4. Temporary falsework for support of spanning or arched structures.
5. Temporary foundation underpinning.
6. Temporary stairs or steps required for construction access only.
7. Temporary hoist(s) and rigging.
8. Investigation of soil conditions to support construction equipment.

1.06 **CONTRACTOR'S DESIGN-RELATED PROFESSIONAL DESIGN SERVICES**

A. Coordination: Contractor's professional design services are subject to requirements of project's Conditions for Construction Contract.

B. Base design on performance and/or design criteria indicated in individual specification sections.

1. Submit a Request for Interpretation to Architect if the criteria indicated are not sufficient to perform required design services.

C. Scope of Contractor's Professional Design Services: Provide for the following items of work:

1. Structural Design of Formwork: As described in Section 03 10 00 - Concrete Forming and Accessories.
2. Concrete Mix Design: As described in Section 03 30 00 - Cast-in-Place Concrete. No specific designer qualifications are required.
3. Structural Design of Railings: As described in Section 05 52 13 - Pipe and Tube Railings.
4. Structural Design of Wood Framed Stairs: to be reviewed by Architect and Engineer.
5. Structural Design of Wood Trusses: As described in Section 06 17 53 - Shop-Fabricated Wood Trusses
6. Structural Design of Glued-Laminated Construction: As described in Section 06 18 00 - Glued-Laminated Construction.

7. Sprinkler Layout: Coordinate with ceiling installation, detailed pipe layout, and hydraulic calculations as described in Section 21 13 00 - Fire-Suppression Sprinkler Systems.
8. System Design of Fire Sprinkler System: Include calculations, detailed layout, component locations, control diagrams, wiring diagrams, and sequences of operation.
9. Design of Structural Fill: As described in Section 31 23 23 - Fill.
10. Structural Calculations and Design: As described in Section 32 32 23 - Segmental Retaining Walls

1.07 **SUBMITTALS**

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Designer's Qualification Statement: Submit for Architect's knowledge as contract administrator, or for Owner's information.

1. Include information for each individual professional responsible for producing, or supervising production of, design-related professional services provided by Contractor.
    a. Full name.
    b. Professional licensure information.
    c. Statement addressing extent and depth of experience specifically relevant to design of items assigned to Contractor.

C. Design Data: Submit for Architect's knowledge as contract administrator for the limited purpose of assessing compliance with information given and the design concept expressed in the contract documents, or for Owner's information.

1. Include calculations that have been used to demonstrate compliance to performance and regulatory criteria provided, and to determine design solutions.
2. Include required product data and shop drawings.
3. Include a statement or certification attesting that design data complies with criteria indicated, such as building codes, loads, functional, and similar engineering requirements.
4. Include signature and seal of design professional responsible for allocated design services on calculations and drawings.

D. Test Reports: After each test/inspection, promptly submit two copies of report to Architect and to Contractor.

1. Include:
    a. Date issued.
    b. Project title and number.
    c. Name of inspector.
    d. Date and time of sampling or inspection.
    e. Identification of product and specifications section.
    f. Location in the Project.
    g. Type of test/inspection.
    h. Date of test/inspection.
    i. Results of test/inspection.
    j. Compliance with Contract Documents.

k. When requested by Architect , provide interpretation of results.

2. Test report submittals are for Architect's knowledge as contract administrator for the limited purpose of assessing compliance with information given and the design concept expressed in the contract documents, or for Owner's information.

E. Certificates: When specified in individual specification sections, submit certification by the manufacturer and Contractor or installation/application subcontractor to Architect, in quantities specified for Product Data.

1. Indicate material or product complies with or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.

2. Certificates may be recent or previous test results on material or product, but must be acceptable to Architect .

F. Manufacturer's Instructions: When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, for the Owner's information. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

G. Manufacturer's Field Reports: Submit reports for Architect 's benefit as contract administrator or for Owner .

1. Submit report in duplicate within 30 days of observation to Architect for information.

2. Submit for information for the limited purpose of assessing compliance with information given and the design concept expressed in the contract documents.

H. Erection Drawings: Submit drawings for Architect 's benefit as contract administrator or for Owner .

1. Submit for information for the limited purpose of assessing compliance with information given and the design concept expressed in the contract documents.

2. Data indicating inappropriate or unacceptable Work may be subject to action by Architect or Owner .

1.08 **QUALITY ASSURANCE**

A. Testing Agency Qualifications:

1. Prior to start of work, submit agency name, address, and telephone number, and names of full time registered Engineer and responsible officer.

2. Submit copy of report of laboratory facilities inspection made by NIST Construction Materials Reference Laboratory during most recent inspection, with memorandum of remedies of any deficiencies reported by the inspection.

3. Qualification Statement: Provide documentation showing testing laboratory is accredited under IAS AC89.

B. Designer Qualifications: Where professional engineering design services and design data submittals are specifically required of Contractor by Contract Documents, provide services of a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.

C. Contractor's Quality Control (CQC) Plan:

1. Prior to start of work, submit a comprehensive plan describing how contract deliverables will be produced. Tailor CQC plan to specific requirements of the project. Include the following information:

a. Management Structure: Identify personnel responsible for quality. Include a chart showing lines of authority.

1) Include qualifications (in resume form), duties, responsibilities of each person assigned to CQC function.

b. Management Approach: Define, describe, and include in the plan specific methodologies used in executing the work.

1) Management and control of documents and records relating to quality.

2) Communications.

3) Coordination procedures.

4) Resource management.

5) Process control.

6) Inspection and testing procedures and scheduling.

7) Control of noncomplying work.

8) Tracking deficiencies from identification, through acceptable corrective action, and verification.

9) Control of testing and measuring equipment.

10) Project materials certification.

11) Managerial continuity and flexibility.

c. Acceptance of the plan is required prior to start of construction activities not including mobilization work. Owner's acceptance of the plan will be conditional and predicated on continuing satisfactory adherence to the plan. Owner reserves the right to require Contractor to make changes to the plan and operations, including removal of personnel, as necessary, to obtain specified quality of work results.

D. Quality-Control Personnel Qualifications. Engage a person with requisite training and experience to implement and manage quality assurance (QA) and quality control (QC) for the project.

1.09 **REFERENCES AND STANDARDS**

A. For products and workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

B. Comply with reference standard of date of issue current on date of Contract Documents, except where a specific date is established by applicable code.

C. Obtain copies of standards where required by product specification sections.

D. Should specified reference standards conflict with Contract Documents, request clarification from Architect before proceeding.

E. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of Architect shall be altered from the Contract Documents by mention or inference otherwise in any reference document.

1.10 **TESTING AND INSPECTION AGENCIES AND SERVICES**

A. Owner will employ services of an independent testing agency to perform certain specified testing; payment for cost of services will be derived from allowance specified in Section 01

21 00; see Section 01 21 00 and applicable sections for description of services included in allowance.

B. Owner will employ and pay for services of an independent testing agency to perform other specified testing.

C. Contractor shall employ and pay for services of an independent testing agency to perform other specified testing.

D. As indicated in individual specification sections, Owner or Contractor shall employ and pay for services of an independent testing agency to perform other specified testing.

E. Employment of agency in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.

F. Contractor Employed Agency:

1. Testing agency: Comply with requirements of ASTM E329, ASTM E543, ASTM E699, ASTM C1021, ASTM C1077, ASTM C1093 and ASTM D3740.
2. Inspection agency: Comply with requirements of ASTM D3740, ASTM E329 and Authority having Jurisdiction .
3. Laboratory Qualifications: Accredited by IAS according to IAS AC89.
4. Laboratory: Authorized to operate in the State in which the Project is located.
5. Laboratory Staff: Maintain a full time registered Engineer on staff to review services.
6. Testing Equipment: Calibrated at reasonable intervals either by NIST or using an NIST established Measurement Assurance Program, under a laboratory measurement quality assurance program.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 **CONTROL OF INSTALLATION**

A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of specified quality.

B. Comply with manufacturers' instructions, including each step in sequence.

C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect before proceeding.

D. Comply with specified standards as minimum quality for the work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

E. Have work performed by persons qualified to produce required and specified quality.

F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.

G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

3.02 **MOCK-UPS**

A. Before installing portions of the Work where mock-ups are required, construct mock-ups in location and size indicated for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work. The purpose of mock-up is to demonstrate the proposed range of aesthetic effects and workmanship.

B. Accepted mock-ups establish the standard of quality the Architect will use to judge the Work.

C. Integrated Exterior Mock-ups: Construct integrated exterior mock-up as indicated on drawings. Coordinate installation of exterior envelope materials and products as required in individual Specification Sections. Provide adequate supporting structure for mock-up materials as necessary.

D. Room Mock-ups: Construct room mock-ups as indicated on drawings. Coordinate installation of materials, products, and assemblies as required in specification sections; finish according to requirements. Provide required lighting and any supplemental lighting where required to enable Architect to evaluate quality of the mock-up.

E. Notify Owner, Architect and Engineering Consultant fifteen (15) working days in advance of dates and times when mock-ups will be constructed.

F. Provide supervisory personnel who will oversee mock-up construction. Provide workers that will be employed during the construction at Project.

G. Tests shall be performed under provisions identified in this section and identified in the respective product specification sections.

H. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.

I. Obtain Architect's approval of mock-ups before starting work, fabrication, or construction.

1. Architect will issue written comments within seven (7) working days of initial review and each subsequent follow up review of each mock-up.

2. Make corrections as necessary until Architect's approval is issued.

J. Accepted mock-ups shall be a comparison standard for the remaining Work.

K. Where mock-up has been accepted by Architect and is specified in product specification sections to be removed, protect mock-up throughout construction, remove mock-up and clear area when directed to do so by Architect.

L. Where possible salvage and recycle the demolished mock-up materials.

3.03 **TOLERANCES**

A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.

B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Architect before proceeding.

C. Adjust products to appropriate dimensions; position before securing products in place.

3.04 **TESTING AND INSPECTION**

A. See individual specification sections for testing and inspection required.

B. Testing Agency Duties:

1. Test samples of mixes submitted by Contractor .

2. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.

3. Perform specified sampling and testing of products in accordance with specified standards.

4. Ascertain compliance of materials and mixes with requirements of Contract Documents.

5. Promptly notify Architect and Contractor of observed irregularities or non-compliance of Work or products.
6. Perform additional tests and inspections required by Architect .
7. Submit reports of all tests/inspections specified.

C. Limits on Testing/Inspection Agency Authority:

1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
2. Agency may not approve or accept any portion of the Work.
3. Agency may not assume any duties of Contractor .
4. Agency has no authority to stop the Work.

D. Contractor Responsibilities:

1. Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.
2. Cooperate with laboratory personnel, and provide access to the Work and to manufacturers' facilities.
3. Provide incidental labor and facilities:
   a. To provide access to Work to be tested/inspected.
   b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
   c. To facilitate tests/inspections.
   d. To provide storage and curing of test samples.
4. Notify Architect and laboratory 24 hours prior to expected time for operations requiring testing/inspection services.
5. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
6. Arrange with Owner 's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.

E. Re-testing required because of non-compliance with specified requirements shall be performed by the same agency on instructions by Architect.

F. Re-testing required because of non-compliance with specified requirements shall be paid for by Contractor.

3.05 **MANUFACTURERS' FIELD SERVICES**

A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust, and balance equipment as applicable, and to initiate instructions when necessary.

B. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

3.06 **DEFECT ASSESSMENT**

A. Replace Work or portions of the Work not complying with specified requirements.

END OF SECTION

SECTION 01 50 00
TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Dewatering

B. Temporary utilities.

C. Temporary telecommunications services.

D. Temporary sanitary facilities.

E. Temporary Controls: Barriers, enclosures and fencing.

F. Security requirements.

G. Vehicular access and parking.

H. Waste removal facilities and services.

I. Project identification sign.

J. Field offices.

1.02 RELATED REQUIREMENTS

A. Section 01 51 00 - Temporary Utilities.

B. Section 01 52 13 - Field Offices and Sheds.

C. Section 01 55 00 - Vehicular Access and Parking.

D. Section 01 58 13 - Temporary Project Signage.

1.03 REFERENCE STANDARDS

A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2018b.

B. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements 2009 (Reapproved 2016).

1.04 DEWATERING

A. Provide temporary means and methods for dewatering all temporary facilities and controls.

B. Maintain temporary facilities in operable condition.

1.05 TEMPORARY UTILITIES - SEE SECTION 01 51 00

A. Provide and pay for all electrical power, lighting, water, heating and cooling and ventilation required for construction purposes.

1.06 TELECOMMUNICATIONS SERVICES

A. Provide, maintain, and pay for telecommunications services to field office at time of project mobilization.

B. Telecommunications services shall include:

1.07 TEMPORARY SANITARY FACILITIES

A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.

B. Maintain daily in clean and sanitary condition.

1.08 BARRIERS

A. Provide barriers to prevent unauthorized entry to construction areas, to prevent access to areas that could be hazardous to workers or the public, to allow for owner's use of site and to protect existing facilities and adjacent properties from damage from construction operations and demolition.

B. Provide barricades and covered walkways required by governing authorities for public rights-of-way and for public access to existing building.

C. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

1.09 **FENCING**

A. Provide 6 foot high fence around construction site; equip with vehicular and pedestrian gates with locks.

1.10 **SECURITY**

A. Provide security and facilities to protect Work, existing facilities, and Owner's operations from unauthorized entry, vandalism, or theft.

1.11 **VEHICULAR ACCESS AND PARKING - SEE SECTION 01 55 00**

A. Coordinate access and haul routes with governing authorities and Owner .

B. Provide and maintain access to fire hydrants, free of obstructions.

C. Provide means of removing mud from vehicle wheels before entering streets.

D. Provide temporary parking areas to accommodate construction personnel. When site space is not adequate, provide additional off-site parking.

1.12 **WASTE REMOVAL**

A. See Section 01 74 19 - Construction Waste Management and Disposal, for additional requirements.

B. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.

C. Provide containers with lids. Remove trash from site periodically.

D. If materials to be recycled or re-used on the project must be stored on-site, provide suitable non-combustible containers; locate containers holding flammable material outside the structure unless otherwise approved by the authorities having jurisdiction.

E. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

1.13 **PROJECT IDENTIFICATION**

A. Provide project identification sign of design and construction per Section 01 58 13.

B. Erect on site at location to be determined by Owner.

C. No other signs are allowed without Owner permission except those required by law.

1.14 **FIELD OFFICES - SEE SECTION 01 52 13**

A. Office: Weathertight, with lighting, electrical outlets, heating, cooling equipment, and equipped with sturdy furniture, drawing rack and drawing display table.

B. Provide space for Project meetings, with table and chairs to accommodate 6 persons.

1.15 **REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS**

A. Remove temporary utilities, equipment, facilities, materials, prior to Date of Substantial Completion inspection.

B. Remove underground installations to a minimum depth of 2 feet. Grade site as indicated.

C. Clean and repair damage caused by installation or use of temporary work.

D. Restore existing facilities used during construction to original condition.

E. Restore new permanent facilities used during construction to specified condition.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 51 00
TEMPORARY UTILITIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Temporary Utilities: Provision of electricity, lighting, heat, ventilation and water.

1.02 RELATED REQUIREMENTS

A. Section 01 50 00 - Temporary Facilities and Controls:

1.03 REFERENCE STANDARDS

A. 29 CFR 1926 - U.S. Occupational Safety and Health Standards current edition.

1.04 TEMPORARY ELECTRICITY

A. Cost: By Contractor .

B. Provide power service required from utility source.

C. Power Service Characteristics: volt, ampere, three phase, four wire, poles, panels, generators, transformers

D. Provide power outlets for construction operations, with branch wiring and distribution boxes located at each floor. Provide flexible power cords as required.

E. Provide main service disconnect and over-current protection at convenient location and meter.

F. Permanent convenience receptacles may be utilized during construction.

G. Provide adequate distribution equipment, wiring, and outlets to provide single phase branch circuits for power and lighting.

1.05 TEMPORARY LIGHTING FOR CONSTRUCTION PURPOSES

A. Provide and maintain LED, compact fluorescent or high-intensity discharge lighting as suitable for the application for construction operations in accordance with requirements of 29 CFR 1926 and authorities having jurisdiction.

B. Provide branch wiring from power source to distribution boxes with lighting conductors, pigtails, and lamps as required.

C. Maintain lighting and provide routine repairs.

D. Permanent building lighting may be utilized during construction.

1.06 TEMPORARY HEATING

A. Cost of Energy: By Contractor .

B. Provide heating devices and heat as needed to maintain specified conditions for construction operations.

C. Maintain minimum ambient temperature of 50 degrees F in areas where construction is in progress, unless indicated otherwise in specifications.

D. Prior to operation of permanent equipment for temporary heating purposes, verify that installation is approved for operation, equipment is lubricated and filters are in place. Provide and pay for operation, maintenance, and regular replacement of filters and worn or consumed parts.

1.07 TEMPORARY COOLING

A. Cost of Energy: By Contractor .

B. Provide cooling devices and cooling as needed to maintain specified conditions for construction operations.

C. Maintain maximum ambient temperature of 80 degrees F in areas where construction is in progress, unless indicated otherwise in specifications.

D. Prior to operation of permanent equipment for temporary cooling purposes, verify that installation is approved for operation, equipment is lubricated and filters are in place. Provide and pay for operation, maintenance, and regular replacement of filters and worn or consumed parts.

1.08 **TEMPORARY VENTILATION**

A. Utilize existing ventilation equipment. Extend and supplement equipment with temporary fan units as required to maintain clean air for construction operations.

1.09 **TEMPORARY WATER SERVICE**

A. Cost of Water Used: By Contractor .

B. Provide and maintain suitable quality water service for construction operations at time of project mobilization.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 52 13
FIELD OFFICES AND SHEDS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Temporary field offices for use of Contractor .

B. Maintenance and removal.

1.02 RELATED REQUIREMENTS

A. Section 01 10 00 - Summary: use of premises and responsibility for providing field offices.

B. Section 01 50 00 - Temporary Facilities and Controls:

C. Section 01 50 00: Parking and access to field offices.

D. Section 01 55 00: Parking and access to field offices.

1.03 USE OF EXISTING FACILITIES

A. Designated existing spaces may be used for field offices: Existing unoccupied buildings that are not a scheduled for demolition prior to this project. Owner will designate the buildings that will be available during mandatory pre-bid walk-through.

1.04 USE OF PERMANENT FACILITIES

A. Permanent facilities shall not be used for field offices.

PART 2 PRODUCTS

2.01 MATERIALS, EQUIPMENT, FURNISHINGS

A. Materials, Equipment, Furnishings: Serviceable, new or used, adequate for required purpose.

2.02 CONSTRUCTION

A. Portable or mobile buildings, or buildings constructed with floors raised above ground, securely fixed to foundations, with steps and landings at entrance doors.

B. Construction: Structurally sound, secure, weather tight enclosures for office. Maintain during progress of Work; remove when no longer needed.

C. Temperature Transmission Resistance of Floors, Walls, and Ceilings: Compatible with occupancy requirements.

D. Exterior Materials: Weather resistant, finished .

E. Interior Materials in Offices: Sheet type materials for walls and ceilings, prefinished or painted; resilient floors and bases.

F. Lighting for Offices: 50 fc at desk top height, exterior lighting at entrance doors.

G. Fire Extinguishers: Appropriate type fire extinguisher at each office.

2.03 ENVIRONMENTAL CONTROL

A. Heating, Cooling, and Ventilating: Automatic equipment to maintain comfort conditions.

2.04 CONTRACTOR OFFICE AND FACILITIES

A. Size: For Contractor 's needs and to provide space for project meetings.

B. Furnishings in Meeting Area: Conference table and chairs to seat at least eight persons; racks and files for Contract Documents, submittals, and project record documents.

C. Other Furnishings: Contractor 's option.

D. Equipment: Six adjustable band protective helmets for visitors, one outdoor weather thermometer and [____].

OWNER AND ARCHITECT/ENGINEER OFFICE N/A

PART 3 EXECUTION

3.01 PREPARATION

A. Fill and grade sites for temporary structures to provide drainage away from buildings.

3.02 INSTALLATION

A. Install office spaces ready for occupancy 15 days after date fixed in Notice to Proceed.

3.03 MAINTENANCE AND CLEANING

A. Weekly janitorial services for offices; periodic cleaning and maintenance for offices.

B. Maintain approach walks free of mud, water, and snow.

3.04 REMOVAL

A. At completion of Work remove buildings, foundations, utility services, and debris. Restore areas.

END OF SECTION

SECTION 01 55 00
VEHICULAR ACCESS AND PARKING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Access roads.

B. Parking.

C. Existing pavements and parking areas.

D. Permanent pavements and parking facilities.

E. Construction parking controls.

F. Flag persons.

G. Flares and lights.

H. Haul routes.

I. Traffic signs and signals.

J. Maintenance.

K. Removal, repair.

L. Mud from site vehicles.

1.02 RELATED REQUIREMENTS

A. Section 01 10 00 - Summary: For access to site, work sequence and occupancy.

B. Section 01 58 13 - Temporary Project Signage: Post Mounted and Wall Mounted Traffic Control and Informational Signs.

C. Section 31 22 00 - Grading: Specifications for earthwork and paving bases.

PART 2 PRODUCTS

2.01 MATERIALS

A. Temporary Construction: Contractor 's option.

B. Materials for Permanent Construction: As specified in product specification sections, including earthwork, paving base and topping.

2.02 SIGNS, SIGNALS, AND DEVICES

A. Post Mounted and Wall Mounted Traffic Control and Informational Signs: Specified in Section 01 58 13 - Temporary Project Signage.

B. Automatic Traffic Control Signals: As approved by local jurisdictions.

C. Traffic Cones and Drums, Flares and Lights: As approved by local jurisdictions.

D. Flag Person Equipment: As required by local jurisdictions.

PART 3 EXECUTION

3.01 PREPARATION

A. Clear areas, provide surface and storm drainage of road, parking, area premises, and adjacent areas.

3.02 ACCESS ROADS

A. Use of existing on-site streets and driveways for construction traffic is permitted.

B. Construct new temporary all-weather access roads from public thoroughfares to serve construction area, of a width and load bearing capacity to provide unimpeded traffic for construction purposes.

C. Construct temporary bridges and culverts to span low areas and allow unimpeded drainage.

D. Extend and relocate as work progress requires, provide detours as necessary for unimpeded traffic flow.

E. Location as indicated.

F. Provide unimpeded access for emergency vehicles. Maintain 20 foot width driveways with turning space between and around combustible materials.

G. Provide and maintain access to fire hydrants free of obstructions.

3.03 **PARKING**

A. Use of designated areas of existing parking facilities by construction personnel is permitted.

B. Use of designated areas of new parking facilities by construction personnel is permitted.

C. Arrange for temporary parking areas to accommodate use of construction personnel.

D. When site space is not adequate, provide additional off-site parking.

3.04 **PERMANENT PAVEMENTS AND PARKING FACILITIES**

A. Prior to Substantial Completion the base for permanent roads and parking areas may be used for construction traffic.

B. Avoid traffic loading beyond paving design capacity. Tracked vehicles not allowed.

3.05 **CONSTRUCTION PARKING CONTROL**

A. Control vehicular parking to prevent interference with public traffic and parking, access by emergency vehicles, and Owner's operations.

B. Monitor parking of construction personnel's vehicles in existing facilities. Maintain vehicular access to and through parking areas.

C. Prevent parking on or adjacent to access roads or in non-designated areas.

3.06 **FLAG PERSONS**

A. Provide trained and equipped flag persons to regulate traffic when construction operations or traffic encroach on public traffic lanes.

3.07 **FLARES AND LIGHTS**

A. Use flares and lights during hours of low visibility to delineate traffic lanes and to guide traffic.

3.08 **HAUL ROUTES**

A. Consult with authority having jurisdiction, establish public thoroughfares to be used for haul routes and site access.

B. Confine construction traffic to designated haul routes.

C. Provide traffic control at critical areas of haul routes to regulate traffic, to minimize interference with public traffic.

3.09 **TRAFFIC SIGNS AND SIGNALS**

A. At approaches to site and on site, install at crossroads, detours, parking areas, and elsewhere as needed to direct construction and affected public traffic.

B. Relocate as work progresses, to maintain effective traffic control.

3.10 **MAINTENANCE**

A. Maintain traffic and parking areas in a sound condition free of excavated material, construction equipment, products, mud, snow, and ice.

B. Maintain existing paved areas used for construction; promptly repair breaks, potholes, low areas, standing water, and other deficiencies, to maintain paving and drainage in original, or specified, condition.

3.11 **REMOVAL, REPAIR**

A. Remove temporary roads when permanent paving is usable.

B. Remove underground work and compacted materials to a depth of 2 feet; fill and grade site as specified.

C. Repair existing facilities damaged by use, to original condition.

D. Remove equipment and devices when no longer required.

E. Repair damage caused by installation.

F. Remove post settings to a depth of 2 feet.

3.12 **MUD FROM SITE VEHICLES**

A. Provide means of removing mud from vehicle wheels before entering streets.

END OF SECTION

SECTION 01 57 13
TEMPORARY EROSION AND SEDIMENT CONTROL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Prevention of erosion due to construction activities.

B. Prevention of sedimentation of waterways, open drainage ways, and storm and sanitary sewers due to construction activities.

C. Restoration of areas eroded due to insufficient preventive measures.

D. Performance bond.

E. Compensation of Owner for fines levied by authorities having jurisdiction due to non-compliance by Contractor .

1.02 RELATED REQUIREMENTS

A. Section 01 33 29 - Sustainable Design Reporting: Submittal procedures for sustainable design documentation.

B. Section 03 30 00 - Cast-in-Place Concrete: Concrete for temporary and permanent erosion control structures indicated on drawings.

C. Section 31 10 00 - Site Clearing: Limits on clearing; disposition of vegetative clearing debris.

D. Section 31 22 00 - Grading: Temporary and permanent grade changes for erosion control.

E. Section 31 37 00 - Riprap: Temporary and permanent stabilization using riprap.

F. Section 32 11 23 - Aggregate Base Courses: Temporary and permanent roadways.

1.03 REFERENCE STANDARDS

A. ASTM D4355/D4355M - Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in a Xenon Arc Type Apparatus 2014.

B. ASTM D4491 - Standard Test Methods for Water Permeability of Geotextiles by Permittivity. 1999a (Reapproved 2014).

C. ASTM D4533 - Standard Test Method for Trapezoid Tearing Strength of Geotextiles 2011.

D. ASTM D4632/D4632M - Standard Test Method for Grab Breaking Load and Elongation of Geotextiles 2015a.

E. ASTM D4751 - Standard Test Method for Determining Apparent Opening Size of a Geotextile 2016.

F. ASTM D4873 - Standard Guide for Identification, Storage, and Handling of Geosynthetic Rolls and Samples 2002 (Reapproved 2009).

G. EPA (NPDES) - National Pollutant Discharge Elimination System (NPDES), Construction General Permit Current Edition.

1.04 PERFORMANCE REQUIREMENTS

A. Comply with requirements of EPA (NPDES) for erosion and sedimentation control, as specified by the NPDES, for Phases I and II, and in compliance with requirements of Construction General Permit (CGP), whether the project is required by law to comply or not.

B. Develop and follow an Erosion and Sedimentation Prevention Plan and submit periodic inspection reports.

C. Do not begin clearing, grading, or other work involving disturbance of ground surface cover until applicable permits have been obtained; furnish all documentation required to obtain applicable permits.

D. Provide to Owner a Performance Bond covering erosion and sedimentation preventive measures only, in an amount equal to 100 percent of the cost of erosion and sedimentation control work.

E. Timing: Put preventive measures in place as soon as possible after disturbance of surface cover and before precipitation occurs.

F. Storm Water Runoff: Control increased storm water runoff due to disturbance of surface cover due to construction activities for this project.

1. Prevent runoff into storm and sanitary sewer systems, including open drainage channels, in excess of actual capacity or amount allowed by authorities having jurisdiction, whichever is less.

2. Anticipate runoff volume due to the most extreme short term and 24-hour rainfall events that might occur in 25 years.

G. Erosion On Site: Minimize wind, water, and vehicular erosion of soil on project site due to construction activities for this project.

1. Control movement of sediment and soil from temporary stockpiles of soil.

2. Prevent development of ruts due to equipment and vehicular traffic.

3. If erosion occurs due to non-compliance with these requirements, restore eroded areas at no cost to Owner .

H. Erosion Off Site: Prevent erosion of soil and deposition of sediment on other properties caused by water leaving the project site due to construction activities for this project.

1. Prevent windblown soil from leaving the project site.

2. Prevent tracking of mud onto public roads outside site.

3. Prevent mud and sediment from flowing onto sidewalks and pavements.

4. If erosion occurs due to non-compliance with these requirements, restore eroded areas at no cost to Owner .

I. Sedimentation of Waterways On Site: Prevent sedimentation of waterways on the project site, including rivers, streams, lakes, ponds, open drainage ways, storm sewers, and sanitary sewers.

1. If sedimentation occurs, install or correct preventive measures immediately at no cost to Owner ; remove deposited sediments; comply with requirements of authorities having jurisdiction.

2. If sediment basins are used as temporary preventive measures, pump dry and remove deposited sediment after each storm.

J. Sedimentation of Waterways Off Site: Prevent sedimentation of waterways off the project site, including rivers, streams, lakes, ponds, open drainage ways, storm sewers, and sanitary sewers.

1. If sedimentation occurs, install or correct preventive measures immediately at no cost to Owner ; remove deposited sediments; comply with requirements of authorities having jurisdiction.

K. Open Water: Prevent standing water that could become stagnant.

L. Maintenance: Maintain temporary preventive measures until permanent measures have been established.

1.05 **SUBMITTALS**

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Sustainable Design Documentation: Submit all submittals required in this section in accordance with procedures specified in Section 01 33 29.

C. Erosion and Sedimentation Control Plan:

1. Include:

a. Site plan identifying soils and vegetation, existing erosion problems, and areas vulnerable to erosion due to topography, soils, vegetation, or drainage.

b. Site plan showing grading; new improvements; temporary roads, traffic accesses, and other temporary construction; and proposed preventive measures.

c. Where extensive areas of soil will be disturbed, include storm water flow and volume calculations, soil loss predictions, and proposed preventive measures.

d. Schedule of temporary preventive measures, in relation to ground disturbing activities.

e. Other information required by law.

f. Format required by law is acceptable, provided any additional information specified is also included.

2. Obtain the approval of the Plan by authorities having jurisdiction.

3. Obtain the approval of the Plan by Owner .

D. Certificate: Mill certificate for silt fence fabric attesting that fabric and factory seams comply with specified requirements, signed by legally authorized official of manufacturer; indicate actual minimum average roll values; identify fabric by roll identification numbers.

E. Inspection Reports: Submit report of each inspection; identify each preventive measure, indicate condition, and specify maintenance or repair required and accomplished.

PART 2 PRODUCTS

2.01 **MATERIALS**

A. Mulch: Use one of the following:

1. Straw or hay.

2. Wood waste, chips, or bark.

3. Erosion control matting or netting.

4. Cutback asphalt.

5. Polyethylene film, where specifically indicated only.

B. Grass Seed For Temporary Cover: Select a species appropriate to climate, planting season, and intended purpose. If same area will later be planted with permanent vegetation, do not use species known to be excessively competitive or prone to volunteer in subsequent seasons.

C. Bales: Air dry, rectangular straw bales.

1. Cross Section: 14 by 18 inches, minimum.

2. Bindings: Wire or string, around long dimension.

D. Bale Stakes: One of the following, minimum 3 feet long:

1. Steel U- or T-section, with minimum mass of 1.33 pound per linear foot.
2. Wood, 2 by 2 inches in cross section.

E. Silt Fence Fabric: Polypropylene geotextile resistant to common soil chemicals, mildew, and insects; non-biodegradable; in longest lengths possible; fabric including seams with the following minimum average roll lengths:

1. Average Opening Size: 30 U.S. Std. Sieve, maximum, when tested in accordance with ASTM D4751.
2. Permittivity: 0.05 sec^-1, minimum, when tested in accordance with ASTM D4491.
3. Ultraviolet Resistance: Retaining at least 70 percent of tensile strength, when tested in accordance with ASTM D4355/D4355M after 500 hours exposure.
4. Tensile Strength: 100 pounds-force, minimum, in cross-machine direction; 124 pounds-force, minimum, in machine direction; when tested in accordance with ASTM D4632/D4632M.
5. Elongation: 15 to 30 percent, when tested in accordance with ASTM D4632/D4632M.
6. Tear Strength: 55 pounds-force, minimum, when tested in accordance with ASTM D4533.
7. Color: Manufacturer's standard, with embedment and fastener lines preprinted.

F. Silt Fence Posts: One of the following, minimum 5 feet long:

1. Steel U- or T-section, with minimum mass of 1.33 pound per linear foot.
2. Softwood, 4 by 4 inches in cross section.
3. Hardwood, 2 by 2 inches in cross section.

G. Gravel: See Section 32 11 23 for aggregate.

H. Riprap: See Section 31 37 00.

I. Concrete: See Section 03 30 00.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine site and identify existing features that contribute to erosion resistance; maintain such existing features to greatest extent possible.

3.02 PREPARATION

A. Schedule work so that soil surfaces are left exposed for the minimum amount of time.

3.03 SCOPE OF PREVENTIVE MEASURES

A. In all cases, if permanent erosion resistant measures have been installed temporary preventive measures are not required.

B. Construction Entrances: Traffic-bearing aggregate surface.

1. Width: As required; 20 feet, minimum.
2. Length: 50 feet, minimum.
3. Provide at each construction entrance from public right-of-way.
4. Where necessary to prevent tracking of mud onto right-of-way, provide wheel washing area out of direct traffic lane, with drain into sediment trap or basin.

C. Linear Sediment Barriers: Made of silt fences.

1. Provide linear sediment barriers:

a. Along downhill perimeter edge of disturbed areas, including soil stockpiles.

2. Space sediment barriers with the following maximum slope length upslope from barrier:

a. Slope of Less Than 2 Percent: 100 feet..

b. Slope Between 2 and 5 Percent: 75 feet.

c. Slope Between 5 and 10 Percent: 50 feet.

d. Slope Between 10 and 20 Percent: 25 feet.

e. Slope Over 20 Percent: 15 feet.

D. Storm Drain Curb Inlet Sediment Trap: Protect each curb inlet using one of the following measures:

1. Filter fabric wrapped around hollow concrete blocks blocking entire inlet face area; use one piece of fabric wrapped at least 1-1/2 times around concrete blocks and secured to prevent dislodging; orient cores of blocks so runoff passes into inlet.

2. Straw bale row blocking entire inlet face area; anchor into pavement.

E. Storm Drain Drop Inlet Sediment Traps: As detailed on drawings.

F. Temporary Splash Pads: Stone aggregate over filter fabric; size to suit application; provide at downspout outlets and storm water outlets.

G. Soil Stockpiles: Protect using one of the following measures:

1. Cover with polyethylene film, secured by placing soil on outer edges.

2. Cover with mulch at least 4 inches thickness of pine needles, sawdust, bark, wood chips, or shredded leaves, or 6 inches of straw or hay.

H. Mulching: Use only for areas that may be subjected to erosion for less than 6 months.

1. Wood Waste: Use only on slopes 3:1 or flatter; no anchoring required.

2. Asphalt: Use only where no traffic, either vehicular or pedestrian, is anticipated.

I. Temporary Seeding: Use where temporary vegetated cover is required.

3.04 **INSTALLATION**

A. Traffic-Bearing Aggregate Surface:

1. Excavate minimum of 6 inches.

2. Place geotextile fabric full width and length, with minimum 12 inch overlap at joints.

3. Place and compact at least 6 inches of 1 1/2 to 3 1/2 inch diameter stone.

B. Silt Fences:

1. Store and handle fabric in accordance with ASTM D4873.

2. Where slope gradient is less than 3:1 or barriers will be in place less than 6 months, use nominal 16 inch high barriers with minimum 36 inch long posts spaced at 6 feet maximum, with fabric embedded at least 4 inches in ground.

3. Where slope gradient is steeper than 3:1 or barriers will be in place over 6 months, use nominal 28 inch high barriers, minimum 48 inch long posts spaced at 6 feet maximum, with fabric embedded at least 6 inches in ground.

4. Where slope gradient is steeper than 3:1 and vertical height of slope between barriers is more than 20 feet, use nominal 32 inch high barriers with woven wire reinforcement and steel posts spaced at 4 feet maximum, with fabric embedded at least 6 inches in ground.

5. Install with top of fabric at nominal height and embedment as specified.
6. Do not splice fabric width; minimize splices in fabric length; splice at post only, overlapping at least 18 inches, with extra post.
7. Fasten fabric to wood posts using one of the following:
    a. Four nails per post with 3/4 inch diameter flat or button head, 1 inch long, and 14 gage, 0.083 inch shank diameter.
    b. Five staples per post with at least 17 gage, 0.0453 inch wire, 3/4 inch crown width and 1/2 inch long legs.
8. Fasten fabric to steel posts using wire, nylon cord, or integral pockets.
9. Wherever runoff will flow around end of barrier or over the top, provide temporary splash pad or other outlet protection; at such outlets in the run of the barrier, make barrier not more than 12 inches high with post spacing not more than 4 feet.

C. Straw Bale Rows:
1. Install bales in continuous rows with ends butting tightly, with one bale at each end of row turned uphill.
2. Install bales so that bindings are not in contact with the ground.
3. Embed bales at least 4 inches in the ground.
4. Anchor bales with at least two stakes per bale, driven at least 18 inches into the ground; drive first stake in each bale toward the previously placed bale to force bales together.
5. Fill gaps between ends of bales with loose straw wedged tightly.
6. Place soil excavated for trench against bales on the upslope side of the row, compacted.

D. Mulching Over Large Areas:
1. Dry Straw and Hay: Apply 2-1/2 tons per acre; anchor using dull disc harrow or emulsified asphalt applied using same spraying machine at 100 gallons of water per ton of mulch.
2. Wood Waste: Apply 6 to 9 tons per acre.
3. Asphalt: Apply at 1200 gallons per acre.
4. Erosion Control Matting: Comply with manufacturer's instructions.

E. Mulching Over Small and Medium Areas:
1. Dry Straw and Hay: Apply 4 to 6 inches depth.
2. Wood Waste: Apply 2 to 3inches depth.
3. Asphalt: Apply 1/4 gallon per square yard.
4. Erosion Control Matting: Comply with manufacturer's instructions.

F. Temporary Seeding:
1. When hydraulic seeder is used, seedbed preparation is not required.
2. When surface soil has been sealed by rainfall or consists of smooth undisturbed cut slopes, and conventional or manual seeding is to be used, prepare seedbed by scarifying sufficiently to allow seed to lodge and germinate.
3. If temporary mulching was used on planting area but not removed, apply nitrogen fertilizer at 1 pound per 1000 sq ft.

4. On soils of very low fertility, apply 10-10-10 fertilizer at rate of 12 to 16 pounds per 1000 sq ft.
5. Incorporate fertilizer into soil before seeding.
6. Apply seed uniformly; if using drill or cultipacker seeders place seed 1/2 to 1 inch deep.
7. Irrigate as required to thoroughly wet soil to depth that will ensure germination, without causing runoff or erosion.
8. Repeat irrigation as required until grass is established.

3.05 **MAINTENANCE**

A. Inspect preventive measures weekly, within 24 hours after the end of any storm that produces 0.5 inches or more rainfall at the project site, and daily during prolonged rainfall.

B. Repair deficiencies immediately.

C. Silt Fences:

1. Promptly replace fabric that deteriorates unless need for fence has passed.
2. Remove silt deposits that exceed one-third of the height of the fence.
3. Repair fences that are undercut by runoff or otherwise damaged, whether by runoff or other causes.

D. Straw Bale Rows:

1. Promptly replace bales that fall apart or otherwise deteriorate unless need has passed.
2. Remove silt deposits that exceed one-half of the height of the bales.
3. Repair bale rows that are undercut by runoff or otherwise damaged, whether by runoff or other causes.

E. Clean out temporary sediment control structures weekly and relocate soil on site.

F. Place sediment in appropriate locations on site; do not remove from site.

3.06 **CLEAN UP**

A. Remove temporary measures after permanent measures have been installed, unless permitted to remain by Architect .

B. Clean out temporary sediment control structures that are to remain as permanent measures.

C. Where removal of temporary measures would leave exposed soil, shape surface to an acceptable grade and finish to match adjacent ground surfaces.

END OF SECTION

SECTION 01 57 19
TEMPORARY ENVIRONMENTAL CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Construction procedures to promote adequate indoor air quality after construction.

B. Testing air change effectiveness after completion of construction.

C. Testing residential unit air isolation.

1.02 PROJECT GOALS

A. See Section 01 33 29 - Sustainable Design Reporting, for overall project goals relating to environment and energy.

B. Dust and Airborne Particulates: Prevent deposition of dust and other particulates in HVAC ducts and equipment.

1. Cleaning of ductwork is not contemplated under this Contract.

2. Contractor shall bear the cost of cleaning required due to failure to protect ducts and equipment from construction dust.

C. Airborne Contaminants: Procedures and products have been specified to minimize indoor air pollutants.

1. Furnish products meeting the specifications.

2. Avoid construction practices that could result in contamination of installed products leading to indoor air pollution.

D. Residential Units Air Isolation: Units have been designed with impermeable party walls and sealed openings in walls and floors.

1.03 REFERENCE STANDARDS

A. ASHRAE Std 129 - Measuring Air-Change Effectiveness. 1997 (Reaffirmed 2002).

B. ASTM E779 - Standard Test Method for Determining Air Leakage Rate by Fan Pressurization 2010 (Reapproved 2018).

C. SMACNA (OCC) - IAQ Guidelines for Occupied Buildings Under Construction 2007.

1.04 DEFINITIONS

A. Adsorptive Materials: Gypsum board, acoustical ceiling tile and panels, carpet and carpet tile, fabrics, fibrous insulation, and other similar products.

B. Contaminants: Gases, vapors, regulated pollutants, airborne mold and mildew, and the like, as specified.

C. Particulates: Dust, dirt, and other airborne solid matter.

D. Wet Work: Concrete, plaster, coatings, and other products that emit water vapor or volatile organic compounds during installation, drying, or curing.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Contractor and Owner's 3rd Party Commisioning Agent Indoor Air Quality Management Plan: Describe in detail measures to be taken to promote adequate indoor air quality upon completion; use SMACNA (OCC) as a guide.

1. Submit not less than 60 days before enclosure of building.

2. Identify potential sources of odor and dust.

3. Identify construction activities likely to produce odor or dust.
4. Identify areas of project potentially affected, especially occupied areas.
5. Evaluate potential problems by severity and describe methods of control.
6. Describe construction ventilation to be provided, including type and duration of ventilation, use of permanent HVAC systems, types of filters and schedule for replacement of filters.
7. Describe cleaning and dust control procedures.

C. Interior Finishes Installation Schedule: Identify each interior finish that either generates odors, moisture, or vapors or is susceptible to adsorption of odors and vapors, and indicate air handling zone, sequence of application, and curing times.

D. Duct and Terminal Unit Inspection Report.

E. Ventilation Effectiveness Test Plan by Owner 3rd Party Commisioning Agent: Identify:

1. Testing agency qualifications.
2. Description of test spaces, including locations of air sampling.
3. Test procedures, in detail; state whether tracer gas decay or step-up will be used.
4. Test instruments and apparatus; identify tracer gas to be used.
5. Sampling methods.

F. Ventilation Effectiveness Test Reports by Owner 3rd Party Commisioning Agent: Show:

1. Include preliminary tests of instruments and apparatus and of test spaces.
2. Calculation of ventilation effectiveness, E.
3. Location where each sample was taken, and time.
4. Test values for each air sample.
5. HVAC operating conditions.
6. Other information specified in ASHRAE Std 129.
7. Other conditions or discrepancies that might have influenced results.

G. Residential Units Air Isolation Test Plan by Owner 3rd Party Commisioning Agent: Identify:

1. Testing agency qualifications.
2. Description of test spaces, including locations of air sampling.
3. Test procedures, in detail.
4. Test instruments and apparatus; identify tracer gas to be used.
5. Sampling methods.

H. Residential Units Air Isolation Reports by Owner 3rd Party Commisioning Agent: Show:

1. Include preliminary tests of instruments and apparatus.
2. Include inspection of membrane seals in test spaces.
3. HVAC operating conditions.
4. Location where each sample was taken, and time.
5. Test values for each air sample.
6. Other information specified in ASHRAE Std 129.
7. Other conditions or discrepancies that might have influenced results.

PART 3 EXECUTION

2.01 CONSTRUCTION PROCEDURES

A. Contractor Prevent the absorption of moisture and humidity by adsorptive materials by:

1. Sequencing the delivery of such materials so that they are not present in the building until wet work is completed and dry.
2. Delivery and storage of such materials in fully sealed moisture-impermeable packaging.
3. Provide sufficient ventilation for drying within reasonable time frame.

B. Begin construction ventilation when building is substantially enclosed.

C. Do not store construction materials or waste in mechanical or electrical rooms.

D. Prior to use of return air ductwork without intake filters clean up and remove dust and debris generated by construction activities.

1. Inspect duct intakes, return air grilles, and terminal units for dust.
2. Clean plenum spaces, including top sides of lay-in ceilings, outsides of ducts, tops of pipes and conduit.
3. Clean tops of doors and frames.
4. Clean mechanical and electrical rooms, including tops of pipes, ducts, and conduit, equipment, and supports.
5. Clean return plenums of air handling units.
6. Remove intake filters last, after cleaning is complete.

E. Do not perform dusty or dirty work after starting use of return air ducts without intake filters.

F. Use other relevant recommendations of SMACNA (OCC) for avoiding unnecessary contamination due to construction procedures.

2.02 VENTILATION EFFECTIVENESS TESTING BY OWNER 3RD PARTY TESTING AGENT

A. Perform ventilation effectiveness testing before occupancy.

B. Do not begin ventilation effectiveness testing until:

1. HVAC testing, adjusting, and balancing has been satisfactorily completed.
2. Building flush-out or air contaminant testing has been completed satisfactorily.
3. New HVAC filtration media have been installed.

C. Test each air handler zone in accordance with ASHRAE Std 129.

D. If calculated air change effectiveness for a particular zone is less than 0.9 due to inadequate balancing of the system, adjust, and retest at no cost to Owner .

2.03 RESIDENTIAL UNITS AIR ISOLATION TESTING BY OWNER 3RD PARTY TESTING AGENT

A. Residential units have been designed to have an airtight sealed membrane between units; inspect membrane seal at the following locations and repair as required:

1. Between party walls and floor structure.
2. Between party walls and roof structure.
3. Around pipes, conduits, and ducts passing through floors and party walls.

B. Airtight membrane has been designed to limit leakage area to less than 1.25 square inches per 100 square feet of wall, ceiling, and floor area.

C. If possible, perform inspection and testing prior to covering up air seals in walls and floors.

D. Otherwise, perform testing after completion of construction but before occupancy.

E. Test airtight membrane in accordance with ASTM E779 or other appropriate method.

F. Acceptable Results: Maximum leakage of 0.23 cubic feet per minute per square foot at 1.1 pounds per square foot pressure .

G. If test results show excess leakage area, reinspect, repair, and retest.

H. Test differential pressure between residential unit and pressurized hallway:

1. With the entrance door closed, operate the ventilation system in normal manner.

2. Take pressure readings for 15 minutes, with minimum of one measurement every 10 seconds.

END OF SECTION

SECTION 01 58 13
TEMPORARY PROJECT SIGNAGE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Project identification sign.

1.02 RELATED REQUIREMENTS

A. Section 01 10 00 - Summary: Responsibility to provide signs.

1.03 REFERENCE STANDARDS

A. FHWA (SHS) - Standard Highway Signs and Markings 2004, with Supplement (2012).

1.04 QUALITY ASSURANCE

A. Design sign and structure to withstand 50 miles/hr wind velocity.

B. Sign Painter: Experienced as a professional sign painter for minimum three years.

C. Finishes, Painting: Adequate to withstand weathering, fading, and chipping for duration of construction.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Shop Drawing: Show content, layout, lettering, color, foundation, structure, sizes and grades of members.

PART 2 PRODUCTS

2.01 SIGN MATERIALS

A. Structure and Framing: New, wood, structurally adequate.

B. Sign Surfaces: Exterior grade plywood with medium density overlay, minimum 3/4 inch thick, standard large sizes to minimize joints.

C. Rough Hardware: Galvanized.

D. Paint and Primers: Exterior quality, two coats; sign background of color as selected.

E. Lettering: Exterior quality paint, contrasting colors.

2.02 PROJECT IDENTIFICATION SIGN

A. One painted sign, 4'-0" x 8'-0", bottom 3 feet above ground.

B. Content:

1. Project number, title, logo and name of Owner as indicated on Contract Documents.
2. Names and titles of authorities.
3. Names and titles of Architect and Consultants.
4. Name of Prime Contractor.

C. Graphic Design, Colors, Style of Lettering: Designated by Architect .

D. Lettering: Standard Alphabet Series C, as specified in FHWA (SHS).

PART 3 EXECUTION

3.01 INSTALLATION

A. Install project identification sign within 30 days after date fixed by Notice to Proceed.

B. Erect at designated location.

C. Erect supports and framing on secure foundation, rigidly braced and framed to resist wind loadings.

D. Install sign surface plumb and level, with butt joints. Anchor securely.

E. Paint exposed surfaces of sign, supports, and framing.

3.02 **MAINTENANCE**

A. Maintain signs and supports clean, repair deterioration and damage.

3.03 **REMOVAL**

A. Remove signs, framing, supports, and foundations at completion of Project and restore the area.

END OF SECTION

SECTION 01 60 00
PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General product requirements.

B. Sustainable design-related product requirements.

C. Re-use of existing products.

D. Transportation, handling, storage and protection.

E. Product option requirements.

F. Substitution limitations.

G. Procedures for Owner -supplied products.

H. Maintenance materials, including extra materials, spare parts, tools, and software.

1.02 RELATED REQUIREMENTS

A. Section 01 10 00 - Summary: Identification of Owner-supplied products.

B. Section 01 25 00 - Substitution Procedures: Substitutions made during procurement and/or construction phases.

C. Section 01 33 29 - Sustainable Design Reporting. Reporting requirements.

D. Section 01 40 00 - Quality Requirements: Product quality monitoring.

E. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions: Requirements for VOC-restricted product categories.

F. Section 01 74 19 - Construction Waste Management and Disposal: Waste disposal requirements potentially affecting product selection, packaging and substitutions.

1.03 REFERENCE STANDARDS

A. 16 CFR 260.13 - Guides for the Use of Environmental Marketing Claims; Federal Trade Commission; Recycled Content Current Edition.

B. ASTM D6866 - Standard Test Methods for Determining the Biobased Content of Solid, Liquid, and Gaseous Samples Using Radiocarbon Analysis 2016.

C. C2C (DIR) - C2C Certified Products Registry; Cradle to Cradle Products Innovation Institute Current Edition.

D. CAL (CDPH SM) - Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions From Indoor Sources Using Environmental Chambers 2017, v1.2.

E. EN 15804 - Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products 2013.

F. GreenScreen (LIST) - GreenScreen for Safer Chemicals List Translator; Clean Production Action www.greenscreenchemicals.org.

G. GreenScreen (METH) - GreenScreen for Safer Chemicals Method v1.2; Clean Production Action www.greenscreenchemicals.org.

H. ISO 14025 - Environmental labels and declarations -- Type III environmental declarations -- Principles and procedures 2006.

I. ISO 14040 - Environmental management -- Life cycle assessment -- Principles and framework 2006.

J. ISO 14044 - Environmental management -- Life cycle assessment -- Requirements and guidelines 2006.

K. ISO 21930 - Sustainability in buildings and civil engineering works -- Core rules for environmental product declarations of construction products and services 2017.

1.04 **SUBMITTALS**

A. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.

B. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

C. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.

1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.

D. Sustainable Design Submittals: Items necessary to document use of sustainable construction materials, products, and practices.

1.05 **QUALITY ASSURANCE**

A. Bio-Based Content: Of vegetable or animal origin, not including products made by killing the animal.

1. Determine percentage of bio-based content in accordance with ASTM D6866.

2. Bio-based content must be sourced from a Sustainable Agriculture Network certified farm.

B. CAL (CDPH SM) v1.1: California Department of Public Health (CDPH) Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers, v. 1.1–2010, for the emissions testing and requirements of products and materials.

C. Chain-of-Custody Certificates: Certificates signed by manufacturers and fabricators certifying that wood used to make products was obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001.

D. Composite Wood and Agrifiber: Products made of wood particles and/or plant material pressed and bonded with adhesive or resin such as particleboard, medium density fiberboard (MDF), plywood, wheatboard, strawboard, panel substrates, and door cores.

E. Cradle-to-Cradle Certified: End use product certified Cradle-to-Cradle v2 Basic or Cradle-to-Cradle v3 Bronze, minimum, as evidenced by C2C (DIR).

F. Environmental Product Declaration (EPD): Publicly available, critically reviewed life cycle analysis having at least a cradle-to-gate scope.

1. Good: Product-specific; compliant with ISO 14044.

2. Better: Industry-wide, generic; compliant with ISO 21930, or with ISO 14044, ISO 14040, ISO 14025, and EN 15804; Type III third-party certification with external verification, in which the manufacturer is recognized as the program operator.

3. Best: Commercial-product-specific; compliant with ISO 21930, or with ISO 14044, ISO 14040, ISO 14025, and EN 15804; Type III third-party certification with external verification, in which the manufacturer is recognized as the program operator.

4. Where demonstration of impact reduction below industry average is required, submit both industry-wide and commercial-product-specific declarations; or submit at least 5 declarations for products of the same type by other manufacturers in the same industry.

G. GreenScreen Chemical Hazard Analysis: Ingredients of 100 parts-per-million or greater evaluated using GreenScreen (METH).

1. Good: GreenScreen (LIST) evaluation to identify Benchmark 1 hazards; a Health Product Declaration includes this information.
2. Better: GreenScreen Full Assessment.
3. Best: GreenScreen Full Assessment by GreenScreen Licensed Profiler.
4. Acceptable Evidence: GreenScreen report.

H. Health Product Declarations (HPD): Complete, published declaration with full disclosure of known hazards, prepared using one of the HPDC (HPD-OLT) online tools.

I. Leadership Extraction Practices: Products that meet at least one of the responsible extraction criteria, which include: extended producer responsibility; bio-based materials; FSC wood products; materials reuse; recycled content; and other programs approved by sustainability certification system used for the project.

J. Manufacturer's Inventory of Product Content: Publicly available inventory of every ingredient identified by name and Chemical Abstract Service Registration Number (CAS RN).

1. For ingredients considered a trade secret or intellectual property, the name and CAS RN may be omitted, provided the ingredient's role, amount, and GreenScreen Benchmark are given.

K. Recycled Content: Determine percentage of post-consumer and pre-consumer (post-industrial) content separately, using the guidelines contained in 16 CFR 260.13.

1. Previously used, reused, refurbished, and salvaged products are not considered recycled.
2. Wood fabricated from timber abandoned in transit to original mill is considered reused, not recycled.
3. Determine percentage of recycled content of any item by dividing the weight of recycled content in the item by the total weight of materials in the item.
4. Determine value of recycled content of each item separately, by multiplying the content percentage by the value of the item.
5. Acceptable Evidence:
    a. For percentage of recycled content, information from manufacturer.
    b. For cost, Contractor's cost data.

L. Regional Materials: Materials that are extracted, harvested, recovered, and manufactured within a radius of 500 miles from the Project site.

M. Reused Products: Materials and equipment previously used in this or other construction, salvaged and refurbished as specified.

1. Wood fabricated from timber abandoned in transit after harvesting is considered reused, not recycled.
2. Acceptable Evidence: Information about the origin or source, from Contractor or supplier.

N. Source Location: Location of harvest, extraction, recovery, or manufacture; where information about source location is required to be submitted, give the postal address:

1. In every case, indicate the location of final assembly.
2. For harvested products, indicate location of harvest.
3. For extracted (i.e. mined) products, indicate location of extraction.
4. For recovered products, indicate location of recovery.
5. For products involving multiple manufacturing steps, provide a description of the process at each step, with location.
6. Acceptable Evidence:
    a. Manufacturer's certification.
    b. Life cycle analysis (LCA) performed by third-party.

O. Sustainably Harvested Wood: Solid wood, wood chips, and wood fiber certified or labeled by an organization accredited by one of the following:

1. The Forest Stewardship Council, The Principles for Natural Forest Management; for Canada visit http://www.fsccanada.org, for the USA visit http://www.fscus.org.
2. Acceptable Evidence: Copies of invoices bearing the certifying organization's certification numbers.

PART 2 PRODUCTS

2.01 EXISTING PRODUCTS

2.02 NEW PRODUCTS

A. Provide new products unless specifically required or permitted by the Contract Documents.

B. See Section 01 40 00 - Quality Requirements, for additional source quality control requirements.

C. Use of products having any of the following characteristics is not permitted:

D. Where other criteria are met, Contractor shall give preference to products that:

1. If used on interior, have lower emissions, as defined in Section 01 61 16.
2. If wet-applied, have lower VOC content, as defined in Section 01 61 16.
3. Are extracted, harvested, and/or manufactured closer to the location of the project.
4. Are made of recycled materials.
5. If made of wood, are made of sustainably harvested wood, wood chips, or wood fiber.

2.03 PRODUCT OPTIONS

A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.

B. Products Specified by Naming One or More Manufacturers: Use a product of one of the manufacturers named and meeting specifications, no options or substitutions allowed.

C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.

2.04 MAINTENANCE MATERIALS

A. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.

B. Deliver and place in location as directed; obtain receipt prior to final payment.

PART 3 EXECUTION

3.01 SUBSTITUTION LIMITATIONS

A. See Section 01 25 00 - Substitution Procedures.

3.02 OWNER-SUPPLIED PRODUCTS

A. See Section 01 10 00 - Summary for identification of Owner-supplied products.

B. Owner 's Responsibilities:

1. Arrange for and deliver Owner reviewed shop drawings, product data, and samples, to Contractor .
2. Arrange and pay for product delivery to site.
3. On delivery, inspect products jointly with Contractor .
4. Submit claims for transportation damage and replace damaged, defective, or deficient items.
5. Arrange for manufacturers' warranties, inspections, and service.

C. Contractor 's Responsibilities:

1. Review Owner reviewed shop drawings, product data, and samples.
2. Receive and unload products at site; inspect for completeness or damage jointly with Owner .
3. Handle, store, install and finish products.
4. Repair or replace items damaged after receipt.

3.03 TRANSPORTATION AND HANDLING

A. Package products for shipment in manner to prevent damage; for equipment, package to avoid loss of factory calibration.

B. If special precautions are required, attach instructions prominently and legibly on outside of packaging.

C. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.

D. Transport and handle products in accordance with manufacturer's instructions.

E. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.

F. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.

G. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage, and to minimize handling.

H. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.04 STORAGE AND PROTECTION

A. Provide protection of stored materials and products against theft, casualty, or deterioration.

B. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication. See Section 01 74 19.

C. Store and protect products in accordance with manufacturers' instructions.

D. Store with seals and labels intact and legible.

E. Arrange storage of materials and products to allow for visual inspection for the purpose of determination of quantities, amounts and unit counts.

F. Store sensitive products in weathertight, climate-controlled enclosures in an environment favorable to product.

G. For exterior storage of fabricated products, place on sloped supports above ground.

H. Provide off-site storage and protection when site does not permit on-site storage or protection.

I. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.

J. Comply with manufacturer's warranty conditions, if any.

K. Do not store products directly on the ground.

L. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.

M. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.

N. Prevent contact with material that may cause corrosion, discoloration, or staining.

O. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

P. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

END OF SECTION

SECTION 01 61 16
VOLATILE ORGANIC COMPOUND (VOC) CONTENT RESTRICTIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Requirements for Indoor-Emissions-Restricted products.

B. Requirements for VOC-Content-Restricted products.

1.02 RELATED REQUIREMENTS

A. Section 01 30 00 - Administrative Requirements: Submittal procedures.

B. Section 01 33 29 - Sustainable Design Reporting: Procedures for reporting emissions and VOC content data.

C. Section 01 33 29.04 - Material Content Form: Form for reporting emissions and VOC content.

D. Section 01 40 00 - Quality Requirements: Procedures for testing and certifications.

E. Section 01 57 19 - Temporary Environmental Controls: Procedures and testing.

F. Section 01 60 00 - Product Requirements: Fundamental product requirements, substitutions and product options, delivery, storage, and handling.

G. Section 07 92 00 - Joint Sealants: Emissions-compliant sealants.

1.03 DEFINITIONS

A. Indoor-Emissions-Restricted Products: All products in the following product categories, whether specified or not:

1. Interior paints and coatings applied on site.
2. Interior adhesives and sealants applied on site, including flooring adhesives.
3. Flooring.
4. Composite wood.
5. Other products when specifically stated in the specifications.

B. VOC-Content-Restricted Products: All products in the following product categories, whether specified or not:

1. Interior paints and coatings applied on site.
2. Interior adhesives and sealants applied on site, including flooring adhesives.
3. Other products when specifically stated in the specifications.

C. Interior of Building: Anywhere inside the exterior weather barrier.

D. Adhesives: All gunnable, trowelable, liquid-applied, and aerosol adhesives, whether specified or not; including flooring adhesives, resilient base adhesives, and pipe jointing adhesives.

E. Sealants: All gunnable, trowelable, and liquid-applied joint sealants and sealant primers, whether specified or not; including firestopping sealants and duct joint sealers.

F. Inherently Non-Emitting Materials: Products composed wholly of minerals or metals, unless they include organic-based surface coatings, binders, or sealants; and specifically the following:

1. Stone.
2. Concrete.

3. Clay brick.
4. Metals that are plated, anodized, or powder-coated.
5. Glass.
6. Ceramics.
7. Solid wood flooring that is unfinished and untreated.

1.04 **REFERENCE STANDARDS**

A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency current edition.

B. ASTM D3960 - Standard Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings 2005 (Reapproved 2013).

C. CAL (CDPH SM) - Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions From Indoor Sources Using Environmental Chambers 2017, v1.2.

D. CARB (ATCM) - Airborne Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products; California Air Resources Board current edition.

E. CARB (SCM) - Suggested Control Measure for Architectural Coatings; California Air Resources Board 2007.

F. CHPS (HPPD) - High Performance Products Database Current Edition at www.chps.net/.

G. CRI (GLP) - Green Label Plus Testing Program - Certified Products Current Edition.

H. GreenSeal GS-36 - Adhesives for Commercial Use 2013.

I. SCAQMD 1113 - Architectural Coatings 1977 (Amended 2016).

J. SCAQMD 1168 - Adhesive and Sealant Applications 1989 (Amended 2017).

K. SCS (CPD) - SCS Certified Products Current Edition.

L. UL (GGG) - GREENGUARD Gold Certified Products Current Edition.

1.05 **SUBMITTALS**

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: For each VOC-restricted product used in the project, submit evidence of compliance.

C. Sustainable Design Reporting: Submit evidence of compliance.

1. Refer to Section 01 33 29.01-2015 Enterprise Green Communities Crtieria, Workbook and Checklist

1.06 **QUALITY ASSURANCE**

A. VOC Content Test Method: 40 CFR 59, Subpart D (EPA Method 24), or ASTM D3960, unless otherwise indicated.

1. Evidence of Compliance: Acceptable types of evidence are:

a. Report of laboratory testing performed in accordance with requirements.

b. Published product data showing compliance with requirements.

c. Certification by manufacturer that product complies with requirements.

B. Composite Wood Emissions Standard: CARB (ATCM) for ultra-low emitting formaldehyde (ULEF) resins.

1. Evidence of Compliance: Acceptable types of evidence are:

a. Current SCS "No Added Formaldehyde (NAF)" certification; www.scscertified.com.

b. Report of laboratory testing performed in accordance with requirements.

c. Published product data showing compliance with requirements.

d. Certification by manufacturer that product complies with requirements.

C. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

PART 2 PRODUCTS

2.01 **MATERIALS**

A. All Products: Comply with the most stringent of federal, State, and local requirements, or these specifications.

B. VOC-Content-Restricted Products: VOC content not greater than required by the following:

1. Adhesives, Including Flooring Adhesives: SCAQMD 1168 Rule.

2. Joint Sealants: SCAQMD 1168 Rule.

3. Paints and Coatings: Each color; most stringent of the following:

a. 40 CFR 59, Subpart D.

b. SCAQMD 1113 Rule.

c. CARB (SCM).

PART 3 EXECUTION

3.01 **FIELD QUALITY CONTROL**

A. Owner reserves the right to reject non-compliant products, whether installed or not, and require their removal and replacement with compliant products at no extra cost to Owner .

B. Additional costs to restore indoor air quality due to installation of non-compliant products will be borne by Contractor.

END OF SECTION

SECTION 01 70 00
EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Examination, preparation, and general installation procedures.

B. Requirements for alterations work, including selective demolition.

C. Pre-installation meetings.

D. Cutting and patching.

E. Surveying for laying out the work.

F. Cleaning and protection.

G. Starting of systems and equipment.

H. Demonstration and instruction of Owner personnel.

I. Closeout procedures, including Contractor's Correction Punch List, except payment procedures.

J. General requirements for maintenance service.

1.02 RELATED REQUIREMENTS

A. Section 01 10 00 - Summary: Limitations on working in existing building; continued occupancy; work sequence; identification of salvaged and relocated materials.

B. Section 01 30 00 - Administrative Requirements: Submittals procedures, Electronic document submittal service.

C. Section 01 40 00 - Quality Requirements: Testing and inspection procedures.

D. Section 01 51 00 - Temporary Utilities: Temporary heating, cooling, and ventilating facilities.

E. Section 01 57 13 - Temporary Erosion and Sediment Control: Additional erosion and sedimentation control requirements.

F. Section 01 71 23 - Field Engineering: Additional requirements for field engineering and surveying work.

G. Section 01 74 19 - Construction Waste Management and Disposal: Additional procedures for trash/waste removal, recycling, salvage, and reuse.

H. Section 01 78 00 - Closeout Submittals: Project record documents, operation and maintenance data, warranties, and bonds.

I. Section 01 79 00 - Demonstration and Training: Demonstration of products and systems to be commissioned and where indicated in specific specification sections

J. Section 01 91 13 - General Commissioning Requirements: Contractor's responsibilities in regard to commissioning.

K. Section 02 41 00 - Demolition: Demolition of whole structures and parts thereof; site utility demolition.

L. Section 07 84 00 - Firestopping.

M. Individual Product Specification Sections:

1. Advance notification to other sections of openings required in work of those sections.

2. Limitations on cutting structural members.

1.03 REFERENCE STANDARDS

A. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations 2013.

1.04 **SUBMITTALS**

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Survey work: Submit name, address, and telephone number of Surveyor before starting survey work.

1. On request, submit documentation verifying accuracy of survey work.
2. Submit a copy of site drawing signed by the Land Surveyor, that the elevations and locations of the work are in compliance with Contract Documents.
3. Submit surveys and survey logs for the project record.

C. Cutting and Patching: Submit written request in advance of cutting or alteration that affects:

1. Structural integrity of any element of Project.
2. Integrity of weather exposed or moisture resistant element.
3. Efficiency, maintenance, or safety of any operational element.
4. Visual qualities of sight exposed elements.
5. Work of Owner or separate Contractor.
6. Include in request:
    a. Identification of Project.
    b. Location and description of affected work.
    c. Necessity for cutting or alteration.
    d. Description of proposed work and products to be used.
    e. Alternatives to cutting and patching.
    f. Effect on work of Owner or separate Contractor.
    g. Written permission of affected separate Contractor.
    h. Date and time work will be executed.

D. Project Record Documents: Accurately record actual locations of capped and active utilities.

1.05 **QUALIFICATIONS**

A. For surveying work, employ a land surveyor registered in the State in which the Project is located and acceptable to Architect. Submit evidence of surveyor's Errors and Omissions insurance coverage in the form of an Insurance Certificate. Employ only individual(s) trained and experienced in collecting and recording accurate data relevant to ongoing construction activities,

B. For field engineering, employ a professional engineer of the discipline required for specific service on Project, licensed in the State in which the Project is located. Employ only individual(s) trained and experienced in establishing and maintaining horizontal and vertical control points necessary for laying out construction work on project of similar size, scope and/or complexity.

C. For design of temporary shoring and bracing, employ a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.

1.06 **PROJECT CONDITIONS**

A. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.

B. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.

C. Perform dewatering activities, as required, for the duration of the project.

D. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.

E. Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere and over adjacent property.

1. Provide dust-proof enclosures to prevent entry of dust generated outdoors.

2. Provide dust-proof barriers between construction areas and areas continuing to be occupied by Owner .

F. Erosion and Sediment Control: Plan and execute work by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.

1. Minimize amount of bare soil exposed at one time.

2. Provide temporary measures such as berms, dikes, and drains, to prevent water flow.

3. Construct fill and waste areas by selective placement to avoid erosive surface silts or clays.

4. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.

G. Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations.

1. At All Times: Excessively noisy tools and operations will not be tolerated inside the building at any time of day; excessively noisy includes jackhammers.

2. Outdoors: Limit conduct of especially noisy exterior work to the hours of 8 am to 5 pm.

H. Pest and Rodent Control: Provide methods, means, and facilities to prevent pests and insects from damaging the work.

1. Pest Control Service: Weekly treatments.

I. Rodent Control: Provide methods, means, and facilities to prevent rodents from accessing or invading premises.

J. Pollution Control: Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations. Comply with federal, state, and local regulations.

1.07 **COORDINATION**

A. See Section 01 10 00 for occupancy-related requirements.

B. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.

C. Notify affected utility companies and comply with their requirements.

D. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.

E. Coordinate space requirements, supports, and installation of mechanical and electrical work that are indicated diagrammatically on drawings. Follow routing indicated for pipes, ducts,

and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

F. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.

G. Coordinate completion and clean-up of work of separate sections.

H. After Owner occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner 's activities.

PART 2 PRODUCTS

2.01 PATCHING MATERIALS

A. New Materials: As specified in product sections; match existing products and work for patching and extending work.

B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.

C. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 01 60 00 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.

B. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.

C. Examine and verify specific conditions described in individual specification sections.

D. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.

E. Verify that utility services are available, of the correct characteristics, and in the correct locations.

F. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

3.02 PREPARATION

A. Clean substrate surfaces prior to applying next material or substance.

B. Seal cracks or openings of substrate prior to applying next material or substance.

C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

3.03 PREINSTALLATION MEETINGS

A. When required in individual specification sections, convene a preinstallation meeting at the site prior to commencing work of the section.

B. Require attendance of parties directly affecting, or affected by, work of the specific section.

C. Notify Architect four days in advance of meeting date.

D. Prepare agenda and preside at meeting:

1. Review conditions of examination, preparation and installation procedures.
2. Review coordination with related work.

E. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect , Owner , participants, and those affected by decisions made.

3.04 **LAYING OUT THE WORK**

A. Verify locations of survey control points prior to starting work.

B. Promptly notify Architect of any discrepancies discovered.

C. Protect survey control points prior to starting site work; preserve permanent reference points during construction.

D. Promptly report to Architect the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.

E. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Architect .

F. Utilize recognized engineering survey practices.

G. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:

1. Site improvements including pavements; stakes for grading, fill and topsoil placement; utility locations, slopes, and invert elevations; and ADA Accessibility.
2. Grid or axis for structures.
3. Building foundation, column locations, ground floor elevations, and floor levels.

H. Periodically verify layouts by same means.

I. Maintain a complete and accurate log of control and survey work as it progresses.

3.05 **GENERAL INSTALLATION REQUIREMENTS**

A. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.

B. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.

C. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.

D. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.

E. Make neat transitions between different surfaces, maintaining texture and appearance.

3.06 **ALTERATIONS**

A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.

1. Verify that construction and utility arrangements are as indicated.
2. Report discrepancies to Architect before disturbing existing installation.
3. Beginning of alterations work constitutes acceptance of existing conditions.

B. Remove existing work as indicated and as required to accomplish new work.

1. Remove items indicated on drawings.
2. Relocate items indicated on drawings.

3. Where new surface finishes are to be applied to existing work, perform removals, patch, and prepare existing surfaces as required to receive new finish; remove existing finish if necessary for successful application of new finish.
4. Where new surface finishes are not specified or indicated, patch holes and damaged surfaces to match adjacent finished surfaces as closely as possible.

C. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, Telecommunications and Data): Remove, relocate, and extend existing systems to accommodate new construction.
1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components; if necessary, modify installation to allow access or provide access panel.
2. Where existing systems or equipment are not active and Contract Documents require reactivation, put back into operational condition; repair supply, distribution, and equipment as required.
3. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
a. Disable existing systems only to make switchovers and connections; minimize duration of outages.
b. Provide temporary connections as required to maintain existing systems in service.
4. Verify that abandoned services serve only abandoned facilities.
5. Remove abandoned pipe, ducts, conduits, and equipment , including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification; patch holes left by removal using materials specified for new construction.

D. Protect existing work to remain.
1. Prevent movement of structure; provide shoring and bracing if necessary.
2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
3. Repair adjacent construction and finishes damaged during removal work.

E. Adapt existing work to fit new work: Make as neat and smooth transition as possible.

F. Patching: Where the existing surface is not indicated to be refinished, patch to match the surface finish that existed prior to cutting. Where the surface is indicated to be refinished, patch so that the substrate is ready for the new finish.

G. Refinish existing surfaces as indicated:
1. Where rooms or spaces are indicated to be refinished, refinish all visible existing surfaces to remain to the specified condition for each material, with a neat transition to adjacent finishes.
2. If mechanical or electrical work is exposed accidentally during the work, re-cover and refinish to match.

H. Clean existing systems and equipment.

I. Remove demolition debris and abandoned items from alterations areas and dispose of off-site; do not burn or bury.

J. Do not begin new construction in alterations areas before demolition is complete.

K. Comply with all other applicable requirements of this section.

3.07 CUTTING AND PATCHING

A. Whenever possible, execute the work by methods that avoid cutting or patching.

B. See Alterations article above for additional requirements.

C. Perform whatever cutting and patching is necessary to:

1. Complete the work.
2. Fit products together to integrate with other work.
3. Provide openings for penetration of mechanical, electrical, and other services.
4. Match work that has been cut to adjacent work.
5. Repair areas adjacent to cuts to required condition.
6. Repair new work damaged by subsequent work.
7. Remove samples of installed work for testing when requested.
8. Remove and replace defective and non-complying work.

D. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.

E. Employ original installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.

F. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.

G. Restore work with new products in accordance with requirements of Contract Documents.

H. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

I. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material in accordance with Section 07 84 00, to full thickness of the penetrated element.

J. Patching:

1. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
2. Match color, texture, and appearance.
3. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.

3.08 PROGRESS CLEANING

A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.

B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.

C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.

D. Collect and remove waste materials, debris, and trash/rubbish from site periodically and dispose off-site; do not burn or bury.

3.09 PROTECTION OF INSTALLED WORK

A. Protect installed work from damage by construction operations.

B. Provide special protection where specified in individual specification sections.

C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.

D. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.

E. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.

F. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.

G. Remove protective coverings when no longer needed; reuse or recycle coverings if possible.

3.10 SYSTEM STARTUP

A. Coordinate schedule for start-up of various equipment and systems.

B. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions that may cause damage.

C. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.

D. Verify that wiring and support components for equipment are complete and tested.

E. Execute start-up under supervision of applicable Contractor personnel and manufacturer's representative in accordance with manufacturers' instructions.

F. Submit a written report that equipment or system has been properly installed and is functioning correctly.

3.11 DEMONSTRATION AND INSTRUCTION

A. See Section 01 79 00 - Demonstration and Training.

3.12 ADJUSTING

A. Adjust operating products and equipment to ensure smooth and unhindered operation.

3.13 FINAL CLEANING

A. Use cleaning materials that are nonhazardous.

B. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.

C. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.

D. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.

E. Clean filters of operating equipment.

F. Clean debris from roofs, gutters, downspouts, scuppers, overflow drains, area drains, drainage systems and detention ponds, rain gardens.

G. Clean site; sweep paved areas, rake clean landscaped surfaces.

H. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

3.14 **CLOSEOUT PROCEDURES**

A. Make submittals that are required by governing or other authorities.

B. Accompany Project Coordinator on preliminary inspection to determine items to be listed for completion or correction in the Contractor's Correction Punch List for Contractor's Notice of Substantial Completion.

C. Notify Architect when work is considered ready for Architect's Substantial Completion inspection.

D. Submit written certification containing Contractor's Correction Punch List, that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Architect's Substantial Completion inspection.

E. Conduct Substantial Completion inspection and create Final Correction Punch List containing Architect's and Contractor's comprehensive list of items identified to be completed or corrected and submit to Architect.

F. Correct items of work listed in Final Correction Punch List and comply with requirements for access to Owner-occupied areas.

G. Notify Architect when work is considered finally complete and ready for Architect's Substantial Completion final inspection.

H. Complete items of work determined by Architect listed in executed Certificate of Substantial Completion.

3.15 **MAINTENANCE**

A. Provide service and maintenance of components indicated in specification sections.

B. Maintenance Period: As indicated in specification sections or, if not indicated, not less than one year from the Date of Substantial Completion or the length of the specified warranty, whichever is longer.

C. Examine system components at a frequency consistent with reliable operation. Clean, adjust, and lubricate as required.

D. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by the manufacturer of the original component.

E. Maintenance service shall not be assigned or transferred to any agent or subcontractor without prior written consent of the Owner .

END OF SECTION

SECTION 01 71 23
FIELD ENGINEERING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Field engineering services by Contractor.

B. Land surveying services by Contractor.

1.02 RELATED REQUIREMENTS

1.03 DESCRIPTION OF SERVICES

A. Specific services listed in this section are in addition to, and do not supersede, general Execution and Closeout Requirements.

B. Sole responsibility for establishing all locations, dimensions and levels of items of work.

C. Sole responsibility for provision of all materials required to establish and maintain benchmarks and control points, including batter boards, grade stakes, structure elevation stakes, and other items.

D. Keeping a transit, theodolite, or TST (total station theodolite with electronic distance measurement device); leveling instrument; and related implements such as survey rods and other measurement devices, at the project site at all times.

E. Provision of facilities and assistance necessary for Architect to check lines and grade points placed by Contractor.

1. Performance of excavation or embankment work until after all cross-sectioning necessary for determining payment quantities for Unit Price work have been completed and accepted by Architect.

F. Preparation and maintenance of daily reports of activity on the work. Submission of reports containing key progress indicators and job conditions to Architect.

1. Major equipment and materials installed as part of the work.
2. Location of areas in which construction was performed.
3. Work performed, including field quality control measures and testing.
4. Weather conditions.
5. Instructions received from Architect or Owner, if any.

G. Preparation and maintenance of professional-quality, accurate, well organized, legible notes of all measurements and calculations made while surveying and laying out the work.

1.04 REFERENCE STANDARDS

A. FGDC-STD-007.1 - Geospatial Positioning Accuracy Standards - Part 1: Reporting Methodology 1998.

B. FGDC-STD-007.2 - Geospatial Positioning Accuracy Standards - Part 2: Standards for Geodetic Networks 1998.

C. FGDC-STD-007.4 - Geospatial Positioning Accuracy Standards - Part 4: Architecture, Engineering, Construction, and Facilities Measurement 2002.

D. State Plane Coordinate System for the State in which the Project is located.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Submit in addition to items required in Section 01 70 00 - Execution and Closeout Requirements.

C. Informational Submittals: Submit the following:

1. Field Engineering: Submit daily reports, with content as indicated in this section.

2. Final property survey.

1.06 **QUALITY ASSURANCE**

A. Field Engineer's Qualifications: As established in Section 01 70 00 - Execution and Closeout Requirements.

B. Land Surveyor's Qualifications: As established in Section 01 70 00 - Execution and Closeout Requirements.

C. Use adequate number of skilled and thoroughly-trained workers to perform the work of this section in a timely and comprehensive manner.

D. Minimum accuracy for required work is as follows:

1. Grade: Horizontal Tolerance: Plus or minus 0.5 feet, Vertical Tolerance: Plus or minus 0.05 feet.

2. Culverts and ditches: Horizontal Tolerance: Plus or minus 0.5 feet, Vertical Tolerance: Plus or minus 0.05 feet.

3. Structures: Horizontal Tolerance: Plus or minus 0.5 feet (location), Vertical Tolerance: Plus or minus 0.05 feet.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 **EXAMINATION**

A. Verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. Notify Owner’s Representative and Architect of any discrepancies immediately in writing before proceeding to lay out the work. Locate and protect existing benchmarks and base line. Preserve permanent reference points during construction.

B. Existing Utilities and Equipment: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify existing conditions.

3.02 **FIELD ENGINEERING**

A. Maintain field office files, drawings, specifications, and record documents.

B. Coordinate field engineering services with Contractor's subcontractors, installers, and suppliers as appropriate.

C. Prepare layout and coordination drawings for construction operations.

D. Check and coordinate the work for conflicts and interferences, and immediately advise Architect and Owner of all discrepancies of which Contractor is aware.

E. Cooperate as required with Architect and Owner in observing the work and performing field inspections.

F. Review and coordinate work on a regular basis with shop drawings and Contractor's other submittals.

G. Check the location, line and grade of every major element as the work progresses. Notify the Architect when deviations from required lines or grades exceed allowable tolerances. Include in such notifications a thorough explanation of the problem, and a proposed plan

and schedule for remedying the deviation. Do not proceed with remedial work without Owner's concurrence of the remediation plan.

3.03 **LAND SURVEYING**

A. General: Follow standards for geospatial positioning accuracy.

1. FGDC-STD-007.1 as amended by Authority Having Jurisdiction.
2. FGDC-STD-007.2 as amended by Authority Having Jurisdiction.
3. FGDC-STD-007.4 as amended by Authority Having Jurisdiction.

B. Coordinate survey data with the State Plane Coordinate System of the State in which the Project is located.

C. Contractor is responsible for the restoration of all property corners and control monuments damaged or destroyed by construction-related activities. Any disturbed monuments must be replaced at Contractor's expense by a surveyor licensed in the State in which the Project is located, and approved by the Architect.

1. Temporarily suspend work at such points and for such reasonable times as the Owner may require for resetting monuments. The Contractor will not be entitled to any additional compensation or extension of time.

3.04 **CONSTRUCTION SURVEYING**

A. General: Perform surveying as applicable to specific items necessary for proper execution of work.

1. Alignment Staking: Provide alignment stakes at 50 foot intervals on tangent, and at 25 foot intervals on curves.
2. Slope Staking: Provide slope staking at 50 foot intervals on tangent, and at 25 foot intervals on curves. Re-stake at every ten-foot difference in elevation.
3. Structure: Stake out structures, including elevations, and check prior to and during construction.
4. Pipelines: Stake out pipelines including elevations, and check prior to and during construction.
5. Site Utilities: Stake out utility lines including elevations, and check prior to and during construction.
6. Road: Stake out roadway elevations at 50 foot50-foot intervals on tangent, and at 25 foot intervals on curves.
7. Cross-sections: Provide original, intermediate, and final staking as required, for site work and other locations as necessary for quantity surveys.
8. Easement Staking: Provide easement staking at 50 foot intervals on tangent, and at 25 foot intervals on curves. If required by project conditions, provide wooden laths with flagging at 100 foot intervals.
9. Record Staking: Provide permanent stake at each blind flange and each utility cap is provided for future connections. Use stakes for record staking of material(s) acceptable to Architect.
10. Structural Frame: Upon completion, certify location and plumbness.

B. Record Log: Maintain a log of layout control work. Record any deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used.

C. Accuracy:

1. Establish Contractor's temporary survey references points for Contractor’s use to at least second-order accuracy (e.g., 1:10000). Set construction staking used as a guide for the work to at least third-order accuracy (e.g., 1:5000). Provide the absolute margin for error specified below on the basis established by such orders.

a. Accuracy of other staking shall be plus or minus 0.04 feet horizontally and plus or minus 0.02 feet vertically.

b. Include an error analysis sufficient to demonstrate required accuracy in survey calculations.

2. Owner reserves the right to check the Contractor's survey, measurements, and calculations. The requirement for accuracy will not be waived, whether this right is exercised or not.

3.05 SUPPORT AND BRACING

A. General requirements: Design all support and bracing systems, if required. Provide for attachment to portions of the building structure capable of bearing the loads imposed. Design systems to not overstress the building structure.

3.06 REPORTS

A. Submit two copies of Contractor’s daily reports at Architect’s field office (or electronically) by 9:00 AM the next working day after the day covered in the associated report. Daily report shall be signed by responsible member of Contractor’s staff, such as project manager or superintendent, or foreman designated by Contractor as having authority to sign daily reports.

3.07 RECORDS

A. Maintain at the Site a complete and accurate log of control and survey work as it progresses.

1. Organize and record survey data in accordance with recognized professional surveying standards, Laws and Regulations, and prevailing standards of practice in the State in which the Project is located. Record Contractor's surveyor's original field notes, computations, and other surveying data in Contractor-furnished hard-bound field books. Contractor is solely responsible for completeness and accuracy of survey work, and completeness and accuracy of survey records, including field books. Survey records,(including field books) may be rejected by Owner due to failure to organize and maintain survey records in a manner that allows reasonable and independent verification of calculations, and/or allows identification of elevations, dimensions, and grades of the work.

2. Illegible notes or data, and erasures on any page of field books, are unacceptable. Do not submit copied notes or data. Corrections by ruling or lining out errors will be unacceptable unless initialed by the surveyor. Violation of these requirements may require re-surveying the data questioned by Architect.

B. Submit three copies of final property survey to Owner. Include on the survey a certification, signed by the surveyor, that principal metes, bounds, lines, and levels of the Project are accurately positioned as shown on the survey. Include the following information:

1. Structure locations from property lines, and distances to adjacent buildings.

2. Dimensions and locations of drives, walks, walls, underground utilities, appurtenances, major site features and existing trees that remained.

3. Location of easements.

4. Final grading topographic survey.

3.08 **CLOSEOUT ACTIVITIES**

A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.

B. See Section 01 79 00 - Demonstration and Training, for additional requirements.

END OF SECTION

SECTION 01 74 19
CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 GENERAL

1.01 WASTE MANAGEMENT REQUIREMENTS

A. Owner requires that this project generate the least amount of trash and waste possible.

B. Project required to meet 2015 Enterprise Green Communities criteria. Refer to Section 01 33 29.01. Contractor's option to meet compliance as specified in 2015 EGC Criteria 6.2 which includes the following, (refer to 2015 Enterprise Green Communities for full requirement information):

1. Option 1: Measured by Percentage
2. Option 2: Material Specific; or
3. Option 3: Minimizing Construction Waste - New Construction Only

C. Employ processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors.

D. Minimize trash/waste disposal in landfills; reuse, salvage, or recycle as much waste as economically feasible.

E. Optional Recycling, Salvage, and Reuse: The following may not be disposed of in landfills or by incineration (refer to 2015 Enterprise Green Communities for more information):

1. Aluminum and plastic beverage containers.
2. Corrugated cardboard.
3. Wood pallets.
4. Clean dimensional wood.
5. Land clearing debris, including brush, branches, logs, and stumps; see Section 31 10 00 - Site Clearing for use options.
6. Concrete: May be crushed and used as riprap, aggregate, sub-base material, or fill.
7. Bricks: May be used on project if whole, or crushed and used as landscape cover, sub-base material, or fill.
8. Concrete masonry units: May be used on project if whole, or crushed and used as sub-base material or fill.
9. Precast concrete panels: May be used for erosion control or landscape features.
10. Asphalt paving: May be recycled into paving for project.
11. Metals, including packaging banding, metal studs, sheet metal, structural steel, piping, reinforcing bars, door frames, and other items made of steel, iron, galvanized steel, stainless steel, aluminum, copper, zinc, lead, brass, and bronze.
12. Gypsum drywall and plaster.

F. Contractor shall submit periodic Waste Disposal Reports; all landfill disposal, incineration, recycling, salvage, and reuse must be reported regardless of to whom the cost or savings accrues; use the same units of measure on all reports.

G. Contractor shall develop and follow a Waste Management Plan designed to implement these requirements.

H. The following sources may be useful in developing the Waste Management Plan:

I. Methods of trash/waste disposal that are not acceptable are:

1. Burning on the project site.
2. Burying on the project site.
3. Dumping or burying on other property, public or private.
4. Other illegal dumping or burying.

J. Regulatory Requirements: Contractor is responsible for knowing and complying with regulatory requirements, including but not limited to Federal, state and local requirements, pertaining to legal disposal of all construction and demolition waste materials.

1.02 **RELATED REQUIREMENTS**

A. Section 01 30 00 - Administrative Requirements: Additional requirements for project meetings, reports, submittal procedures, and project documentation.

B. Section 01 50 00 - Temporary Facilities and Controls: Additional requirements related to trash/waste collection and removal facilities and services.

C. Section 01 60 00 - Product Requirements: Waste prevention requirements related to delivery, storage, and handling.

D. Section 01 70 00 - Execution and Closeout Requirements: Trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.

E. Section 31 10 00 - Site Clearing: Handling and disposal of land clearing debris.

1.03 **DEFINITIONS**

A. Clean: Untreated and unpainted; not contaminated with oils, solvents, caulk, or the like.

B. Construction and Demolition Waste: Solid wastes typically including building materials, packaging, trash, debris, and rubble resulting from construction, remodeling, repair and demolition operations.

C. Hazardous: Exhibiting the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity or reactivity.

D. Nonhazardous: Exhibiting none of the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity, or reactivity.

E. Nontoxic: Neither immediately poisonous to humans nor poisonous after a long period of exposure.

F. Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.

G. Recycle: To remove a waste material from the project site to another site for remanufacture into a new product for reuse by others.

H. Recycling: The process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for the purpose of using the altered form. Recycling does not include burning, incinerating, or thermally destroying waste.

I. Return: To give back reusable items or unused products to vendors for credit.

J. Reuse: To reuse a construction waste material in some manner on the project site.

K. Salvage: To remove a waste material from the project site to another site for resale or reuse by others.

L. Sediment: Soil and other debris that has been eroded and transported by storm or well production run-off water.

M. Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.

N. Toxic: Poisonous to humans either immediately or after a long period of exposure.

O. Trash: Any product or material unable to be reused, returned, recycled, or salvaged.

P. Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.

1.04 **SUBMITTALS**

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Submit Waste Management Plan within 10 calendar days after receipt of Notice of Award of Bid, or prior to any trash or waste removal, whichever occurs sooner; submit projection of all trash and waste that will require disposal and alternatives to landfilling.

C. Waste Management Plan: Include the following information:

1. Analysis of the trash and waste projected to be generated during the entire project construction cycle, including types and quantities.

2. Landfill Options: The name, address, and telephone number of the landfill(s) where trash/waste will be disposed of, the applicable landfill tipping fee(s), and the projected cost of disposing of all project trash/waste in the landfill(s).

3. Landfill Alternatives: List all waste materials that will be diverted from landfills by reuse, salvage, or recycling.

4. Meetings: Describe regular meetings to be held to address waste prevention, reduction, recycling, salvage, reuse, and disposal.

5. Materials Handling Procedures: Describe the means by which materials to be diverted from landfills will be protected from contamination and prepared for acceptance by designated facilities; include separation procedures for recyclables, storage, and packaging.

6. Transportation: Identify the destination and means of transportation of materials to be recycled; i.e. whether materials will be site-separated and self-hauled to designated centers, or whether mixed materials will be collected by a waste hauler.

D. Waste Disposal Reports: Submit at specified intervals, with details of quantities of trash and waste, means of disposal or reuse, and costs; show both totals to date and since last report.

1. Submit updated Report with each Application for Progress Payment; failure to submit Report will delay payment.

2. Submit Report on a form acceptable to Owner .

3. Landfill Disposal: Include the following information:

a. Identification of material.

b. Amount, in tons or cubic yards, of trash/waste material from the project disposed of in landfills.

c. State the identity of landfills, total amount of tipping fees paid to landfill, and total disposal cost.

d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.

4. Incinerator Disposal: Include the following information:

a. Identification of material.

b. Amount, in tons or cubic yards, of trash/waste material from the project delivered to incinerators.

c. State the identity of incinerators, total amount of fees paid to incinerator, and total disposal cost.

d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.

5. Recycled and Salvaged Materials: Include the following information for each:

a. Identification of material, including those retrieved by installer for use on other projects.

b. Amount, in tons or cubic yards, date removed from the project site, and receiving party.

c. Transportation cost, amount paid or received for the material, and the net total cost or savings of salvage or recycling each material.

d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.

e. Certification by receiving party that materials will not be disposed of in landfills or by incineration.

6. Material Reused on Project: Include the following information for each:

a. Identification of material and how it was used in the project.

b. Amount, in tons or cubic yards.

c. Include weight tickets as evidence of quantity.

7. Other Disposal Methods: Include information similar to that described above, as appropriate to disposal method.

PART 3 EXECUTION

2.01 **WASTE MANAGEMENT PROCEDURES**

A. See Section 01 30 00 for additional requirements for project meetings, reports, submittal procedures, and project documentation.

B. See Section 01 50 00 for additional requirements related to trash/waste collection and removal facilities and services.

C. See Section 01 60 00 for waste prevention requirements related to delivery, storage, and handling.

D. See Section 01 70 00 for trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.

2.02 **WASTE MANAGEMENT PLAN IMPLEMENTATION**

A. Manager: Designate an on-site person or persons responsible for instructing workers and overseeing and documenting results of the Waste Management Plan.

B. Communication: Distribute copies of the Waste Management Plan to job site foreman, each subcontractor, Owner , and Architect .

C. Instruction: Provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the project.

D. Meetings: Discuss trash/waste management goals and issues at project meetings.

1. Prebid meeting.

2. Preconstruction meeting.

3. Regular job-site meetings.

E. Facilities: Provide specific facilities for separation and storage of materials for recycling, salvage, reuse, return, and trash disposal, for use by all contractors and installers.

1. Provide containers as required.
2. Provide adequate space for pick-up and delivery and convenience to subcontractors.
3. Keep recycling and trash/waste bin areas neat and clean and clearly marked in order to avoid contamination of materials.

F. Hazardous Wastes: Separate, store, and dispose of hazardous wastes according to applicable regulations.

G. Recycling: Separate, store, protect, and handle at the site identified recyclable waste products in order to prevent contamination of materials and to maximize recyclability of identified materials. Arrange for timely pickups from the site or deliveries to recycling facility in order to prevent contamination of recyclable materials.

H. Reuse of Materials On-Site: Set aside, sort, and protect separated products in preparation for reuse.

I. Salvage: Set aside, sort, and protect products to be salvaged for reuse off-site.

END OF SECTION

SECTION 01 78 00
CLOSEOUT SUBMITTALS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Project Record Documents.

B. Operation and Maintenance Data.

C. Warranties and bonds.

1.02 RELATED REQUIREMENTS

A. Section 00 72 00 - General Conditions and 00 73 00 - Supplementary Conditions: Performance bond and labor and material payment bonds, warranty, and correction of work.

B. Section 01 30 00 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.

C. Section 01 70 00 - Execution and Closeout Requirements: Contract closeout procedures.

D. Individual Product Sections: Specific requirements for operation and maintenance data.

E. Individual Product Sections: Warranties required for specific products or Work.

1.03 SUBMITTALS

A. Project Record Documents: Submit documents to Architect with claim for final Application for Payment.

B. Operation and Maintenance Data:

1. For equipment, or component parts of equipment put into service during construction and operated by Owner , submit completed documents within ten days after acceptance.

2. Submit one copy of completed documents 15 days prior to final inspection. This copy will be reviewed and returned after final inspection, with Architect comments. Revise content of all document sets as required prior to final submission.

3. Submit two sets of revised final documents in final form within 10 days after final inspection.

C. Warranties and Bonds:

1. For equipment or component parts of equipment put into service during construction with Owner 's permission, submit documents within 10 days after acceptance.

2. Make other submittals within 10 days after Date of Substantial Completion, prior to final Application for Payment.

3. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within 10 days after acceptance, listing the date of acceptance as the beginning of the warranty period.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PROJECT RECORD DOCUMENTS

A. Maintain on site one set of the following record documents; record actual revisions to the Work:

1. Drawings.

2. Addenda.

3. Change Orders and other modifications to the Contract.

B. Ensure entries are complete and accurate, enabling future reference by Owner .

C. Store record documents separate from documents used for construction.

D. Record information concurrent with construction progress.

E. Record Drawings: Legibly mark each item to record actual construction including:

1. Field changes of dimension and detail.

2. Details not on original Contract drawings.

3.02 **OPERATION AND MAINTENANCE DATA**

A. Source Data: For each product or system, list names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.

B. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.

C. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.

D. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

3.03 **OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES**

A. For Each Product, Applied Material, and Finish:

B. Instructions for Care and Maintenance: Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental cleaning agents and methods, and recommended schedule for cleaning and maintenance.

C. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

3.04 **OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS**

A. For Each Item of Equipment and Each System:

1. Description of unit or system, and component parts.

2. Identify function, normal operating characteristics, and limiting conditions.

3. Include performance curves, with engineering data and tests.

4. Complete nomenclature and model number of replaceable parts.

B. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

C. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.

D. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and trouble shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.

E. Provide servicing and lubrication schedule, and list of lubricants required.

F. Include manufacturer's printed operation and maintenance instructions.

G. Include sequence of operation by controls manufacturer.

H. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

3.05 **ASSEMBLY OF OPERATION AND MAINTENANCE MANUALS**

A. Assemble operation and maintenance data into durable manuals for Owner's personnel use, with data arranged in the same sequence as, and identified by, the specification sections.

B. Where systems involve more than one specification section, provide separate tabbed divider for each system.

C. Binders: Commercial quality, 8-1/2 by 11 inch three D side ring binders with durable plastic covers; 2 inch maximum ring size. When multiple binders are used, correlate data into related consistent groupings.

D. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.

E. Project Directory: Title and address of Project; names, addresses, and telephone numbers of Architect, Consultants, Contractor and subcontractors, with names of responsible parties.

F. Tables of Contents: List every item separated by a divider, using the same identification as on the divider tab; where multiple volumes are required, include all volumes Tables of Contents in each volume, with the current volume clearly identified.

G. Dividers: Provide tabbed dividers for each separate product and system; identify the contents on the divider tab; immediately following the divider tab include a description of product and major component parts of equipment.

H. Text: Manufacturer's printed data, or typewritten data on 20 pound paper.

I. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

J. Arrangement of Contents: Organize each volume in parts as follows:

1. Project Directory.
2. Table of Contents, of all volumes, and of this volume.
3. Operation and Maintenance Data: Arranged by system, then by product category.
    a. Source data.
    b. Operation and maintenance data.
    c. Field quality control data.
    d. Photocopies of warranties and bonds.

3.06 **WARRANTIES AND BONDS**

A. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within 10 days after completion of the applicable item of work. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial completion is determined.

B. Verify that documents are in proper form, contain full information, and are notarized.

C. Co-execute submittals when required.

D. Retain warranties and bonds until time specified for submittal.

E. Manual: Bind in commercial quality 8-1/2 by 11 inch three D side ring binders with durable plastic covers.

F. Cover: Identify each binder with typed or printed title WARRANTIES AND BONDS, with title of Project; name, address and telephone number of Contractor and equipment supplier; and name of responsible company principal.

G. Table of Contents: Neatly typed, in the sequence of the Table of Contents of the Project Manual, with each item identified with the number and title of the specification section in which specified, and the name of product or work item.

H. Separate each warranty or bond with index tab sheets keyed to the Table of Contents listing. Provide full information, using separate typed sheets as necessary. List Subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

END OF SECTION

SECTION 01 79 00
DEMONSTRATION AND TRAINING

PART 1 GENERAL

1.01 SUMMARY

A. Demonstration of products and systems to be commissioned and where indicated in specific specification sections.

B. Training of Owner personnel in operation and maintenance is required for:

1. HVAC systems and equipment.
2. Plumbing equipment.
3. Electrical systems and equipment.

1.02 RELATED REQUIREMENTS

A. Section 01 78 00 - Closeout Submittals: Operation and maintenance manuals.

B. Section 01 91 13 - General Commissioning Requirements: Additional requirements applicable to demonstration and training.

C. Other Specification Sections: Additional requirements for demonstration and training.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures; except:

1. Make all submittals specified in this section, and elsewhere where indicated for commissioning purposes, directly to the Commissioning Authority.
2. Submit one copy to the Commissioning Authority, not to be returned.
3. Make commissioning submittals on time schedule specified by Commissioning Authority.
4. Submittals indicated as "Draft" are intended for the use of the Commissioning Authority in preparation of overall Training Plan; submit in editable electronic format, Microsoft Word 2003 preferred.

B. Draft Training Plans: Owner will designate personnel to be trained; tailor training to needs and skill-level of attendees.

1. Submit to Commissioning Authority for review and inclusion in overall training plan.
2. Submit not less than four weeks prior to start of training.
3. Revise and resubmit until acceptable.
4. Provide an overall schedule showing all training sessions.
5. Include at least the following for each training session:
    a. Identification, date, time, and duration.
    b. Description of products and/or systems to be covered.
    c. Name of firm and person conducting training; include qualifications.
    d. Intended audience, such as job description.
    e. Objectives of training and suggested methods of ensuring adequate training.
    f. Methods to be used, such as classroom lecture, live demonstrations, hands-on, etc.
    g. Media to be used, such a slides, hand-outs, etc.

h. Training equipment required, such as projector, projection screen, etc., to be provided by Contractor .

C. Training Manuals: Provide training manual for each attendee; allow for minimum of two attendees per training session.

1. Include applicable portion of O&M manuals.

2. Include copies of all hand-outs, slides, overheads, video presentations, etc., that are not included in O&M manuals.

3. Provide one extra copy of each training manual to be included with operation and maintenance data.

1.04 **QUALITY ASSURANCE**

A. Instructor Qualifications: Familiar with design, operation, maintenance and troubleshooting of the relevant products and systems.

1. Provide as instructors the most qualified trainer of those contractors and/or installers who actually supplied and installed the systems and equipment.

2. Where a single person is not familiar with all aspects, provide specialists with necessary qualifications.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 **DEMONSTRATION - GENERAL**

A. Demonstrations conducted during system start-up do not qualify as demonstrations for the purposes of this section, unless approved in advance by Owner .

B. Demonstrations conducted during Functional Testing need not be repeated unless Owner personnel training is specified.

C. Demonstration may be combined with Owner personnel training if applicable.

D. Operating Equipment and Systems: Demonstrate operation in all modes, including start-up, shut-down, seasonal changeover, emergency conditions, and troubleshooting, and maintenance procedures, including scheduled and preventive maintenance.

1. Perform demonstrations not less than two weeks prior to Substantial Completion.

2. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.

E. Non-Operating Products: Demonstrate cleaning, scheduled and preventive maintenance, and repair procedures.

1. Perform demonstrations not less than two weeks prior to Substantial Completion.

3.02 **TRAINING - GENERAL**

A. Contractor will prepare the Training Plan based on draft plans submitted.

B. Conduct training on-site unless otherwise indicated.

C. Owner will provide classroom and seating at no cost to Contractor .

D. Do not start training until Functional Testing is complete, unless otherwise specified or approved by the Commissioning Authority.

E. Provide training in minimum two hour segments.

F. The Owner is responsible for determining that the training was satisfactorily completed.

G. Training schedule will be subject to availability of Owner 's personnel to be trained; re-schedule training sessions as required by Owner ; once schedule has been approved by Owner failure to conduct sessions according to schedule will be cause for Owner to charge Contractor for personnel "show-up" time.

H. Review of Facility Policy on Operation and Maintenance Data: During training discuss:

1. The location of the O&M manuals and procedures for use and preservation; backup copies.
2. Typical contents and organization of all manuals, including explanatory information, system narratives, and product specific information.
3. Typical uses of the O&M manuals.

I. Product- and System-Specific Training:

1. Review the applicable O&M manuals.
2. For systems, provide an overview of system operation, design parameters and constraints, and operational strategies.
3. Review instructions for proper operation in all modes, including start-up, shut-down, seasonal changeover and emergency procedures, and for maintenance, including preventative maintenance.
4. Provide hands-on training on all operational modes possible and preventive maintenance.
5. Emphasize safe and proper operating requirements; discuss relevant health and safety issues and emergency procedures.
6. Discuss common troubleshooting problems and solutions.
7. Discuss any peculiarities of equipment installation or operation.
8. Discuss warranties and guarantees, including procedures necessary to avoid voiding coverage.
9. Review recommended tools and spare parts inventory suggestions of manufacturers.
10. Review spare parts and tools required to be furnished by Contractor .
11. Review spare parts suppliers and sources and procurement procedures.

J. Be prepared to answer questions raised by training attendees; if unable to answer during training session, provide written response within three days.

END OF SECTION

SECTION 01 91 13
GENERAL COMMISSIONING REQUIREMENTS

PART 1 GENERAL

1.01 SUMMARY

A. Commissioning is intended to achieve the following specific objectives; this section specifies the Contractor 's and Commisiong Authority's responsibilities for commissioning.

B. Contractor's commissioning responsiblites include:

1. Verify that the work is installed in accordance with Contract Documents and the manufacturer’s recommendations and instructions, and that it receives adequate operational checkout prior to startup: Startup reports and Prefunctional Checklists executed by Contractor are utilized to achieve this.

2. Verify that operation and maintenance manuals submitted to Owner are complete: Detailed operation and maintenance (O&M) data submittals by Contractor are utilized to achieve this.

3. Verify that the Owner ’s operating personnel are adequately trained: Formal training conducted by Contractor is utilized to achieve this.

C. The Commissioning Authority directs and coordinates some but not all commissioning activities; this section describes some but not all of the Commissioning Authority's responsibilities.

D. Commision Authorty's commissioning responsiblites include:

1. Verify and document that functional performance is in accordance with Contract Documents: Functional Tests executed by Commissioning Authority are utilized to achieve this.

E. The Commissioning Authority is employed by Owner .

F. Commissioning, including Functional Tests, O&M documentation review, and training, is to occur after startup and initial checkout and be completed before Substantial Completion.

1.02 SCOPE OF COMMISSIONING

A. The following are to be commissioned:

B. Building envelope:

1. Air tightness.

C. HVAC System, including:

1. Ductwork and accessories.

D. Other equipment and systems explicitly identified elsewhere in Contract Documents as requiring commissioning.

1.03 RELATED REQUIREMENTS

A. Section 01 33 29 - Sustainable Design Reporting: Reporting requirements relating to commissioning.

B. Section 01 78 00 - Closeout Submittals: Scope and procedures for operation and maintenance manuals and project record documents.

1.04 REFERENCE STANDARDS

A. ANSI/RESNET/ICC 301 - Standard for the Calculation and Labeling of the Energy Performance of Low-Rise Residential Buildings using an Energy Rating Index 2014.

B. ANSI/RESNET/ICC 380 - Standard for Testing Airtightness of Building Enclosures, Airtightness of Heating and Cooling Air Distribution Systems, and Airflow of Mechanical Ventilation Systems 2016.

C. ASHRAE Std 202 - Commissioning Process for Buildings and Systems 2018.

D. ASTM E336 - Standard Test Method for Measurement of Airborne Sound Attenuation between Rooms in Buildings 2019.

E. ASTM E779 - Standard Test Method for Determining Air Leakage Rate by Fan Pressurization 2010 (Reapproved 2018).

F. ASTM E1827 - Standard Test Methods for Determining Airtightness of Buildings Using an Orifice Blower Door 2011 (Reapproved 2017).

G. CSI/CSC MF - Masterformat 2016.

H. NEBB S110 - Whole Building Technical Commissioning Of New Construction 2018.

I. PECI (Samples) - Sample Forms for Prefunctional Checklists and Functional Performance Tests Current Edition.

1.05 **SUBMITTALS**

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures; except:

1. Make all submittals specified in this section, and elsewhere where indicated for commissioning purposes, directly to the Commissioning Authority, unless they require review by Architect ; in that case, submit to Architect first.

2. Submit one copy to the Commissioning Authority, not to be returned.

3. Make commissioning submittals on time schedule specified by Commissioning Authority.

4. Submittals indicated as "Draft" are intended for the use of the Commissioning Authority in preparation of Prefunctional Checklists or Functional Test requirements; submit in editable electronic format, Microsoft Word 2010 preferred.

5. As soon as possible after submittals made to Architect are approved, submit copy of approved submittal to the Commissioning Authority.

B. Product Data: Submittals to Architect shall include the following, submit copies as soon as possible:

1. Manufacturer's product data, cut sheets, and shop drawings.

2. Manufacturer's installation instructions.

3. Startup, operating, and troubleshooting procedures.

4. Fan and pump curves.

5. Factory test reports.

6. Warranty information, including details of Owner 's responsibilities in regard to keeping warranties in force.

C. Manufacturers' Instructions: Submit copies of all manufacturer-provided instructions that are shipped with the equipment as soon as the equipment is delivered.

D. Startup Plans and Reports.

E. Commissioning Issues Log:

1. Construction observations.

2. Supporting photographs.

F. HERS Rating Report: Include the following mandatory completed reports for ENERGY STAR Certified Homes:

1. Rater Design Review Checklist, to be completed by Commissioning Authority
2. Rater Field Checklist, to be completed by Comissioning Authority.
3. HVAC Commissioning Checklist, to be completed by HVAC Contractor
4. Water Management System Builder Requirements, to be completed by the Contractor

1.06 **QUALITY ASSURANCE**

A. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

B. HERS (Home Energy Rating System) Rater: Residential Energy Services Network (RESNET) certified professional, to be employed by the Owner.

PART 2 PRODUCTS

2.01 **TEST EQUIPMENT**

A. Contractor to provide all standard testing equipment required to perform startup and initial checkout; unless otherwise noted such testing equipment will NOT become the property of Owner .

B. Comissioning Authority to provide equipment for required Functional Testing; unless otherwise noted such testing equipment will NOT become the property of Owner .

C. Commissioning Authority to provide all standard testing equipment required to perform building envelope air tightness testing; unless otherwise noted such testing equipment will NOT become the property of Owner.

D. Calibration Tolerances: Contractor to provide testing equipment of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified. If not otherwise noted, the following minimum requirements apply:

1. Temperature Sensors and Digital Thermometers: Certified calibration within past year to accuracy of 0.5 degree F and resolution of plus/minus 0.1 degree F.
2. Pressure Sensors: Accuracy of plus/minus 2.0 percent of the value range being measured (not full range of meter), calibrated within the last year.
3. Calibration: According to the manufacturer’s recommended intervals and when dropped or damaged; affix calibration tags or keep certificates readily available for inspection.

E. Equipment-Specific Tools: Where special testing equipment, tools and instruments are specific to a piece of equipment, are only available from the vendor, and are required in order to accomplish startup or Functional Testing, provide such equipment, tools, and instruments as part of the work at no extra cost to Owner ; such equipment, tools, and instruments are to become the property of Owner .

F. Dataloggers: Independent equipment and software for monitoring flows, currents, status, pressures, etc. of equipment.

1. Dataloggers required to for Functional Tests will be provided by the Commissioning Authority and will not become the property of Owner .

PART 3 EXECUTION

3.01 **COMMISSIONING PLAN**

A. Commissioning Authority will prepare the Commissioning Plan.

1. Attend meetings called by the Commissioning Authority for purposes of completing the commissioning plan.
2. Require attendance and participation of relevant subcontractors, installers, suppliers, and manufacturer representatives.

B. Contractor is responsible for compliance with the Commissioning Plan.

C. Commissioning Plan: The commissioning schedule, procedures, and coordination requirements for all parties in the commissioning process.

D. Commissioning Schedule:

1. Submit anticipated dates of startup of each item of equipment and system to Commissioning Authority within 60 days after award of Contract.
2. Re-submit anticipated startup dates monthly, but not less than 4 weeks prior to startup.
3. Prefunctional Checklists and Functional Tests are to be performed in sequence from components, to subsystems, to systems.
4. Provide sufficient notice to Commissioning Authority for delivery of relevant Checklists and Functional Test procedures, to avoid delay.

3.02 STARTUP PLANS AND REPORTS BY CONTRACTOR

A. Startup Plans: For each item of equipment and system for which the manufacturer provides a startup plan, Contractor submit the plan not less than 8 weeks prior to startup.

B. Startup Reports: For each item of equipment and system for which the manufacturer provides a startup checklist (or startup plan or field checkout sheet), Contractor document compliance by submitting the completed startup checklist prior to startup, signed and dated by responsible entity.

C. Submit directly to the Commissioning Authority/Owner/Architect.

3.03 PREFUNCTIONAL CHECKLISTS BY CONTRACTOR

A. A Prefunctional Checklist is required to be filled out for each item of equipment or other assembly specified to be commissioned.

1. No sampling of identical or near-identical items is allowed.
2. These checklists do not replace manufacturers' recommended startup checklists, regardless of apparent redundancy.
3. Prefunctional Checklist forms will not be complete until after award of the contract; the following types of information will be gathered via the completed Checklist forms:
    a. Certification by installing contractor that the unit is properly installed, started up, and operating and ready for Functional Testing.
    b. Confirmation of receipt of each shop drawing and commissioning submittal specified, itemized by unit.
    c. Manufacturer, model number, and relevant capacity information; list information "as specified," "as submitted," and "as installed."
    d. Serial number of installed unit.
    e. List of inspections to be conducted to document proper installation prior to startup and Functional Testing; these will be primarily static inspections and procedures; for equipment and systems may include normal manufacturer’s start-up checklist items and minor testing.
    f. Sensor and actuator calibration information.

4. PECI (Samples) found at http://www.peci.org/library/mcpgs.htm indicate anticipated level of detail for Prefunctional Checklists.

B. Contractor is responsible for filling out Prefunctional Checklists, after completion of installation and before startup; witnessing by the Commissioning Authority is not required unless otherwise specified.

1. Each line item without deficiency is to be witnessed, initialed, and dated by the actual witness; checklists are not complete until all line items are initialed and dated complete without deficiencies.

2. Checklists with incomplete items may be submitted for approval provided the Contractor attests that incomplete items do not preclude the performance of safe and reliable Functional Testing; re-submission of the Checklist is required upon completion of remaining items.

3. Individual Checklists may contain line items that are the responsibility of more than one installer; Contractor shall assign responsibility to appropriate installers or subcontractors, with identification recorded on the form.

4. If any Checklist line item is not relevant, record reasons on the form.

5. Contractor may independently perform startup inspections and/or tests, at Contractor's option.

6. Regardless of these reporting requirements, Contractor is responsible for correct startup and operation.

7. Submit completed Checklists to Commissioning Authority within two days of completion.

C. Contractor is responsible for furnishing the Prefunctional Checklists

1. Initial Drafts: Contractor is responsible for initial draft of Prefunctional Checklist where so indicated in Contract Documents.

2. Provide all additional information to aid in preparation of checklists, such as shop drawing submittals, manufacturers' startup checklists, and O&M data.

3. Owner/Architect may add any relevant items deemed necessary regardless of whether they are explicitly mentioned in Contract Documents or not.

4. When asked to review the proposed Checklists, do so in a timely manner.

D. Deficiencies: Correct deficiencies and re-inspect or re-test, as applicable, at no extra cost to Owner .

1. If difficulty in correction would delay progress, report deficiency to the Commissioning Authority immediately.

3.04 **FUNCTIONAL TESTS BY CONTRACTOR**

A. A Functional Test is required for each item of equipment, system, or other assembly specified to be commissioned, unless sampling of multiple identical or near-identical units is allowed by the final test procedures.

B. Contractor is responsible for execution of required Functional Tests, after completion of Prefunctional Checklist and before closeout.

C. Contractor is responsible for witnessing and reporting results of Functional Tests, including preparation and completion of forms for that purpose.

D. Contractor is responsible for correction of deficiencies and re-testing at no extra cost to Owner ; if a deficiency is not corrected and re-tested immediately, the Cpmtractor will document the deficiency and the Contractor 's stated intentions regarding correction.

1. Deficiencies are any condition in the installation or function of a component, piece of equipment or system that is not in compliance with Contract Documents or does not perform properly.
2. When the deficiency has been corrected, the Contractor completes the form certifying that the item is ready to be re-tested and returns the form to the Commissioning Authority; the Commissioning Authority will reschedule the test and the Contractor shall re-test.
3. Identical or Near-Identical Items: If 10 percent, or three, whichever is greater, of identical or near-identical items fail to perform due to material or manufacturing defect, all items will be considered defective; provide a proposal for correction within 2 weeks after notification of defect, including provision for testing sample installations prior to replacement of all items.
4. Contractor shall bear the cost of Owner and Commissioning Authority personnel time witnessing re-testing.
5. Contractor shall bear the cost of Owner and Commissioning Authority personnel time witnessing re-testing if the test failed due to failure to execute the relevant Prefunctional Checklist correctly; if the test failed for reasons that would not have been identified in the Prefunctional Checklist process, Contractor shall bear the cost of the second and subsequent re-tests.

E. Functional Test Procedures:

1. Some test procedures are included in Contract Documents; where Functional Test procedures are not included in Contract Documents, test procedures will be determined by the Owner/Architect with input by and coordination with Contractor.
2. Examples of Functional Testing:
    a. Test the dynamic function and operation of equipment and systems (rather than just components) using manual (direct observation) or monitoring methods under full operation (e.g., the chiller pump is tested interactively with the chiller functions to see if the pump ramps up and down to maintain the differential pressure setpoint).
    b. Systems are tested under various modes, such as during low cooling or heating loads, high loads, component failures, unoccupied, varying outside air temperatures, fire alarm, power failure, etc.
    c. Systems are run through all the HVAC control system’s sequences of operation and components are verified to be responding as the sequence's state.
    d. Traditional air or water test and balancing (TAB) is not Functional Testing; spot checking of TAB by demonstration to the Commissioning Authority is Functional Testing.
3. PECI (Samples) found at http://www.peci.org/library/mcpgs.htm indicated anticipated level of detail for Functional Tests.

F. Deferred Functional Tests: Some tests may need to be performed later, after substantial completion, due to partial occupancy, equipment, seasonal requirements, design or other site conditions; performance of these tests remains the Contractor 's responsibility regardless of timing.

3.05 **SENSOR AND ACTUATOR CALIBRATION BY CONTRACTOR**

A. Contractor calibrate all field-installed temperature, relative humidity, carbon monoxide, carbon dioxide, and pressure sensors and gauges, and all actuators (dampers and valves)

on this piece of equipment shall be calibrated. Sensors installed in the unit at the factory with calibration certification provided need not be field calibrated.

B. Calibrate using the methods described below; alternate methods may be used, if approved by Owner beforehand. See PART 2 for test instrument requirements. Record methods used on the relevant Prefunctional Checklist or other suitable forms, documenting initial, intermediate and final results.

C. All Sensors:

1. Verify that sensor location is appropriate and away from potential causes of erratic operation.
2. Verify that sensors with shielded cable are grounded only at one end.
3. For sensor pairs that are used to determine a temperature or pressure difference, for temperature make sure they are reading within 0.2 degree F of each other, and for pressure, within tolerance equal to 2 percent of the reading, of each other.
4. Tolerances for critical applications may be tighter.

D. Sensors Without Transmitters - Standard Application:

1. Make a reading with a calibrated test instrument within 6 inches of the site sensor.
2. Verify that the sensor reading, via the permanent thermostat, gauge or building automation system, is within the tolerances in the table below of the instrument-measured value.
3. If not, install offset, calibrate or replace sensor.

E. Sensors With Transmitters - Standard Application.

1. Disconnect sensor.
2. Connect a signal generator in place of sensor.
3. Connect ammeter in series between transmitter and building automation system control panel.
4. Using manufacturer’s resistance-temperature data, simulate minimum desired temperature.
5. Adjust transmitter potentiometer zero until 4 mA is read by the ammeter.
6. Repeat for the maximum temperature matching 20 mA to the potentiometer span or maximum and verify at the building automation system.
7. Record all values and recalibrate controller as necessary to comply with specified control ramps, reset schedules, proportional relationship, reset relationship and P/I reaction.
8. Reconnect sensor.
9. Make a reading with a calibrated test instrument within 6 inches of the site sensor.
10. Verify that the sensor reading, via the permanent thermostat, gauge or building automation system, is within the tolerances in the table below of the instrument-measured value.
11. If not, replace sensor and repeat.
12. For pressure sensors, perform a similar process with a suitable signal generator.

F. Sensor Tolerances for Standard Applications: Plus/minus the following maximums:

1. Watthour, Voltage, Amperage: 1 percent of design.
2. Pressure, Air, Water, Gas: 3 percent of design.

3. Air Temperatures (Outside Air, Space Air, Duct Air): 0.4 degrees F.
4. Relative Humidity: 4 percent of design.
5. Barometric Pressure: 0.1 inch of Hg.
6. Flow Rate, Air: 10 percent of design.
7. Flow Rate, Water: 4 percent of design.
8. AHU Wet Bulb and Dew Point: 2.0 degrees F.

G. Critical Applications: For some applications more rigorous calibration techniques may be required for selected sensors. Describe any such methods used on an attached sheet.

H. Valve/Damper Stroke Setup and Check:

1. For all valve/damper actuator positions checked, verify the actual position against the control system readout.
2. Set pump/fan to normal operating mode.
3. Command valve/damper closed; visually verify that valve/damper is closed and adjust output zero signal as required.
4. Command valve/damper to open; verify position is full open and adjust output signal as required.
5. Command valve/damper to a few intermediate positions.
6. If actual valve/damper position does not reasonably correspond, replace actuator or add pilot positioner (for pneumatics).

I. Isolation Valve or System Valve Leak Check: For valves not associated with coils.

1. With full pressure in the system, command valve closed.
2. Use an ultra-sonic flow meter to detect flow or leakage.

3.06 TEST PROCEDURES - GENERAL BY CONTRACTOR

A. Contractor to provide skilled technicians to execute starting of equipment and to execute the Functional Tests. Ensure that they are available and present during the agreed upon schedules and for sufficient duration to complete the necessary tests, adjustments and problem-solving.

B. Contractor to provide all necessary materials and system modifications required to produce the flows, pressures, temperatures, and conditions necessary to execute the test according to the specified conditions. At completion of the test, return all affected equipment and systems to their pre-test condition.

C. Sampling: Where Functional Testing of fewer than the total number of multiple identical or near-identical items is explicitly permitted, sampling shall be completed as designated by the Commissioning Authority/Owner/Architect.

D. Manual Testing: Use hand-held instruments, immediate control system readouts, or direct observation to verify performance (contrasted to analyzing monitored data taken over time to make the “observation”).

E. Simulating Conditions: Artificially create the necessary condition for the purpose of testing the response of a system; for example apply hot air to a space sensor using a hair dryer to see the response in a VAV box.

F. Simulating Signals: Disconnect the sensor and use a signal generator to send an amperage, resistance or pressure to the transducer and control system to simulate the sensor value.

G. Over-Writing Values: Change the sensor value known to the control system in the control system to see the response of the system; for example, change the outside air temperature value from 50 degrees F to 75 degrees F to verify economizer operation.

H. Indirect Indicators: Remote indicators of a response or condition, such as a reading from a control system screen reporting a damper to be 100 percent closed, are considered indirect indicators.

I. Monitoring: Record parameters (flow, current, status, pressure, etc.) of equipment operation using dataloggers or the trending capabilities of the relevant control systems; where monitoring of specific points is called for in Functional Test Procedures:

1. All points that are monitored by the relevant control system shall be trended by Contractor ; at the Commissioning Authority's request, Contractor shall trend up to 20 percent more points than specified at no extra charge.

2. Other points will be monitored by the Commissioning Authority using dataloggers.

3. At the option of the Commissioning Authority, some control system monitoring may be replaced with datalogger monitoring.

4. Provide hard copies of monitored data in columnar format with time down left column and at least 5 columns of point values on same page.

5. Graphical output is desirable and is required for all output if the system can produce it.

6. Monitoring may be used to augment manual testing.

3.07 **BUILDING ENVELOPE COMMISSIONING BY COMMISSIONING AUTHORITY**

A. General: Comply with the following procedural requirements:

1. ASTM E1827 Standard Test Methods for Determining Airtightness of Buildings Using an Orifice Blower Door.

2. ANSI/RESNET/ICC 301 Standard for the Calculation and Labeling of the Energy Performance of Low-Rise Residential Buildings using an Energy Rating Index.

3. ANSI/RESNET/ICC 380 Standard for Testing Airtightness of Building Enclosures, Airtightness of Heating and Cooling Air Distribution Systems, and Airflow of Mechanical Ventilation Systems.

B. Contractor verify that the building envelope and heating and cooling air distribution system has been sufficiently completed for testing to commence.

C. Contractor conduct ongoing inspections as construction progresses to document satisfactory installation conditions. related to thermal and moisture integrity of the building envelope that become concealed upon completion of construction.

D. Commissioning Authority test the completed building and demonstrate that the air leakage rate of the building envelope does not exceed the specified requirements.

1. Use RESNET accredited software to document salient features of project's building envelope and to calculate the HERS Index Score.

E. Commissioning Authority and Contractor determine location and nature of undesirable air leakage pathways using methods specified in ASTM E1186-17 Standard Practices for Air Leakage Site Detection in Building Envelopes and Air Barrier Systems.

F. Deficiencies: Contractor correct deficiencies and re-inspect or re-test, as applicable, at no extra cost to Owner.

1. If difficulty in correction would delay progress, report deficiency to the Commissioning Authority immediately.

2. Insulation for remedying building envelope deficiencies evidenced as excessive air leakage is specified in Section 07 21 00.
3. Air barriers for remedying building envelope deficiencies evidenced as excessive air leakage are specified in Section 07 25 00.
4. Sealants for remedying building envelope deficiencies evidenced as excessive air leakage are specified in Section 07 92 00.

3.08 **OPERATION AND MAINTENANCE MANUALS**

A. See Section 01 78 00 - Closeout Submittals for additional requirements.

B. Add design intent documentation furnished by Architect to manuals prior to submission to Owner .

C. Submit manuals related to items that were commissioned to Commissioning Authority for review; make changes recommended by Commissioning Authority.

D. Commissioning Authority will add commissioning records to manuals after submission to Owner .

END OF SECTION

National Program Requirements
ENERGY STAR Certified Homes, Version 3 (Rev. 09)

Eligibility Requirements

The following site-built or modular [1] homes are eligible to earn the ENERGY STAR:

- Detached dwelling units [2] (e.g. single family homes); OR
- Dwelling units [2] in any multifamily building with 4 units or fewer; OR
- Dwelling units [2] in multifamily buildings with 3 stories or fewer above-grade [3,4]; OR
- Dwelling units [2] in multifamily buildings with 4 or 5 stories above-grade [3,4] where dwelling units occupy 80% or more of the occupiable [4] square footage of the building [5,6]. When evaluating mixed–use buildings for eligibility, exclude commercial / retail space when assessing whether the 80% threshold has been met.

Dwelling units [2] in multifamily buildings that are not eligible to earn the ENERGY STAR through the Certified Homes Program may be eligible through the Multifamily High Rise Program. For more information, visit: www.energystar.gov/mfhr/eligibility.

Note that compliance with these requirements is not intended to imply compliance with all local code requirements that may be applicable to the home to be built. [7]

Partnership, Training, and Credentialing Requirements

Builders, Raters, and HVAC contractors must meet the following requirements prior to certifying homes:

- Builders are required to sign an ENERGY STAR Partnership Agreement and complete the online Version 3 Builder Orientation, which can be found at www.energystar.gov/homesPA.
- HVAC installing contractors are required to be credentialed by an EPA-recognized HVAC Quality Installation Training and Oversight Organization (H-QUITO). An explanation of this process can be found at www.energystar.gov/newhomesHVAC.
- Raters and Field Inspectors are required to complete training, which can be found at www.energystar.gov/newhomestraining.

ENERGY STAR Certification Process [8]

1. The certification process provides flexibility to select a custom combination of measures for each home that is equivalent in performance to the minimum requirements of the ENERGY STAR Reference Design Home, Exhibit 1, as assessed through energy modeling. Use a Home Energy Rating Software program accredited by an EPA-Approved Verification Oversight Organization (VOO) to determine the ENERGY STAR ERI Target, which is the highest ERI value that each rated home may achieve to earn the ENERGY STAR. [9]
2. Using the same software program, configure the preferred set of efficiency measures for the home to be certified and verify that the resulting ERI meets or exceeds the ENERGY STAR ERI Target, as determined in Step 1.

   Note that, regardless of the measures selected, the Mandatory Requirements for All Certified Homes in Exhibit 2 are also required and impose certain constraints on the efficiency measures selected (e.g., insulation levels, insulation installation quality, window performance, duct leakage). Furthermore, on-site power generation may only be used to meet the ENERGY STAR ERI Target for homes that are larger than the Benchmark Home and only for the incremental change in the ENERGY STAR ERI Target caused by the Size Adjustment Factor. [10]
3. Construct the home using the measures selected in Step 2 and the Mandatory Requirements for All Certified Homes, Exhibit 2.
4. Using a Rater, verify that all requirements have been met in accordance with the Mandatory Requirements for All Certified Homes and with the on-site inspection procedures for minimum rated features of an EPA-Approved VOO.[11] For modular homes, a Rater must verify any requirement in the plant not able to be verified on-site because a feature will be concealed prior to shipment. Finally, register the rated home with the same EPA-Approved VOO. The Rater is required to keep electronic or hard copies of the completed and signed National Rater checklists and the National HVAC Design Report.

   The Rater must review all items on the National Rater checklists. Raters are expected to use their experience and discretion to verify that the overall intent of each inspection checklist item has been met (i.e., identifying major defects that undermine the intent of the checklist item versus identifying minor defects that the Rater may deem acceptable).

   In the event that a Rater finds an item that is inconsistent with the intent of the checklists, the home cannot earn the ENERGY STAR until the item is corrected. If correction of the item is not possible, the home cannot earn the ENERGY STAR. In the event that an item on a National Rater checklist cannot be inspected by the Rater, the home also cannot earn the ENERGY STAR. The only exceptions to this rule are in the Thermal Enclosure System Section of the National Rater Field Checklist, where the builder may assume responsibility for verifying a maximum of eight items. This option shall only be used at the discretion of the Rater. When exercised, the builder's responsibility will be formally acknowledged by the builder signing the checklist for the item(s) that they verified.

   In the event that a Rater is not able to determine whether an item is consistent with the intent (e.g., an alternative method of meeting a checklist requirement has been proposed), then the Rater shall consult their Provider. If the Provider also cannot make this determination, then the Rater or Provider shall report the issue to EPA prior to project completion at: energystarhomes@energystar.gov and will typically receive an initial response within 5 business days. If EPA believes the current program requirements are sufficiently clear to determine whether the intent has been met, then this guidance will be provided to the partner and enforced beginning with the house in question. In contrast, if EPA believes the program requirements require revisions to make the intent clear, then this guidance will be provided to the partner but only enforced for homes permitted after a specified transition period after the release of the revised program requirements, typically 60 days in length.

   This process will allow EPA to make formal policy decisions as partner questions arise and to disseminate these policy decisions through the periodic release of revised program documents to ensure consistent application of the program requirements.

National Program Requirements
ENERGY STAR Certified Homes, Version 3 (Rev. 09)

Exhibit 1: ENERGY STAR Reference Design Home [12]

The ENERGY STAR Reference Design Home is the set of efficiency features modeled to determine the ENERGY STAR ERI Target for each home pursuing certification. Therefore, while the features below are not mandatory, if they are not used then other measures will be needed to achieve the ENERGY STAR ERI Target. In addition, note that the Mandatory Requirements for All Certified Homes, Exhibit 2, contain additional requirements such as total duct leakage limits, minimum allowed insulation levels, and minimum allowed fenestration performance. Therefore, EPA recommends that partners review the documents in Exhibit 2 prior to selecting measures.

Hot Climates (2009 IECC Zones 1,2,3) [13]	**Mixed and Cold Climates** (2009 IECC Zones 4,5,6,7,8) [13]
Cooling Equipment (Where Provided)	
• Cooling equipment modeled at the applicable efficiency levels below:	
• 14.5 SEER / 12 EER AC, • Heat pump (See Heating Equipment)	• 13 SEER AC, • Heat pump (See Heating Equipment)
Heating Equipment	
• Heating equipment modeled at the applicable efficiency levels below, dependent on fuel and system type:	

• 80 AFUE gas furnace,
• 80 AFUE oil furnace,
• 80 AFUE boiler,
• 8.2 HSPF / 14.5 SEER / 12 EER air-source heat pump with electric or dual-fuel backup
	• 90 AFUE gas furnace,
	• 85 AFUE ENERGY STAR oil furnace,
	• 85 AFUE ENERGY STAR boiler,
	• Heat pump, with efficiency as follows:
	  • *CZ 4:* 8.5 HSPF / 14.5 SEER / 12 EER air-source w/ electric or dual-fuel backup,
	  • *CZ 5:* 9.25 HSPF / 14.5 SEER / 12 EER air-source w/ electric or dual-fuel backup,
	  • *CZ 6:* 9.5 HSPF / 14.5 SEER / 12 EER air-source w/ electric or dual-fuel backup,
	  • CZ 7-8: 3.5 COP / 16.1 EER ground-source w/ electric or dual-fuel backup

Envelope, Windows, & Doors	
• A radiant barrier modeled if more than 10 linear feet of ductwork are located in an unconditioned attic.	• No radiant barrier modeled.

- Insulation levels modeled to 2009 IECC levels and Grade I installation per ANSI / RESNET / ICC Standard 301.[14]
- Infiltration rates modeled as follows:

6 ACH50 in CZs 1,2	5 ACH50 in CZs 3,4	4 ACH50 in CZs 5,6,7	3 ACH50 in CZ 8

- Windows and doors modeled, as illustrated below:

Window U-Value:	0.60 in CZs 1,2	0.35 in CZ 3	0.32 in CZ 4	0.30 in CZs 4 C,5,6,7,8
Window SHGC:	0.27 in CZs 1,2	0.30 in CZ 3	0.40 in CZ 4	Any in CZs 4 C,5,6,7,8

Door U-value:	Opaque: 0.21	≤½ lite: 0.27	>½ lite: 0.32
Door SHGC:	Opaque: Any	≤½ lite: 0.30	>½ lite: 0.30

Water Heater

- DHW equipment modeled with the following efficiency levels as applicable:

Gas:	30 Gal = 0.63 EF	40 Gal = 0.61 EF	50 Gal = 0.59 EF	60 Gal = 0.57 EF	70 Gal = 0.55 EF	80 Gal = 0.53 EF
Electric:	30 Gal = 0.94 EF	40 Gal = 0.93 EF	50 Gal = 0.92 EF	60 Gal = 0.91 EF	70 Gal = 0.90 EF	80 Gal = 0.89 EF
Oil:	30 Gal = 0.55 EF	40 Gal = 0.53 EF	50 Gal = 0.51 EF	60 Gal = 0.49 EF	70 Gal = 0.47 EF	80 Gal = 0.45 EF

Thermostat & Ductwork

- Programmable thermostat modeled.
- Supply ducts in unconditioned attics modeled with R-8 insulation; all other ducts in unconditioned space modeled with R-6 insulation.
- Duct leakage to outdoors modeled at the greater of ≤ 4 CFM25 per 100 sq. ft. of conditioned floor area or ≤ 40 CFM25.

Lighting & Appliances

- ENERGY STAR refrigerators, dishwashers, and ceiling fans modeled.
- ENERGY STAR light bulbs modeled in 80% of ANSI / RESNET / ICC Standard 301-defined Qualifying Light Fixture Locations. [14]

National Program Requirements
ENERGY STAR Certified Homes, Version 3 (Rev. 09)

Exhibit 2: Mandatory Requirements for All Certified Homes

Party Responsible	Mandatory Requirements
Rater	• Completion of National Rater Design Review Checklist • Completion of National Rater Field Checklist
HVAC System Designer	• Completion of National HVAC Design Report
HVAC Installing Contractor	• Completion of National HVAC Commissioning Checklist
Builder	• Completion of National Water Management System Builder Requirements

Exhibit 3: Benchmark Home [10]

Bedrooms in Home to be Built	0	1	2	3	4	5	6	7	8
Conditioned Floor Area Benchmark Home	1,000	1,000	1,600	2,200	2,800	3,400	4,000	4,600	5,200

Effective Date

To determine the program Version and Revision that a home is required to be certified under, look up the location and permit date of the home in Exhibit 4. Note that the National Version 3.1 program requirements are being implemented in states that have adopted the 2012, 2015, or 2018 IECC, or an equivalent code. Note, as well, that regional program requirements, and associated implementation timelines, have been developed for homes in CA, FL, GU, HI, the Northern Mariana Islands, OR, PR, and WA. The National Version 3.1 and regional program requirements can be found at www.energystar.gov/newhomesrequirements.

This Exhibit contains all implementation timelines applicable on or after September 1, 2016. Implementation timelines applicable prior to this date can be obtained by contacting energystarhomes@energystar.gov.

Exhibit 4: ENERGY STAR Certified Homes Implementation Timeline

State / Territory	Homes Permitted [15] On or After This Date Must Meet the Adjacent Version & Revision	Version	Revision [16]
AL, AK, AZ, AR, CO, GA, IN, ID, KS, KY, LA, ME, MS, MO, NE, NH, NM, NC, ND, OH, OK, PA, SC, SD, TN, UT, VA, WV, WI, WY	07-01-2016	National v3	Rev. 08
	01-01-2019	National v3	Rev. 09
DC, DE, IA, IL, MA, MD, MN, MT, RI, VT	07-01-2016	National v3.1	Rev. 08
	01-01-2019	National v3.1	Rev. 09
NV	07-01-2016	National v3	Rev. 08
	10-01-2016	National v3.1	Rev. 08
	01-01-2019	National v3.1	Rev. 09
MI, NJ	07-01-2016	National v3	Rev. 08
	04-01-2017	National v3.1	Rev. 08
	01-01-2019	National v3.1	Rev. 09
CT, NY	07-01-2016	National v3	Rev. 08
	10-01-2017	National v3.1	Rev. 08
	01-01-2019	National v3.1	Rev. 09
TX	07-01-2016	National v3	Rev. 08
	07-01-2018	National v3.1	Rev. 08
	01-01-2019	National v3.1	Rev. 09

Footnotes:

1. A modular home is a prefabricated home that is made of multiple modules or sections that are manufactured and substantially assembled in a manufacturing plant. These pre–built sections are transported to the building site and constructed by a builder to meet all applicable building codes for site–built homes.
2. A dwelling unit, as defined by the 2009 IECC, is a single unit that provides complete independent living facilities for one or more persons, including permanent provisions for living, sleeping, eating, cooking, and sanitation.
3. Any above-grade story with 20% or more occupiable space, including commercial space, shall be counted towards the total number of stories for the purpose of determining eligibility to participate in the program. The definition of an 'above-grade story' is one for which more than half of the gross surface area of the exterior walls is above-grade. All below-grade stories, regardless of type, shall not be included when evaluating eligibility.
4. Per ASHRAE 62.2-2010, occupiable space is any enclosed space inside the pressure boundary and intended for human activities or continual human occupancy, including, but not limited to, areas used for living, sleeping, dining, and cooking, toilets, closets, halls, storage and utility areas, and laundry areas.
5. These units may earn the ENERGY STAR through either the Certified Homes Program or the Multifamily High Rise (MFHR) Program. If participating in the Certified Homes Program and the dwelling unit is served by a central heating, cooling, or hot water system, use of the RESNET Guidelines for Multifamily Ratings for modeling the specified central system(s) is recommended.
6. If permitted prior to July 1, 2012, units in multifamily buildings with 4 or 5 stories above-grade may earn the ENERGY STAR through either the Certified Homes Program or the Multifamily High Rise (MFHR) Program, without assessing whether the 80% threshold has been met.
7. Where requirements of the local codes, manufacturers' installation instructions, engineering documents, or regional ENERGY STAR programs overlap with these program requirements, EPA offers the following guidance:
   a. Where the overlapping requirements exceed the ENERGY STAR requirements, these overlapping requirements shall be met;
   b. Where overlapping requirements conflict with a requirement of the ENERGY STAR program (e.g., slab insulation is prohibited to allow visual access for termite inspections), then the conflicting requirement within these program requirements shall not be met. Certification shall only be allowed if the Rater has determined that no equivalent option is available that could meet the intent of the conflicting requirement (e.g., switching from exterior to interior slab edge insulation). Note that a home must still meet its ENERGY STAR ERI Target. Therefore, other efficiency measures may be needed to compensate for the omission of the conflicting requirement.
8. Prior to Rev. 08, homes were permitted to be certified using either a Prescriptive Path or a Performance Path. Homes with a permit date on or after 60 days after the release of Rev. 08 shall only use the Performance Path, which has been renamed the ENERGY STAR Certification Process. To minimize disruption to projects that are in process, homes with a permit date before 09/01/2015 are permitted to use a modified version of the Prescriptive Path in lieu of the Performance Path. For more information about this compliance option, visit: www.energystar.gov/v3prescriptivepath.
9. The software program shall automatically determine (i.e., without relying on a user-configured ENERGY STAR Reference Design) this target for each rated home by following the National ERI Target Procedure, Version 3 (Rev. 09), available on EPA's website.
10. The average-size home with a specific number of bedrooms is termed the "Benchmark Home". The conditioned floor area of a Benchmark Home ($CFA_{Benchmark\ Home}$) is determined by selecting the appropriate value from Exhibit 3. For homes with more than 8 bedrooms, the $CFA_{Benchmark\ Home}$ shall be determined by multiplying 600 sq. ft. by the total number of bedrooms & adding 400 sq. ft.

    A bedroom is defined by ANSI / RESNET / ICC Standard 301-2014 as a room or space 70 sq. ft. or greater size, with egress window and closet, used or intended to be used for sleeping. A "den", "library", or "home office" with a closet, egress window, and 70 sq. ft. or greater size or other similar rooms shall count as a bedroom, but living rooms and foyers shall not.

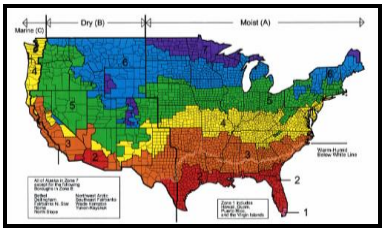
    An egress window, as defined in 2009 IRC section R310, shall refer to any operable window that provides for a means of escape and access for rescue in the event of an emergency. The egress window definition has been summarized for convenience. The egress window shall:

    - have a sill height of not more than 44 in. above the floor; AND
    - have a minimum net clear opening of 5.7 sq. ft.; AND
    - have a minimum net clear opening height of 24 in.; AND
    - have a minimum net clear opening width of 20 in.; AND
    - be operational from the inside of the room without the use of keys, tools or special knowledge.
11. The term 'Rater' refers to the person completing the third-party inspections required for certification. This person shall: a) be a certified Home Energy Rater, Rating Field Inspector, or an equivalent designation as determined by a VOO such as RESNET; and, b) have attended and successfully completed an EPA-recognized training class. See www.energystar.gov/newhomestraining.

    Raters who operate under a Sampling Provider are permitted to verify the Minimum Rated Features of the home and to verify any Checklist Item designated "Rater Verified" using a VOO-approved sampling protocol for homes outside California, and the CEC-approved sampling protocol for homes in CA. No parties other than Raters are permitted to use sampling. All other items shall be verified for each certified home. For example, no items on the HVAC Commissioning Checklist are permitted to be verified using a sampling protocol.
12. Note that the efficiency levels of ENERGY STAR certified products aligned with these product specifications when this Version was first released. These efficiency features form the basis of the ENERGY STAR ERI target, regardless of any subsequent revisions to

ENERGY STAR certified product specifications. EPA recommends, but does not require, that current ENERGY STAR products be included in ENERGY STAR homes. For current ENERGY STAR products, visit www.energystar.gov/products.

13. The following map illustrates the Climate Zone boundaries as defined by the 2009 IECC Figure 301.1.



14. The version of ANSI / RESNET / ICC Std. 301 utilized by RESNET for HERS ratings is used to model this parameter.
15. The Rater may define the 'permit date' as either the date that the permit was issued or the date of the contract on the home. In cases where permit or contract dates are not available, Providers have discretion to estimate permit dates based on other construction schedule factors. These assumptions should be both defensible and documented.
16. Homes certified under Rev. 09 of the program requirements are permitted to use either Rev. 08 or Rev. 09 of the National HVAC Design Report.

National Rater Design Review Checklist
ENERGY STAR Certified Homes, Version 3 / 3.1 (Rev. 09)

Home Address: _____ City: _____ State: _____ Permit Date: _____

1. Partnership Status	**Must Correct**	**Rater [1] Verified**
1.1 Rater has verified that builder is an ENERGY STAR partner using energystar.gov/partnerlocator	☐	☐
1.2 Rater has verified that HVAC contractor holds credential required to complete National HVAC Commissioning Checklist, unless all equipment to be installed in home to be certified is an exempted type, in which case check "N/A" [2] ☐ N/A HVAC Contractor Company Name: _____	☐	☐
2. High-Performance Fenestration		
2.1 Specified fenestration meets or exceeds 2009 IECC requirements [3]	☐	☐
3. High-Performance Insulation		
3.1 Specified ceiling, wall, floor, and slab insulation levels comply with one of the following options:	☐	☐
3.1.1 Meets or exceeds 2009 IECC levels [4, 5, 6] **OR**;	-	-
3.1.2 Achieves ≤ 133% of the total UA resulting from the U-factors in 2009 IECC Table 402.1.3, per guidance in Footnote 4d, AND specified home infiltration does not exceed the following: [5, 6] 3 ACH50 in CZs 1, 2 2.5 ACH50 in CZs 3, 4 2 ACH50 in CZs 5, 6, 7 1.5 ACH50 in CZ 8	-	-
4. Review of National HVAC Design Report [7]		
4.1 National HVAC Design Report collected for records, with no Items left blank	☐	☐
4.2 National HVAC Design Report reviewed by Rater for the following parameters (National HVAC Design Report Item # in parenthesis):		
4.2.1 Cooling season and heating season outdoor design temperatures used in loads (3.3) are within the limits defined at energystar.gov/hvacdesigntemps for the State and County, or US Territory, where the home will be built, or the designer has provided an allowance from EPA to use alternative values [8]	☐	☐
4.2.2 Number of occupants used in loads (3.4) is within ± 2 of the home to be certified [9]	☐	☐
4.2.3 Conditioned floor area used in loads (3.5) is between 100 sq. ft. smaller and 300 sq. ft. larger than the home to be certified	☐	☐
4.2.4 Window area used in loads (3.6) is between 15 sq. ft. smaller and 60 sq. ft. larger than the home to be certified, or, for homes to be certified with > 500 sq. ft. of window area, between 3% smaller and 12% larger	☐	☐
4.2.5 Predominant window SHGC used in loads (3.7) is within 0.1 of predominant value in the home to be certified [10]	☐	☐
4.2.6 Sensible, latent, & total heat gain are documented (3.10 - 3.12) for the orientation of the home to be certified [11]	☐	☐
4.2.7 The variation in total heat gain across orientations (3.13) is ≤ 6 kBtuh [11]	☐	☐
4.2.8 Cooling sizing % (4.13) is within the cooling sizing limit (4.15) selected by the HVAC designer	☐	☐

Rater Name: _____ Date of Review: _____

Rater Signature: _____ Rater Company Name:_____

Footnotes

1. The term 'Rater' refers to the person completing the third-party inspections required for certification. This person shall: a) be a certified Home Energy Rater, Rating Field Inspector, or an equivalent designation as determined by a Verification Oversight Organization such as RESNET; and, b) have attended and successfully completed an EPA-recognized training class. See energystar.gov/newhomestraining.
2. HVAC contractors must be credentialed by an EPA-recognized HVAC Quality Installation Training and Oversight Organization (H-QUITO) if a split air conditioner, unitary air conditioner, air-source heat pump, or water-source (i.e., geothermal) heat pump up to 65 kBtuh with a forced-air distribution system (i.e., ducts) or a furnace up to 225 kBtuh with a forced-air distribution system (i.e., ducts) will be installed in the home to be certified. For all other permutations of equipment (e.g., boilers, mini-split / multi-split systems) and distribution systems, a credential is not required. An explanation of this credentialing process and links to H-QUITOs, which maintain lists of credentialed contractors, can be found at energystar.gov/newhomeshvac.
3. All windows, doors and skylights shall meet or exceed the component U-factor and SHGC requirements specified in 2009 IECC Table 402.1.1. If no NFRC rating is noted on the window or in product literature (e.g., for site-built fenestration), select the U-factor and SHGC value from Tables 4 and 10, respectively, in 2013 ASHRAE Fundamentals, Chapter 15. Select the highest U-factor and SHGC value among the values listed for the known window characteristics (e.g., frame type, number of panes, glass color, and presence of low-e coating). Note that the U-factor requirement applies to all fenestration while the SHGC only applies to the glazed portion. The following exceptions apply:
   a. An area-weighted average of fenestration products shall be permitted to satisfy the U-factor requirements;
   b. An area-weighted average of fenestration products ≥ 50% glazed shall be permitted to satisfy the SHGC requirements;
   c. 15 square feet of glazed fenestration per dwelling unit shall be exempt from the U-factor and SHGC requirements, and shall be excluded from area-weighted averages calculated using a) and b), above;
   d. One side-hinged opaque door assembly up to 24 square feet in area shall be exempt from the U-factor requirements and shall be excluded from area-weighted averages calculated using a) and b), above;
   e. Fenestration utilized as part of a passive solar design shall be exempt from the U-factor and SHGC requirements, and shall be excluded from area-weighted averages calculated using a) and b), above. Exempt windows shall be facing within 45 degrees of true South and directly coupled to thermal storage mass that has a heat capacity > 20 btu / $ft^3 x^o F$ and provided in a ratio of at least 3 sq. ft. per sq. ft. of South facing fenestration. Generally, thermal mass materials will be at least 2 in. thick.

   In PHIUS+ or PHI certified homes, where triple-glazed window assemblies with thermal breaks / spacers between the panes are used, such windows meet the intent of Item 2.1 and shall be excluded when assessing compliance of a) through e), above.
4. Specified levels shall meet or exceed the component insulation levels in 2009 IECC Table 402.1.1. The following exceptions apply:
   a. Steel-frame ceilings, walls, and floors shall meet the insulation levels of 2009 IECC Table 402.2.5. In CZ 1 and 2, the continuous insulation requirements in this table shall be permitted to be reduced to R-3 for steel-frame wall assemblies with studs spaced at 24 in. on center. This exception shall not apply if the alternative calculations in d) are used;
   b. For ceilings with attic spaces, R-30 shall satisfy the requirement for R-38 and R-38 shall satisfy the requirement for R-49 wherever the full height of uncompressed insulation at the lower R-value extends over the wall top plate at the eaves. This exemption shall not apply if the alternative calculations in d) are used;
   c. For ceilings without attic spaces, R-30 shall satisfy the requirement for any required value above R-30 if the design of the roof / ceiling assembly does not provide sufficient space for the required insulation value. This exemption shall be limited to 500 sq. ft. or 20% of the total insulated ceiling area, whichever is less. This exemption shall not apply if the alternative calculations in d) are used;
   d. An alternative equivalent U-factor or total UA calculation may also be used to demonstrate compliance, as follows:

      An assembly with a U-factor equal or less than specified in 2009 IECC Table 402.1.3 complies.

      A total building thermal envelope UA that is less than or equal to the total UA resulting from the U-factors in Table 402.1.3 also complies. The performance of all components (i.e., ceilings, walls, floors, slabs, and fenestration) can be traded off using the UA approach. Note that Items 3.1 through 3.3 of the National Rater Field Checklist shall be met regardless of the UA tradeoffs calculated. The UA calculation shall be done using a method consistent with the ASHRAE Handbook of Fundamentals and shall include the thermal bridging effects of framing materials. The calculation for a steel-frame envelope assembly shall use the ASHRAE zone method or a method providing equivalent results, and not a series-parallel path calculation method.
5. Consistent with the 2009 IECC, slab edge insulation is only required for slab-on-grade floors with a floor surface less than 12 inches below grade. Slab insulation shall extend to the top of the slab to provide a complete thermal break. If the top edge of the insulation is installed between the exterior wall and the edge of the interior slab, it shall be permitted to be cut at a 45-degree angle away from the exterior wall. Alternatively, the thermal break is permitted to be created using ≥ R-3 rigid insulation on top of an existing slab (e.g., in a home undergoing a gut rehabilitation). In such cases, up to 10% of the slab surface is permitted to not be insulated (e.g., for sleepers, for sill plates). Insulation installed on top of slab shall be covered by a durable floor surface (e.g., hardwood, tile, carpet).
6. Where an insulated wall separates a garage, patio, porch, or other unconditioned space from the conditioned space of the house, slab insulation shall also be installed at this interface to provide a thermal break between the conditioned and unconditioned slab. Where specific details cannot meet this requirement, partners shall provide the detail to EPA to request an exemption prior to the home's certification. EPA will compile exempted details and work with industry to develop feasible details for use in future revisions to the program. A list of currently exempted details is available at: energystar.gov/slabedge.
7. The Rater shall collect one National HVAC Design Report per system design per plan. Regardless of whether the "site-specific design" or "group design" box has been checked in Item 1.6 of the National HVAC Design Report, the system design as documented on the National HVAC Design Report must fall within the tolerances in Item 4.2 for the home to be certified. The report is only required to be collected once per system design, even if multiple homes are built using this design (e.g., in a production environment where the same plan is built multiple times, only one report is required as long as no aspect of the system design changes between homes). The Rater is only responsible for verifying that the designer has not left any items blank on the National HVAC Design Report and for verifying the discrete objective parameters in Item 4.2 of this Checklist, not for verifying the accuracy of every input on the National HVAC Design Report.

8. Visit energystar.gov/hvacdesigntemps for the maximum cooling season design temperature and minimum heating season design temperature permitted for ENERGY STAR certified homes and the process for a designer to obtain an allowance from EPA. The same design report is permitted to be used in other counties, as long as the design temperature limits in those other counties meet or exceed the cooling and heating season temperature limits for the county selected. For example, if Fauquier County, VA, is used for the load calculations, with a 1% cooling temperature limit of 93 F, then the same report could be used in Fairfax County (which has a higher limit of 94 F) but not in Arlington County (which has a lower limit of 92 F).
9. To determine the number of occupants among all HVAC systems in the home, calculate the number of bedrooms, as defined below, and add one. The number of occupants used in loads must be within ± 2 of the home to be certified, unless Item 1.5 of the National HVAC Design Report indicates that the system is a cooling system for temporary occupant loads.

   A bedroom is defined by ANSI / RESNET / ICC Standard 301-2014 as a room or space 70 sq. ft. or greater size, with egress window and closet, used or intended to be used for sleeping. A “den”, “library”, or “home office” with a closet, egress window, and 70 sq. ft. or greater size or other similar rooms shall count as a bedroom, but living rooms and foyers shall not.

   An egress window, as defined in 2009 IRC section R310, shall refer to any operable window that provides for a means of escape and access for rescue in the event of an emergency. The egress window definition has been summarized for convenience. The egress window shall:

   - have a sill height of not more than 44 inches above the floor; AND
   - have a minimum net clear opening of 5.7 sq. ft.; AND
   - have a minimum net clear opening height of 24 in.; AND
   - have a minimum net clear opening width of 20 in.; AND
   - be operational from the inside of the room without the use of keys, tools or special knowledge.

10. “Predominant” is defined as the SHGC value used in the greatest amount of window area in the home.
11. Orientation represents the direction that the front door of the house is facing. The designer is only required to document the loads for the orientation(s) that the house might be built in. For example, if a house plan will only be built one time in a specific orientation (e.g., a site-specific design), then the designer only needs to document the loads for this one orientation.

National Rater Field Checklist
ENERGY STAR Certified Homes, Version 3 / 3.1 (Rev. 09)

Home Address: _____ City: _____ State: _____ Permit Date: _____

Thermal Enclosure System	Must Correct	Builder Verified [1]	Rater Verified [2]	N/A [3]
1. High-Performance Fenestration & Insulation				
1.1 Fenestration meets or exceeds specification in Item 2.1 of the National Rater Design Review Checklist	☐	☐	☐	-
1.2 Insulation meets or exceeds specification in Item 3.1 of the National Rater Design Review Checklist	☐	☐	☐	-
1.3 All insulation achieves Grade I install. per ANSI / RESNET / ICC Std. 301. Alternatives in Footnote 4. [4,5]	☐	☐	☐	-
2. Fully-Aligned Air Barriers [6] At each insulated location below, a complete air barrier is provided that is fully aligned as follows:				
Ceilings: At interior or exterior horizontal surface of ceiling insulation in Climate Zones 1-3; at interior horizontal surface of ceiling insulation in Climate Zones 4-8. Also, at exterior vertical surface of ceiling insulation in all climate zones (e.g., using a wind baffle that extends to the full height of the insulation in every bay or a tabbed baffle in each bay with a soffit vent that prevents wind washing in adjacent bays).[7]				
2.1 Dropped ceilings / soffits below unconditioned attics, and all other ceilings	☐	☐	☐	☐
Walls: At exterior vertical surface of wall insulation in all climate zones; also at interior vertical surface of wall insulation in Climate Zones 4-8 [8]				
2.2 Walls behind showers, tubs, staircases, and fireplaces	☐	☐	☐	☐
2.3 Attic knee walls and skylight shaft walls [9]	☐	☐	☐	☐
2.4 Walls adjoining porch roofs or garages	☐	☐	☐	☐
2.5 Double-walls and all other exterior walls	☐	☐	☐	-
Floors: At exterior vertical surface of floor insulation in all climate zones and, if over unconditioned space, also at interior horizontal surface including supports to ensure alignment. Alternatives in Footnotes 11 & 12. [10, 11, 12]				
2.6 Floors above garages, floors above unconditioned basements or crawlspaces, and cantilevered floors	☐	☐	☐	☐
2.7 All other floors adjoining unconditioned space (e.g., rim / band joists at exterior wall or at porch roof)	☐	☐	☐	☐
3. Reduced Thermal Bridging				
3.1 For insulated ceilings with attic space above (i.e., non-cathedralized), Grade I insulation extends to the inside face of the exterior wall below and is ≥ R-21 in CZ 1-5; ≥ R-30 in CZ 6-8 [13]	☐	☐	☐	☐
3.2 For slabs on grade in CZ 4-8, 100% of slab edge insulated to ≥ R-5 at the depth specified by the 2009 IECC and aligned with the thermal boundary of the walls [14, 15]	☐	☐	☐	☐
3.3 Insulation beneath attic platforms (e.g., HVAC platforms, walkways) ≥ R-21 in CZ 1-5; ≥ R-30 in CZ 6-8	☐	☐	☐	☐
3.4 At above-grade walls separating conditioned from unconditioned space, one of the following options used (rim / band joists exempted): [16]				
3.4.1 Continuous rigid insulation, insulated siding, or combination of the two is: ≥ R-3 in CZ 1-4; ≥ R-5 in CZ 5-8 [17, 18, 19], **OR**;	☐	☐	☐	☐
3.4.2 Structural Insulated Panels **OR**; Insulated Concrete Forms **OR**; Double-wall framing **OR**; [17,20]	☐	☐	☐	☐
3.4.3 Advanced framing, including all of the Items below: [21]				
3.4.3a Corners insulated ≥ R-6 to edge [22], **AND**;	☐	☐	☐	☐
3.4.3b Headers above windows & doors insulated ≥ R-3 for 2x4 framing or equivalent cavity width, and ≥ R-5 for all other assemblies (e.g., with 2x6 framing) [23], **AND**;	☐	☐	☐	☐
3.4.3c Framing limited at all windows & doors to one pair of king studs, plus one pair of jack studs per window opening to support the header and sill, **AND**;	☐	☐	☐	☐
3.4.3d Interior / exterior wall intersections insulated to same R-value as rest of exterior wall, [24] **AND**;	☐	☐	☐	☐
3.4.3e Minimum stud spacing of 16 in. o.c. for 2x4 framing in all Climate Zones and, in CZ 6-8, 24 in. o.c. for 2x6 framing [25]	☐	☐	☐	☐
4. Air Sealing (Unless otherwise noted below, "sealed" indicates the use of caulk, foam, or equivalent material)				
4.1 Ducts, flues, shafts, plumbing, piping, wiring, exhaust fans, & other penetrations to unconditioned space sealed, with blocking / flashing as needed	☐	☐	☐	-
4.2 Recessed lighting fixtures adjacent to unconditioned space ICAT labeled and gasketed. Also, if in insulated ceiling without attic above, exterior surface of fixture insulated to ≥ R-10 in CZ 4-8.	☐	☐	☐	☐
4.3 Above-grade sill plates adjacent to conditioned space sealed to foundation or sub-floor. Gasket also placed beneath above-grade sill plate if resting atop concrete / masonry & adjacent to cond. space [26,27]	☐	☐	☐	☐
4.4 Continuous top plate or blocking is at top of walls adjoining unconditioned space, and sealed	☐	☐	☐	☐
4.5 Drywall sealed to top plate at all unconditioned attic / wall interfaces using caulk, foam, drywall adhesive (but not other construction adhesives), or equivalent material. Either apply sealant directly between drywall and top plate or to the seam between the two from the attic above.	☐	☐	☐	☐
4.6 Rough opening around windows & exterior doors sealed [28]	☐	☐	☐	-
4.7 Walls that separate attached garages from occupiable space sealed and, also, an air barrier installed and sealed at floor cavities aligned with these walls	☐	☐	☐	☐
4.8 In multifamily buildings, the gap between the common wall (e.g. the drywall shaft wall) and the structural framing between units sealed at all exterior boundaries	☐	☐	☐	☐
4.9 Doors adjacent to unconditioned space (e.g., attics, garages, basements) or ambient conditions made substantially air-tight with weatherstripping or equivalent gasket.	☐	☐	☐	☐
4.10 Attic access panels, drop-down stairs, & whole-house fans equipped with durable ≥ R-10 cover that is gasketed (i.e., not caulked). Fan covers either installed on house side or mechanically operated. [29]	☐	☐	☐	☐

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HVAC System [30] (National HVAC Design Report Item # in parenthesis)	Must Correct	Rater Verified [2]	N/A [3]
5. Heating & Cooling Equipment			
5.1 HVAC manufacturer & model number on installed equipment matches either of the following (check box): [31] ☐ National HVAC Design Report (4.3, 4.4, & 4.17) ☐ Written approval received from designer	☐	☐	-
5.2 External static pressure measured by Rater at contractor-provided test locations and documented below: [32] Return-Side External Static Pressure: _____IWC Supply-Side External Static Pressure: _____IWC	☐	☐	☐
5.3 Permitted, but not required: National HVAC Commissioning Checklist collected, with no items left blank	☐	☐	☐
6. Duct Quality Installation - *Applies to Heating, Cooling, Ventilation, Exhaust, & Pressure Balancing Ducts, Unless Noted in Footnote*			
6.1 Ductwork installed without kinks, sharp bends, compressions, or excessive coiled flexible ductwork [33]	☐	☐	☐
6.2 Bedrooms pressure-balanced (e.g., using transfer grilles, jump ducts, dedicated return ducts, undercut doors) to achieve a Rater-measured pressure differential ≥ -3 Pa and ≤ +3 Pa with respect to the main body of the house when all air handlers are operating. Test configuration and an alternative compliance option in Footnote 34. [34]	☐	☐	-
6.3 All supply and return ducts in unconditioned space, including connections to trunk ducts, are insulated to ≥ R-6 [35]	☐	☐	☐
6.4 Rater-measured total duct leakage meets one of the following two options. Alternative in Footnote 37: [36, 37, 38]			
6.4.1 Rough-in: The greater of ≤ 4 CFM25 per 100 sq. ft. of CFA or ≤ 40 CFM25, with air handler & all ducts, building cavities used as ducts, & duct boots installed. In addition, all duct boots sealed to finished surface, Rater-verified at final. [39]	☐	☐	☐
6.4.2 Final: The greater of ≤ 8 CFM25 per 100 sq. ft. of CFA or ≤ 80 CFM25, with the air handler & all ducts, bldg. cavities used as ducts, duct boots, & register grilles atop the finished surface (e.g., drywall, floor) installed [40]	☐	☐	☐
6.5 Rater-measured duct leakage to outdoors the greater of ≤ 4 CFM25 per 100 sq. ft. of CFA or ≤ 40 CFM25 [36, 38, 41]	☐	☐	☐
7. Whole-House Mechanical Ventilation System			
7.1 Rater-measured ventilation rate is within either ± 15 CFM or ±15% of design value (2.3) [42]	☐	☐	-
7.2 A readily-accessible ventilation override control installed and also labeled if its function is not obvious (e.g., a label is required for a standalone wall switch, but not for a switch that's on the ventilation equipment) [43]	☐	☐	-
7.3 No outdoor air intakes connected to return side of the HVAC system, unless controls are installed to operate intermittently & automatically based on a timer and to restrict intake when not in use (e.g., motorized damper)	☐	☐	-
7.4 System fan rated ≤ 3 sones if intermittent and ≤ 1 sone if continuous, or exempted [44]	☐	☐	-
7.5 If system utilizes the HVAC fan, then the specified fan type is ECM / ICM (4.7), or the controls will reduce the standalone ventilation run-time by accounting for hours when the HVAC system is heating or cooling	☐	☐	☐
7.6 Bathroom fans are ENERGY STAR certified if used as part of the whole-house system [45]	☐	☐	☐
7.7 Air inlet location (Complete if ventilation air inlet location was specified (2.12, 2.13); otherwise check "N/A"): [46, 47]	-	-	☐
7.7.1 Inlet pulls ventilation air directly from outdoors and not from attic, crawlspace, garage, or adjacent dwelling unit	☐	☐	-
7.7.2 Inlet is ≥ 2 ft. above grade or roof deck; ≥ 10 ft. of stretched-string distance from known contamination sources (e.g., stack, vent, exhaust, vehicles) not exiting the roof, and ≥ 3 ft. distance from dryer exhausts and sources exiting the roof	☐	☐	-
7.7.3 Inlet is provided with rodent / insect screen with ≤ 0.5 inch mesh	☐	☐	-

8. Local Mechanical Exhaust - In each kitchen and bathroom, a system is installed that exhausts directly to the outdoors and meets one of the following Rater-measured airflow and manufacturer-rated sound level standards: [42, 48]

Location		**Continuous Rate**	**Intermittent Rate** [49]			
8.1 Kitchen	Airflow	≥ 5 ACH, based on kitchen volume [50, 51]	≥ 100 CFM and, if not integrated with range, also ≥ 5 ACH based on kitchen volume [50, 51, 52]	☐	☐	-
	Sound	Recommended: ≤ 1 sone	Recommended: ≤ 3 sones			
8.2 Bathroom	Airflow	≥ 20 CFM	≥ 50 CFM	☐	☐	-
	Sound	Required: ≤ 1 sone	Recommended: ≤ 3 sones			

9. Filtration			
9.1 At least one MERV 6 or higher filter installed in each ducted mechanical system in a location that facilitates access and regular service by the ocupant [53]	☐	☐	☐
9.2 Filter access panel includes gasket or comparable sealing mechanism and fits snugly against the exposed edge of filter when closed to prevent bypass [54]	☐	☐	☐
9.3 All return air and mechanically supplied outdoor air passes through filter prior to conditioning	☐	☐	☐
10. Combustion Appliances			
10.1 Furnaces, boilers, and water heaters located within the home's pressure boundary are mechanically drafted or direct-vented. Alternatives in Footnote 57. [55, 56, 57]	☐	☐	☐
10.2 Fireplaces located within the home's pressure boundary are mechanically drafted or direct-vented. Alternatives in Footnote 59. [55, 56, 58]	☐	☐	☐
10.3 If unvented combustion appliances other than cooking ranges or ovens are located inside the home's pressure boundary, the Rater has followed Section 802 of RESNET's Standards, encompassing ANSI/ACCA 12 QH-2014, Appendix A, Section A3 (Carbon Monoxide Test), and verified the equipment meets the limits defined within [55, 59]	☐	☐	☐

Rater Name: _____ Rater Pre-Drywall Inspection Date: _____ Rater Initials: _____

Rater Name: _____ Rater Final Inspection Date: _____ Rater Initials: _____

Builder Employee: _____ Builder Inspection Date: _____ Builder Initials: _____

Footnotes

1. At the discretion of the Rater, the builder may verify up to eight items in Sections 1-4 of this Checklist. When exercised, the builder's responsibility will be formally acknowledged by the builder signing off on the checklist for the item(s) that they verified. However, if a quality assurance review indicates that Items have not been successfully completed, the Rater will be responsible for facilitating corrective action.
2. The term 'Rater' refers to the person completing the third-party inspections required for certification. This person shall: a) be a certified Home Energy Rater, Rating Field Inspector, or an equivalent designation as determined by a Verification Oversight Organization such as RESNET; and, b) have attended and successfully completed an EPA-recognized training class. See energystar.gov/newhomestraining.
3. The column titled "N/A," which denotes items that are "not applicable," should be used when the checklist Item is not present in the home or conflicts with local requirements.
4. Two alternatives are provided: a) Grade II cavity insulation is permitted to be used for assemblies that contain a layer of continuous, air impermeable insulation ≥ R-3 in Climate Zones 1 to 4, ≥ R-5 in Climate Zones 5 to 8; b) Grade II batts are permitted to be used in floors if they fill the full depth of the floor cavity, even when compression occurs due to excess insulation, as long as the R-value of the batts has been appropriately assessed based on manufacturer guidance and the only defect preventing the insulation from achieving Grade I is the compression caused by the excess insulation.
5. Ensure compliance with this requirement using the version of ANSI / RESNET / ICC Std. 301 utilized by RESNET for HERS ratings.
6. For purposes of this Checklist, an air barrier is defined as any durable solid material that blocks air flow between conditioned space and unconditioned space, including necessary sealing to block excessive air flow at edges and seams and adequate support to resist positive and negative pressures without displacement or damage. EPA recommends, but does not require, rigid air barriers.

   Open-cell or closed-cell foam shall have a finished thickness ≥ 5.5 in. or 1.5 in., respectively, to qualify as an air barrier unless the manufacturer indicates otherwise.

   If flexible air barriers such as house wrap are used, they shall be fully sealed at all seams and edges and supported using fasteners with caps or heads ≥ 1 in. diameter unless otherwise indicated by the manufacturer. Flexible air barriers shall not be made of kraft paper, paper-based products, or other materials that are easily torn. If polyethylene is used, its thickness shall be ≥ 6 mil.
7. All insulated ceiling surfaces, regardless of slope (e.g., cathedral ceilings, tray ceilings, conditioned attic roof decks, flat ceilings, sloped ceilings), must meet the requirements for ceilings.
8. All insulated vertical surfaces are considered walls (e.g., above and below grade exterior walls, knee walls) and must meet the air barrier requirements for walls. The following exceptions apply: air barriers recommended, but not required, in adiabatic walls in multifamily dwellings; and, in Climate Zones 4 through 8, an air barrier at the interior vertical surface of insulation is recommended but not required in basement walls or crawlspace walls. For the purpose of these exceptions, a basement or crawlspace is a space for which ≥ 40% of the total gross wall area is below-grade.
9. Exterior air barriers are not required for attic knee walls that are ≤ 24 in. in height if an interior air barrier is provided and insulation extends in all directions from the top of this interior air barrier into unconditioned space at the following levels: CZ 1-5: ≥ R-21; CZ 6-8: ≥ R-30.
10. EPA highly recommends, but does not require, an air barrier at the interior vertical surface of floor insulation in Climate Zones 4-8.
11. Examples of supports necessary for permanent contact include staves for batt insulation or netting for blown-in insulation. Alternatively, supports are not required if batts fill the full depth of the floor cavity, even when compression occurs due to excess insulation, as long as the R-value of the batts has been appropriately assessed based on manufacturer guidance and the only defect preventing the insulation from achieving the required installation grade is the compression caused by the excess insulation.
12. Alternatively, an air barrier is permitted to be installed at the exterior horizontal surface of the floor insulation if the insulation is installed in contact with this air barrier, the exterior vertical surfaces of the floor cavity are also insulated, and air barriers are included at the exterior vertical surfaces of this insulation.
13. The minimum designated R-values must be achieved regardless of the trade-offs determined using an equivalent U-factor or UA alternative calculation, with the following exception:

    For homes permitted through 12/31/2012: CZ 1-5: For spaces that provide less than 5.5 in. of clearance, R-15 Grade I insulation is permitted. CZ 6-8: For spaces that provide less than 7.0 in. of clearance, R-21 Grade I insulation is permitted.

    For homes permitted on or after 01/01/2013: Homes shall achieve Item 3.1 without exception.

    Note that if the minimum designated values are used, then higher insulation values may be needed elsewhere to meet Item 1.2. Also, note that these requirements can be met by using any available strategy, such as a raised-heel truss, alternate framing that provides adequate space, and / or high-density insulation.
14. Consistent with the 2009 IECC, slab edge insulation is only required for slab-on-grade floors with a floor surface less than 12 inches below grade. Slab insulation shall extend to the top of the slab to provide a complete thermal break. If the top edge of the insulation is installed between the exterior wall and the edge of the interior slab, it shall be permitted to be cut at a 45-degree angle away from the exterior wall. Alternatively, the thermal break is permitted to be created using ≥ R-3 rigid insulation on top of an existing slab (e.g., in a home undergoing a gut rehabilitation). In such cases, up to 10% of the slab surface is permitted to not be insulated (e.g., for sleepers, for sill plates). Insulation installed on top of slab shall be covered by a durable floor surface (e.g., hardwood, tile, carpet).
15. Where an insulated wall separates a garage, patio, porch, or other unconditioned space from the conditioned space of the house, slab insulation shall also be installed at this interface to provide a thermal break between the conditioned and unconditioned slab. Where specific details cannot meet this requirement, partners shall provide the detail to EPA to request an exemption prior to the home's certification. EPA will compile exempted details and work with industry to develop feasible details for use in future revisions to the program. A list of currently exempted details is available at: energystar.gov/slabedge.
16. Mass walls utilized as the thermal mass component of a passive solar design (e.g., a Trombe wall) are exempt from this Item. To be eligible for this exemption, the passive solar design shall be comprised of the following five components: an aperture or collector, an absorber, thermal mass, a distribution system, and a control system. For more information, see: energy.gov/sites/prod/files/guide_to_passive_solar_home_design.pdf.

Mass walls that are not part of a passive solar design (e.g., CMU block or log home enclosure) shall either utilize the strategies outlined in Item 3.4 or the pathway in the assembly with the least thermal resistance, as determined using a method consistent with the 2013 ASHRAE Handbook of Fundamentals, shall provide ≥ 50% of the applicable assembly resistance, defined as the reciprocal of the mass wall equivalent U-factor in the 2009 IECC Table 402.1.3. Documentation identifying the pathway with the least thermal resistance and its resistance value shall be collected by the Rater and any Builder Verified or Rater Verified box under Item 3.4 shall be checked.

17. Up to 10% of the total exterior wall surface area is exempted from the reduced thermal bridging requirements to accommodate intentional designed details (e.g., architectural details such as thermal fins, wing walls, or masonry fireplaces; structural details, such as steel columns). It shall be apparent to the Rater that the exempted areas are intentional designed details or the exempted area shall be documented in a plan provided by the builder, architect, or engineer. The Rater need not evaluate the necessity of the designed detail to certify the home.
18. If used, insulated siding shall be attached directly over a water-resistive barrier and sheathing. In addition, it shall provide the required R-value as demonstrated through either testing in accordance with ASTM C 1363 or by attaining the required R-value at its minimum thickness. Insulated sheathing rated for water protection can be used as a water resistant barrier if all seams are taped and sealed. If non-insulated structural sheathing is used at corners, the advanced framing details listed in Item 3.4.3 shall be met for those wall sections.
19. Steel framing shall meet the reduced thermal bridging requirements by complying with Item 3.4.1 of the Checklist.
20. Double-wall framing is defined as any framing method that ensures a continuous layer of insulation covering the studs to at least the R-value required in Item 3.4.1 of the Checklist, such as offset double-stud walls, aligned double-stud walls with continuous insulation between the adjacent stud faces, or single-stud walls with 2x2 or 2x3 cross-framing. In all cases, insulation shall fill the entire wall cavity from the interior to exterior sheathing except at windows, doors and other penetrations.
21. All advanced framing details shall be met except where the builder, architect, or engineer provides a framing plan that encompasses the details in question, indicating that structural members are required at these locations and including the rationale for these members (e.g., full-depth solid framing is required at wall corners or interior / exterior wall intersections for shear strength, a full-depth solid header is required above a window to transfer load to jacks studs, additional jack studs are required to support transferred loads, additional cripple studs are required to maintain on-center spacing, or stud spacing must be reduced to support multiple stories in a multifamily building). The Rater shall retain a copy of the detail and rationale for their records, but need not evaluate the rationale to certify the home.
22. All exterior corners shall be constructed to allow access for the installation of ≥ R-6 insulation that extends to the exterior wall sheathing. Examples of compliance options include standard-density insulation with alternative framing techniques, such as using three studs per corner, or high-density insulation (e.g., spray foam) with standard framing techniques.
23. Compliance options include continuous rigid insulation sheathing, SIP headers, other prefabricated insulated headers, single-member or two-member headers with insulation either in between or on one side, or an equivalent assembly. R-value requirement refers to manufacturer's nominal insulation value.
24. Insulation shall run behind interior / exterior wall intersections using ladder blocking, full length 2x6 or 1x6 furring behind the first partition stud, drywall clips, or other equivalent alternative.
25. In Climate Zones 6 - 8, a minimum stud spacing of 16 in. o.c. is permitted to be used with 2x6 framing if ≥ R-20.0 wall cavity insulation is achieved. However, all 2x6 framing with stud spacing of 16 in. o.c. in Climate Zones 6 - 8 shall have ≥ R-20.0 wall cavity insulation installed regardless of any framing plan or alternative equivalent total UA calculation.
26. Existing sill plates (e.g., in a home undergoing a gut rehabilitation) on the interior side of structural masonry or monolithic walls are exempt from this Item. In addition, other existing sill plates resting atop concrete or masonry and adjacent to conditioned space are permitted, in lieu of using a gasket, to be sealed with caulk, foam, or equivalent material at both the interior seam between the sill plate and the subfloor and the seam between the top of the sill plate and the sheathing.
27. In Climate Zones 1 through 3, a continuous stucco cladding system adjacent to sill and bottom plates is permitted to be used in lieu of sealing plates to foundation or sub-floor with caulk, foam, or equivalent material.
28. In Climate Zones 1 through 3, a continuous stucco cladding system sealed to windows and doors is permitted to be used in lieu of sealing rough openings with caulk or foam.
29. Examples of durable covers include, but are not limited to, pre-fabricated covers with integral insulation, rigid foam adhered to cover with adhesive, or batt insulation mechanically fastened to the cover (e.g., using bolts, metal wire, or metal strapping).
30. This Checklist is designed to meet the requirements of ASHRAE 62.2-2010 / 2013 / 2016, and ANSI / ACCA's 5 QI-2015 protocol, thereby improving the performance of HVAC equipment in new homes when compared to homes built to minimum code. However, these features alone cannot prevent all ventilation, indoor air quality, and HVAC problems, (e.g., those caused by a lack of maintenance by occupants). Therefore, this Checklist is not a guarantee of proper ventilation, indoor air quality, or HVAC performance.
31. If installed equipment does not match the National HVAC Design Report, then prior to certification the Rater shall obtain written approval from the designer (e.g., email, updated National HVAC Design Report) confirming that the installed equipment meets the requirements of the National HVAC Design Report. In cases where the condenser unit is installed after the time of inspection by the Rater, the HVAC manufacturer and model numbers on installed equipment can be documented through the use of photographs provided by the HVAC Contractor after installation is complete.
32. The Rater shall measure and record the external static pressure in the return-side and supply-side of the system using the contractor-provided test locations. However, at this time, the Rater need not assess whether these values are within a specific range to certify the home.
33. Kinks are to be avoided and are caused when ducts are bent across sharp corners such as framing members. Sharp bends are to be avoided and occur when the radius of the turn in the duct is less than one duct diameter. Compression is to be avoided and occurs when flexible ducts in unconditioned space are installed in cavities smaller than the outer duct diameter and ducts in conditioned space are installed in cavities smaller than inner duct diameter. Ducts shall not include coils or loops except to the extent needed for acoustical control.
34. Item 6.2 does not apply to ventilation or exhaust ducts. For an HVAC system with a multi-speed fan, the highest design fan speed shall be used when verifying this requirement. When verifying this requirement, doors separating bedrooms from the main body of the house (e.g., a door between a bedroom and a hallway) shall be closed and doors to rooms that can only be entered from the bedroom (e.g., a closet, a bathroom) shall be open. As an alternative to the ± 3 Pa limit, a Rater-measured pressure differential ≥ -5 Pa and ≤ +5 Pa is permitted to be used for bedrooms with a design airflow ≥ 150 CFM. The Rater-measured pressure shall be rounded to the nearest whole number to assess compliance

35. Item 6.3 does not apply to ducts that are a part of local mechanical exhaust and exhaust-only whole-house ventilation systems. EPA recommends, but does not require, that all metal ductwork not encompassed by Section 6 (e.g., exhaust ducts, duct boots, ducts in conditioned space) also be insulated and that insulation be sealed to duct boots to prevent condensation.
36. Items 6.4 and 6.5 only apply to heating, cooling, and balanced ventilation ducts. Duct leakage shall be determined and documented by a Rater using the same version of ANSI / RESNET / ICC Std. 380 that is utilized by RESNET for HERS ratings. Leakage limits shall be assessed on a per-system, rather than per-home, basis. For balanced ventilation ducts that are not connected to space heating or cooling systems, a Rater is permitted to visually verify, in lieu of duct leakage testing, that all seams and connections are sealed with mastic or metal tape and all duct boots are sealed to floor, wall, or ceiling using caulk, foam, or mastic tape.
37. For a duct system with three or more returns, the total Rater-measured duct leakage is permitted to be the greater of ≤ 6CFM25 per 100 sq. ft. of CFA or ≤ 60 CFM25 at 'rough-in' or the greater of ≤ 12 CFM25 per 100 sq. ft. of CFA or ≤ 120 CFM25 at 'final'.
38. For a home certified in the State of ID, MT, OR, or WA that is permitted before 01/01/2016, as an alternate to Rater-verified duct leakage, a PTCS® Duct Sealing Certification Form is permitted to be collected by the Home Energy Rater.
39. Cabinets (e.g., kitchen, bath, multimedia) or ducts that connect duct boots to toe-kick registers are not required to be in place during the 'rough-in' test. For homes permitted through 12/31/2013: Homes are permitted to be certified if rough-in leakage is ≤ 6 CFM25 per 100 sq. ft. of CFA or ≤ 60 CFM25, with air handler & all ducts, building cavities used as ductwork, & duct boots installed.
40. Registers atop carpets are permitted to be removed and the face of the duct boot temporarily sealed during testing. In such cases, the Rater shall visually verify that the boot has been durably sealed to the subfloor (e.g., using duct mastic or caulk) to prevent leakage during normal operation.
41. Testing of duct leakage to the outside can be waived if all ducts & air handling equipment are located within the home's air and thermal barriers AND infiltration does not exceed the following: CZ 1-2: 3 ACH50; CZ 3-4: 2.5 ACH50; CZ 5-7: 2 ACH50; CZ 8: 1.5 ACH50. Alternatively, testing of duct leakage to the outside can be waived if total duct leakage is ≤ 4 CFM25 per 100 sq. ft. of conditioned floor area or 40 CFM25, whichever is larger.
42. The whole-house ventilation air flow and local exhaust air flows shall be determined and documented by a Rater using the same version of ANSI / RESNET / ICC Std. 380 that is utilized by RESNET for HERS ratings.
43. In a multi-family dwelling unit, the override control is not required to be readily accessible to the occupant. However, in such cases, EPA recommends but does not require that the control be readily accessible to others (e.g., building maintenance staff) in lieu of the occupant.
44. Whole-house mechanical ventilation fans shall be rated for sound at no less than the airflow rate in Item 2.3 of the National HVAC Design Report. Fans exempted from this requirement include HVAC air handler fans, remote-mounted fans, and intermittent fans rated ≥ 400 CFM. To be considered for this exemption, a remote-mounted fan must be mounted outside the habitable spaces, bathrooms, toilets, and hallways and there shall be ≥ 4 ft. ductwork between the fan and intake grill. Per ASHRAE 62.2-2010, habitable spaces are intended for continual human occupancy; such space generally includes areas used for living, sleeping, dining, and cooking but does not generally include bathrooms, toilets, hallways, storage areas, closets, or utility rooms.
45. Bathroom fans with a rated flow rate ≥ 500 CFM are exempted from the requirement to be ENERGY STAR certified.
46. Ventilation air inlets that are only visible via rooftop access are exempted from Item 7.7 and the Rater shall mark "n/a". The outlet and inlet of balanced ventilation systems shall meet these spacing requirements unless manufacturer instructions indicate that a smaller distance may be used. However, if this occurs the manufacturer's instructions shall be collected for documentation purposes.
47. Without proper maintenance, ventilation air inlet screens often become filled with debris. Therefore, EPA recommends, but does not require, that these ventilation air inlets be located so as to facilitate access and regular service by the occupant.
48. Continuous bathroom local mechanical exhaust fans shall be rated for sound at no less than the airflow rate in Item 8.2. Intermittent bathroom and both intermittent and continuous kitchen local mechanical exhaust fans are recommended, but not required, to be rated for sound at no less than the airflow rate in Items 8.1 and 8.2. Per ASHRAE 62.2-2010, an exhaust system is one or more fans that remove air from the building, causing outdoor air to enter by ventilation inlets or normal leakage paths through the building envelope (e.g., bath exhaust fans, range hoods, clothes dryers). Per ASHRAE 62.2-2010, a bathroom is any room containing a bathtub, shower, spa, or similar source of moisture.
49. An intermittent mechanical exhaust system, where provided, shall be designed to operate as needed by the occupant. Control devices shall not impede occupant control in intermittent systems.
50. Kitchen volume shall be determined by drawing the smallest possible rectangle on the floor plan that encompasses all cabinets, pantries, islands, peninsulas, ranges / ovens, and the kitchen exhaust fan, and multiplying by the average ceiling height for this area. In addition, the continuous kitchen exhaust rate shall be ≥ 25 CFM, per 2009 IRC Table M1507.3, regardless of the rate calculated using the kitchen volume. Cabinet volume shall be included in the kitchen volume.
51. *For homes permitted through 01/01/2014:* Homes are permitted to be certified without enforcement of this Item to provide partners with additional time to integrate this feature into their homes.

    For homes permitted on or after 01/01/2014: Homes shall meet this Item. Alternatively, the prescriptive duct sizing requirements in Table 5.3 of ASHRAE 62.2-2010 / 2013 / 2016 are permitted to be used for kitchen exhaust fans based upon the rated airflow of the fan at 0.25 IWC. If the rated airflow is unknown, ≥ 6 in. smooth duct shall be used, with a rectangular to round duct transition as needed. Guidance to assist partners with these alternatives is available at energystar.gov/newhomesresources. As an alternative to Item 8.1, homes are permitted to use a continuous kitchen exhaust rate of 25 CFM per 2009 IRC Table M1507.3, if they are either a) PHIUS+ or PHI certified, or b) provide both whole-house ventilation and local mechanical kitchen exhaust using a balanced system, and have a Rater-verified whole-building infiltration rate ≤ 0.05 CFM50 per sq. ft. of Enclosure Area, and a Rater-verified dwelling unit compartmentalization rate ≤ 0.30 CFM50 per sq. ft. of Enclosure Area if multiple dwelling units are present in the building. 'Enclosure Area' is defined as the area of the surfaces that bound the volume being pressurized / depressurized during the test.
52. All intermittent kitchen exhaust fans must be capable of exhausting at least 100 CFM. In addition, if the fan is not part of a vented range hood or appliance-range hood combination (i.e., if the fan is not integrated with the range), then it must also be capable of exhausting ≥ 5 ACH, based on the kitchen volume.

53. Based upon ASHRAE 62.2-2010, ducted mechanical systems are those that supply air to an occupiable space with a total amount of supply ductwork exceeding 10 ft. in length and through a thermal conditioning component, except for evaporative coolers. Systems that do not meet this definition are exempt from this requirement. While filters are recommended for mini-split systems, HRV's and ERV's, these systems, ducted or not, typically do not have MERV-rated filters available for use and are, therefore, also exempted under this version of the requirements. HVAC filters located in the attic shall be considered accessible to the occupant if either 1) drop-down stairs provide access to attic and a permanently installed walkway has been provided between the attic access location and the filter or 2) the filter location enables arm-length access from a portable ladder without the need to step into the attic and the ceiling height where access is provided is ≤ 12 ft.
54. The filter media box (i.e., the component in the HVAC system that houses the filter) may be either site-fabricated by the installer or pre-fabricated by the manufacturer to meet this requirement. These requirements only apply when the filter is installed in a filter media box located in the HVAC system, not when the filter is installed flush with the return grill.
55. The pressure boundary is the primary enclosure boundary separating indoor and outdoor air. For example, a volume that has more leakage to outside than to conditioned space would be outside the pressure boundary.
56. Per the 2009 International Mechanical Code, a direct-vent appliance is one that is constructed and installed so that all air for combustion is derived from the outdoor atmosphere and all flue gases are discharged to the outside atmosphere; a mechanical draft system is a venting system designed to remove flue or vent gases by mechanical means consisting of an induced draft portion under non-positive static pressure or a forced draft portion under positive static pressure; and a natural draft system is a venting system designed to remove flue or vent gases under nonpositive static vent pressure entirely by natural draft.
57. Naturally drafted equipment is allowed within the home's pressure boundary in Climate Zones 1-3 if the Rater has followed Section 802 of RESNET's Standards, encompassing ANSI / ACCA 12 QH-2014, Appendix A, Sections A3 (Carbon Monoxide Test) and A4 (Depressurization Test for the Combustion Appliance Zone), and verified that the equipment meets the limits defined within.
58. Naturally drafted fireplaces are allowed within the home's pressure boundary if the Rater has verified that the total net rated exhaust flow of the two largest exhaust fans (excluding summer cooling fans) is ≤ 15 CFM per 100 sq. ft. of occupiable space when at full capacity. If the net exhaust flow exceeds the allowable limit, it shall be reduced or compensating outdoor airflow provided. Per ASHRAE 62.2-2010, the term "net rated exhaust flow" is defined as flow through an exhaust fan minus the compensating outdoor airflow through any supply fan that is interlocked to the exhaust fan. Per ASHRAE 62.2-2010, the term "occupiable space" is defined as any enclosed space inside the pressure boundary and intended for human activities, including, but not limited to, all habitable spaces, toilets, closets, halls, storage and utility areas, and laundry areas. See Footnote 44 for the definition of "habitable spaces".
59. The minimum volume of combustion air required for safe operation by the manufacturer and / or code shall be met or exceeded. Also, in accordance with the National Fuel Gas Code, ANSI Z223.I / NFPA54, unvented room heaters shall not be installed in bathrooms or bedrooms.

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HVAC Designer Responsibilities:

- Complete one National HVAC Design Report for each system design for a house plan, created for either the specific plan configuration (i.e., elevation, option, orientation, & county) of the home to be certified or for a plan that is intended to be built with different configurations (i.e., different elevations, options, and/or orientations). Visit www.energystar.gov/newhomeshvacdesign and see Footnote 2 for more information. [2]
- Obtain efficiency features (e.g., window performance, insulation levels, and infiltration rate) from the builder or Home Energy Rater.
- Provide the completed National HVAC Design Report to the builder or credentialed HVAC contractor and to the Home Energy Rater.

1. Design Overview

1.1 Designer name: _____ Designer company: _____ Date: _____

1.2 Select which party you are providing these design services to: ☐ Builder or ☐ Credentialed HVAC contractor

1.3 Name of company you are providing these design services to (if different than Item 1.1): _____

1.4 Area that system serves: ☐ Whole-house ☐ Upper-level ☐ Lower-level ☐ Other _____

1.5 Is cooling system for a temporary occupant load? [3] ☐ Yes ☐ No

1.6 House plan: _____ Check box to indicate whether the system design is site-specific or part of a group: [2]

☐ Site-specific design. Option(s) & elevation(s) modeled: _____

☐ Group design. Group #: _____ out of _____ total groups for this house plan. Configuration modeled: _____

2. Whole-House Mechanical Ventilation Design [4, 5]		Designer Verified
Airflow:		
	2.1 Ventilation airflow design rate & run-time meet the requirements of ASHRAE 62.2-2010, 2013, or 2016 [6]	☐
	2.2 Ventilation airflow rate required by 62.2 for a continuous system _____ CFM	-
	2.3 Design for this system: Vent. airflow rate: _____ CFM Run-time per cycle: _____ minutes Cycle time: _____ minutes	-
System Type & Controls:		
	2.4 Specified system type: ☐ Supply ☐ Exhaust ☐ Balanced	-
	2.5 Specified control location: _____ (e.g., Master bath, utility room)	-
	2.6 Specified controls allow the system to operate automatically, without occupant intervention	☐
	2.7 Specified controls include a readily-accessible ventilation override and a label has also been specified if its function is not obvious (e.g., a label is required for a standalone wall switch, but not for a switch that's on the ventilation equipment)	☐
	2.8 No outdoor air intakes designed to connect to the return side of the HVAC system, unless specified controls operate intermittently and automatically based on a timer and restrict intake when not in use (e.g., motorized damper) [7]	☐
Sound:	2.9 The fan of the specified system is rated ≤ 3 sones if intermittent and ≤ 1 sone if continuous, or exempted [8]	☐
Efficiency:		
	2.10 If system utilizes the HVAC fan, then the specified fan type in Item 4.7 is ECM / ICM, or the specified controls will reduce the standalone ventilation run-time by accounting for hours when the HVAC system is heating or cooling	☐
	2.11 If bathroom fans are specified as part of the system, then they are ENERGY STAR certified [9]	☐
Air Inlet Location: (Complete this section if system has a specified air inlet location; otherwise check "N/A") [10]		☐ N/A
	2.12 Inlet pulls ventilation air directly from outdoors and not from attic, crawlspace, garage, or adjacent dwelling unit	☐
	2.13 Inlet is ≥ 2 ft. above grade or roof deck; ≥ 10 ft. of stretched-string distance from known contamination sources (e.g., stack, vent, exhaust, vehicles) not exiting the roof, and ≥ 3 ft. from known sources exiting the roof	☐

3. Room-by-Room Heating & Cooling Loads

3.1 Room-by-room loads calculated using: ☐ Unabridged ACCA Manual J v8 ☐ 2013 ASHRAE Fundamentals ☐ Other per AHJ [11]									-
3.2 Indoor design temperatures used in loads are 70°F for heating and 75°F for cooling									☐
3.3 Outdoor design temperatures used in loads: (See Footnote 12 and energystar.gov/hvacdesigntemps) [12] County & State, or US Territory, selected: _____ Cooling season: _____°F Heating season: _____°F									-
3.4 Number of occupants used in loads: [13] _____									-
3.5 Conditioned floor area used in loads: _____ Sq. Ft.									-
3.6 Window area used in loads: _____ Sq. Ft.									-
3.7 Predominant window SHGC used in loads: [14] _____									-
3.8 Infiltration rate used in loads: [15] Summer: _____ Winter: _____									-
3.9 Mechanical ventilation rate used in loads: _____ CFM									-
Loads At Design Conditions (kBtuh)		**N**	**NE**	**E**	**SE**	**S**	**SW**	**W**	**NW**	-
Cooling	3.10 Sensible heat gain (By orientation [16])									-
	3.11 Latent heat gain (Not by orientation)									-
	3.12 Total heat gain (By orientation [16])									-
	3.13 Maximum – minimum total heat gain (Item 3.12) across orientations = _____ kBtuh						Variation is ≤ 6 kBtuh [16, 17]			☐
Heating	3.14 Total heat loss (Not by orientation)									-

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4. Heating & Cooling Equipment Selection	**Designer Verified**
4.1 Equipment selected per ACCA Manual S (see Footnote 18 & 19) [18, 19]	☐
Air Conditioner / Heat Pump (Complete if air conditioner or heat pump will be installed; otherwise check "N/A")	☐ N/A
4.2 Equipment type: ☐ Cooling-only air conditioner or ☐ Cooling & heating heat pump	-
4.3 Condenser manufacturer & model: _____	-
4.4 Evaporator / fan coil manufacturer & model: _____	-
4.5 AHRI reference #: [20] _____	-
4.6 AHRI listed efficiency: _____ / _____ EER / SEER Air-source heat pump: ____ HSPF Ground-source heat pump: _____COP	-
4.7 Evaporator fan type: ☐PSC ☐ECM / ICM ☐Other: _____	-
4.8 Compressor type: ☐Single-speed ☐Two-speed ☐Variable-speed	-
4.9 Latent capacity at design conditions, from OEM expanded performance data: _____ kBtuh	-
4.10 Sensible capacity at design conditions, from OEM expanded performance data: _____ kBtuh	-
4.11 Total capacity at design conditions, from OEM expanded performance data: _____ kBtuh	-
4.12 Air-source heat pump capacity: At 17°F: _____ kBtuh At 47°F: _____ kBtuh ☐ N/A	-
4.13 Cooling sizing % = Total capacity (Item 4.11) divided by maximum total heat gain (Item 3.12): _____ %	-
4.14 Complete this Item if Condition B Climate will be used to select sizing limit in Item 4.15. Otherwise, check "N/A": [21] ☐N/A	
4.14.1 Load sensible heat ratio = Max. sensible heat gain (Item 3.10) / Max. total heat gain (Item 3.12) = _____ %	-
4.14.2 HDD / CDD ratio (Visit energystar.gov/hvacdesigntemps to determine this value for the design location) = _____	
4.15 Check box of applicable cooling sizing limit from chart below: [18, 19]	-

Equipment Type (Per Item 4.2) & Climate Condition (Per Item 4.14)	Compressor Type (Per Item 4.8)		
	Single-Speed	Two-Speed	Variable-Speed
For Cooling-Only Equipment or For Cooling Mode of Heat Pump in Condition A Climate	☐ Recommended: 90 – 115% Allowed: 90 – 130%	☐ Recommended: 90 – 120% Allowed: 90 – 140%	☐ Recommended: 90 – 130% Allowed: 90 – 160%
For Cooling Mode of Heat Pump in Condition B Climate	☐ 90% - 100%, plus 15 kBtuh	☐ 90% - 100%, plus 15 kBtuh	☐ 90% - 100%, plus 15 kBtuh

4.16 Cooling sizing % (4.13) is within cooling sizing limit (4.15)	☐
Furnace (Complete if furnace will be installed; otherwise check "N/A")	☐ N/A
4.17 Furnace manufacturer & model: _____	-
4.18 Listed efficiency: _____ AFUE	-
4.19 Total capacity: _____ kBtuh	-
4.20 Heating sizing % = Total capacity (Item 4.19) divided by total heat loss (Item 3.14): _____ %	-
4.21 Check box of applicable heating sizing limit from chart below:	-

When Used for Heating Only	When Paired With Cooling
☐ 100 – 140%	☐ Recommended: 100 – 140% Allowed: 100 – 400%

4.22 Heating sizing % (4.20) is within heating sizing limit (4.21)	☐
5. Duct Design (Complete if heating or cooling equipment will be installed with ducts; otherwise check "N/A")	☐ N/A
5.1 Duct system designed for the equipment selected in Section 4, per ACCA Manual D	☐
5.2 Design HVAC fan airflow: [22] Cooling mode _____ CFM Heating mode _____ CFM	-
5.3 Design HVAC fan speed setting (e.g., low, medium, high): [23] Cooling mode _____ Heating mode _____	-
5.4 Design total external static pressure (corresponding to the mode with the higher airflow in Item 5.2): [24] _____ IWC	-
5.5 Room-by-room design airflows documented below (which must sum to the mode with the higher airflow in Item 5.2) [25, 26]	-

Room Name		Design Airflow (CFM)	Room Name		Design Airflow (CFM)	Room Name		Design Airflow (CFM)
1			12			23		
2			13			24		
3			14			25		
4			15			26		
5			16			27		
6			17			28		
7			18			29		
8			19			30		
9			20			31		
10			21			32		
11			22			Total for all rooms		

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Footnotes

1. This report is designed to meet ASHRAE 62.2-2010 / 2013 / 2016 and ANSI / ACCA's 5 QI-2015 protocol, thereby improving the performance of HVAC equipment in new homes when compared to homes built to minimum code. However, these features alone cannot prevent all ventilation, indoor air quality, and HVAC problems (e.g., those caused by a lack of maintenance or occupant behavior). Therefore, system designs documented through the use of this report are not a guarantee of proper ventilation, indoor air quality, or HVAC performance.

   This report applies to split air conditioners, unitary air conditioners, air-source heat pumps, and water-source (i.e., geothermal) heat pumps up to 65 kBtuh with forced-air distribution systems (i.e., ducts) and to furnaces up to 225 kBtuh with forced-air distribution systems (i.e., ducts). For all other permutations of equipment (e.g., boilers, mini-split / multi-split systems) and distribution systems, Section 1 and 2 are required and Sections 3 through 5 are recommended, but not required.

2. The report shall represent a single system design for a house plan. Check the box for "site-specific design" if the design was created for the specific plan configuration (i.e., elevation, option, orientation, and county) of the home to be certified. Check the box for "group design" if the design was created for a plan that is intended to be built with potentially different configurations (i.e., different elevations, options, and/or orientations). Regardless of the box checked, the system design as documented on this National HVAC Design Report must fall within the following tolerances for the home to be certified:

   - Item 3.3: The outdoor design temperature used in loads are within the limits defined at energystar.gov/hvacdesigntemps.
   - Item 3.4: The number of occupants used in loads is within ± 2 of the home to be certified.
   - Item 3.5: The conditioned floor area used in loads is between 100 sq. ft. smaller and 300 sq. ft. larger than the home to be certified.
   - Item 3.6: The window area used in loads is between 15 sq. ft. smaller and 60 sq. ft. larger than the home to be certified, or, for homes to be certified with >500 sq. ft. of window area, between 3% smaller and 12% larger.
   - Item 3.7: The predominant window SHGC is within 0.1 of the predominant value in the home to be certified.
   - Items 3.10 - 3.12: The sensible, latent, & total heat gain are documented for the orientation of the home to be certified.
   - Item 3.13: The variation in total heat gain across orientations is ≤ 6 kBtuh.
   - Item 4.16: The cooling sizing % is within the cooling sizing limit selected.

   Provide the National HVAC Design Report to the party you are providing these design services to (i.e., a builder or credentialed HVAC contractor) and to the Home Energy Rater. The report is only required to be provided once per system design, even if multiple homes are built using this design (e.g., in a production environment where the same plan is built multiple times, only one report is required). As long as a report has been provided that falls within these tolerances for the home to be certified, no additional work is required. However, if no report falls within these tolerances or if any aspect of the system design changes, then an additional report will need to be generated prior to certification.

   Visit energystar.gov/newhomeshvacdesign for a tool to assist with group designs and for more information.

3. Check "Yes" if this system is to handle temporary occupant loads. Such a system may be required to accommodate a significant number of guests on a regular or sporadic basis and shall be handled by a supplemental cooling system (e.g., a small, single-package unit or split-coil unit) or by a system that can shift capacity from zone to zone (e.g., a variable volume system).

4. The system shall have at least one supply or exhaust fan with associated ducts and controls. Local exhaust fans are allowed to be part of a whole-house ventilation system. Designers may provide supplemental documentation as needed to document the system design.

5. In "Warm-Humid" climates as defined by 2009 IECC Figure 301.1 (i.e., CZ 1 and portions of CZ 2 and 3A below the white line), it is recommended, but not required, that equipment be specified with sufficient latent capacity to maintain indoor relative humidity at ≤ 60%.

6. Airflow design rates and run-times shall be determined using ASHRAE 62.2-2010 or later. Designers are permitted, but not required, to use published addenda and/or the 2013 or 2016 version of the standard to assess compliance.

7. In addition, consult manufacturer requirements to ensure return air temperature requirements are met.

8. Whole-house mechanical ventilation fans shall be rated for sound at no less than the airflow rate in Item 2.3. Fans exempted from this requirement include HVAC air handler fans, remote-mounted fans, and intermittent fans rated ≥ 400 CFM. To be considered for this exemption, a remote-mounted fan must be mounted outside the habitable spaces, bathrooms, toilets, and hallways and there shall be ≥ 4 ft. ductwork between the fan and intake grill. Per ASHRAE 62.2-2010, habitable spaces are intended for continual human occupancy; such space generally includes areas used for living, sleeping, dining, and cooking but does not generally include bathrooms, toilets, hallways, storage areas, closets, or utility rooms.

9. Bathroom fans with a rated flow rate ≥ 500 CFM are exempted from the requirement to be ENERGY STAR certified.

10. Without proper maintenance, ventilation air inlet screens often become filled with debris. Therefore, EPA recommends, but does not require, that these ventilation air inlets be located so as to facilitate access and regular service by the occupant.

11. Select "2013 ASHRAE Fundamentals" if using Chapter 17 of the 2013 ASHRAE Handbook of Fundamentals. Select "Other per AHJ" if the Authority Having Jurisdiction where the home will be certified mandates the use of a load calculation methodology other than Unabridged ACCA Manual J v8 or 2013 ASHRAE Fundamentals.

12. Visit energystar.gov/hvacdesigntemps for the maximum cooling season design temperature and minimum heating season design temperature permitted for ENERGY STAR certified homes. For "County & State, or US Territory, selected", select the County and State or US Territory (i.e., Guam, Northern Mariana Islands, Puerto Rico, or US Virgin Islands), where the home is to be certified. The same design report is permitted to be used in other counties, as long as the design temperature limits in those other counties meet or exceed the cooling and heating season temperature limits for the county selected. For example, if Fauquier County, VA, is used for the load calculations, with a 1% cooling temperature limit of 93 F, then the same report could be used in Fairfax County (which has a higher limit of 94 F) but not in Arlington County (which has a lower limit of 92 F). If a jurisdiction-specified design temperature is used that exceeds the limit in the ENERGY STAR Certified Homes Design Temperature Limit Reference Guide, designers must submit a Design Temperature Exception Request.

13. To determine the number of occupants among all HVAC systems in the home, calculate the number of bedrooms, as defined below, and add one. This number of occupants must be within ± 2 of the home to be certified, unless Item 1.5 indicates that the system is a cooling system for temporary occupant loads.

    A bedroom is defined by ANSI / RESNET / ICC Standard 301-2014 as a room or space 70 sq. ft. or greater size, with egress window and closet, used or intended to be used for sleeping. A "den", "library", or "home office" with a closet, egress window, and 70 sq. ft. or greater size or other similar rooms shall count as a bedroom, but living rooms and foyers shall not.

    An egress window, as defined in 2009 IRC section R310, shall refer to any operable window that provides for a means of escape and access for rescue in the event of an emergency. The egress window definition has been summarized for convenience. The egress window shall:

    - have a sill height of not more than 44 inches above the floor; AND
    - have a minimum net clear opening of 5.7 sq. ft.; AND
    - have a minimum net clear opening height of 24 in.; AND
    - have a minimum net clear opening width of 20 in.; AND
    - be operational from the inside of the room without the use of keys, tools or special knowledge.

14. "Predominant" is defined as the SHGC value used in the greatest amount of window area in the home.
15. Infiltration rate shall reflect the value used in the confirmed or projected ERI rating for home to be certified. Alternatively, use "Average" or "Semi-loose" values for the cooling season infiltration rate and "Semi-tight" or "Average" values for the heating season infiltration rate, as defined by ACCA Manual J, Eighth Edition, Version Two.
16. Orientation represents the direction that the front door of the house is facing. The designer is only required to document the loads for the orientation(s) that the house might be built in. For example, if a house plan will only be built one time in a specific orientation (e.g., a site-specific design), then the designer only needs to document the loads for this one orientation.
17. Determine the orientation with the largest and smallest Total Heat Gain. Verify that the difference in Total Heat Gain between the orientation with the largest and smallest value is ≤ 6 kBtuh. If not, then assign the orientations into one or more groups until the difference is ≤ 6 kBtuh and then complete a separate National HVAC Design Report for each group.
18. Equipment shall be selected using the maximum total heat gain in Item 3.12 and the total heat loss in Item 3.14 per ACCA Manual S, Second Edition, except that cooling ranges above ACCA Manual S limits are temporarily allowed, per Item 4.15.
19. As an alternative for low-load spaces, a system match-up including a single-speed compressor with a total capacity ≤ 20 kBtuh is permitted to be used in spaces with a total cooling load ≤ 15 kBtuh. A system match-up including a two-speed or variable-speed compressor with a total capacity ≤ 25 kBtuh is permitted to be used in spaces with a total cooling load ≤ 18 kBtuh.
20. If an AHRI Reference # is not available, OEM-provided documentation shall be attached with the rated efficiency of the specific combination of indoor and outdoor components of the air conditioner or heat pump, along with confirmation that the two components are designed to be used together.
21. Per ACCA Manual S, Second Edition, if the load sensible heat ratio is ≥ 95% and the HDD/CDD ratio is ≥ 2.0, then the Climate is Condition B, otherwise it is Condition A.
22. Design HVAC fan airflow is the design airflow for the blower in CFM, as determined using the manufacturer's expanded performance data.
23. Design HVAC fan speed setting is the fan speed setting on the control board (e.g., low, medium, high) that corresponds with the Design HVAC fan airflow.
24. Design total external static pressure is the pressure corresponding to the Design HVAC fan airflow, inclusive of external components (e.g., evaporator coil, whole-house humidifier, or ≥ MERV 6 filter).
25. Designers may provide supplemental documentation with room-by-room and total design airflows in lieu of completing Item 5.5. Sample supplemental documentation can be found at http://www.energystar.gov/newhomeshvacdesign.
26. Orientation-specific room-by-room design airflows are recommended, but not required, to distribute airflow proportional to load, thereby improving comfort and efficiency.

National HVAC Commissioning Checklist [1, 2]
ENERGY STAR Certified Homes, Version 3 / 3.1 (Rev. 09)

HVAC Commissioning Contractor Responsibilities:

- The commissioning contractor must be credentialed by an HVAC oversight organization to complete this checklist. One checklist must be completed and signed by the commissioning contractor for each HVAC system that is commissioned.
- The completed checklist for each commissioned system, along with the corresponding National HVAC Design Report, shall be retained by the contractor for a minimum of three years for quality assurance purposes. Furthermore, the contractor shall provide the completed checklist to the builder, the Home Energy Rater responsible for certifying the home, and the HVAC oversight organization upon request.
- Visit www.energystar.gov/newhomeshvac for information about the credential requirement and this checklist.

1. Commissioning Overview

1.1 Contractor name_____ Contractor company_____ Date_____

1.2 Organization that your company is credentialed with: ☐ ACCA ☐ Advanced Energy ☐ NYSERDA

1.3 Builder client name: _____

1.4 Home address: _____ City: _____ State: _____ Zip code: _____

1.5 National HVAC Design Report corresponding to this system has been collected from designer or builder. ☐ Contractor-verified

1.6 Area that system serves, per Item 1.4 of National HVAC Design Report: ☐ Whole-house ☐ Upper-level ☐ Lower-level ☐ Other _____

1.7 House plan, per Item 1.6 of National HVAC Design Report:_____ ☐ Site-specific design ☐ Group design #: _____

2. Refrigerant Charge - Run system for 15 minutes before testing. If outdoor ambient temperature at the condenser is ≤ 55°F or, if known, below the manufacturer-recommended minimum operating temperature for the cooling cycle, then the system shall include a TXV, the outdoor temperature shall be recorded in Item 2.1, and the contractor shall check "N/A" in this Section. [3]			**Contractor Verified**	**N/A**
2.1 Outdoor ambient temperature at condenser:	_____	°F DB	-	-
2.2 Return-side air temperature inside duct near evaporator, during cooling mode:	_____	°F WB	-	☐
2.3 Liquid line pressure:	_____	psig	-	☐
2.4 Liquid line temperature:	_____	°F DB	-	☐
2.5 Suction line pressure:	_____	psig	-	☐
2.6 Suction line temperature:	_____	°F DB	-	☐
For System with Thermal Expansion Valve (TXV):				
2.7 Condenser saturation temperature:	_____	°F DB (Using Item 2.3)	-	☐
2.8 Subcooling value:	_____	°F DB (Item 2.7 - Item 2.4)	-	☐
2.9 OEM subcooling goal:	_____	°F DB	-	☐
2.10 Subcooling deviation:	_____	°F DB (Item 2.8 – Item 2.9)	-	☐
For System with Fixed Orifice:				
2.11 Evaporator saturation temperature:	____	°F DB (Using Item 2.5)	-	☐
2.12 Superheat value:	____	°F DB (Item 2.6 – Item 2.11)	-	☐
2.13 OEM superheat goal:	____	°F DB (Using superheat tables and Items 2.1 & 2.2)	-	☐
2.14 Superheat deviation:	____	°F DB (Item 2.12 – Item 2.13)	-	☐
2.15 Item 2.10 is ± 3°F or Item 2.14 is ± 5°F			☐	☐
2.16 An OEM test procedure (e.g., as defined for a ground-source heat pump) has been used in place of the sub-cooling or super-heat process and documentation has been attached that defines this procedure			☐	☐

3. Indoor HVAC Fan Airflow

3.1 The mode with the higher design HVAC fan airflow used, per Item 5.2 of National HVAC Design Report: ☐ Heating ☐ Cooling	☐	-
3.2 Static pressure test holes have been created, and test hole locations are well-marked and accessible.	☐	-
Test hole location for **return** external static pressure: ☐ Plenum ☐ Cabinet ☐ Transition ☐ Other: _____	-	-
Test hole location for **supply** external static pressure: ☐ Plenum ☐ Cabinet ☐ Transition ☐ Other: _____	-	-
3.3 Measured **return** external static pressure (Enter value only, without negative sign): _____ IWC	-	-
3.4 Measured **supply** external static pressure (Enter value only, without positive sign): _____ IWC	-	-
3.5 Measured **total** external static pressure = Value-only from Item 3.3 + Value-only from Item 3.4 = _____ IWC	-	-
3.6 **Measured** (Item 3.5) - **Design** (Item 5.4 on National HVAC Design Report) total external static pressure = _____ IWC	-	-
3.7 Measured HVAC fan airflow, using Item 3.5 and fan speed setting: _____ CFM	-	-
3.8 Measured HVAC fan airflow (Item 3.7) is ± 15% of design HVAC fan airflow (Item 5.2 on National HVAC Design Report)	☐	-

4. Air Balancing of Supply Registers & Return Grilles (Recommended, but not Required) [4]

4.1 Balancing report attached with room-by-room design airflows from Item 5.5 on National HVAC Design Report, and contractor-measured airflow using ANSI / ACCA 5 QI-2015 protocol	☐	☐
4.2 Room-by-room airflows verified by contractor to be within the greater of ± 20% or 25 CFM of design airflow	☐	☐

National HVAC Commissioning Checklist [1, 2]
ENERGY STAR Certified Homes, Version 3 / 3.1 (Rev. 09)

Footnotes

1. This Checklist is designed to align with the requirements of ANSI / ACCA's 5 QI-2015 protocol, thereby improving the performance of HVAC equipment in new homes when compared to homes built to minimum code. However, these features alone cannot prevent all ventilation, indoor air quality, and HVAC problems (e.g., those caused by a lack of maintenance or occupant behavior). Therefore, this Checklist is not a guarantee of proper ventilation, indoor air quality, or HVAC performance.

   This Checklist applies to split air conditioners, unitary air conditioners, air-source heat pumps, and water-source (i.e., geothermal) heat pumps up to 65 kBtuh with forced-air distribution systems (i.e., ducts) and to furnaces up to 225 kBtuh with forced-air distribution systems (i.e., ducts). All other permutations of equipment (e.g., boilers, mini-split / multi-split systems) and distribution systems are exempt.

2. For a home certified in the State of ID, MT, OR, or WA, the following alternatives and exemptions apply:
   a. For a home with an air-source heat pump up to 65 kBtuh with a forced-air distribution system (i.e., ducts), the contractor is permitted to complete the 2011 PTCS® Commissioned Heat Pump Certificate and Startup Form in lieu of this Checklist.
   b. For a home with a split air conditioner or unitary air conditioner up to 65 kBtuh with a forced-air distribution system (i.e., ducts), the contractor is permitted to complete the Northwest Central AC Commissioning & Startup Form in lieu of this Checklist.
   c. For a home in a location with < 600 CDD, the completion of this Checklist is recommended, but not required.

3. Either factory-installed or field-installed TXV's may be used. For field-installed TXV's, ensure that sensing bulbs are insulated and tightly clamped to the vapor line with good linear thermal contact at the recommended orientation, usually 4 or 8 o'clock.

4. Air balancing of supply registers and return grilles is highly recommended to improve the performance of the HVAC system and comfort of the occupants, but is not required at this time for certification. When air balancing is completed, balancing dampers or proper duct sizing shall be used instead of looped or coiled ductwork to limit flow to diffusers. When balancing dampers are used, they shall be located at the trunk to limit noise unless the trunk will not be accessible when the balancing process is conducted. In such cases, Opposable Blade Dampers (OBD) or dampers located in the duct boot are permitted to be used.

National Water Management System Builder Requirements[1] ENERGY STAR Certified Homes, Version 3 / 3.1 (Rev. 09)

Builder Responsibilities:

- It is the exclusive responsibility of builders to ensure that each certified home is constructed to meet these requirements.
- While builders are not required to maintain documentation demonstrating compliance for each individual certified home, builders are required to develop a process to ensure compliance for each certified home (e.g., incorporate these requirements into the Scope of Work for relevant sub-contractors, require the site supervisor to inspect each home for these requirements, and / or sub-contract the verification of these requirements to a Rater).
- In the event that the EPA determines that a certified home was constructed without meeting these requirements, the home may be decertified.

1. Water-Managed Site and Foundation
1.1 Patio slabs, porch slabs, walks, and driveways sloped ≥ 0.25 in. per ft. away from home to edge of surface or 10 ft., whichever is less. [2]
1.2 Back-fill has been tamped and final grade sloped ≥ 0.5 in. per ft. away from home for ≥ 10 ft. Alternatives in Footnote. [2]
1.3 Capillary break beneath all slabs (e.g., slab on grade, basement slab) except crawlspace slabs using either: ≥ 6 mil polyethylene sheeting, lapped 6-12 in., or ≥ 1 in. extruded polystyrene insulation with taped joints. [3, 4, 5]
1.4 Capillary break at all crawlspace floors using ≥ 6 mil polyethylene sheeting, lapped 6-12 in., & installed using one of the following: [3, 4, 5]
1.4.1 Placed beneath a concrete slab; OR,
1.4.2 Lapped up each wall or pier and fastened with furring strips or equivalent; OR,
1.4.3 Secured in the ground at the perimeter using stakes.
1.5 Exterior surface of below-grade walls of basements & unvented crawlspaces finished as follows: a) For poured concrete, masonry, & insulated concrete forms, finish with damp-proofing coating. [6] b) For wood framed walls, finish with polyethylene and adhesive or other equivalent waterproofing.
1.6 Class 1 vapor retarder not installed on interior side of air permeable insulation in exterior below-grade walls. [7]
1.7 Sump pump covers mechanically attached with full gasket seal or equivalent.
1.8 Drain tile installed at basement and crawlspace walls, with the top of the drain tile pipe below the bottom of the concrete slab or crawlspace floor. Drain tile surrounded with ≥ 6 in. of ½ to ¾ in. washed or clean gravel and with gravel layer fully wrapped with fabric cloth. Drain tile level or sloped to discharge to outside grade (daylight) or to a sump pump. If drain tile is on interior side of footing, then channel provided through footing to exterior side. [8]
2. Water-Managed Wall Assembly
2.1 Flashing at bottom of exterior walls with weep holes included for masonry veneer and weep screed for stucco cladding systems, or equivalent drainage system. [9]
2.2 Fully sealed continuous drainage plane behind exterior cladding that laps over flashing in Item 2.1 and fully sealed at all penetrations. Additional bond-break drainage plane layer provided behind all stucco and non-structural masonry cladding wall assemblies. [9, 10]
2.3 Window and door openings fully flashed. [11]
3. Water-Managed Roof Assembly
3.1 Step and kick-out flashing at all roof-wall intersections, extending ≥ 4" on wall surface above roof deck and integrated shingle-style with drainage plane above; boot / collar flashing at all roof penetrations. [12]
3.2 For homes that don't have a slab-on-grade foundation and do have expansive or collapsible soils, gutters & downspouts provided that empty to lateral piping that discharges water on sloping final grade ≥ 5 ft. from foundation, or to underground catchment system not connected to the foundation drain system that discharges water ≥ 10 ft. from foundation. Alternatives & exemptions in Footnote. [3, 13, 14]
3.3 Self-adhering polymer-modified bituminous membrane at all valleys & roof deck penetrations. [3, 15]
3.4 In 2009 IECC Climate Zones 5 & higher, self-adhering polymer-modified bituminous membrane over sheathing at eaves from the edge of the roof line to > 2 ft. up roof deck from the interior plane of the exterior wall. [3, 15]
4. Water-Managed Building Materials
4.1 Wall-to-wall carpet *not* installed within 2.5 ft. of toilets, tubs, and showers.
4.2 Cement board or equivalent moisture-resistant backing material installed on all walls behind tub and shower enclosures composed of tile or panel assemblies with caulked joints. Paper-faced backerboard shall not be used. [16]
4.3 In Warm-Humid climates, Class 1 vapor retarders not installed on the interior side of air permeable insulation in above-grade walls, except at shower and tub walls. [7]
4.4 Building materials with visible signs of water damage or mold *not* installed or allowed to remain. [17]
4.5 Framing members & insulation products having high moisture content *not* enclosed (e.g., with drywall). [18]
4.6 For each condensate-producing HVAC component, corrosion-resistant drain pan (e.g., galvanized steel, plastic) included that drains to a conspicuous point of disposal in case of blockage. Backflow prevention valve included if connected to a shared drainage system.

Footnotes:

1. These requirements are designed to improve moisture control in homes. However, these features alone cannot prevent all moisture problems. For example, leaky pipes or overflowing baths can lead to moisture issues and negatively impact the performance of the home.
2. Swales or drains designed to carry water from foundation are permitted to be provided as an alternative to the slope requirements for any home, and shall be provided for a home where setbacks limit space to less than 10 ft. Also, tamping of back-fill is not required if either:

proper drainage can be achieved using non-settling compact soils, as determined by a certified hydrologist, soil scientist, or engineer; OR, the builder has scheduled a site visit to provide in-fill and final grading after settling has occurred (e.g., after the first rainy season).

3. Not required in Dry (B) climates as shown in 2009 IECC Figure 301.1 and Table 301.1.
4. Not required for raised pier foundations with no walls. To earn the ENERGY STAR, EPA recommends, but does not require, that radon-resistant features be included in homes built in EPA Radon Zones 1, 2 & 3. For more information, see www.epa.gov/indoorairplus.
5. For an existing slab (e.g., in a home undergoing a gut rehabilitation), in lieu of a capillary break beneath the slab, a continuous and sealed Class I or Class II Vapor Retarder (per Footnote 7) is permitted to be installed on top of the entire slab. In such cases, up to 10% of the slab surface is permitted to be exempted from this requirement (e.g., for sill plates). In addition, for existing slabs in occupiable space, the Vapor Retarder shall be, or shall be protected by, a durable floor surface. If Class I Vapor Retarders are installed, they shall not be installed on the interior side of air permeable insulation or materials prone to moisture damage.
6. Interior surface of an existing below-grade wall (e.g., in a home undergoing a gut rehab.) listed in Item 1.5a is permitted to be finished by:
   - Installing a continuous and sealed drainage plane, capillary break, Class I Vapor Retarder (per Footnote 7) and air barrier that terminates into a foundation drainage system as specified in Item 1.8; OR
   - If a drain tile is not required as specified in Footnote 8, adhering a capillary break and Class I Vapor Retarder (per Footnote 7) directly to the wall with the edges taped/sealed to make it continuous.

   Note that no alternative compliance option is provided for existing below-grade wood-framed walls in Item 1.5b.
7. The 2009 IRC defines Class I vapor retarders as a material or assembly with a rating of ≤ 0.1 perm, using the desiccant method with Proc. A of ASTM E 96. The following materials are typically ≤ 0.1 perm and shall not be used on the interior side of air permeable insulation in above-grade exterior walls in warm-humid climates or below-grade exterior walls in any climate: rubber membranes, polyethylene film, glass, aluminum foil, sheet metal, and foil-faced insulating / non-insulating sheathings. These materials can be used on the interior side of walls if air permeable insulation is not present (e.g., foil-faced rigid foam board adjacent to a below-grade concrete foundation wall is permitted).

   Note that this list is not comprehensive and other materials with a perm rating ≤ 0.1 also shall not be used. Also, if mfr. spec.'s for a product indicate a perm rating ≥ 0.1, then it may be used, even if it is in this list. Also note that open-cell and closed-cell foam generally have ratings above this limit and may be used unless mfr. spec.'s indicate a perm rating ≤ 0.1. Several exemptions to these requirements apply:
   - Class I vapor retarders, such as ceramic tile, may be used at shower and tub walls;
   - Class I vapor retarders, such as mirrors, may be used if mounted with clips or other spacers that allow air to circulate behind them.
8. Alternatively, either a drain tile that is pre-wrapped with a fabric filter or a Composite Foundation Drainage System (CFDS) that has been evaluated by ICC-ES per AC 243 are permitted to be used. Note that the CFDS must include a soil strip drain or another ICC-ES evaluated perimeter drainage system to be eligible for use. In an existing home (e.g, in a home undergoing a gut rehab.) a drain tile installed only on the interior side of the footing without a channel is permitted. Additionally, a drain tile is not required when a certified hydrologist, soil scientist, or engineer has determined that a crawlspace foundation, or an existing basement foundation (e.g., in a home undergoing a gut rehab.), is installed in Group I Soils (i.e. well-drained ground or sand-gravel mixtures), as defined by 2009 IRC Table R405.1.
9. These Items not required for existing structural masonry walls (e.g., in a home undergoing a gut rehabilitation). Note this exemption does not extend to existing wall assemblies with masonry veneers.
10. Any of the following systems may be used: a monolithic weather-resistant barrier (i.e., house wrap) shingled at horizontal joints and sealed or taped at all joints; weather resistant sheathings (e.g., faced rigid insulation) fully taped at all "butt" joints; lapped shingle-style building paper or felts; or other water-resistive barrier recognized by ICC-ES or other accredited agency.
11. Apply pan flashing over the rough sill framing, inclusive of the corners of the sill framing; side flashing that extends over pan flashing; and top flashing that extends over side flashing or equivalent details for structural masonry walls or structural concrete walls.
12. Intersecting wall siding shall terminate 1 in. above the roof or higher, per manufacturer's recommendations. Continuous flashing shall be installed in place of step flashing for metal and rubber membrane roofs.
13. The assessment of whether the soil is expansive or collapsible shall be completed by a certified hydrologist, soil scientist, or engineer.
14. Any of the following are permitted to be used as alternatives to Item 3.2: a) a roof design that deposits rainwater to a grade-level rock bed with a waterproof liner and a lateral drain pipe that meets discharge requirements per Item 3.2; b) a rainwater harvesting system that drains overflow to meet discharge requirements per Item 3.2; or c) a continuous rubber membrane (e.g. EPDM) that is aligned with the foundation wall from final grade to ≥ 8 in. below grade and then slopes ≥ 0.5 in. per ft. away from the home for at least 5 ft., with Group I Soils (as defined in Footnote 8) covering the membrane to within 3 in. of final grade.
15. As an alternative, any applicable option in 2009 IRC Section R905.2.8.2 is permitted to be used to meet Item 3.3 and any option in 2009 IRC Section R905.2.7.1 is permitted to be used to meet Item 3.4. EPA recommends, but does not require, that products meet ASTM D1970. In addition, any option in 2009 IRC Section R905.13 is permitted to be used to meet either Item 3.3 or 3.4.
16. In addition to cement board, materials that have been evaluated by ICC-ES per AC 115 may also be used to meet this requirement. Monolithic tub and shower enclosures (e.g., fiberglass with no seams) are exempt from this backing material requirement unless required by the manufacturer. Paper-faced backerboard may only be used behind monolithic enclosures or waterproof membranes that have been evaluated by ICC-ES per AC 115, and then only if it meets ASTM mold-resistant standards ASTM D3273 or ASTM D6329.
17. If mold is present, effort should be made to remove all visible signs of mold (e.g., by damp wipe with water and detergent). If removal methods are not effective, then the material shall be replaced. However, stains that remain after damp wipe are acceptable. Lumber with "sap stain fungi" is exempt from this Item as long as the lumber is structurally intact.
18. For wet-applied insulation, follow manufacturer's drying recommendations. EPA recommends that lumber moisture content be ≤ 18%.

SECTION 02 41 00
DEMOLITION

PART 3 EXECUTION

1.01 **GENERAL PROCEDURES AND PROJECT CONDITIONS**

A. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.

1. Obtain required permits.
2. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.
3. Provide, erect, and maintain temporary barriers and security devices.
4. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
5. Do not close or obstruct roadways or sidewalks without permit.
6. Conduct operations to minimize obstruction of public and private entrances and exits; do not obstruct required exits at any time; protect persons using entrances and exits from removal operations.
7. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon or limit access to their property.

B. Do not begin removal until receipt of notification to proceed from Owner .

C. Protect existing structures and other elements that are not to be removed.

1. Provide bracing and shoring.
2. Prevent movement or settlement of adjacent structures.
3. Stop work immediately if adjacent structures appear to be in danger.

1.02 **DEBRIS AND WASTE REMOVAL**

A. Remove debris, junk, and trash from site.

B. Leave site in clean condition, ready for subsequent work.

C. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION

SECTION 03 10 00
CONCRETE FORMING AND ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Formwork for cast-in place concrete, with shoring, bracing and anchorage.

B. Openings for other work.

C. Form accessories.

D. Form stripping.

1.02 RELATED REQUIREMENTS

A. Section 03 20 00 - Concrete Reinforcing.

B. Section 03 30 00 - Cast-in-Place Concrete.

C. Section 04 20 00 - Unit Masonry: Reinforcement for masonry.

D. Section 05 12 00 - Structural Steel Framing: Placement of embedded steel anchors and plates in cast-in-place concrete.

E. Section 31 23 16 - Excavation: Shoring and underpinning for excavation.

1.03 REFERENCE STANDARDS

A. ACI 117 - Specifications for Tolerances for Concrete Construction and Materials 2010 (Reapproved 2015).

B. ACI 301 - Specifications for Structural Concrete 2016.

C. ACI 318 - Building Code Requirements for Structural Concrete and Commentary 2014 (Errata 2018).

D. ACI 347R - Guide to Formwork for Concrete 2014.

E. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2018.

F. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes 2014.

G. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric) 2013.

H. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus 2013.

I. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2018b.

J. PS 1 - Structural Plywood 2009.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver prefabricated forms and installation instructions in manufacturer's packaging.

B. Store prefabricated forms off ground in ventilated and protected manner to prevent deterioration from moisture.

PART 2 PRODUCTS

2.01 FORMWORK - GENERAL

A. Provide concrete forms, accessories, shoring, and bracing as required to accomplish cast-in-place concrete work.

B. Design and construct concrete that complies with design with respect to shape, lines, and dimensions.

C. Comply with applicable state and local codes with respect to design, fabrication, erection, and removal of formwork.

D. Comply with relevant portions of ACI 347R, ACI 301 and ACI 318.

2.02 **WOOD FORM MATERIALS**

A. Softwood Plywood: PS 1, C Grade, Group 2.

B. Softwood Plywood: PS 1, B-B High Density Concrete Form Overlay, Class I.

2.03 **REMOVABLE PREFABRICATED FORMS**

A. Preformed Steel Forms: Minimum 16 gage, 0.0598 inch thick, matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished surfaces.

B. Preformed Aluminum Forms: ASTM B221 (ASTM B221M), 6061-T6 alloy, matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished surfaces.

C. Tubular Column Type: Round, spirally wound laminated fiber material, surface treated with release agent, non-reusable, of sizes indicated.

D. Void Forms: Moisture resistant treated paper faces, biodegradable, structurally sufficient to support weight of wet concrete mix until initial set; 2 inches thick.

2.04 **FORMWORK ACCESSORIES**

A. Form Ties: Removable type, galvanized metal, adjustable length, cone type, with waterproofing washer, 1-1/2inch back break dimension, free of defects that could leave holes larger than 1 inch in concrete surface. Provide [_____] manufactured by [_____] .

B. Form Release Agent: Capable of releasing forms from hardened concrete without staining or discoloring concrete or forming bugholes and other surface defects, compatible with concrete and form materials, and not requiring removal for satisfactory bonding of coatings to be applied.

1. Composition: Colorless mineral oil-based compound.

2. Do not use materials containing diesel oil or petroleum-based compounds.

3. VOC Content: In compliance with applicable local, State, and federal regulations and 2015 Enterprise Green Communities requirements.

C. Dowel Sleeves: Plastic sleeve for smooth, round, steel load-transfer dowels.

D. Dovetail Anchor Slot: Galvanized steel, at least 22 gage, 0.0299 inch thick, foam filled, release tape sealed slots, anchors for securing to concrete formwork.

E. Flashing Reglets: Galvanized steel, at least 22 gage, 0.0299 inch thick, longest possible lengths, with alignment splines for joints, foam filled, release tape sealed slots, anchors for securing to concrete formwork.

F. Nails, Spikes, Lag Bolts, Through Bolts, Anchorages: Sized as required, of sufficient strength and character to maintain formwork in place while placing concrete.

G. Embedded Anchor Shapes, Plates, Angles and Bars: As specified in Section 05 12 00.

H. Waterstops: Rubber, minimum 1,750 psi tensile strength, minimum 50 degrees F to plus 175 degrees F working temperature range, ribbed profile, preformed corner sections, heat welded jointing.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify lines, levels and centers before proceeding with formwork. Ensure that dimensions agree with drawings.

3.02 EARTH FORMS

A. Earth forms are not permitted.

3.03 ERECTION - FORMWORK

A. Erect formwork, shoring and bracing to achieve design requirements, in accordance with requirements of ACI 301.

B. Provide bracing to ensure stability of formwork. Shore or strengthen formwork subject to overstressing by construction loads.

C. Arrange and assemble formwork to permit dismantling and stripping. Do not damage concrete during stripping. Permit removal of remaining principal shores.

D. Align joints and make watertight. Keep form joints to a minimum.

E. Obtain approval before framing openings in structural members that are not indicated on drawings.

F. Install void forms in accordance with manufacturer's recommendations. Protect forms from moisture or crushing.

G. Coordinate this section with other sections of work that require attachment of components to formwork.

H. If formwork is placed after reinforcement, resulting in insufficient concrete cover over reinforcement, request instructions from Architect before proceeding.

3.04 APPLICATION - FORM RELEASE AGENT

A. Apply form release agent on formwork in accordance with manufacturer's recommendations.

B. Apply prior to placement of reinforcing steel, anchoring devices, and embedded items.

C. Do not apply form release agent where concrete surfaces will receive special finishes or applied coverings that are affected by agent. Soak inside surfaces of untreated forms with clean water. Keep surfaces coated prior to placement of concrete.

3.05 INSERTS, EMBEDDED PARTS, AND OPENINGS

A. Provide formed openings where required for items to be embedded in passing through concrete work.

B. Locate and set in place items that will be cast directly into concrete.

C. Coordinate with work of other sections in forming and placing openings, slots, reglets, recesses, sleeves, bolts, anchors, other inserts, and components of other work.

D. Install accessories in accordance with manufacturer's instructions, so they are straight, level, and plumb. Ensure items are not disturbed during concrete placement.

E. Install waterstops in accordance with manufacturer's instructions, so they are continuous without displacing reinforcement. Heat seal joints so they are watertight.

3.06 FORM CLEANING

A. Clean forms as erection proceeds, to remove foreign matter within forms.

B. Clean formed cavities of debris prior to placing concrete.

1. Flush with water or use compressed air to remove remaining foreign matter. Ensure that water and debris drain to exterior through clean-out ports.
2. During cold weather, remove ice and snow from within forms. Do not use de-icing salts. Do not use water to clean out forms, unless formwork and concrete construction proceed within heated enclosure. Use compressed air or other means to remove foreign matter.

3.07 FORMWORK TOLERANCES

A. Construct formwork to maintain tolerances required by ACI 117, unless otherwise indicated.

3.08 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests, as specified in Section 01 40 00 - Quality Requirements.

B. Inspect erected formwork, shoring, and bracing to ensure that work is in accordance with formwork design, and to verify that supports, fastenings, wedges, ties, and items are secure.

3.09 FORM REMOVAL

A. Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads.

B. Loosen forms carefully. Do not wedge pry bars, hammers, or tools against finish concrete surfaces scheduled for exposure to view.

C. Store removed forms to prevent damage to form materials or to fresh concrete. Discard damaged forms.

END OF SECTION

SECTION 03 20 00
CONCRETE REINFORCING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Reinforcing steel for cast-in-place concrete.

B. Supports and accessories for steel reinforcement.

1.02 RELATED REQUIREMENTS

A. Section 03 10 00 - Concrete Forming and Accessories.

B. Section 03 30 00 - Cast-in-Place Concrete.

C. Section 04 20 00 - Unit Masonry: Reinforcement for masonry.

1.03 REFERENCE STANDARDS

A. ACI 301 - Specifications for Structural Concrete 2016.

B. ACI 318 - Building Code Requirements for Structural Concrete and Commentary 2014 (Errata 2018).

C. ACI SP-66 - ACI Detailing Manual 2004.

D. ASTM A1094/A1094M - Standard Specification for Continuous Hot-Dip Galvanized Steel Bars for Concrete Reinforcement 2016.

E. ASTM A184/A184M - Standard Specification for Welded Deformed Steel Bar Mats for Concrete Reinforcement 2017.

F. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement 2018.

G. ASTM A641/A641M - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire 2009a (Reapproved 2014).

H. ASTM A704/A704M - Standard Specification for Welded Steel Plain Bar or Rod Mats for Concrete Reinforcement 2018.

I. ASTM A706/A706M - Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement 2016.

J. ASTM A767/A767M - Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement 2016.

K. ASTM A775/A775M - Standard Specification for Epoxy-Coated Steel Reinforcing Bars 2017.

L. ASTM A884/A884M - Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement 2014.

M. ASTM A996/A996M - Standard Specification for Rail-Steel and Axle-Steel Deformed Bars for Concrete Reinforcement 2016.

N. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete 2018a.

O. ASTM D3963/D3963M - Standard Specification for Fabrication and Jobsite Handling of Epoxy-Coated Steel Reinforcing Bars 2015.

P. AWS D1.4/D1.4M - Structural Welding Code - Reinforcing Steel 2011.

Q. CRSI (DA4) - Manual of Standard Practice 2009.

R. CRSI (P1) - Placing Reinforcing Bars 2011.

1.04 **SUBMITTALS**

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Comply with requirements of ACI SP-66. Include bar schedules, shapes of bent bars, spacing of bars, and location of splices.

C. Manufacturer's Certificate: Certify that reinforcing steel and accessories supplied for this project meet or exceed specified requirements.

1.05 **QUALITY ASSURANCE**

A. Perform work of this section in accordance with ACI 301.

B. Welders' Certificates: Submit certifications for welders employed on the project, verifying AWS qualification within the previous 12 months.

PART 2 PRODUCTS

2.01 **REINFORCEMENT**

A. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi).

1. Deformed billet-steel bars.

2. Epoxy coated in accordance with ASTM A775/A775M.

B. Stirrup Steel: ASTM A1064/A1064M steel wire, unfinished.

C. Steel Welded Wire Reinforcement (WWR): Galvanized, deformed type; ASTM A1064/A1064M.

1. WWR Style: As indicated on drawings.

D. Reinforcement Accessories:

1. Tie Wire: Annealed, minimum 16 gage, 0.0508 inch.

2. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement.

2.02 **RE-BAR SPLICING:**

A. Coupler Systems: Mechanical devices for splicing reinforcing bars; capable of developing full steel reinforcing design strength in tension and compression.

B. Dowel Bar Splicer with Dowel-Ins: Mechanical devices for connecting dowels; capable of developing full steel reinforcing design strength in tension and compression.

C. Grout: Cementitious, non-metallic, non-shrink grout for use with manufacturer's grout sleeve reinforcing bar coupler system.

2.03 **FABRICATION**

A. Fabricate concrete reinforcing in accordance with CRSI (DA4) - Manual of Standard Practice.

B. Welding of reinforcement is permitted only with the specific approval of Architect. Perform welding in accordance with AWS D1.4/D1.4M.

C. Fabricate and handle epoxy-coated reinforcing in accordance with ASTM D3963/D3963M.

D. Locate reinforcing splices not indicated on drawings at point of minimum stress.

PART 3 EXECUTION

3.01 **PLACEMENT**

A. Place, support and secure reinforcement against displacement. Do not deviate from required position.

B. Do not displace or damage vapor barrier.

C. Accommodate placement of formed openings.

D. Maintain concrete cover around reinforcing as follows:

1. Beams:1/2 inch
2. Supported Slabs and Joists: 3/4 inch.
3. Walls (exposed to weather or backfill):No. 5 Bar or smaller 1/2 inch. No. 6 Bar or larger 2 inch
4. Footings and Concrete Formed Against Earth: 3 inch.
5. Slabs on Fill: 3/4 inch.

E. Comply with applicable code for concrete cover over reinforcement.

3.02 **FIELD QUALITY CONTROL**

A. An independent testing agency, as specified in Section 01 40 00 - Quality Requirements, will inspect installed reinforcement for conformance to contract documents before concrete placement.

3.03 **SCHEDULES**

A. Reinforcement For Foundation Wall Framing Members and Slab-on-Grade: Deformed bars and welded wire reinforcement, galvanized finish.

END OF SECTION

SECTION 03 30 00
CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Elevated concrete slabs.

B. Floors and slabs on grade.

C. Concrete foundation walls.

D. Joint devices associated with concrete work.

E. Miscellaneous concrete elements, including equipment pads, equipment pits, light pole bases, flagpole bases, thrust blocks and manholes.

F. Concrete curing.

1.02 RELATED REQUIREMENTS

A. Section 03 10 00 - Concrete Forming and Accessories: Forms and accessories for formwork.

B. Section 03 20 00 - Concrete Reinforcing.

C. Section 03 35 11 - Concrete Floor Finishes: Densifiers, hardeners, applied coatings, and polishing.

D. Section 07 92 00 - Joint Sealants: Products and installation for sealants and joint fillers for saw cut joints and isolation joints in slabs.

E. Section 07 95 13 - Expansion Joint Cover Assemblies.

F. Section 32 13 13 - Concrete Paving: Sidewalks, curbs and gutters.

1.03 REFERENCE STANDARDS

A. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete 1991 (Reapproved 2009).

B. ACI 211.2 - Standard Practice for Selecting Proportions for Structural Lightweight Concrete 1998 (Reapproved 2004).

C. ACI 301 - Specifications for Structural Concrete 2016.

D. ACI 302.1R - Guide to Concrete Floor and Slab Construction 2015.

E. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete 2000 (Reapproved 2009).

F. ACI 305R - Guide to Hot Weather Concreting 2010.

G. ACI 306R - Guide to Cold Weather Concreting 2016.

H. ACI 308R - Guide to External Curing of Concrete 2016.

I. ACI 318 - Building Code Requirements for Structural Concrete and Commentary 2014 (Errata 2018).

J. ACI 347R - Guide to Formwork for Concrete 2014.

K. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement 2018.

L. ASTM A767/A767M - Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement 2016.

M. ASTM A775/A775M - Standard Specification for Epoxy-Coated Steel Reinforcing Bars 2017.

N. ASTM A884/A884M - Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement 2014.

O. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete 2018a.

P. ASTM C1602/C1602M - Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete 2012.

Q. ASTM C33/C33M - Standard Specification for Concrete Aggregates 2016, with Editorial Revision (2016).

R. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens 2018.

S. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete 2018.

T. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or (50-mm) Cube Specimens) 2016a.

U. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete 2015a.

V. ASTM C150/C150M - Standard Specification for Portland Cement 2018.

W. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete 2016.

X. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method 2016.

Y. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete 2010a (Reapproved 2016).

Z. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete 2011.

AA. ASTM C330/C330M - Standard Specification for Lightweight Aggregates for Structural Concrete 2017a.

BB. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete 2017.

CC. ASTM C579 - Standard Test Methods for Compressive Strength of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings, and Polymer Concretes 2018.

DD. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete 2015.

EE. ASTM C685/C685M - Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing 2014.

FF. ASTM C827/C827M - Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens of Cementitious Mixtures 2016.

GG. ASTM C845/C845M - Standard Specification for Expansive Hydraulic Cement 2018.

HH. ASTM C881/C881M - Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete 2015.

II. ASTM C979/C979M - Standard Specification for Pigments for Integrally Colored Concrete 2016.

JJ. ASTM C1059/C1059M - Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete 2013.

KK. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink) 2014a.

LL. ASTM C1116/C1116M - Standard Specification for Fiber-Reinforced Concrete 2010a (Reapproved 2015).

MM. ASTM C1240 - Standard Specification for Silica Fume Used in Cementitious Mixtures 2015.

NN. ASTM C1311 - Standard Specification for Solvent Release Sealants 2014.

OO. ASTM C1315 - Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete 2011.

PP. ASTM C1582/C1582M - Standard Specification for Admixtures to Inhibit Chloride-Induced Corrosion of Reinforcing Steel in Concrete 2011, with Editorial Revision (2017).

QQ. ASTM D471 - Standard Test Method for Rubber Property--Effect of Liquids 2016a.

RR. ASTM D695 - Standard Test Method for Compressive Properties of Rigid Plastics 2015.

SS. ASTM D8139 - Standard Specification for Semi-Rigid, Closed-Cell Polypropylene Foam, Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction 2017.

TT. ASTM D994/D994M - Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type) 2011 (Reapproved 2016).

UU. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types) 2018.

VV. ASTM D1752 - Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction 2018.

WW. ASTM D2103 - Standard Specification for Polyethylene Film and Sheeting 2015.

XX. ASTM D3963/D3963M - Standard Specification for Fabrication and Jobsite Handling of Epoxy-Coated Steel Reinforcing Bars 2015.

YY. ASTM E11 - Standard Specification for Woven Wire Test Sieve Cloth and Test Sieves 2017.

ZZ. ASTM E154/E154M - Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover 2008a, with Editorial Revision (2013).

AAA. ASTM E1155 - Standard Test Method for Determining F(F) Floor Flatness and F(L) Floor Levelness Numbers 2014.

BBB. ASTM E1155M - Standard Test Method for Determining F(F) Floor Flatness and F(L) Floor Levelness Numbers (Metric) 2014.

CCC. ASTM E1643 - Standard Practice for Selection, Design, Installation and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs 2011 (Reapproved 2017).

DDD. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs 2017.

EEE. ASTM E1993/E1993M - Standard Specification for Bituminous Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs 1998, with Editorial Revision (2013).

FFF. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials 2016.

GGG. COE CRD-C 48 - Method of Test for Water Permeability of Concrete 1992.

HHH. COE CRD-C 513 - COE Specifications for Rubber Waterstops 1974.

III. COE CRD-C 572 - Corps of Engineers Specifications for Polyvinylchloride Waterstop 1974.

JJJ. ICC-ES AC380 - Acceptance Criteria for Termite Physical Barrier Systems 2014, with Editorial Revision (2017).

KKK. ICRI 310.2R - Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays, and Concrete Repair 2013.

LLL. NSF 61 - Drinking Water System Components - Health Effects 2017.

MMM. NSF 372 - Drinking Water System Components - Lead Content 2016.

1.04 **SUBMITTALS**

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements and installation instructions.

1. For curing compounds, provide data on method of removal in the event of incompatibility with floor covering adhesives.

C. Mix Design: Submit proposed concrete mix design.

1. Indicate proposed mix design complies with requirements of ACI 301, Section 4 - Concrete Mixtures.

2. Indicate proposed mix design complies with requirements of ACI 318, Chapter 5 - Concrete Quality, Mixing and Placing.

3. Indicate proposed mix design complies with fiber reinforcing manufacturer's written recommendations.

D. Samples for Pigment Color Selection: Submit manufacturer's complete sample chip set, including pigment number and required dosage rate for each color.

E. Verification Samples: Submit sample chips of specified colors indicating pigment numbers and required dosage rates, for subsequent comparison to installed concrete.

F. Samples: Submit samples of underslab vapor retarder to be used.

G. Test Reports: Submit report for each test or series of tests specified.

H. Manufacturer's Installation Instructions: For concrete accessories, indicate installation procedures and interface required with adjacent construction.

I. Sustainable Design Submittals: If any wood or wood-based form materials, including supports, are permanently installed in the project, submit documentation required for sustainably harvested wood as specified in Section 01 60 00 - Product Requirements.

J. Sustainable Design Submittal: If any fly ash, ground granulated blast furnace slag, silica fume, rice hull ash, or other waste material is used in mix designs to replace Portland cement, submit the total volume of concrete cast in place, mix design(s) used showing the quantity of portland cement replaced, reports showing successful cylinder testing, and temperature on day of pour if cold weather mix is used.

K. Sustainable Design Submittal: Submit environmental assessment report for concrete mix. Compare concrete mix submitted with a conventional or reference concrete mixture that meets the specified performance requirements. Include:

1. Energy consumption.

2. Emissions.

3. Potential toxicity.

4. Potential risk.

5. Raw material consumption.
6. Land use.
7. Third-party validation of comparison methodology.

L. Project Record Documents: Accurately record actual locations of embedded utilities and components that will be concealed from view upon completion of concrete work.

M. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.05 **QUALITY ASSURANCE**

A. Perform work of this section in accordance with ACI 301 and ACI 318.

B. Follow recommendations of ACI 305R when concreting during hot weather.

C. Follow recommendations of ACI 306R when concreting during cold weather.

D. For slabs required to include moisture vapor reduction admixture (MVRA), do not proceed with placement unless manufacturer's representative is present for every day of placement.

1.06 **WARRANTY**

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Slabs with Moisture Vapor Reducing Admixture (MVRA): Provide warranty to cover the cost of flooring failures due to moisture migration from slabs for ten years.

1. Include cost of repair or removal of failed flooring, placement of topical moisture remediation system, and replacement of flooring with comparable flooring system.

C. Moisture Emission Reducing Curing and Sealing Compound: Provide warranty to cost of flooring delamination failures for 10 years.

1. Include cost of repair or removal of failed flooring, remediation with a moisture vapor impermeable surface coating, and replacement of flooring with comparable flooring system.

PART 2 PRODUCTS

2.01 **FORMWORK**

A. Comply with requirements of Section 03 10 00.

2.02 **REINFORCEMENT MATERIALS**

A. Comply with requirements of Section 03 20 00.

2.03 **CONCRETE MATERIALS**

A. Cement: ASTM C150/C150M, Type II - Moderate Portland type.

1. Acquire cement for entire project from same source.

B. Fine and Coarse Aggregates: ASTM C33/C33M.

1. Acquire aggregates for entire project from same source.

C. Lightweight Aggregate: ASTM C330/C330M.

D. Fly Ash: ASTM C618, Class C or F.

E. Calcined Pozzolan: ASTM C618, Class N.

F. Silica Fume: ASTM C1240, proportioned in accordance with ACI 211.1.

G. Color Additives: Pure, concentrated mineral pigments specifically intended for mixing into concrete and complying with ASTM C979/C979M.

1. Concentration: Base dosage rates on weight of Portland cement, fly ash, silica fume, and other cementitious materials but not aggregate or sand.
2. Packaging: If pigments are to be added to mix at site, furnish pigments in premeasured disintegrating bags to minimize job site waste.
3. Color(s): As selected by Architect from manufacturer's full range.

H. Water: ASTM C1602/C1602M; clean, potable, and not detrimental to concrete.

I. Structural Fiber Reinforcement: ASTM C1116/C1116M.

2.04 **ADMIXTURES**

A. Do not use chemicals that will result in soluble chloride ions in excess of 0.1 percent by weight of cement.

B. Air Entrainment Admixture: ASTM C260/C260M.

C. Water Reducing and Accelerating Admixture: ASTM C494/C494M Type E.

D. Accelerating Admixture: ASTM C494/C494M Type C.

E. Moisture Vapor Reduction Admixture (MVRA): Liquid, inorganic admixture free of volatile organic compounds (VOCs) and formulated to close capillary systems formed during curing to reduce moisture vapor emission and transmission with no adverse effect on concrete properties or finish flooring.

1. Provide admixture in slabs to receive adhesively applied flooring.

F. Waterproofing Admixture: Admixture formulated to reduce permeability to liquid water, with no adverse effect on concrete properties.

1. Admixture Composition: Crystalline, functioning by growth of crystals in capillary pores.

2.05 **ACCESSORY MATERIALS**

A. Underslab Vapor Retarder: Sheet material complying with ASTM E1745, Class A; stated by manufacturer as suitable for installation in contact with soil or granular fill under concrete slabs. Minimum 10-mil Polyethlene or equal.

1. Installation: Comply with ASTM E1643.
2. Accessory Products: Vapor retarder manufacturer's recommended tape, adhesive, mastic, prefabricated boots, etc., for sealing seams and penetrations.
3. Manufacturers:
    a. Fortifiber Building Systems Group ; Moistop Ultra 10: www.fortifiber.com/#sle.
    b. ISI Building Products; Viper VaporCheck II 10-mil (Class A): www.isibp.com/#sle.
    c. Stego Industries, LLC: www.stegoindustries.com/#sle.
    d. W. R. Meadows, Inc; PERMINATOR Class A - 10 mils (0.25 mm): www.wrmeadows.com/#sle.
    e. Substitutions: See Section 01 60 00 - Product Requirements.

2.06 **BONDING AND JOINTING PRODUCTS**

A. Epoxy Bonding System:

1. Complying with ASTM C881/C881M and of Type required for specific application.

B. Slab Isolation Joint Filler: 1/2 inch thick, height equal to slab thickness, with removable top section that will form 1/2 inch deep sealant pocket after removal.

C. Slab Contraction Joint Device: Preformed linear strip intended for pressing into wet concrete to provide straight route for shrinkage cracking.

D. Slab Construction Joint Devices: Combination keyed joint form and screed, galvanized steel, with rectangular or round knockout holes for conduit or rebar to pass through joint form at 6 inches on center; ribbed steel stakes for setting.

2.07 **CURING MATERIALS**

A. Curing and Sealing Compound, Moisture Emission Reducing, Membrane-Forming: Liquid, membrane-forming, clear sealer, for application to newly-placed concrete; capable of providing adequate bond for flooring adhesives, initially and over the long term; with sufficient moisture vapor impermeability to prevent deterioration of flooring adhesives due to moisture emission.

1. Use this product to cure and seal all slabs to receive adhesively applied flooring or roofing.
2. Comply with ASTM C309 and ASTM C1315 Type I Class A.
3. VOC Content: Less than 100 g/L.
4. Solids Content: 25 percent, minimum.

B. Curing and Sealing Compound, Low Gloss: Liquid, membrane-forming, clear, non-yellowing acrylic; complying with ASTM C1315 Type 1 Class A.

2.08 **CONCRETE MIX DESIGN**

A. Proportioning Normal Weight Concrete: Comply with ACI 211.1F recommendations.

B. Proportioning Structural Lightweight Concrete: Comply with ACI 211.2 recommendations.

C. Concrete Strength: Establish required average strength for each type of concrete on the basis of field experience or trial mixtures, as specified in ACI 301.

D. Admixtures: Add acceptable admixtures as recommended in ACI 211.1 and at rates recommended or required by manufacturer.

E. Fiber Reinforcement: Add to mix at rate of 1.5 pounds per cubic yard, or as recommended by manufacturer for specific project conditions.

F. Normal Weight Concrete:

1. Compressive Strength, when tested in accordance with ASTM C39/C39M at 28 days: 4,000 pounds per square inch.
2. Water-Cement Ratio: Maximum 40 percent by weight.
3. Total Air Content: 4 percent, determined in accordance with ASTM C173/C173M.
4. Maximum Slump: 3 inches.
5. Maximum Aggregate Size: 5/8 inch.

G. Structural Lightweight Concrete:

1. Compressive Strength, when tested in accordance with ASTM C39/C39M at 28 days: 4,000 pounds per square inch.
2. Water-Cement Ratio: Maximum 40 percent by weight.
3. Total Air Content: 4 percent, determined in accordance with ASTM C173/C173M.
4. Maximum Slump: 3 inches.
5. Maximum Aggregate Size: 5/8 inch.

2.09 **MIXING**

A. Site mixed concrete is not permitted.

B. Transit Mixers: Comply with ASTM C94/C94M.

C. Adding Water: If concrete arrives on-site with slump less than suitable for placement, do not add water that exceeds the maximum water-cement ratio or exceeds the maximum permissible slump.

PART 3 EXECUTION

3.01 **EXAMINATION**

A. Verify lines, levels, and dimensions before proceeding with work of this section.

3.02 **PREPARATION**

A. Verify that forms are clean and free of rust before applying release agent.

B. Coordinate placement of embedded items with erection of concrete formwork and placement of form accessories.

C. Where new concrete is to be bonded to previously placed concrete, prepare existing surface by cleaning and applying bonding agent in according to bonding agent manufacturer's instructions.

1. Use epoxy bonding system for bonding to damp surfaces, for structural load-bearing applications, and where curing under humid conditions is required.

D. In locations where new concrete is doweled to existing work, drill holes in existing concrete, insert steel dowels and pack solid with non-shrink grout.

E. Interior Slabs on Grade: Install vapor retarder under interior slabs on grade. Lap joints minimum 12 inches. Seal joints, seams and penetrations watertight with manufacturer's recommended products and follow manufacturer's written instructions. Repair damaged vapor retarder before covering.

1. Vapor Retarder Over Granular Fill: Install compactible granular fill before placing vapor retarder as indicated on drawings. Do not use sand.

2. Install composite vapor retarder sheet with non-woven geotextile surface facing concrete.

3.03 **PLACING CONCRETE**

A. Place concrete in accordance with ACI 304R.

B. Place concrete for floor slabs in accordance with ACI 302.1R.

C. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.

D. Ensure reinforcement, inserts, waterstops, embedded parts and formed construction joint devices will not be disturbed during concrete placement.

E. Place concrete continuously without construction (cold) joints wherever possible; where construction joints are necessary, before next placement prepare joint surface by removing laitance and exposing the sand and sound surface mortar, by sandblasting or high-pressure water jetting.

F. Finish floors level and flat, unless otherwise indicated, within the tolerances specified below.

3.04 **SLAB JOINTING**

A. Locate joints as indicated on drawings or as specified below.

B. Anchor joint fillers and devices to prevent movement during concrete placement.

C. Isolation Joints: Use preformed joint filler with removable top section for joint sealant, total height equal to thickness of slab, set flush with top of slab.

1. Install wherever necessary to separate slab from other building members, including columns, walls, equipment foundations, footings, stairs, manholes, sumps, and drains.

D. Load Transfer Construction and Contraction Joints: Install load transfer devices as indicated; saw cut joint at surface as indicated for contraction joints.

E. Saw Cut Contraction Joints: Saw cut joints before concrete begins to cool, within 4 to 12 hours after placing; use 3/16 inch thick blade and cut at least 1 inch deep but not less than one quarter (1/4) the depth of the slab.

1. Maximum 14 ft. o.c. at interior slabs

2. Required off each corner or protrusion through slab.

F. Construction Joints: Where not otherwise indicated, use metal combination screed and key form, with removable top section for joint sealant.

3.05 FLOOR FLATNESS AND LEVELNESS TOLERANCES

A. Maximum Variation of Surface Flatness:

1. Exposed Concrete Floors: 1/8 inch in 10 feet.

2. Under Seamless Resilient Flooring: 1/8 inch in 10 feet.

3. Under Carpeting: 1/8 inch in 10 feet.

B. Correct the slab surface if tolerances are less than specified.

C. Correct defects by grinding or by removal and replacement of the defective work. Areas requiring corrective work will be identified. Re-measure corrected areas by the same process.

3.06 CONCRETE FINISHING

A. Repair surface defects, including tie holes, immediately after removing formwork.

B. Unexposed Form Finish: Rub down or chip off fins or other raised areas 1/4 inch or more in height.

C. Exposed Form Finish: Rub down or chip off and smooth fins or other raised areas 1/4 inch or more in height. Provide finish as follows:

1. Smooth Rubbed Finish: Wet concrete and rub with carborundum brick or other abrasive, not more than 24 hours after form removal.

D. Concrete Slabs: Finish to requirements of ACI 302.1R, and as follows:

1. Surfaces to Receive Thin Floor Coverings: "Steel trowel" as described in ACI 302.1R; thin floor coverings include carpeting, resilient flooring, seamless flooring, resinous matrix terrazzo, thin set quarry tile and thin set ceramic tile.

2. Decorative Exposed Surfaces: Trowel as described in ACI 302.1R; use steel-reinforced plastic trowel blades instead of steel blades to avoid black-burnish marks; decorative exposed surfaces include surfaces to be stained or dyed, pigmented concrete, surfaces to receive liquid hardeners, surfaces to receive dry-shake hardeners, surfaces to be polished and all other exposed slab surfaces.

3. Other Surfaces to Be Left Exposed: Trowel as described in ACI 302.1R, minimizing burnish marks and other appearance defects.

E. In areas with floor drains, maintain floor elevation at walls; pitch surfaces uniformly to drains at 1:100 nominal.

3.07 **CURING AND PROTECTION**

A. Comply with requirements of ACI 308R. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.

B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.

1. Normal concrete: Not less than seven days.

2. High early strength concrete: Not less than four days.

C. Formed Surfaces: Cure by moist curing with forms in place for full curing period.

D. Surfaces Not in Contact with Forms:

1. Slabs and Floors To Receive Adhesive-Applied Flooring: Curing compounds and other surface coatings are usually considered unacceptable by flooring and adhesive manufacturers. If such materials must be used, either obtain the approval of the flooring and adhesive manufacturers prior to use or remove the surface coating after curing to flooring manufacturer's satisfaction.

2. Initial Curing: Start as soon as free water has disappeared and before surface is dry. Keep continuously moist for not less than three days by water ponding, water-saturated sand, water-fog spray, saturated burlap or polyethylene sheets.

a. Ponding: Maintain 100 percent coverage of water over floor slab areas, continuously for 4 days.

b. Spraying: Spray water over floor slab areas and maintain wet.

c. Saturated Burlap: Saturate burlap-polyethylene and place burlap-side down over floor slab areas, lapping ends and sides; maintain in place.

3. Final Curing: Begin after initial curing but before surface is dry.

a. Curing Compound: Apply in two coats at right angles, using application rate recommended by manufacturer.

3.08 **FIELD QUALITY CONTROL**

A. An independent testing agency will perform field quality control tests, as specified in Section 01 40 00 - Quality Requirements.

B. Provide free access to concrete operations at project site and cooperate with appointed firm.

C. Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of concrete operations.

D. Tests of concrete and concrete materials may be performed at any time to ensure compliance with specified requirements.

E. Compressive Strength Tests: ASTM C39/C39M, for each test, mold and cure three concrete test cylinders. Obtain test samples for every 100 cubic yards or less of each class of concrete placed.

F. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.

G. Perform one slump test for each set of test cylinders taken, following procedures of ASTM C143/C143M.

H. Slab Testing: Cooperate with manufacturer of specified moisture vapor reduction admixture (MVRA) to allow access for sampling and testing concrete for compliance with warranty requirements.

3.09 **DEFECTIVE CONCRETE**

A. Test Results: The testing agency shall report test results in writing to Owner, Architect and Contractor within 24 hours of test.

B. Defective Concrete: Concrete not complying with required lines, details, dimensions, tolerances or specified requirements.

C. Repair or replacement of defective concrete will be determined by the Architect . The cost of additional testing shall be borne by Contractor when defective concrete is identified.

D. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Architect for each individual area.

3.10 **PROTECTION**

A. Do not permit traffic over unprotected concrete floor surface until fully cured.

END OF SECTION

SECTION 03 35 11
CONCRETE FLOOR FINISHES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface treatments for concrete floors and slabs.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Finishing of concrete surface to tolerance; floating, troweling, and similar operations; curing.

B. Section 03 30 00 - Cast-in-Place Concrete: Curing compounds that also function as sealers.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the work with concrete floor placement and concrete floor curing.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's published data on each finishing product, including information on compatibility of different products and limitations.

C. Maintenance Data: Provide data on maintenance and renewal of applied finishes.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manufacturer's sealed packaging, including application instructions.

PART 2 PRODUCTS

2.01 CONCRETE FLOOR FINISH APPLICATIONS

A. Unless otherwise indicated, all concrete floors are to be finished using slip resistant coating.

B. Slip Resistant Coating: High gloss clear sealer with plastic aggregate.

2.02 COATINGS

A. Concrete Stain or Dye: Translucent, penetrating compound for interior or exterior use; must be finished with a topical sealer.

1. Composition: Water-based, non-reactive.
2. Number of Coats: Minimum of two.
3. VOC: 100 g/L or less.
4. Application:
    a. Primary Color: Spray applied.
    b. Secondary Color: Spray applied.

B. High Gloss Clear Coating: Transparent, non-yellowing, water- or solvent-based coating.

1. Composition: Acrylic polymer-based.

C. Plastic Aggregate: Finely ground polymer for addition to coatings for slip resistance.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that floor surfaces are acceptable to receive the work of this section.

B. Verify that flaws in concrete have been patched and joints filled with methods and materials suitable for further finishes.

3.02 GENERAL

A. Apply materials in accordance with manufacturer's instructions.

3.03 **COATING APPLICATION**

A. Verify that surface is free of previous coatings, sealers, curing compounds, water repellents, laitance, efflorescence, fats, oils, grease, wax, soluble salts, residues from cleaning agents, and other impediments to adhesion.

B. Verify that water vapor emission from concrete and relative humidity in concrete are within limits established by coating manufacturer.

C. Protect adjacent non-coated areas from drips, overflow, and overspray; immediately remove excess material.

D. Apply coatings in accordance with manufacturer's instructions, matching approved mock-ups for color, special effects, sealing and workmanship.

END OF SECTION

SECTION 03 35 33
STAMPED CONCRETE FINISHING

PART 1 GENERAL

PART 2 PRODUCTS

2.01 STAMPED CONCRETE APPLICATIONS

2.02 STAMPING MATERIALS

A. Stamping Mats: Mat type imprinting tools for texturing freshly placed concrete, in pattern and texture to achieve required surface profile and design.

1. Mat Composition: Polyurethane.

B. Release Agent: Bond breaker compound capable of releasing stamping forms from concrete without creating surface defects or leaving any residue; type as recommended by stamping mat manufacturer; compatible with concrete, form materials and specified coloring agents.

END OF SECTION

SECTION 03 54 00
CAST UNDERLAYMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Liquid-applied self-leveling floor underlayment.

1. Use gypsum-based type at locations indicated on drawings.

1.02 RELATED REQUIREMENTS

A. Section 01 70 00 - Execution and Closeout Requirements: Alteration project procedures; selective demolition for remodeling.

1.03 REFERENCE STANDARDS

A. ASTM C33/C33M - Standard Specification for Concrete Aggregates 2016, with Editorial Revision (2016).

B. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or (50-mm) Cube Specimens) 2016a.

C. ASTM C150/C150M - Standard Specification for Portland Cement 2018.

D. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete 2010a (Reapproved 2016).

E. ASTM C1602/C1602M - Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete 2012.

F. ASTM C348 - Standard Test Method for Flexural Strength of Hydraulic-Cement Mortars 2018.

G. ASTM C472 - Standard Test Methods for Physical Testing of Gypsum, Gypsum Plasters and Gypsum Concrete 1999 (Reapproved 2014).

H. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2018b.

I. ICRI 310.2R - Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays, and Concrete Repair 2013.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's data sheets documenting physical characteristics and product limitations of underlayment materials. Include information on surface preparation, environmental limitations and installation instructions.

C. Manufacturer's Instructions.

1.05 QUALITY ASSURANCE

A. Applicator Qualifications: Company specializing in performing the work of this section, and approved by manufacturer.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Keep dry and protect from direct sun exposure, freezing, and ambient temperature greater than 105 degrees F.

1.07 FIELD CONDITIONS

A. Do not install underlayment until floor penetrations and peripheral work are complete.

B. Maintain minimum ambient temperatures of 50 degrees F 24 hours before, during and 72 hours after installation of underlayment.

C. During the curing process, ventilate spaces to remove excess moisture.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Gypsum Underlayment:

1. Maxxon Corporation; Gyp-Crete 2000/3.2K: www.maxxon.com/#sle.
2. Substitutions: See Section 01 60 00 - Product Requirements.

B. Sound Control Mat:

1. Maxxon Corporation; Acousti-Mat 1/4: www.maxxon.com/#sle.
2. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 MATERIALS

A. Cast Underlayments, General:

1. Comply with applicable code for combustibility or flame spread requirements.

B. Gypsum-Based Underlayment: Gypsum based mix, that when mixed with water in accordance with manufacturer's directions will produce self-leveling underlayment with the following properties:

1. Compressive Strength: Minimum 2500 pounds per square inch, tested per ASTM C472.
2. Density: Maximum 100 pounds per cubic foot.
3. Final Set Time: 1 to 2 hours, maximum.
4. Thickness: 3/4 inch to maximum 3-1/2 inch, or as indicated on drawings.
5. Surface Burning Characteristics: Flame spread/Smoke developed index of 0/0 in accordance with ASTM E84.

C. Aggregate: Dry, well graded, washed silica aggregate, approximately 1/8 inch in size and acceptable to underlayment manufacturer.

D. Water: ASTM C1602/C1602M; clean, potable, and not detrimental to underlayment mix materials.

E. Primer: Manufacturer's recommended type.

F. Joint and Crack Filler: Latex based filler, as recommended by manufacturer.

G. Sound Control Mat: Sheet material, perimeter isolation strip, and tape; as recommended by the underlayment manufacturer.

2.03 MIXING

A. Site mix materials in accordance with manufacturer's instructions.

B. Add aggregate for areas where thickness will exceed 1/2 inch. Mix underlayment and water for at least two minutes before adding aggregate, and continue mixing to assure that aggregate has been thoroughly coated.

C. Mix to self-leveling consistency without over-watering.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are clean, dry, unfrozen, do not contain petroleum byproducts, or other compounds detrimental to underlayment material bond to substrate.

3.02 **PREPARATION**

A. Remove substrate surface irregularities. Fill voids and deck joints with filler. Finish smooth.

B. Vacuum clean surfaces.

C. Prime substrate in accordance with manufacturer's instructions. Allow to dry.

D. Close floor openings.

E. Install sound control mat in accordance with manufacturer's instructions.

3.03 **APPLICATION**

A. Install underlayment in accordance with manufacturer's instructions.

B. Place to indicated thickness, with top surface level to 1/8 inch in 10 ft.

C. Place before partition installation.

D. Where additional aggregate has been used in the mix, add a top layer of neat mix (without aggregate), if needed to level and smooth the surface.

3.04 **CURING**

A. Once underlayment starts to set, prohibit foot traffic until final set has been reached.

B. Air cure in accordance with manufacturer's instructions.

3.05 **FIELD QUALITY CONTROL**

A. An independent testing agency will perform field inspection and testing, as specified in Section 01 40 00 - Quality Requirements.

B. Placed Material: Agency will inspect and test for compliance with specification requirements.

3.06 **PROTECTION**

A. Protect against direct sunlight, heat, and wind; prevent rapid drying to avoid shrinkage and cracking.

B. Do not permit traffic over unprotected floor underlayment surfaces.

END OF SECTION

SECTION 04 05 11
MORTAR AND MASONRY GROUT

PART 2 PRODUCTS

1.01 MORTAR AND GROUT APPLICATIONS

A. Mortar Mix Designs: ASTM C270, Property Specification.

1.02 MATERIALS

A. Mortar Aggregate: ASTM C144.

B. Water: Clean and potable.

END OF SECTION

SECTION 04 20 00
UNIT MASONRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Concrete block.

B. Clay facing brick.

C. Common brick.

D. Mortar and grout.

E. Reinforcement and anchorage.

F. Flashings.

G. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 03 10 00 - Concrete Forming and Accessories: Dovetail slots for masonry anchors.

B. Section 03 20 00 - Concrete Reinforcing: Reinforcing steel for grouted masonry.

C. Section 03 30 00 - Cast-in-Place Concrete: Installation of dovetail slots for masonry anchors.

D. Section 06 10 00 - Rough Carpentry: Nailing strips built into masonry.

E. Section 07 11 13 - Bituminous Dampproofing: Dampproofing parged masonry surfaces.

F. Section 07 21 00 - Thermal Insulation: Insulation for cavity spaces.

G. Section 07 25 00 - Weather Barriers: Water-resistive barriers or air barriers applied to the exterior face of the backing sheathing or masonry.

H. Section 07 62 00 - Sheet Metal Flashing and Trim: Through-wall masonry flashings.

I. Section 07 84 00 - Firestopping: Firestopping at penetrations of fire-rated masonry and at top of fire-rated walls.

J. Section 07 92 00 - Joint Sealants: Sealing control and expansion joints.

1.03 REFERENCE STANDARDS

A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware 2016a.

B. ASTM A240/A240M - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications 2018.

C. ASTM A480/A480M - Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip 2018a.

D. ASTM A580/A580M - Standard Specification for Stainless Steel Wire 2016.

E. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement 2018.

F. ASTM A641/A641M - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire 2009a (Reapproved 2014).

G. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2018.

H. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar 2015.

I. ASTM A951/A951M - Standard Specification for Steel Wire for Masonry Joint Reinforcement 2016.

J. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable 2018.

K. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete 2018a.

L. ASTM B370 - Standard Specification for Copper Sheet and Strip for Building Construction 2012.

M. ASTM C27 - Standard Classification of Fireclay and High-Alumina Refractory Brick 1998 (Reapproved 2018).

N. ASTM C34 - Standard Specification for Structural Clay Load-Bearing Wall Tile 2017.

O. ASTM C55 - Standard Specification for Concrete Building Brick 2017.

P. ASTM C56 - Standard Specification for Structural Clay Nonloadbearing Tile 2013.

Q. ASTM C62 - Standard Specification for Building Brick (Solid Masonry Units Made From Clay or Shale) 2017.

R. ASTM C67/C67M - Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile 2018.

S. ASTM C73 - Standard Specification for Calcium Silicate Brick (Sand-Lime Brick) 2017.

T. ASTM C90 - Standard Specification for Loadbearing Concrete Masonry Units 2016a.

U. ASTM C91/C91M - Standard Specification for Masonry Cement 2012.

V. ASTM C129 - Standard Specification for Nonloadbearing Concrete Masonry Units 2017.

W. ASTM C140/C140M - Standard Test Methods of Sampling and Testing Concrete Masonry Units and Related Units 2017a.

X. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar 2018.

Y. ASTM C150/C150M - Standard Specification for Portland Cement 2018.

Z. ASTM C199 - Standard Test Method for Pier Test for Refractory Mortars 1984 (Reapproved 2016).

AA. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes 2018.

BB. ASTM C216 - Standard Specification for Facing Brick (Solid Masonry Units Made From Clay or Shale) 2017a.

CC. ASTM C270 - Standard Specification for Mortar for Unit Masonry 2014a.

DD. ASTM C404 - Standard Specification for Aggregates for Masonry Grout 2018.

EE. ASTM C476 - Standard Specification for Grout for Masonry 2018.

FF. ASTM C530 - Standard Specification for Structural Clay Nonloadbearing Screen Tile 2013.

GG. ASTM C652 - Standard Specification for Hollow Brick (Hollow Masonry Units Made From Clay or Shale) 2017a.

HH. ASTM C744 - Standard Specification for Prefaced Concrete and Calcium Silicate Masonry Units 2016.

II. ASTM C780 - Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry 2018a.

JJ. ASTM C979/C979M - Standard Specification for Pigments for Integrally Colored Concrete 2016.

KK. ASTM C1072 - Standard Test Method for Measurement of Masonry Flexural Bond Strength 2013, with Editorial Revision (2014).

LL. ASTM C1148 - Standard Test Method for Measuring the Drying Shrinkage of Masonry Mortar 1992a (Reapproved 2014).

MM. ASTM C1714/C1714M - Standard Specification for Preblended Dry Mortar Mix for Unit Masonry 2016.

NN. ASTM E11 - Standard Specification for Woven Wire Test Sieve Cloth and Test Sieves 2017.

OO. ASTM E514/E514M - Standard Test Method for Water Penetration and Leakage Through Masonry 2014a.

PP. BIA Technical Notes No. 7 - Water Penetration Resistance – Design and Detailing 2017.

QQ. BIA Technical Notes No. 13 - Ceramic Glazed Brick Exterior Walls 2017.

RR. BIA Techical Notes No. 28B - Brick Veneer/Steel Stud Walls 2005.

SS. BIA Technical Notes No. 46 - Maintenance of Brick Masonry 2017.

TT. ICC-ES AC380 - Acceptance Criteria for Termite Physical Barrier Systems 2014, with Editorial Revision (2017).

UU. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures 2016.

VV. UL (FRD) - Fire Resistance Directory Current Edition.

1.04 **SUBMITTALS**

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data for masonry units, fabricated wire reinforcement, mortar and masonry accessories.

C. Shop Drawings: Indicate pertinent dimensions, materials, anchorage, size and type of fasteners, and accessories for brickwork support system.

D. Samples: Submit four samples of decorative block units to illustrate color, texture, and extremes of color range.

E. Manufacturer's Certificate: Certify that masonry units meet or exceed specified requirements.

F. Manufacturer's Qualification Statement.

1.05 **QUALITY ASSURANCE**

A. Comply with provisions of ACI 530/530.1/ERTA, except where exceeded by requirements of the contract documents.

B. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section with minimum three years of documented experience.

C. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.06 **DELIVERY, STORAGE, AND HANDLING**

A. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.

PART 2 PRODUCTS

2.01 **CONCRETE MASONRY UNITS**

A. Concrete Block: Comply with referenced standards and as follows:

1. Load-Bearing Units: ASTM C90, normal weight.

a. Hollow block, as indicated.

b. Exposed Faces: Manufacturer's standard color and texture where indicated.

c. Pattern: Vertical single score.

d. Manufacturers:

2. Non-Loadbearing Units: ASTM C129.

a. Hollow block, as indicated.

b. Lightweight.

c. Manufacturers:

1) Substitutions: See Section 01 60 00 - Product Requirements.

2.02 **BRICK UNITS**

A. Manufacturers:

1. Summit Brick Company: www.summitbrick.com/.

2. Substitutions: See section 01 60 00 - Product Requirements.

B. Facing Brick: ASTM C216, Type FBS Smooth, Grade SW.

1. Color and texture: to be selected by Owner/Architect from manufacturer's standard range..

2. Nominal size: As indicated on drawings.

3. Special shapes: Molded units as required by conditions indicated, unless standard units can be sawn to produce equivalent effect.

4. Compressive strength: As indicated on drawings, measured in accordance with ASTM C67/C67M.

2.03 **MORTAR AND GROUT MATERIALS**

A. Masonry Cement: ASTM C91/C91M, Type N.

1. Colored Mortar: Premixed cement as required to match Architect's color sample.

B. Portland Cement: ASTM C150/C150M, Type I; color as required to produce approved color sample.

1. Not more than 0.60 percent alkali.

C. Hydrated Lime: ASTM C207, Type S.

D. Mortar Aggregate: ASTM C144.

E. Grout Aggregate: ASTM C404.

F. Water: Clean and potable.

G. Moisture-Resistant Admixture: Water repellent compound designed to reduce capillarity.

H. Integral Water Repellent Admixture for Mortar: Polymeric liquid admixture added to mortar at the time of manufacture.

1. Use only in combination with masonry units manufactured with integral water repellent admixture.

2. Use only water repellent admixture for mortar from the same manufacturer as water repellent admixture in masonry units.
3. Meet or exceed performance specified for water repellent admixture used in masonry units.

I. Packaged Dry Material for Mortar for Unit Masonry: Premixed Portland cement, hydrated lime, and sand; complying with ASTM C1714/C1714M and capable of producing mortar of the specified strength in accordance with ASTM C270 with the addition of water only.
1. Type: Type N.
2. Color: Standard gray.
3. Water-repellent mortar for use with water repellent masonry units.

J. Packaged Dry Material for Grout for Masonry: Premixed cementitious materials and dried aggregates; capable of producing grout of the specified strength in accordance with ASTM C476 with the addition of water only.
1. Type: Fine.

K. Refractory Mortar: Provide hydraulic-setting or premixed high-alumina refractory mortar containing calcium aluminate cements, ground fire clay, ganister, etc. and complying with ASTM C199.

2.04 **REINFORCEMENT AND ANCHORAGE**

A. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi), deformed billet bars; galvanized.

B. Single Wythe Joint Reinforcement: ASTM A951/A951M.
1. Type: Truss or ladder.
2. Material: ASTM A1064/A1064M steel wire, mill galvanized to ASTM A641/A641M Class 3.
3. Size: 0.1483 inch side rods with 0.1483 inch cross rods; width as required to provide not less than 5/8 inch of mortar coverage on each exposure.

C. Multiple Wythe Joint Reinforcement: ASTM A951/A951M.
1. Type: Truss or ladder.
2. Material: ASTM A1064/A1064M steel wire, mill galvanized to ASTM A641/A641M Class 3.
3. Size: 0.1483 inch side rods with 0.1483 inch cross rods; width as required to provide not less than 5/8 inch of mortar coverage on each exposure.

D. Strap Anchors: Bent steel shapes, 1-1/2 inch width, 0.105 inch thick, 24 inch length, with 1-1/2 inch long, 90 degree bend at each end to form a U or Z shape or with cross pins, hot dip galvanized to ASTM A153/A153M Class B.

E. Flexible Anchors: 2-piece anchors that permit differential movement between masonry and building frame, sized to provide not less than 5/8 inch of mortar coverage from masonry face.

F. Residential Wall Ties: Corrugated formed sheet metal, 7/8 inch wide by 0.05 inch thick, hot dip galvanized to ASTM A 153/A 153M, Class B, sized to extend at least 1-1/2 inches into the veneer with at least 5/8 inch of mortar coverage from masonry face.

G. Two-Piece Wall Ties: Formed steel wire, 0.1875 inch thick, adjustable, eye and pintle type, hot dip galvanized to ASTM A 153/A 153M, Class B, sized to provide not less than 5/8 inch of mortar coverage from masonry face and to allow vertical adjustment of up to 1-1/4 in.

H. Masonry Veneer Anchors: 2-piece anchors that permit differential movement between masonry veneer and structural backup, hot dip galvanized to ASTM A 153/A 153M, Class B.

1. Anchor plates: Not less than 0.075 inch thick, designed for fastening to structural backup through sheathing by two fasteners; provide design with legs that penetrate sheathing and insulation to provide positive anchorage.

2. Wire ties: Manufacturer's standard shape, 0.1875 inch thick.

3. Vertical adjustment: Not less than 3-1/2 inches.

I. Metal-to-Metal Fasteners: Self-drilling, self-tapping screws; corrosion resistant finish or hot dip galvanized to ASTM A153/A153M.

2.05 **FLASHINGS**

A. Metal Flashing Materials: Stainless Steel, as specified in Section 07 62 00.

2.06 **ACCESSORIES**

A. Preformed Control Joints: Rubber material. Provide with corner and tee accessories, fused joints.

B. Joint Filler: Closed cell polyvinyl chloride; oversized 50 percent to joint width; self expanding; in maximum lengths available.

C. Cavity Mortar Control: Semi-rigid polyethylene or polyester mesh panels, sized to thickness of wall cavity, and designed to prevent mortar droppings from clogging weeps and cavity vents and allow proper cavity drainage.

D. Weeps:

1. Type: Polyester mesh.

2. Color(s): As selected by Architect from manufacturer's full range.

E. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.

2.07 **MORTAR AND GROUT MIXING**

A. Mortar for Unit Masonry: ASTM C270, using the Proportion Specification.

B. Admixtures: Add to mixture at manufacturer's recommended rate and in accordance with manufacturer's instructions; mix uniformly.

PART 3 EXECUTION

3.01 **EXAMINATION**

A. Verify that field conditions are acceptable and are ready to receive masonry.

B. Verify that related items provided under other sections are properly sized and located.

C. Verify that built-in items are in proper location, and ready for roughing into masonry work.

3.02 **PREPARATION**

A. Direct and coordinate placement of metal anchors supplied for installation under other sections.

B. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.

3.03 **COLD AND HOT WEATHER REQUIREMENTS**

A. Comply with requirements of ACI 530/530.1/ERTA or applicable building code, whichever is more stringent.

3.04 **COURSING**

A. Establish lines, levels, and coursing indicated. Protect from displacement.

B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.

C. Concrete Masonry Units:

1. Bond: Running.

2. Coursing: One unit and one mortar joint to equal 8 inches.

3. Mortar Joints: Concave.

D. Brick Units:

1. Bond: Running.

2. Coursing: Three units and three mortar joints to equal 8 inches.

3. Mortar Joints: Concave.

3.05 **PLACING AND BONDING**

A. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.

B. Lay hollow masonry units with face shell bedding on head and bed joints.

C. Buttering corners of joints or excessive furrowing of mortar joints is not permitted.

D. Remove excess mortar and mortar smears as work progresses.

E. Remove excess mortar with water repellent admixture promptly. Do not use acids, sandblasting or high pressure cleaning methods.

F. Interlock intersections and external corners, except for units laid in stack bond.

G. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.

H. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.

3.06 **WEEPS/CAVITY VENTS**

A. Install weeps in veneer and cavity walls at 24 inches on center horizontally on top of through-wall flashing above shelf angles and lintels and at bottom of walls.

3.07 **CAVITY MORTAR CONTROL**

A. Do not permit mortar to drop or accumulate into cavity air space or to plug weep/cavity vents.

B. Install cavity mortar diverter at base of cavity and at other flashing locations as recommended by manufacturer to prevent mortar droppings from blocking weep/cavity vents.

3.08 **REINFORCEMENT AND ANCHORAGE - GENERAL, SINGLE WYTHE MASONRY AND CAVITY WALL MASONRY**

A. Unless otherwise indicated on drawings or specified under specific wall type, install horizontal joint reinforcement 16 inches on center.

B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.

C. Place continuous joint reinforcement in first and second joint below top of walls.

D. Embed longitudinal wires of joint reinforcement in mortar joint with at least 5/8 inch mortar cover on each side.

E. Lap joint reinforcement ends minimum 6 inches.

F. Reinforce stack bonded unit joint corners and intersections with strap anchors 16 inches on center.

G. Fasten anchors to structural framing and embed in masonry joints as masonry is laid. Unless otherwise indicated on drawings or closer spacing is indicated under specific wall type, space anchors at maximum of 36 inches horizontally and 24 inches vertically.

H. Embed ties and anchors in mortar joint and extend into masonry unit a minimum of 1-1/2 inches with at least 5/8 inch mortar cover to the outside face of the anchor.

3.09 **REINFORCEMENT AND ANCHORAGE - MASONRY VENEER**

A. Masonry Back-Up: Embed anchors to bond veneer at maximum 16 inches on center vertically and 36 inches on center horizontally. Place additional anchors at perimeter of openings and ends of panels, so maximum spacing of anchors is 8 inches on center.

B. Stud Back-Up: Secure veneer anchors to stud framed back-up and embed into masonry veneer at maximum 16 inches on center vertically and 24 inches on center horizontally. Place additional anchors at perimeter of openings and ends of panels, so maximum spacing of anchors is 8 inches on center.

3.10 **REINFORCEMENT AND ANCHORAGES - MULTIPLE WYTHE UNIT MASONRY**

A. Use individual metal ties installed in horizontal joints to bond wythes together. Provide ties spaced as indicated on drawings.

3.11 **MASONRY FLASHINGS**

A. Whether or not specifically indicated, install masonry flashing to divert water to exterior at all locations where downward flow of water will be interrupted.

1. Extend flashings full width at such interruptions and at least 6 inches, minimum, into adjacent masonry or turn up flashing ends at least 1 inch, minimum, to form watertight pan at non-masonry construction.

2. Remove or cover protrusions or sharp edges that could puncture flashings.

3. Seal lapped ends and penetrations of flashing before covering with mortar.

B. Terminate flashing up 8 inches minimum on vertical surface of backing:

1. Install vertical leg of flashing behind water-resistive barrier sheet over backing.

2. Install vertical leg of flashing over fluid-applied or self-adhered air/vapor barriers over backing or per manufacturer’s directions.

3. Terminate vertical leg of flashing into bed joint in masonry or reglet in concrete.

4. Anchor vertical leg of flashing into backing with a termination bar and sealant.

5. Apply cap bead of sealant on top edge of self-adhered flashing.

C. Install flashing in accordance with manufacturer's instructions and BIA Technical Notes No. 7.

D. Extend metal flashings through exterior face of masonry and terminate in an angled drip with hemmed edge. Install joint sealer below drip edge to prevent moisture migration under flashing.

E. Support flexible flashings across gaps and openings.

F. Lap end joints of flashings at least 6 inches, minimum, and seal watertight with flashing sealant/adhesive.

3.12 **CONTROL AND EXPANSION JOINTS**

A. Do not continue horizontal joint reinforcement through control or expansion joints.

B. Install preformed control joint device in continuous lengths. Seal butt and corner joints in accordance with manufacturer's instructions.

C. Size control joints as indicated on drawings; if not indicated, 3/4 inch wide and deep.

3.13 **BUILT-IN WORK**

A. As work progresses, install built-in metal door frames and glazed frames and other items to be built into the work and furnished under other sections.

B. Install built-in items plumb, level, and true to line.

3.14 **TOLERANCES**

A. Install masonry within the site tolerances found in TMS 402/602.

B. Maximum Variation from Alignment of Columns: 1/4 inch.

C. Maximum Variation From Unit to Adjacent Unit: 1/16 inch.

D. Maximum Variation from Plane of Wall: 1/4 inch in 10 ft and 1/2 inch in 20 ft or more.

E. Maximum Variation from Plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.

F. Maximum Variation from Level Coursing: 1/8 inch in 3 ft and 1/4 inch in 10 ft; 1/2 inch in 30 ft.

G. Maximum Variation of Mortar Joint Thickness: Head joint, minus 1/4 inch, plus 3/8 inch.

H. Maximum Variation from Cross Sectional Thickness of Walls: 1/4 inch.

3.15 **CUTTING AND FITTING**

A. Cut and fit for chases. Coordinate with other sections of work to provide correct size, shape, and location.

B. Obtain approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

3.16 **FIELD QUALITY CONTROL**

A. An independent testing agency will perform field quality control tests, as specified in Section 01 40 00 - Quality Requirements.

B. Clay Masonry Unit Tests: Test each variety of clay masonry in accordance with ASTM C67/C67M requirements, sampling 5 randomly chosen units for each 50,000 installed.

C. Concrete Masonry Unit Tests: Test each variety of concrete unit masonry in accordance with ASTM C140/C140M for compliance with requirements of this specification.

D. Mortar Tests: Test each type of mortar in accordance with ASTM C780, testing with same frequency as masonry samples.

3.17 **CLEANING**

A. Remove excess mortar and mortar droppings.

B. Replace defective mortar. Match adjacent work.

C. Clean soiled surfaces with cleaning solution.

3.18 **PROTECTION**

A. Without damaging completed work, provide protective boards at exposed external corners that are subject to damage by construction activities.

END OF SECTION

SECTION 05 12 00
STRUCTURAL STEEL FRAMING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Structural steel framing members.

B. Structural steel support members.

C. Base plates, .

D. Grouting under base plates.

1.02 RELATED REQUIREMENTS

A. Section 05 50 00 - Metal Fabrications: Steel fabrications affecting structural steel work.

1.03 REFERENCE STANDARDS

A. AISC (MAN) - Steel Construction Manual 2017.

B. AISC 303 - Code of Standard Practice for Steel Buildings and Bridges 2016.

C. ASTM A36/A36M - Standard Specification for Carbon Structural Steel 2014.

D. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength 2014 (Editorial 2017).

E. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes 2013.

F. ASTM A563 - Standard Specification for Carbon and Alloy Steel Nuts 2015.

G. ASTM A563M - Standard Specification for Carbon and Alloy Steel Nuts (Metric) 2007 (Reapproved 2013).

H. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength 2018a.

I. ASTM C827/C827M - Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens of Cementitious Mixtures 2016.

J. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions 2015a.

K. ASTM F436/F436M - Standard Specification for Hardened Steel Washers Inch and Metric Dimensions 2018a.

L. ASTM F959/F959M - Standard Specification for Compressible-Washer-Type Direct Tension Indicators for Use with Structural Fasteners, Inch and Metric Series 2017a.

M. ASTM F1554 - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength 2018.

N. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination 2012.

O. AWS D1.1/D1.1M - Structural Welding Code - Steel 2015, with Errata (2016).

P. RCSC (HSBOLT) - Specification for Structural Joints Using High-Strength Bolts; Research Council on Structural Connections 2014, with Errata (2015).

Q. SSPC-SP 3 - Power Tool Cleaning 1982, with Editorial Revision (2004).

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings:

1. Indicate profiles, sizes, spacing, locations of structural members, openings, attachments and fasteners.

2. Connections not detailed.

3. Indicate cambers and loads.

4. Indicate welded connections with AWS A2.4 welding symbols. Indicate net weld lengths.

C. Manufacturer's Mill Certificate: Certify that products meet or exceed specified requirements.

D. Mill Test Reports: Indicate structural strength, destructive test analysis and non-destructive test analysis.

E. Fabricator Test Reports: Comply with ASTM A1011/A1011M.

F. Welders Certificates: Certify welders employed on the Work, verifying AWS qualification within the previous 12 months.

1.05 **QUALITY ASSURANCE**

A. Fabricate structural steel members in accordance with AISC (MAN) "Steel Construction Manual."

PART 2 PRODUCTS

2.01 **MATERIALS**

A. Steel Angles and Plates: ASTM A36/A36M.

B. Cold-Formed Structural Tubing: ASTM A500/A500M, Grade B.

C. Structural Bolts and Nuts: Carbon steel, ASTM A307, Grade A and galvanized in compliance with ASTM A153/A153M Class C.

D. High-Strength Structural Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, with matching compatible ASTM A563 or ASTM A563M nuts and ASTM F436/F436M washers.

E. Tension Control Bolts: Twist-off type; ASTM F3125/F3125M.

F. Unheaded Anchor Rods: ASTM F1554, Grade 36, plain, with matching ASTM A563 or ASTM A563M nuts and ASTM F436/F436M Type 1 washers.

G. Headed Anchor Rods: ASTM A307 Grade C, plain.

H. Load Indicator Washers: Provide washers complying with ASTM F959/F959M at connections requiring high-strength bolts.

I. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

J. Grout: ASTM C1107/C1107M; Non-shrink; premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents.

1. Minimum Compressive Strength at 48 Hours: 2,000 pounds per square inch.

2. Minimum Compressive Strength at 28 Days: 7,000 pounds per square inch.

3. Height Change, Plastic State; when tested according to ASTM C827/C827M:

a. Maximum: Plus 4 percent.

b. Minimum: Plus 1 percent.

K. Shop and Touch-Up Primer: Fabricator's standard, complying with VOC limitations of authorities having jurisdiction.

L. Touch-Up Primer for Galvanized Surfaces: Fabricator's standard, complying with VOC limitations of authorities having jurisdiction.

2.02 **FABRICATION**

A. Shop fabricate to greatest extent possible.

B. Continuously seal joined members by continuous welds. Grind exposed welds smooth.

C. Fabricate connections for bolt, nut, and washer connectors.

D. Develop required camber for members.

2.03 **FINISH**

A. Prepare structural component surfaces in accordance with SSPC-SP 3.

B. Leave structural steel members un-primed.

2.04 **SOURCE QUALITY CONTROL**

A. Provide shop testing and analysis of structural steel.

PART 3 EXECUTION

3.01 **EXAMINATION**

A. Verify that conditions are appropriate for erection of structural steel and that the work may properly proceed.

3.02 **ERECTION**

A. Erect structural steel in compliance with AISC 303.

B. Allow for erection loads, and provide sufficient temporary bracing to maintain structure in safe condition, plumb, and in true alignment until completion of erection and installation of permanent bracing.

C. Field weld components and shear studs indicated on shop drawings.

D. Use carbon steel bolts only for temporary bracing during construction, unless otherwise specifically permitted on drawings. Install high-strength bolts in accordance with RCSC (HSBOLT) "Specification for Structural Joints Using High-Strength Bolts".

E. Do not field cut or alter structural members without approval of Architect .

F. After erection, prime welds, abrasions, and surfaces not shop primed, except surfaces to be in contact with concrete.

G. Grout solidly between column plates and bearing surfaces, complying with manufacturer's instructions for nonshrink grout. Trowel grouted surfaces smooth, splaying neatly to 45 degrees.

3.03 **TOLERANCES**

A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch.

3.04 **FIELD QUALITY CONTROL**

A. An independent testing agency will perform field quality control tests, as specified in Section 01 40 00 - Quality Requirements.

END OF SECTION

SECTION 05 50 00
METAL FABRICATIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Shop fabricated steel and aluminum items.

B. Downspout boots.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Placement of metal fabrications in concrete.

B. Section 05 12 00 - Structural Steel Framing: Structural steel column anchor bolts.

C. Section 05 52 13 - Pipe and Tube Railings.

D. Section 09 91 13 - Exterior Painting: Paint finish.

E. Section 09 91 23 - Interior Painting: Paint finish.

1.03 REFERENCE STANDARDS

A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum 2014 (2015 Errata).

B. AAMA 2603 - Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix) 2017a.

C. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix) 2017a.

D. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix) 2017a.

E. ASTM A36/A36M - Standard Specification for Carbon Structural Steel 2014.

F. ASTM A48/A48M - Standard Specification for Gray Iron Castings 2003 (Reapproved 2016).

G. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless 2018.

H. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products 2017.

I. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength 2014 (Editorial 2017).

J. ASTM A501/A501M - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing 2014.

K. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2018.

L. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength 2018a.

M. ASTM B26/B26M - Standard Specification for Aluminum-Alloy Sand Castings 2018.

N. ASTM B85/85M - Standard Specification for Aluminum-Alloy Die Castings 2014.

O. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate 2014.

P. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric) 2014.

Q. ASTM B210 - Standard Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes 2012.

R. ASTM B210M - Standard Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes (Metric) 2012.

S. ASTM B211 - Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold Finished Bar, Rod, and Wire 2012.

T. ASTM B211M - Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold-Finished Bar, Rod, and Wire (Metric) 2012.

U. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes 2014.

V. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions 2015a.

W. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination 2012.

X. AWS D1.1/D1.1M - Structural Welding Code - Steel 2015, with Errata (2016).

Y. AWS D1.2/D1.2M - Structural Welding Code - Aluminum 2014, with Errata.

Z. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer 1999 (Ed. 2004).

AA. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic") 2002 (Ed. 2004).

BB. SSPC-SP 2 - Hand Tool Cleaning 1982, with Editorial Revision (2004).

1.04 **SUBMITTALS**

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's data sheets on each ladder safety system product to be used, including installation instructions.

C. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.

1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.

PART 2 PRODUCTS

2.01 **MATERIALS - STEEL**

A. Steel Sections: ASTM A36/A36M.

B. Steel Tubing: ASTM A501/A501M hot-formed structural tubing.

C. Plates: ASTM A283/A283M.

D. Pipe: ASTM A53/A53M, Grade B Schedule 40, black finish.

E. Slotted Channel Framing: ASTM A653/A653M, Grade 33.

F. Slotted Channel Fittings: ASTM A1011/A1011M.

G. Bolts, Nuts, and Washers: ASTM A307, Grade A, plain.

H. Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, plain.

I. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

J. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

K. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.02 **MATERIALS - ALUMINUM**

A. Extruded Aluminum: ASTM B221 (ASTM B221M), 6063 alloy, T6 temper.

B. Sheet Aluminum: ASTM B209 (ASTM B209M), 5052 alloy, H32 or H22 temper.

C. Aluminum-Alloy Drawn Seamless Tubes: ASTM B210 (ASTM B210M), 6063 alloy , T6 temper.

D. Aluminum-Alloy Bars: ASTM B211 (ASTM B211M), 6061 alloy , T6 temper.

E. Aluminum-Alloy Sand Castings: ASTM B26/B26M.

F. Aluminum-Alloy Die Castings: ASTM B85/B85M.

G. Bolts, Nuts, and Washers: Stainless steel.

H. Welding Materials: AWS D1.2/D1.2M; type required for materials being welded.

2.03 **FABRICATION**

A. Fit and shop assemble items in largest practical sections, for delivery to site.

B. Fabricate items with joints tightly fitted and secured.

C. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

D. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.04 **FABRICATED ITEMS**

A. Bollards: Steel pipe, concrete filled, crowned cap, as detailed; prime paint finish.

2.05 **DOWNSPOUT BOOTS**

A. Downspout Boots: Smooth interior without boxed corners or choke points; include integral lug slots, integral cleanout, cleanout cover and tamper proof fasteners.

1. Configuration: Angular.

2. Material: Cast iron; ASTM A48/A48M; casting thickness 3/8 inch (9.5 mm), minimum.

3. Color: To be selected by Architect from manufacturer's standard range.

4. Accessories: Manufacturer's standard stainless steel fasteners, stainless steel building wall anchors, integral neoprene gaskets and rubber coupling.

2.06 **FINISHES - STEEL**

A. Prime paint steel items.

1. Exceptions: Galvanize items to be embedded in concrete and items specified for high-performance of powder coat finish.

2. Exceptions: Do not prime surfaces in direct contact with concrete, where field welding is required, and items to be covered with sprayed fireproofing.

B. Prepare surfaces to be primed in accordance with SSPC-SP2.

C. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.

D. Prime Painting: One coat.

E. Galvanizing of Structural Steel Members: Galvanize after fabrication to ASTM A123/A123M requirements. Provide minimum 1.7 oz/sq ft galvanized coating.

F. Galvanizing of Non-structural Items: Galvanize after fabrication to ASTM A123/A123M requirements.

2.07 **FINISHES - ALUMINUM**

A. Exterior Aluminum Surfaces: Class I color anodized.

B. Interior Aluminum Surfaces: Class I natural anodized.

C. Class I Natural Anodized Finish: AAMA 611 AA-M12C22A41 Clear anodic coating not less than 0.7 mils thick.

D. Class II Natural Anodized Finish: AAMA 611 AA-M12C22A31 Clear anodic coating not less than 0.4 mils thick.

E. Class I Color Anodized Finish: AAMA 611 AA-M12C22A42 Integrally colored anodic coating not less than 0.7 mils thick; light bronze.

F. Class I Color Anodized Finish: AAMA 611 AA-M12C22A44 Electrolytically deposited colored anodic coating not less than 0.7 mils thick; light bronze.

G. Class II Color Anodized Finish: AAMA 611 AA-M12C22A32 Integrally colored anodic coating not less than 0.4 mils thick; light bronze.

H. Class II Color Anodized Finish: AAMA 611 AA-M12C22A34 Electrolytically deposited colored anodic coating not less than 0.4 mils thick; light bronze.

I. Pigmented Organic Coating System: AAMA 2603 polyester or acrylic baked enamel finish; color as indicated.

J. High Performance Organic Coating System: AAMA 2604 multiple coat, thermally cured fluoropolymer system; color as indicated.

K. Superior Performance Organic Coating System: AAMA 2605 multiple coat, thermally cured polyvinylidene fluoride system; color as indicated.

L. Apply one coat of bituminous paint to concealed aluminum surfaces in contact with cementitious or dissimilar materials.

2.08 **FABRICATION TOLERANCES**

A. Squareness: 1/8 inch maximum difference in diagonal measurements.

B. Maximum Offset Between Faces: 1/16 inch.

C. Maximum Misalignment of Adjacent Members: 1/16 inch.

D. Maximum Bow: 1/8 inch in 48 inches.

E. Maximum Deviation From Plane: 1/16 inch in 48 inches.

PART 3 EXECUTION

3.01 **EXAMINATION**

A. Verify that field conditions are acceptable and are ready to receive work.

3.02 **PREPARATION**

A. Clean and strip primed steel items to bare metal where site welding is required.

B. Supply setting templates to the appropriate entities for steel items required to be cast into concrete or embedded in masonry.

3.03 **INSTALLATION**

A. Install items plumb and level, accurately fitted, free from distortion or defects.

B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

C. Obtain approval prior to site cutting or making adjustments not scheduled.

3.04 **TOLERANCES**

A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch.

C. Maximum Out-of-Position: 1/4 inch.

END OF SECTION

SECTION 05 52 13
PIPE AND TUBE RAILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Balcony railings and guardrails.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Placement of anchors in concrete.

B. Section 09 21 16 - Gypsum Board Assemblies: Placement of backing plates in stud wall construction.

C. Section 09 91 13 - Exterior Painting: Paint finish.

D. Section 09 91 23 - Interior Painting: Paint finish.

1.03 REFERENCE STANDARDS

A. AISC 201 - AISC Certification Program for Structural Steel Fabricators, Standard for Steel Building Structures 2006.

B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products 2017.

C. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes 2013.

D. ASTM E935 - Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings 2013, with Editorial Revision.

E. ASTM E985 - Standard Specification for Permanent Metal Railing Systems and Rails for Buildings 2000 (Reapproved 2006).

F. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination 2012.

G. SSPC-Paint 15 - Steel Joist Shop Primer/Metal Building Primer 1999 (Ed. 2004).

H. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic") 2002 (Ed. 2004).

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.

1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.

C. Samples: Submit two, 3 inch long samples of handrail. Submit two samples of elbow, wall bracket and end stop.

1.05 QUALITY ASSURANCE

A. Structural Designer Qualifications: Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located, or personnel under direct supervision of such an engineer.

B. Welder Qualifications: Show certification of welders employed on the Work, verifying AWS qualification within the previous 12 months.

C. Fabricator Qualifications:

1. A qualified steel fabricator that is certified by the American Institute for Steel Construction (AISC) under AISC 201.

PART 2 PRODUCTS

2.01 MANUFACTURERS

2.02 RAILINGS - GENERAL REQUIREMENTS

A. Design, fabricate, and test railing assemblies in accordance with the most stringent requirements of ASTM E985 and applicable local code.

B. Distributed Loads: Design railing assembly, wall rails, and attachments to resist distributed force of 75 pounds per linear foot applied to the top of the assembly and in any direction, without damage or permanent set. Test in accordance with ASTM E935

C. Concentrated Loads: Design railing assembly, wall rails, and attachments to resist a concentrated force of 200 pounds applied at any point on the top of the assembly and in any direction, without damage or permanent set. Test in accordance with ASTM E935

D. Allow for expansion and contraction of members and building movement without damage to connections or members.

E. Dimensions: See drawings for configurations and heights.

1. Top Rails and Wall Rails: 1-1/2 inches square
2. Intermediate Rails: 1-1/2 inches square.
3. Posts: 1-1/2 inches square.
4. Balusters: 1/2 inch square solid bar.

F. Provide anchors and other components as required to attach to structure, made of same materials as railing components unless otherwise indicated; where exposed fasteners are unavoidable provide flush countersunk fasteners.

1. For anchorage to stud walls, provide backing plates, for bolting anchors.
2. Posts: Provide adjustable flanged brackets.

G. Provide slip-on non-weld mechanical fittings to join lengths, seal open ends, and conceal exposed mounting bolts and nuts, including but not limited to elbows, T-shapes, splice connectors, flanges, escutcheons, and wall brackets.

2.03 STEEL RAILING SYSTEM

A. Steel Tube: ASTM A500/A500M Grade B cold-formed structural tubing.

B. Welding Fittings: Factory- or shop-welded from matching pipe or tube; seams continuously welded; joints and seams ground smooth.

C. Exposed Fasteners: Flush countersunk screws or bolts; consistent with design of railing.

D. Straight Splice Connectors: Steel concealed spigots.

E. Galvanizing: In accordance with requirements of ASTM A123/A123M.

1. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20 Type I - Inorganic.

F. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

2.04 FABRICATION

A. Accurately form components to suit specific project conditions and for proper connection to building structure.

B. Fit and shop assemble components in largest practical sizes for delivery to site.

C. Fabricate components with joints tightly fitted and secured. Provide spigots and sleeves to accommodate site assembly and installation.

D. Welded Joints:

1. Exterior Components: Continuously seal joined pieces by intermittent welds and plastic filler. Drill condensate drainage holes at bottom of members at locations that will not encourage water intrusion.

2. Interior Components: Continuously seal joined pieces by intermittent welds and plastic filler.

3. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION

A. Clean and strip primed steel items to bare metal where site welding is required.

B. Supply items required to be cast into concrete or embedded in masonry with setting templates, for installation as work of other sections.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install components plumb and level, accurately fitted, free from distortion or defects, with tight joints.

C. Anchor railings securely to structure.

D. Field weld anchors as indicated on drawings. Touch-up welds with primer. Grind welds smooth.

E. Conceal anchor bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per floor level, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch.

C. Maximum Out-of-Position: 1/4 inch.

END OF SECTION

SECTION 06 10 00
ROUGH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Structural dimension lumber framing.

B. Non-structural dimension lumber framing.

C. Rough opening framing for doors, windows, and roof openings.

D. Sheathing.

E. Subflooring.

F. Underlayment.

G. Roofing nailers.

H. Preservative treated wood materials.

I. Fire retardant treated wood materials.

J. Miscellaneous framing and sheathing.

K. Communications and electrical room mounting boards.

L. Concealed wood blocking, nailers, and supports.

M. Miscellaneous wood nailers, furring, and grounds.

N. Wall sheathing with factory applied water-resistive and air barrier sheet.

O. Roof sheathing with factory applied roofing underlayment.

1.02 RELATED REQUIREMENTS

A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 03 30 00 - Cast-in-Place Concrete: Setting anchors in concrete.

C. Section 03 54 00 - Cast Underlayment.

D. Section 05 12 00 - Structural Steel Framing: Prefabricated beams and columns for support of wood framing.

E. Section 05 50 00 - Metal Fabrications: Miscellaneous steel connectors and support angles for wood framing.

F. Section 06 15 00 - Wood Decking.

G. Section 06 17 33 - Wood I-Joists.

H. Section 06 17 53 - Shop-Fabricated Wood Trusses.

I. Section 06 18 00 - Glued-Laminated Construction.

J. Section 07 25 00 - Weather Barriers: Water-resistive barrier over sheathing.

K. Section 07 62 00 - Sheet Metal Flashing and Trim: Sill flashings.

L. Section 09 21 16 - Gypsum Board Assemblies: Gypsum-based sheathing.

1.03 REFERENCE STANDARDS

A. ANSI A208.1 - American National Standard for Particleboard 2009.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware 2016a.

C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2018.

D. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus 2013.

E. ASTM C208 - Standard Specification for Cellulosic Fiber Insulating Board 2012, with Editorial Revision (2017).

F. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation 2018.

G. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing 2013.

H. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board 2018a.

I. ASTM C1396/C1396M - Standard Specification for Gypsum Board 2017.

J. ASTM D2898 - Standard Test Methods for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing 2010 (Reapproved 2017).

K. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber 2016.

L. ASTM E2178 - Standard Test Method for Air Permeance of Building Materials 2013.

M. ASTM E2357 - Standard Test Method for Determining Air Leakage of Air Barrier Assemblies 2018.

N. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2018b.

O. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials 2016.

P. AWPA U1 - Use Category System: User Specification for Treated Wood 2017.

Q. ICC (IBC) - International Building Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

R. ICC (IECC) - International Energy Conservation Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

S. ICC-ES AC38 - Acceptance Criteria for Water-Resistive Barriers 2016.

T. ICC-ES AC310 - Acceptance Criteria for Water-resistive Membranes Factory-bonded to Wood-based Structural Sheathing, Used as Water-Resistive Barriers 2008, with Editorial Revision (2015).

U. PS 1 - Structural Plywood 2009.

V. PS 2 - Performance Standard for Wood-Based Structural-Use Panels 2010.

W. PS 20 - American Softwood Lumber Standard 2015.

X. RIS (GR) - Standard Specifications for Grades of California Redwood Lumber 2000.

Y. SPIB (GR) - Grading Rules 2014.

Z. WCLIB (GR) - Standard Grading Rules for West Coast Lumber No. 17 2015.

AA. WWPA G-5 - Western Lumber Grading Rules 2017.

1.04 **QUALITY ASSURANCE**

A. Air Barrier Association of America (ABAA) Quality Assurance Program (QAP); www.airbarrier.org/#sle:

1. Installer Qualification: Use accredited contractor, certified installers, evaluated materials, and third-party field quality control audit.

2. Manufacturer Qualification: Use evaluated materials from a single manufacturer regularly engaged in air barrier material manufacture. Use secondary materials approved in writing by primary material manufacturer.

1.05 **DELIVERY, STORAGE, AND HANDLING**

A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.

B. Fire Retardant Treated Wood: Prevent exposure to precipitation during shipping, storage, or installation.

1.06 **WARRANTY**

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 **GENERAL REQUIREMENTS**

A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.

1. Species: Hem-fir, unless otherwise indicated.

2. If no species is specified, provide any species graded by the agency specified; if no grading agency is specified, provide lumber graded by any grading agency meeting the specified requirements.

3. Grading Agency: Any grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee (www.alsc.org) and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.

B. Lumber fabricated from old growth timber is not permitted.

C. Provide sustainably harvested wood; see Section 01 60 00 - Product Requirements for requirements.

D. Provide wood harvested within a 500 mile radius of the project site wBen possible.

2.02 **DIMENSION LUMBER**

A. Sizes: Nominal sizes as indicated on drawings, S4S.

B. Moisture Content: S-dry or MC19.

C. Stud Framing (2x2 through 2x8):

1. Species: Hem-fir.

2. Grade: No. 2.

D. Joist, Rafter and Small Beam Framing (2 by 6 through 4 by 16):

1. Species: Hem-fir.

2. Grade: No. 2.

E. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:

1. Lumber: S4S, No. 2 or Standard Grade.

2. Boards: Standard or No. 3.

2.03 **STRUCTURAL COMPOSITE LUMBER**

A. At Contractor 's option, structural composite lumber may be substituted for concealed dimension lumber and timbers.

B. Structural Composite Lumber: Factory fabricated beams, headers, and columns, of sizes and types indicated on drawings; structural capacity as published by manufacturer.

2.04 **CONSTRUCTION PANELS**

A. Subflooring: As noted in drawings.

B. Roof Sheating: As noted in drawings.

C. Roof Sheathing: Oriented strand board structural wood panel, PS 2, with factory laminated roofing underlayment layer.

D. Wall Sheathing: Oriented strand board structural wood panel with factory laminated water-resistive and air barrier layer.

1. Sheathing Panel: PS 2, Exposure 1.
    a. Size: 4 feet wide by 8 feet long.
    b. Grade: Sheathing.
    c. Performance Category: 7/16 PERF CAT.
    d. Span Rating: 24/16.
    e. Edge Profile: Square edge.
2. Integral Water-Resistive and Air Barrier: Sheet material qualifying as a Grade D water resistive barrier; complying with ICC-ES AC310.
3. Water Vapor Permeance of Water Resistive and Air Barrier: 12 to 16 perms, minimum, when tested in accordance with ASTM E96/E96M Procedure B.
4. Maximum Allowable Air Leakage of Assembly, complying with ASTM E2357:
    a. Infiltration: 0.0072 cfm per square foot, maximum, at a pressure differential of 1.57 pounds per square foot.
    b. Exfiltration: 0.0023 cfm per square foot, maximum, at a pressure differential of 1.57 pounds per square foot.
5. Provide fastening guide on top panel surface with separate markings indicating fastener spacing for 16 inches and 24 inches on center, respectively.
6. Seam Tape: Manufacturer's standard pressure-sensitive, self-adhering, cold-applied, seam tape.
7. Warranty: Manufacturer's standard, limited system warranty for:
    a. Residential Projects: Lifetime of the structure, limited to original owner.
    b. Commercial Projects: Two year; transferable.
8. Manufacturers:
    a. Huber Engineered Woods, LLC; ZIP System Roof/Wall Sheathing and ZIP System Seam Tape: www.huberwood.com/#sle.
    b. Substitutions: See Section 01 60 00 - Product Requirements.

E. Communications and Electrical Room Mounting Boards: PS 1 A-D plywood, or medium density fiberboard; 3/4 inch thick; flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E84.

2.05 **ACCESSORIES**

A. Fasteners and Anchors:

1. Metal and Finish: Hot-dipped galvanized steel complying with ASTM A153/A153M for high humidity and preservative-treated wood locations, unfinished steel elsewhere.

2. Drywall Screws: Bugle head, hardened steel, power driven type, length three times thickness of sheathing.

3. Anchors: Toggle bolt type for anchorage to hollow masonry.

B. Die-Stamped Connectors: Hot dipped galvanized steel, sized to suit framing conditions.

1. For contact with preservative treated wood in exposed locations, provide minimum G185 galvanizing complying with ASTM A653/A653M.

C. Joist Hangers: Hot dipped galvanized steel, sized to suit framing conditions.

1. For contact with preservative treated wood in exposed locations, provide minimum G185 galvanizing complying with ASTM A653/A653M.

D. Sill Gasket on Top of Foundation Wall: 1/4 inch thick, plate width, closed cell plastic foam from continuous rolls.

E. Sill Flashing: As specified in Section 07 62 00.

F. Subfloor Adhesives: Waterproof, air cure type, cartridge dispensed.

G. Water-Resistive Barrier: As specified in Section 07 25 00.

2.06 **FACTORY WOOD TREATMENT**

A. Treated Lumber and Plywood: Comply with requirements of AWPA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.

1. Fire-Retardant Treated Wood: Mark each piece of wood with producer's stamp indicating compliance with specified requirements.

2. Preservative-Treated Wood: Provide lumber and plywood marked or stamped by an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWPA standards.

B. Fire Retardant Treatment:

1. Exterior Type: AWPA U1, Category UCFB, Commodity Specification H, chemically treated and pressure impregnated; capable of providing a maximum flame spread index of 25 when tested in accordance with ASTM E84, with no evidence of significant combustion when test is extended for an additional 20 minutes both before and after accelerated weathering test performed in accordance with ASTM D2898.

a. Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.

b. Do not use treated wood in direct contact with the ground.

2. Interior Type A: AWPA U1, Use Category UCFA, Commodity Specification H, low temperature (low hygroscopic) type, chemically treated and pressure impregnated; capable of providing a maximum flame spread index of 25 when tested in accordance with ASTM E84, with no evidence of significant combustion when test is extended for an additional 20 minutes.

a. Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.

b. Treat rough carpentry items as indicated .

c. Do not use treated wood in applications exposed to weather or where the wood may become wet.

C. Preservative Treatment:

1. Preservative Pressure Treatment of Lumber Above Grade: AWPA U1, Use Category UC3B, Commodity Specification A using waterborne preservative.
    a. Kiln dry lumber after treatment to maximum moisture content of 19 percent.
    b. Treat lumber exposed to weather.
    c. Treat lumber in contact with roofing, flashing or waterproofing.
    d. Treat lumber in contact with masonry or concrete.

PART 3 EXECUTION

3.01 PREPARATION

A. Install sill gasket under sill plate of framed walls bearing on foundations; puncture gasket cleanly to fit tightly around protruding anchor bolts.

B. Coordinate installation of rough carpentry members specified in other sections.

3.02 INSTALLATION - GENERAL

A. Select material sizes to minimize waste.

B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.

C. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.

3.03 FRAMING INSTALLATION

A. Set structural members level, plumb, and true to line. Discard pieces with defects that would lower required strength or result in unacceptable appearance of exposed members.

B. Make provisions for temporary construction loads, and provide temporary bracing sufficient to maintain structure in true alignment and safe condition until completion of erection and installation of permanent bracing.

C. Install structural members full length without splices unless otherwise specifically detailed.

D. Comply with member sizes, spacing, and configurations indicated, and fastener size and spacing indicated, but not less than required by applicable codes, AWC (WFCM) Wood Frame Construction Manual and 2015 IBC.

E. Construct double joist headers at floor and ceiling openings and under wall stud partitions that are parallel to floor joists; use metal joist hangers unless otherwise detailed.

F. Frame wall openings with two or more studs at each jamb; support headers on cripple studs.

3.04 BLOCKING, NAILERS, AND SUPPORTS

A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.

B. In framed assemblies that have concealed spaces, provide solid wood fireblocking as required by applicable local code, to close concealed draft openings between floors and between top story and roof/attic space; other material acceptable to code authorities may be used in lieu of solid wood blocking.

C. In walls, provide blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened to two or more studs or other method of support is explicitly indicated.

D. Where ceiling-mounting is indicated, provide blocking and supplementary supports above ceiling, unless other method of support is explicitly indicated.

E. Provide the following specific non-structural framing and blocking:

1. Cabinets and shelf supports.
2. Wall brackets.
3. Handrails.
4. Grab bars.
5. Towel and bath accessories.
6. Wall-mounted door stops.
7. Chalkboards and marker boards.
8. Wall paneling and trim.
9. Joints of rigid wall coverings that occur between studs.
10. At all other locations indicated on the drawings..

3.05 ROOF-RELATED CARPENTRY

A. Coordinate installation of roofing carpentry with deck construction, framing of roof openings, and roofing assembly installation.

3.06 INSTALLATION OF CONSTRUCTION PANELS

A. Subflooring: Glue and nail to framing; staples are not permitted.

B. Roof Sheathing: Secure panels with long dimension perpendicular to framing members, with ends staggered and over firm bearing.

1. Nail panels to framing; staples are not permitted.

C. Wall Sheathing: Secure with long dimension perpendicular to wall studs, with ends over firm bearing and staggered, using nails, screws or staples.

1. Place water-resistive barrier horizontally over wall sheathing, weather lapping edges and ends.

D. Communications and Electrical Room Mounting Boards: Secure with screws to studs with edges over firm bearing; space fasteners at maximum 24 inches on center on all edges and into studs in field of board.

1. At fire-rated walls, install board over wall board indicated as part of the fire-rated assembly.
2. Where boards are indicated as full floor-to-ceiling height, install with long edge of board parallel to studs.
3. Install adjacent boards without gaps.

3.07 TOLERANCES

A. Framing Members: 1/4 inch from true position, maximum.

B. Surface Flatness of Floor: 1/8 inch in 10 feet maximum, and 1/4 inch in 30 feet maximum.

C. Variation from Plane (Other than Floors): 1/4 inch in 10 feet maximum, and 1/4 inch in 30 feet maximum.

3.08 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Coordination of ABAA Tests and Inspections:

1. Provide testing and inspection required by ABAA QAP.

2. Notify in ABAA writing of schedule for air barrier work. Allow adequate time for testing and inspection.
3. Cooperate with ABAA testing agency.
4. Allow access to air barrier work areas and staging.
5. Do not cover air barrier work until tested, inspected, and accepted.

3.09 **CLEANING**

A. Waste Disposal: Comply with the requirements of Section 01 74 19 - Construction Waste Management and Disposal.
   1. Comply with applicable regulations.
   2. Do not burn scrap on project site.
   3. Do not burn scraps that have been pressure treated.
   4. Do not send materials treated with pentachlorophenol, CCA, or ACA to co-generation facilities or “waste-to-energy” facilities.

B. Do not leave any wood, shavings, sawdust, etc. on the ground or buried in fill.

C. Prevent sawdust and wood shavings from entering the storm drainage system.

END OF SECTION

SECTION 06 15 00
WOOD DECKING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Plywood structural wood decking.

B. Preservative treatment of wood.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Bearing support.

B. Section 04 20 00 - Unit Masonry: Bearing support.

C. Section 06 10 00 - Rough Carpentry: Bearing support.

D. Section 09 91 13 - Exterior Painting: Field finishing.

E. Section 09 93 00 - Staining and Transparent Finishing: Field finishing.

1.03 REFERENCE STANDARDS

A. AITC 109 - Standard for Preservative Treatment of Structural Glued Laminated Timber 2007.

B. AITC 110 - Standard Appearance Grades for Structural Glued Laminated Timber 2001.

C. AITC 111 - Recommended Practice for Protection of Structural Glued Laminated Timber During Transit, Storage and Erection 2005.

D. AITC 113 - Standard for Dimensions of Structural Glued Laminated Timber 2010.

E. AITC A190.1 - American National Standard for Wood Products - Structural Glued Laminated Timber 2007.

F. ANSI A208.1 - American National Standard for Particleboard 2009.

G. ASTM D143 - Standard Test Methods for Small Clear Specimens of Timber 2014.

H. ASTM D198 - Standard Test Methods of Static Tests of Lumber in Structural Sizes 2015.

I. ASTM D1761 - Standard Test Methods for Mechanical Fasteners in Wood 2012.

J. ASTM D2559 - Standard Specification for Adhesives for Bonded Structural Wood Products for Use Under Exterior Exposure Conditions 2012a (Reapproved 2018).

K. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2018b.

L. AWPA U1 - Use Category System: User Specification for Treated Wood 2017.

M. PS 1 - Structural Plywood 2009.

N. PS 20 - American Softwood Lumber Standard 2015.

O. SPIB (GR) - Grading Rules 2014.

P. WWPA G-5 - Western Lumber Grading Rules 2017.

Q. UL (FRD) - Fire Resistance Directory Current Edition.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with at least three years of documented experience and certified by AITC.

B. Installer Qualifications: Company specializing in performing work of the type specified in this section, with at least three years of documented experience.

1.05 **DELIVERY, STORAGE, AND HANDLING**

A. Protect glue laminated members in accordance with AITC 111 requirements for unwrapped material.

PART 2 PRODUCTS

2.01 **MANUFACTURERS**

A. Plywood Decking:

1. Boise Cascade Company www.bc.com/#sle.
2. Georgia-Pacific LLC: www.buildgp.com/#sle.
3. Weyerhaeuser Company: www.weyerhaeuser.com/#sle.
4. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 **WOOD MATERIALS**

A. Wood fabricated from old growth timber is not permitted.

B. Provide sustainably harvested wood; see Section 01 60 00 - Product Requirements for requirements.

C. Provide wood harvested within a 500 mile radius of the project site when possible

D. Marking: Mark each piece with producer's stamp indicating compliance with specified requirements; for pieces exposed to view in completed construction, submit manufacturer's certificate certifying that products comply with specified requirements in lieu of grade stamping.

E. Plywood Decking: As noted on drawings.

F. Plywood Decking: PS 1 veneer plywood; APA Rated Sheathing APA Rated Sheathing ; Exterior grade;1 1 A A interior veneer appearance grade; sanded sanded.

2.03 **ACCESSORIES**

A. Fasteners and Anchors:

1. Fastener Type and Finish: Hot-dipped galvanized steel for high humidity and preservative-treated wood locations, unfinished steel elsewhere.
2. Screws: Bugle head, hardened steel, power driven type, length three times thickness of decking.
3. Anchors: Toggle bolt type for anchorage to hollow masonry.

2.04 **WOOD TREATMENT**

A. Factory-Treated Lumber and Plywood: Comply with requirements of AWPA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.

B. Preservative Pressure Treatment:

1. Preservative Pressure Treatment of Plywood Decking: AWPA U1, Use Category UC2 and UC3B, Commodity Specification F using waterborne preservative to 0.25 lb/cu ft retention.
    a. Kiln dry plywood after treatment to maximum moisture content of 18 percent.

PART 3 EXECUTION

3.01 **EXAMINATION**

A. Verify that support framing is ready to receive decking.

3.02 **PREPARATION**

A. Coordinate placement of bearing items.

3.03 **INSTALLATION - PLYWOOD DECKING**

A. Install decking perpendicular to framing members with ends staggered over firm bearing. On sloped surfaces, lay decking with tongue upward.

B. Engage plywood tongue and groove edges.

C. Allow expansion space at edges and ends.

D. Attach decking with adhesive and screws.

3.04 **TOLERANCES**

A. Surface Flatness of Decking Without Load: 1/4 inch in 10 feet maximum, and 1/2 inch in 30 feet maximum.

END OF SECTION

SECTION 06 17 33
WOOD I-JOISTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wood I-joists for floor framing.

B. Bridging, bracing, and anchorage.

C. Framing for openings.

D. Preservative treatment of wood.

1.02 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Installation requirements for miscellaneous framing.

B. Section 06 10 00 - Rough Carpentry: Material requirements for blocking, plates, and miscellaneous framing.

1.03 REFERENCE STANDARDS

A. ASTM D2559 - Standard Specification for Adhesives for Bonded Structural Wood Products for Use Under Exterior Exposure Conditions 2012a (Reapproved 2018).

B. ASTM D5055 - Standard Specification for Establishing and Monitoring Structural Capacities of Prefabricated Wood I-Joists 2016.

C. AWPA U1 - Use Category System: User Specification for Treated Wood 2017.

D. PS 1 - Structural Plywood 2009.

E. PS 2 - Performance Standard for Wood-Based Structural-Use Panels 2010.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's literature describing materials, dimensions, allowable spans and spacings, bearing and anchor details, bridging and bracing requirements, and installation instructions; identify independent inspection agency.

C. Shop Drawings: Indicate sizes and spacing of joists, bracing and bridging, bearing stiffeners, holes to be cut (if any), and framed openings between joists.

D. Certificate: Certification by joist manufacturer that products delivered are of the same design and construction as those evaluated by the independent inspection agency.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in manufacturer's original packaging with manufacturer's name and product identification intact and legible.

B. Protect products from damage due to weather and breakage.

C. Protect joists from warping or other distortion by stacking in upright position, braced to resist movement, with air circulation under coverings and around stacks.

D. Handle individual joists in the upright position.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Wood I-Joists:

1. Boise Cascade Company www.bc.com/#sle.
2. Louisiana-Pacific Corporation www.lpcorp.com/#sle.
3. Weyerhaeuser Company www.weyerhaeuser.com/#sle.
4. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 **MATERIALS**

A. Wood I-Joist: as noted on drawings.

B. Wood I-Joists: Solid lumber top and bottom flanges and oriented strand board (OSB) webs bonded together with structural adhesive, with published span rating to meet project requirements.

1. Span Rating: Established and monitored in accordance with ASTM D5055 by independent inspection agency.
2. Oriented Strand Board: Comply with PS 2.
3. Adhesive: Tested for wet/exterior service in accordance with ASTM D2559.
4. Fabrication Tolerances:
   a. Flange Width: Plus/minus 1/32 inch.
   b. Flange Thickness: Minus 1/16 inch.
   c. Joist Depth: Plus 0, minus 1/8 inch.
5. Marking: Mark each piece with depth, joist spacing, and allowable span for joist spacing.

C. Wood-Based Components:

1. Wood fabricated from old growth timber is not permitted.
2. Provide sustainably harvested wood, certified or labeled as specified in Section 01 60 00.

D. Joist Hangers: As noted on drawings..

E. Joist Bridging: Type, size and spacing recommended by joist manufacturer.

F. Wood Blocking, Plates, and Miscellaneous Framing: Softwood lumber, any species, construction grade, maximum moisture content of 19 percent.

G. Wood Blocking, Plates, and Miscellaneous Framing: As specified in Section 06 10 00.

H. Fasteners: Electrogalvanized steel, type to suit application.

I. Bearing Plates: Electrogalvanized steel, unfinished.

2.03 **WOOD TREATMENT**

A. Factory-Treated Lumber and Plywood: Comply with requirements of AWPA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.

PART 3 EXECUTION

3.01 **EXAMINATION**

A. Verify that supports and openings are ready to receive joists.

B. Verify that field measurements are as indicated on shop drawings.

3.02 **PREPARATION**

A. Coordinate placement of bearing items.

3.03 **ERECTION**

A. Install joists in accordance with manufacturer's instructions.

B. Set structural members level and plumb, in correct position.

C. Make provisions for erection loads and for sufficient temporary bracing to maintain structure plumb and in true alignment until completion of erection and installation of permanent bracing.

D. Install permanent bridging and bracing.

E. Install headers and supports to frame openings required.

3.04 **TOLERANCES**

A. Framing Members: 1/2 inch maximum, from true position.

END OF SECTION

SECTION 06 17 53
SHOP-FABRICATED WOOD TRUSSES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Shop fabricated wood trusses for roof framing.

B. Bridging, bracing, and anchorage.

1.02 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Installation requirements for miscellaneous framing.

B. Section 06 10 00 - Rough Carpentry: Material requirements for blocking, bridging, plates, and miscellaneous framing.

1.03 REFERENCE STANDARDS

A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2018.

B. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar 2015.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2018b.

D. AWPA U1 - Use Category System: User Specification for Treated Wood 2017.

E. SPIB (GR) - Grading Rules 2014.

F. TPI 1 - National Design Standard for Metal-Plate-Connected Wood Truss Construction 2014.

G. TPI BCSI 1 - Building Component Safety Information Booklet: The Guide to Good Practice for Handling, Installing & Bracing of Metal Plate Connected Wood Trusses 2015.

H. TPI DSB-89 - Recommended Design Specification for Temporary Bracing of Metal Plate Connected Wood Trusses 1989.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's data sheets on plate connectors, bearing plates, and metal bracing components.

C. Shop Drawings: Show truss configurations, sizes, spacing, size and type of plate connectors, cambers, framed openings, bearing and anchor details, and bridging and bracing.

1. Include identification of engineering software used for design.
2. Provide shop drawings stamped or sealed by design engineer.
3. Submit design calculations.

D. Designer's Qualification Statement.

E. Fabricator's Qualification Statement.

1.05 QUALITY ASSURANCE

A. Designer Qualifications: Perform design by or under direct supervision of a Professional Structural Colorado Engineer experienced in design of this Work and licensed in the State in which the Project is located.

B. Fabricator Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

1.06 **DELIVERY, STORAGE, AND HANDLING**

A. Handle and erect trusses in accordance with TPI BCSI 1.

B. Store trusses in vertical position resting on bearing ends.

PART 2 PRODUCTS

2.01 **TRUSSES**

A. Wood Trusses: Designed and fabricated in accordance with TPI 1 and TPI DSB-89 to achieve structural requirements indicated.

2.02 **MATERIALS**

A. Lumber:

1. Moisture Content: Between 7 and 9 percent.
2. Lumber fabricated from old growth timber is not permitted.
3. Provide sustainably harvested lumber, certified or labeled as specified in Section 01 60 00.

B. Truss Bridging: Type, size and spacing recommended by truss manufacturer.

2.03 **ACCESSORIES**

A. Wood Blocking, Bridging, Plates, and Miscellaneous Framing: Softwood lumber, any species, construction grade, 19 percent maximum and 7 percent minimum moisture content.

B. Wood Blocking, Bridging, Plates, and Miscellaneous Framing: As specified in Section 06 10 00.

C. Fasteners: Electrogalvanized steel, type to suit application.

D. Bearing Plates: Electrogalvanized steel.

PART 3 EXECUTION

3.01 **EXAMINATION**

A. Verify that field measurements are as indicated.

B. Verify that supports and openings are ready to receive trusses.

3.02 **PREPARATION**

A. Coordinate placement of bearing items.

3.03 **ERECTION**

A. Install trusses in accordance with manufacturer's instructions and TPI DSB-89 and TPI BCSI 1; maintain a copy of each TPI document on site until installation is complete.

B. Set members level and plumb, in correct position.

C. Make provisions for erection loads, and for sufficient temporary bracing to maintain structure plumb, and in true alignment until completion of erection and installation of permanent bracing.

D. Do not field cut or alter structural members without approval of Architect .

E. Install permanent bridging and bracing.

F. Install headers and supports to frame openings required.

G. Frame openings between trusses with lumber in accordance with Section 06 10 00.

H. Coordinate placement of decking with work of this section.

3.04 **TOLERANCES**

A. Framing Members: 1/2 inch maximum, from true position.

END OF SECTION

SECTION 06 18 00
GLUED-LAMINATED CONSTRUCTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Glue laminated wood beams and purlins.

B. Preservative treatment of wood.

C. Steel hardware and attachment brackets.

1.02 RELATED REQUIREMENTS

A. Section 09 91 13 - Exterior Painting: Field finishing.

B. Section 09 91 23 - Interior Painting: Field finishing.

C. Section 09 93 00 - Staining and Transparent Finishing: Field finishing.

1.03 REFERENCE STANDARDS

A. AITC 117 - Standard Specifications for Structural Glued Laminated Timber of Softwood Species 2010.

B. AITC A190.1 - American National Standard for Wood Products - Structural Glued Laminated Timber 2007.

C. ASTM A36/A36M - Standard Specification for Carbon Structural Steel 2014.

D. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products 2017.

E. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware 2016a.

F. ASTM A563 - Standard Specification for Carbon and Alloy Steel Nuts 2015.

G. ASTM A563M - Standard Specification for Carbon and Alloy Steel Nuts (Metric) 2007 (Reapproved 2013).

H. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar 2015.

I. ASTM D2559 - Standard Specification for Adhesives for Bonded Structural Wood Products for Use Under Exterior Exposure Conditions 2012a (Reapproved 2018).

J. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2018b.

K. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions 2015a.

L. AWPA U1 - Use Category System: User Specification for Treated Wood 2017.

M. AWS D1.1/D1.1M - Structural Welding Code - Steel 2015, with Errata (2016).

N. FM (AG) - FM Approval Guide current edition.

O. ITS (DIR) - Directory of Listed Products current edition.

P. RIS (GR) - Standard Specifications for Grades of California Redwood Lumber 2000.

Q. SPIB (GR) - Grading Rules 2014.

R. UL (DIR) - Online Certifications Directory Current Edition.

S. UL (FRD) - Fire Resistance Directory Current Edition.

T. WCLIB (GR) - Standard Grading Rules for West Coast Lumber No. 17 2015.

U. WWPA G-5 - Western Lumber Grading Rules 2017.

1.04 **SUBMITTALS**

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide technical data on wood preservative materials, application technique and resultant performance information.

C. Shop Drawings: Indicate framing system, sizes and spacing of members, loads and cambers, bearing and anchor details, bridging and bracing, framed openings , and Sustainable material submittals.

D. Manufacturer's Qualification Statement.

1.05 **QUALITY ASSURANCE**

A. Manufacturer/Fabricator Qualifications: Company specializing in manufacture of glue laminated structural units with five years of documented experience, and certified by AITC in accordance with AITC A190.1.

1.06 **DELIVERY, STORAGE, AND HANDLING**

A. Protect members to AITC requirements for not wrapped.

B. Leave individual wrapping in place until finishing occurs.

C. Fire Retardant Treated Wood: Prevent exposure to precipitation during shipping, storage, or installation.

PART 2 PRODUCTS

2.01 **MANUFACTURERS**

A. Glued-Laminated Structural Units:

1. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 **GLUED-LAMINATED UNITS**

A. Glued-Laminated Units: Fabricate in accordance with AITC 117 Industrial grade.

1. Verify dimensions and site conditions prior to fabrication.
2. Cut and fit members accurately to length to achieve tight joint fit.
3. Fabricate member with camber built in.
4. Do not splice or join members in locations other than those indicated without permission.
5. After end trimming, seal with penetrating sealer in accordance with AITC requirements.

2.03 **MATERIALS**

A. Lumber: Softwood lumber complying with RIS (GR) grading rules with 12 percent maximum moisture content before fabrication. Design for the following values:

1. Provide sustainably harvested lumber, certified or labeled as specified in Section 01 60 00.

B. Steel Connections and Brackets: ASTM A36/A36M weldable quality, galvanize per ASTM A123/A123M.

C. Steel Connections and Brackets: ASTM A666, Type 304 stainless steel.

D. Anchor Bolts: ASTM F3125/F3125M, Type 1 heavy hex high strength bolts and ASTM A563 (ASTM A563M) nuts; hot-dip galvanized to meet requirements of ASTM A153/A153M, matching washers.

E. Laminating Adhesive: Tested for wet/exterior service in accordance with ASTM D2559.

F. Bearing Plate Anchors: Expansion shield and lag bolt type for anchorage to solid masonry or concrete.

2.04 **WOOD TREATMENT**

A. Factory-Treated Lumber: Comply with requirements of AWPA U1 - Use Category System for pressure impregnated wood treatments determined by use categories, expected service conditions, and specific applications.

B. Preservative Pressure Treatment:

1. Preservative Pressure Treatment of Glued-Laminated Structural Units: AWPA U1, Use Category UC3B, Commodity Specification F using waterborne preservative to 0.25 lb/cu ft retention.

a. Kiln dry lumber after treatment and before lamination to maximum moisture content of 19 percent.

2. Marking: Marked each piece with stamp of an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWPA standards.

2.05 **FABRICATION**

A. Fabricate glue laminated structural members in accordance with AITC Industrial grade.

B. Welding: Perform welding in accordance with AWS D1.1/D1.1M.

C. Verify dimensions and site conditions prior to fabrication.

D. Cut and fit members accurately to length to achieve tight joint fit.

E. Fabricate member with camber built in.

F. Do not splice or join members in locations other than those indicated without permission.

G. Fabricate steel hardware and connections with joints neatly fitted, welded, and ground smooth.

H. After end trimming, seal with penetrating sealer in accordance with AITC requirements.

I. Field Finishing of Members: Specified in Section 09 91 13 and 09 91 23.

PART 3 EXECUTION

3.01 **EXAMINATION**

A. Verify that supports are ready to receive units.

B. Verify sufficient end bearing area.

3.02 **PREPARATION**

A. Coordinate placement of bearing items.

3.03 **ERECTION**

A. Lift members using protective straps to prevent visible damage.

B. Set structural members level and plumb, in correct positions or sloped where indicated.

C. Provide temporary bracing and anchorage to hold members in place until permanently secured.

D. Fit members together accurately without trimming, cutting, splicing, or other unauthorized modification.

E. Swab and seal the interior wood surfaces of field drilled holes in members with primer.

F. Field Finishing: Specified in Section 09 91 13 and 09 91 23.

3.04 **TOLERANCES**

A. Framing Members: 1/2 inch maximum from true position.

END OF SECTION

SECTION 06 20 00
FINISH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Finish carpentry items.

B. Wood door frames, glazed frames.

C. Wood casings and moldings.

D. Hardware and attachment accessories.

1.02 RELATED REQUIREMENTS

A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 06 10 00 - Rough Carpentry: Support framing, grounds, and concealed blocking.

C. Section 12 35 30: Cabinet hardware.

D. Section 09 91 13 - Exterior Painting: Painting of finish carpentry items.

E. Section 09 91 23 - Interior Painting: Painting of finish carpentry items.

F. Section 09 93 00 - Staining and Transparent Finishing: Staining and transparent finishing of finish carpentry items.

G. Section 12 35 30 - Residential Casework: Shop fabricated cabinet work.

1.03 REFERENCE STANDARDS

A. ANSI A135.4 - American National Standard for Basic Hardboard 2012.

B. ANSI A208.1 - American National Standard for Particleboard 2009.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2018b.

D. AWI (QCP) - Quality Certification Program current edition at www.awiqcp.org.

E. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards 2014, with Errata (2016).

F. AWMAC (GIS) - Guarantee and Inspection Services Program current edition at www.awmac.com/gis.php.

G. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 3.1 2016, with Errata (2017).

H. AWPA U1 - Use Category System: User Specification for Treated Wood 2017.

I. BHMA A156.9 - American National Standard for Cabinet Hardware 2015.

J. HPVA HP-1 - American National Standard for Hardwood and Decorative Plywood 2016.

K. NEMA LD 3 - High-Pressure Decorative Laminates 2005.

L. NHLA G-101 - Rules for the Measurement & Inspection of Hardwood & Cypress 2015.

M. PS 1 - Structural Plywood 2009.

N. PS 20 - American Softwood Lumber Standard 2015.

O. WDMA I.S. 4 - Industry Specification for Preservative Treatment for Millwork 2015a.

P. WI (CCP) - Certified Compliance Program (CCP) Current Edition.

Q. WI (MCP) - Monitored Compliance Program (MCP) Current Edition.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the work with plumbing rough-in, electrical rough-in and installation of associated and adjacent components.

B. Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.

1.05 **SUBMITTALS**

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data:

1. Provide data on fire retardant treatment materials and application instructions.

2. Provide instructions for attachment hardware, finish hardware and Installation.

C. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.

1. Provide the information required by AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS).

1.06 **QUALITY ASSURANCE**

A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.

1.07 **DELIVERY, STORAGE, AND HANDLING**

A. Protect work from moisture damage.

PART 2 PRODUCTS

2.01 **FINISH CARPENTRY ITEMS**

A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.

B. Surface Burning Characteristics: Provide materials having fire and smoke properties as required by applicable code.

C. Interior Woodwork Items:

1. Moldings, Bases, Casings, and Miscellaneous Trim: Clear white pine; prepare for paint finish.

2. Door, Glazed Light, and Pocket Door Frames: White birch; prepare for paint finish.

3. Stairs, Balustrades, and Handrails: Clear fir; prepare for stained finish.

4. Loose Shelving: Birch plywood; prepare for paint finish.

2.02 **WOOD-BASED COMPONENTS**

A. Wood fabricated from old growth timber is not permitted.

B. Provide sustainably harvested wood, certified or labeled as specified in Section 01 60 00 - Product Requirements.

2.03 **LUMBER MATERIALS**

A. Softwood Lumber: Red Oak species, Straight panel sawn, maximum moisture content of 6 percent; with vertical grain, of quality suitable for transparent finish.

B. Hardwood Lumber: Birch species, Straight panel sawn, maximum moisture content of 6 percent ; with vertical grain , of quality suitable for transparent finish.

2.04 **SHEET MATERIALS**

A. Softwood Plywood, Not Exposed to View: Any face species, medium density fiberboard core; PS 1 Grade A-B, glue type as recommended for application.

B. Softwood Plywood, Exposed to View: Face species as indicated, plain sawn, medium density fiberboard core; PS 1 Grade A-B, glue type as recommended for application.

C. Hardwood Plywood: Face species as indicated, plain sawn, book matched, medium density fiberboard core; HPVA HP-1 Front Face Grade AA, Back Face Grade 1, glue type as recommended for application.

2.05 **PLASTIC LAMINATE MATERIALS**

A. Plastic Laminate: NEMA LD 3; color as selected by Architect; textured, low gloss finish.

B. Laminate Adhesive: Type recommended by laminate manufacturer to suit application; not containing formaldehyde or other volatile organic compounds.

2.06 **FASTENINGS**

A. Adhesive for Purposes Other Than Laminate Installation: Suitable for the purpose; not containing formaldehyde or other volatile organic compounds.

B. Fasteners: Of size and type to suit application; match finish in concealed locations and satin chrome finish in exposed locations.

2.07 **ACCESSORIES**

A. Lumber for Shimming and Blocking: Softwood lumber of Cedar, or pine species.

B. Primer: Alkyd primer sealer.

C. Wood Filler: Solvent base, tinted to match surface finish color.

D. Attachment Accessories.

E. Boxes and Trim for Recessed Component.

2.08 **HARDWARE**

A. Hardware: Comply with BHMA A156.9.

B. Standard Shelf, Countertop, and Workstation Brackets:

1. Material: Steel.

2. Finish: Manufacturer's standard, factory-applied, textured powder coat.

3. Color: Selected by Architect from manufacturer's standard range.

C. Americans with Disabilities Act (ADA)-Compliant Vanity and Countertop Brackets:

1. Material: Steel.

2. Finish: Manufacturer's standard, factory-applied, textured powder coat.

3. Color: Selected by Architect from manufacturer's standard range.

2.09 **WOOD TREATMENT**

A. Factory-Treated Lumber: Comply with requirements of AWPA U1 - Use Category System for pressure impregnated wood treatments determined by use categories, expected service conditions, and specific applications.

B. Fire Retardant Treatment (FR-S Type): Chemically treated and pressure impregnated; capable of providing flame spread index of 25, maximum, and smoke developed index of 450, maximum, when tested in accordance with ASTM E84.

C. Wood Preservative by Pressure Treatment (PT Type): Provide AWPA U1 treatment using waterborne preservative with 0.25 percent retainage.

D. Water Repellent Preservative Treatment by Dipping Method: WDMA I.S. 4, with 0.25 percent retainage.

E. Shop pressure treat wood materials requiring fire rating to concealed wood blocking.

F. Provide identification on fire retardant treated material.

G. Redry wood after pressure treatment to maximum 6 percent moisture content.

2.10 **FABRICATION**

A. Shop assemble work for delivery to site, permitting passage through building openings.

B. Fit exposed sheet material edges with 3/8 inch matching hardwood edging. Use one piece for full length only.

C. Cap exposed plastic laminate finish edges with material of same finish and pattern.

D. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

E. Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arises. Locate counter butt joints minimum 2 feet from sink cut-outs.

2.11 **SHOP FINISHING**

A. Sand work smooth and set exposed nails and screws.

B. Apply wood filler in exposed nail and screw indentations.

C. On items to receive transparent finishes, use wood filler that matches surrounding surfaces and is of type recommended for the applicable finish.

D. Finish work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 5 - Finishing for grade specified and as follows:

1. Transparent:
    a. System - 4, Latex Acrylic, Water-based.
    b. Stain: As selected by Architect.
    c. Sheen: Flat.
2. Opaque:
    a. System - 4, Latex Acrylic, Water-based.
    b. Color: As selected by Architect.
    c. Sheen: Flat.

E. Stain, seal, and varnish exposed to view surfaces. Brush apply only.

F. Seal internal surfaces and semi-concealed surfaces. Brush apply only.

G. Prime paint surfaces in contact with cementitious materials.

H. Back prime woodwork items to be field finished, prior to installation.

PART 3 EXECUTION

3.01 **EXAMINATION**

A. Verify adequacy of backing and support framing.

B. Verify mechanical, electrical, and building items affecting work of this section are placed and ready to receive this work.

C. See Section 06 10 00 for installation of recessed wood blocking.

3.02 **INSTALLATION**

A. Install work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade indicated.

B. Set and secure materials and components in place, plumb and level.

C. Carefully scribe work abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim to conceal larger gaps.

D. See Section 12 35 30 an manufacturer's recommendation for installation requirements for attachment accessories.

E. Install components with nails at 12 inch on center.

F. Install hardware in accordance with manufacturer's written instructions.

3.03 **PREPARATION FOR SITE FINISHING**

A. Set exposed fasteners. Apply wood filler in exposed fastener indentations. Sand work smooth.

B. Site Finishing: See Section 09 91 13 and 09 91 23.

C. Before installation, prime paint surfaces of items or assemblies to be in contact with cementitious materials.

3.04 **TOLERANCES**

A. Maximum Variation from True Position: 1/16 inch.

B. Maximum Offset from True Alignment with Abutting Materials: 1/32 inch.

END OF SECTION

SECTION 06 61 00
CAST POLYMER FABRICATIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Cast plastic window sills.

1.02 REFERENCE STANDARDS

A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2018b.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate dimensions, thicknesses, required clearances, tolerances, materials, colors, finishes, fabrication details, field jointing, adjacent construction, methods of support, integration of components, and anchorages.

C. Samples: Submit two samples representative of window sill, 4x4 inch in size, illustrating color, texture, and finish.

D. Maintenance Data: Indicate list of approved cleaning materials and procedures required; list of substances that are harmful to the component materials.

PART 2 PRODUCTS

2.01 MATERIALS

A. Provide finished products having flame spread index of 35 and smoke developed index of 15, when tested in accordance with ASTM E84 in thickness of 3/4 inch.

B. Resin: Polyester; integrally-colored, stain-resistant and resistant to domestic chemicals and cleaners.

2.02 FABRICATION

A. Fabricate components by mold to achieve shape and configuration.

B. Gel coat the finish exposed surfaces smooth and polish to a gloss sheen.

C. Radius corners and edges.

D. Cure components prior to shipment, except sheet materials requiring site handling.

2.03 FINISH

A. Color: color as selected by Architect from manufacturer's standard color range

B. Exposed to View Surface Visual Texture: Marbleized design.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated on shop drawings.

B. Verify that joint preparation and affected dimensions are acceptable.

C. Verify mechanical, electrical, and building items affecting work of this section are placed and ready to receive this work.

3.02 PREPARATION

A. Provide anchoring devices for installation and embedding.

B. Provide templates and rough-in measurements.

3.03 INSTALLATION

A. Install components in accordance with approved shop drawings and manufacturer's instructions.

B. Align work plumb and level.

C. Rigidly anchor to substrate to prevent misalignment.

3.04 **TOLERANCES**

A. Maximum Variation From True Dimension: 1/8 inch.

B. Maximum Offset From True Position: 1/8 inch.

3.05 **CLEANING**

A. Clean and polish surfaces in accordance with manufacturer's instructions.

3.06 **PROTECTION**

A. Do not permit construction near unprotected surfaces.

END OF SECTION

SECTION 07 05 53
FIRE AND SMOKE ASSEMBLY IDENTIFICATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Identification markings for fire and smoke rated partitions, and fire rated walls.

1.02 RELATED REQUIREMENTS

A. Section 09 91 23 - Interior Painting: Paint finish.

1.03 REFERENCE STANDARDS

A. ICC (IBC) - International Building Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 FIELD CONDITIONS

A. Do not install adhered markings when ambient temperature is lower than recommended by label or sign manufacturer.

B. Do not install painted markings when ambient temperature is lower than recommended by coating manufacturer.

PART 2 PRODUCTS

2.01 FIRE AND SMOKE ASSEMBLY IDENTIFICATION

A. Regulatory Requirements: Comply with "Marking and Identification" requirements of "Fire-Resistance Ratings and Fire Tests" chapter of ICC (IBC).

B. Adhered Fire and Smoke Assembly Identification Signs: Printed vinyl or paper sign with factory applied adhesive backing.

C. Applied Fire and Smoke Assembly Identification: Identification markings applied to partition with paint and a code compliant stencil. See Section 09 91 23 for products.

D. Languages: Provide sign markings in English.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.

3.02 PREPARATION

A. See Section 09 91 23 for substrate preparation for painted markings.

3.03 INSTALLATION

A. Locate markings as required by ICC (IBC).

B. Install adhered markings in accordance with manufacturer's instructions.

C. Install applied markings in accordance with Section 09 91 23.

D. Install neatly, with horizontal edges level.

E. Protect from damage until Date of Substantial Completion; repair or replace damaged markings.

END OF SECTION

SECTION 07 11 13
BITUMINOUS DAMPPROOFING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Bituminous dampproofing.

B. Protection boards.

C. Drainage panels.

1.02 RELATED REQUIREMENTS

A. Section 31 23 23 - Fill.

B. Section 33 41 00 - Subdrainage.

1.03 REFERENCE STANDARDS

A. ASTM D41/D41M - Standard Specification for Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing 2011 (Reapproved 2016).

B. ASTM D43/D43M - Standard Specification for Coal Tar Primer Used in Roofing, Dampproofing, and Waterproofing 2000 (Reapproved 2012).

C. ASTM D449/D449M - Standard Specification for Asphalt Used in Dampproofing and Waterproofing 2003 (Reapproved 2014).

D. ASTM D450/D450M - Standard Specification for Coal-Tar Pitch Used in Roofing, Dampproofing, and Waterproofing 2007 (Reapproved 2013).

E. ASTM D1187/D1187M - Standard Specification for Asphalt-Base Emulsions for Use as Protective Coatings for Metal 1997 (Reapproved 2018).

F. ASTM D1227 - Standard Specification for Emulsified Asphalt Used as a Protective Coating for Roofing 2013.

G. ASTM D3747 - Standard Specification for Emulsified Asphalt Adhesive for Adhering Roof Insulation 1979 (Reapproved 2007).

H. ASTM D4479/D4479M - Standard Specification for Asphalt Roof Coatings - Asbestos-Free 2007, with Editorial Revision (2012).

I. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement, Asbestos-Free 2007, with Editorial Revision (2012).

J. ASTM D5643/D5643M - Standard Specification for Coal Tar Roof Cement, Asbestos Free 2006, with Editorial Revision (2012).

K. NRCA (WM) - The NRCA Waterproofing Manual 2005.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide properties of primer, bitumen, and mastics.

C. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

1.05 FIELD CONDITIONS

A. Maintain ambient temperatures above 40 degrees F for 24 hours before and during application until dampproofing has cured.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design: Sonneborn; Hydrocide.

B. Other Acceptable Bituminous Dampproofing Manufacturers:

1. Karnak Corporation; Karnak 83: www.karnakcorp.com/#sle.

2. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 **BITUMINOUS DAMPPROOFING**

A. Bituminous Dampproofing: Cold-applied water-based emulsion; asphalt with mineral colloid or chemical emulsifying agent; with or without fiber reinforcement; asbestos-free; suitable for application on vertical and horizontal surfaces.

1. Composition - Vertical Application: ASTM D1227 Type III or ASTM D1187/D1187M Type I.

2. Composition - Horizontal and Low-Slope Application: ASTM D1227 Type II or III.

3. VOC Content: Not more than permitted by local, State, and federal regulations.

4. Applied Thickness: 1/16 inch, minimum, wet film.

B. Bituminous Dampproofing: Cold-applied, spray-grade; asphalt base, volatile petroleum solvents, and other content, suitable for application by spray, brush, roller, or squeegee; asbestos-free; suitable for application on vertical and horizontal surfaces.

1. Composition: ASTM D4479/D4479M Type I, minimum, asbestos free.

2. VOC Content: Not more than permitted by local, State, and federal regulations.

3. Applied Thickness: 1/16 inch, minimum, wet film.

C. Bituminous Dampproofing: Cold-applied, trowel-grade; asphalt base, volatile petroleum solvents, and other content, suitable for application by trowel on vertical and horizontal surfaces.

1. Composition: ASTM D4586/D4586M Type I, minimum, asbestos free.

2. VOC Content: Not more than permitted by local, State, and federal regulations.

3. Applied Thickness: 1/16 inch, minimum, wet film.

D. Primers, Mastics, and Related Materials: Type as recommended by dampproofing manufacturer.

2.03 **BITUMEN MATERIALS**

A. Hot Asphaltic Type:

1. Bitumen: ASTM D449/D449M, Type I, asphalt.

2. Primer: ASTM D41/D41M, compatible with substrate.

3. Sealing Mastic: Asphalt roof cement, ASTM D4586/D4586M, Type I, asbestos-free.

B. Coal Tar Type:

1. Bitumen: ASTM D450/D450M, Type II, coal tar pitch.

2. Primer: ASTM D43/D43M, coal tar type.

3. Sealing Mastic: ASTM D5643/D5643M, coal tar roof cement, asbestos-free.

C. Cold Asphaltic Type:

1. Bitumen: Emulsified asphalt, ASTM D1227with fiber reinforcement other than asbestos (Type II).

2. Asphalt Primer: ASTM D41/D41M, compatible with substrate.

PART 3 EXECUTION

3.01 **EXAMINATION**

A. Verify existing conditions are acceptable prior to starting this work.

B. Verify substrate surfaces are durable, free of matter detrimental to adhesion or application of dampproofing system.

C. Verify that items penetrating surfaces to receive dampproofing are securely installed.

3.02 **PREPARATION**

A. Protect adjacent surfaces not designated to receive dampproofing.

B. Clean and prepare surfaces to receive dampproofing in accordance with manufacturer's instructions.

C. Do not apply dampproofing to surfaces unacceptable to manufacturer.

D. Apply mastic to seal penetrations, small cracks, or minor honeycombs in substrate.

3.03 **APPLICATION**

A. Foundation Walls: Apply two coats of asphalt dampproofing.

B. Foundation Walls: Patch disturbed areas of existing dampproofing with two additional coats of dampproofing of the same generic type.

C. Perform this work in accordance with manufacturer's instructions and NRCA (WM) applicable requirements.

D. Prime surfaces in accordance with manufacturer's instructions and NRCA (WM) applicable requirements.

E. Apply bitumen spray application, trowel or brush..

F. Apply bitumen at a temperature limited by equiviscous temperature (EVT) plus or minus 25 degrees F; do not exceed finish blowing temperature for four hours.

G. Apply bitumen in one coat, continuous and uniform, at a rate of 25 sq ft/gal per coat.

H. Apply from 2 inches below finish grade elevation down to top of footings.

I. Seal items watertight with mastic, that project through dampproofing surface.

J. Immediately backfill against dampproofing to protect from damage.

END OF SECTION

SECTION 07 19 15
ICE AND WATER SHIELD

PART 1 GENERAL

1.01 DESCRIPTION

A. Scope: includes the furnishing of all labor, materials, and equipment required for the completion of ice and water shield waterproof membrane shown on the drawings and specified herein.

B. The General Conditions, the Supplementary General Conditions, and the General Requirements are a part of the requirements of this section.

1.02 REGULATIONS, REFERENCES, AND STANDARDS

A. Applicable sections and referenced sections of the following standards, latest edition in effect on date of Invitation for Bids, form a part of these specifications.

1. American Society for Testing and Materials (ASTM)
2. Occupational Safety and Health Administration (OSHA)
3. Federal Specifications (FS)
4. Underwriters Laboratory (UL)

1.03 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. All materials: shall be delivered to the site in original, unopened containers.

B. Waterproofing materials: shall be kept dry at all times. Where materials must be stored outdoors, the materials shall be covered with polyethylene tarps or other suitable waterproof tarps.

1.04 SHOP DRAWINGS

A. Submit: the manufacturer's specifications and samples of materials proposed for installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Approved manufacturer: W.R. Grace

2.02 MATERIALS

A. Membrane: W.R. Grace Ice and Water Shield

1. Color: Gray-Black
2. Thickness (mils): 40 minimum
3. Tensile strength (psi): 250 minimum, ASTM D412 (Die C) modified
4. Elongation-ultimate failure of rubberized asphalt (%): 250 minimum, ASTM D412 (Die C) modified
5. Pliability: 180N bend (1" mandrel at -25NF): Unaffected, ASTM D146
6. Adhesion to plywood (lb/inch width): 3.0 minimum

PART 3 EXECUTION

3.01 PREPARATION

A. Inspect: the area for defects or irregularities in the surfaces to receive ice and water shield that would preclude the proper installation of the single-ply membrane roofing system.

1. Report any unacceptable conditions to the General Contractor. Do not proceed until substrate is acceptable.

3.02 **APPLICATION**

A. The membrane should not be folded over the roof edge unless the edge is protected by a gutter, flashing, or fascia board.

B. Apply ice and water shield only in fair weather at air temperatures of 35N or higher.

C. Ice and water shield must not be left permanently exposed to sunlight. It must always be adhered directly to the plywood structural deck and be covered by shingles or other roofing materials.

D. Ice and water shield is a vapor barrier. If the entire deck is covered by the membrane, space under the deck must be properly ventilated.

END OF SECTION

SECTION 07 21 00
THERMAL INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Board insulation and integral vapor retarder at perimeter foundation wall and underside of floor slabs.

B. Batt insulation in exterior wall construction.

C. Batt insulation for filling perimeter window and door shim spaces and crevices in exterior wall and roof.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Field-applied termiticide for concrete slabs and foundations.

B. Section 06 10 00 - Rough Carpentry: Supporting construction for batt insulation.

C. Section 07 21 19 - Foamed-In-Place Insulation: Plastic foam insulation other than boards.

D. Section 07 25 00 - Weather Barriers: Separate air barrier and vapor retarder materials.

E. Section 07 84 00 - Firestopping: Insulation as part of fire-rated through-penetration assemblies.

F. Section 09 21 16 - Gypsum Board Assemblies: Acoustic insulation inside walls and partitions.

1.03 REFERENCE STANDARDS

A. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation 2018.

B. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing 2017.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2018b.

D. ASTM E136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace At 750 Degrees C 2016a.

E. ASTM E2357 - Standard Test Method for Determining Air Leakage of Air Barrier Assemblies 2018.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on product characteristics, performance criteria and product limitations.

C. ABAA Field Quality Control Submittals: Submit third-party reports of testing and inspection required by ABAA QAP.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

E. Manufacturer's Installation Instructions: Include information on special environmental conditions required for installation and installation techniques.

F. ABAA Manufacturer Qualification: Submit documentation of current evaluation of proposed manufacturer and materials.

G. ABAA Installer Qualification: Submit documentation of current contractor accreditation and current installer certification. Keep copies of contractor accreditation and installer

certification on site during and after installation. Present on-site documentation upon request.

1.05 **QUALITY ASSURANCE**

A. Air Barrier Association of America (ABAA) Quality Assurance Program (QAP); www.airbarrier.org/#sle:

1. Installer Qualification: Use accredited contractor, certified installers, evaluated materials, and third-party field quality control audit.

2. Manufacturer Qualification: Use evaluated materials from a single manufacturer regularly engaged in air barrier material manufacture. Use secondary materials approved in writing by primary material manufacturer.

1.06 **FIELD CONDITIONS**

A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

PART 2 PRODUCTS

2.01 **APPLICATIONS**

A. Insulation Under Concrete Slabs: Extruded polystyrene (XPS) board.

B. Insulation at Perimeter of Foundation: Extruded polystyrene (XPS) board.

C. Insulation in Wood Framed Walls: Batt insulation with no vapor retarder.

D. Insulation in Exterior Vertical Surfaces in Attic: Batt insulation with integral or separate vapor retarder; contractor's option.

2.02 **FOAM BOARD INSULATION MATERIALS**

A. Extruded Polystyrene (XPS) Board Insulation: Complies with ASTM C578 with either natural skin or cut cell surfaces.

1. Type and Compressive Resistance: Type IV, 25 psi (173 kPa), minimum.

2. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.

3. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.

4. Type and Thermal Resistance, R-value: Type IV, 5.0 (0.88) per 1 inch thickness at 75 degrees F mean temperature.

5. Type and Water Absorption: Type IV, 0.3 percent by volume, maximum, by total immersion.

6. Manufacturers:

a. Dow Chemical Company; STYROFOAM HIGHLOAD 40: www.dowbuildingsolutions.com/#sle.

b. Kingspan Insulation LLC; GreenGuard XPS TYPE IV 25 PSI: www.trustgreenguard.com/#sle.

c. Kingspan Insulation LLC; GreenGuard XPS TYPE VI 40 PSI: www.trustgreenguard.com/#sle.

d. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 **BATT INSULATION MATERIALS**

A. Where batt insulation is indicated, high-density glass fiber shall be used in all exterior walls and either glass fiber or mineral fiber batt insulation may be used in fire and sound rated

interior wall as specificed per the invidual UL Design, at Contractor 's option. At fire rated horizontal assemblies, glass fiber batt insulation shall be used as specified in the UL Design. Refer to Drawings.

B. Glass Fiber Batt Insulation: Flexible preformed batt or blanket, complying with ASTM C665; friction fit.

1. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
2. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.
3. Combustibility: Non-combustible, when tested in accordance with ASTM E136.
4. Formaldehyde Content: Zero.
5. Thermal Resistance: At exterior walls: minimun R-value of 20 , unless otherwise noted.
6. Thickness: At exterior walls: 5-1/2 inch. At fire and sound rated interior fire partition separation walls: 3-1/2 inch. At fire and sound rated horizontal assemblies: 6 inch.
7. Facing: Aluminum foil, flame spread 25 rated; one side at Exterior Vertical Surfaces in Attic Space with seams taped (or Unfaced with separate vapor retarder at Contractor's option), Unfaced at Exterior Walls and Interior Fire and Sound Rated walls and horizontal assemblies.
8. Manufacturers:
    a. CertainTeed Corporation: www.certainteed.com/#sle.
    b. Johns Manville www.jm.com/#sle.
    c. Owens Corning Corporation; EcoTouch PINK FIBERGLAS Insulation: www.ocbuildingspec.com/#sle.
    d. Substitutions: See Section 01 60 00 - Product Requirements.

C. Mineral Fiber Batt Insulation: Flexible or semi-rigid preformed batt or blanket, complying with ASTM C665; friction fit; unfaced flame spread index of 0 (zero) when tested in accordance with ASTM E84.

1. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
2. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.
3. Thermal Resistance: At exterior walls: minimun R-value of 20, unless otherwise noted.
4. Thickness: At rated interior fire partition separation walls: 3-1/2" inch
5. Manufacturers:
    a. Johns Manville; MinWool Sound Attenuation Fire Batts: www.jm.com/#sle.
    b. Knauf Insulation; EcoBatt Insulation: www.knaufinsulation.com/#sle.
    c. ROCKWOOL (ROXUL, Inc); COMFORTBATT: www.rockwool.com/#sle.
    d. ROCKWOOL (ROXUL, Inc); AFB: www.rockwool.com/#sle.
    e. ROCKWOOL (ROXUL, Inc); AFB evo™: www.rockwool.com/#sle.
    f. Thermafiber, Inc; SAFB: www.thermafiber.com/#sle.
    g. Thermafiber, Inc; SAFB FF: www.thermafiber.com/#sle.
    h. Substitutions: See Section 01 60 00 - Product Requirements.

2.04 **ACCESSORIES**

A. Sheet Vapor Retarder: Specified in Section 07 25 00.

B. Sheet Vapor Retarder: Natural color polyethylene film for above grade application, 10 mil, 0.010 inch thick min. Class I or Class II vapor retarder.
   1. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
   2. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.
   3. Vapor Transmission Rating: max. 0.2 perms

C. Tape: Reinforced polyethylene film with acrylic pressure sensitive adhesive.
   1. Application: Sealing of interior circular penetrations, such as pipes or cables.
   2. Width: Are required for application.

D. Flashing Tape: Special polyolefin film with high performance adhesive.
   1. Application: Interior window and door sill flashing tape.
   2. Width: As required for application.

E. Tape: Bright aluminum self-adhering type, mesh reinforced, 2 inch wide.

F. Tape joints of rigid insulation in accordance with roofing and insulation manufacturers' instructions.

G. Nails or Staples: Steel wire; electroplated or galvanized; type and size to suit application.

H. Adhesive: Type recommended by insulation manufacturer for application.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation.

B. Verify substrate surfaces are flat, free of honeycomb, fins, irregularities or materials or substances that may impede adhesive bond.

3.02 BOARD INSTALLATION AT FOUNDATION PERIMETER

A. Install boards horizontally on foundation perimeter.
   1. Place boards to maximize adhesive contact.
   2. Install in running bond pattern.
   3. Butt edges and ends tightly to adjacent boards and to protrusions.

B. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

3.03 BOARD INSTALLATION UNDER CONCRETE SLABS

A. Place insulation under slabs on grade after base for slab has been compacted.

B. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

C. Prevent insulation from being displaced or damaged while placing vapor retarder and placing slab.

3.04 BATT INSTALLATION

A. Install insulation in accordance with manufacturer's instructions.

B. Install in exterior wall spaces without gaps or voids. Do not compress insulation.

C. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.

D. Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation.

3.05 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Coordination of Air Barrier Association of America (ABAA) Tests and Inspections:

1. Provide testing and inspection required by ABAA Quality Assurance Program (QAP).
2. Notify in ABAA writing of schedule for air barrier work, and allow adequate time for testing and inspection.
3. Cooperate with ABAA testing agency.
4. Allow access to air barrier work areas and staging.
5. Do not cover air barrier work until tested, inspected, and accepted.

3.06 **PROTECTION**

A. Do not permit installed insulation to be damaged prior to its concealment.

END OF SECTION

SECTION 07 21 19
FOAMED-IN-PLACE INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Foamed-in-place insulation.

B. Protective intumescent coating.

1.02 REFERENCE STANDARDS

A. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus 2017.

B. ASTM D2842 - Standard Test Method for Water Absorption of Rigid Cellular Plastics 2012.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2018b.

D. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials 2016.

E. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen 2004 (Reapproved 2012).

F. ASTM E2178 - Standard Test Method for Air Permeance of Building Materials 2013.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide product description, insulation properties, overcoat properties, and preparation requirements.

C. Certificates: Certify that products of this section meet or exceed specified requirements.

D. ABAA Field Quality Control Submittals: Submit third-party reports of testing and inspection required by ABAA QAP.

E. Manufacturer's Installation Instructions: Indicate special procedures, and perimeter conditions requiring special attention.

F. ABAA Manufacturer Qualification: Submit documentation of current evaluation of proposed manufacturer and materials.

G. ABAA Installer Qualification: Submit documentation of current contractor accreditation and current installer certification. Keep copies of all contractor accreditation and installer certification on site during and after installation. Present on-site documentation upon request.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with not less than three years of documented experience.

B. Applicator Qualifications: Company specializing in performing work of the type specified, with minimum three years documented experience.

C. Air Barrier Association of America (ABAA) Quality Assurance Program (QAP); www.airbarrier.org/#sle:

1. Installer Qualification: Use accredited contractor, certified installers, evaluated materials, and third-party field quality control audit.

2. Manufacturer Qualification: Use evaluated materials from a single manufacturer regularly engaged in air barrier material manufacture. Use secondary materials approved in writing by primary material manufacturer.

1.05 **FIELD CONDITIONS**

A. Do not apply foam when temperature is below that specified by the manufacturer for ambient air and substrate.

B. Do not apply foam when temperature is within 5 degrees F of dew point.

PART 2 PRODUCTS

2.01 **MANUFACTURERS**

A. Foamed-In-Place Insulation:

1. BASF Corporation; WALLTITE US Series Closed Cell: www.spf.basf.com/#sle.
2. Icynene-Lapolla; Icynene ProSeal: www.icynene.com/#sle.
3. Johns Manville; JM Corbond III Closed Cell Spray Polyurethane Foam: www.jm.com/#sle.
4. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 **MATERIALS**

A. Foamed-In-Place Insulation: Medium-density, rigid or semi-rigid, closed cell polyurethane foam; foamed on-site, using blowing agent of water or non-ozone-depleting gas.

1. Regulatory Requirements: Comply with applicable code for flame and smoke, concealment and overcoat limitations.
2. Thermal Resistance: R-value of 6.5, minimum, per 1 inch thickness at 75 degrees F mean temperature when tested in accordance with ASTM C518.
3. Water Vapor Permeance: Vapor retarder; 2 perms, maximum, when tested at intended thickness in accordance with ASTM E96/E96M, desiccant method.
4. Water Absorption: Less than 2 percent by volume, maximum, when tested in accordance with ASTM D2842.
5. Air Permeance: 0.04 cfm/sq ft, maximum, when tested at intended thickness in accordance with ASTM E2178 or ASTM E283 at 1.57 psf.
6. Closed Cell Content: At least 95 percent.
7. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/450, maximum, when tested in accordance with ASTM E84.
8. Basis of Design:
    a. Icynene-Lapolla; Icynene ProSeal MD-C-200 Closed Cell.
9. Other Acceptable Manufacturers:
    a. BASF Corporation; WALLTITE US: www.spf.basf.com/#sle.
    b. Icynene-Lapolla; Icynene ProSeal: www.icynene.com/#sle.
    c. Johns Manville; JM Corbond III Closed Cell Spray Polyurethane Foam: www.jm.com/#sle.
10. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 **ACCESSORIES**

A. Primer: As required by insulation manufacturer.

B. Protective Coating: Intumescent coating of type recommended by insulation manufacturer and as required to comply with applicable codes.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify work within construction spaces or crevices is complete prior to insulation application.

B. Verify that surfaces are clean, dry, and free of matter that may inhibit insulation or overcoat adhesion.

3.02 PREPARATION

A. Mask and protect adjacent surfaces from over spray or dusting.

B. Apply primer in accordance with manufacturer's instructions.

3.03 APPLICATION

A. Apply insulation in accordance with manufacturer's instructions.

B. Apply insulation by spray method, to a uniform monolithic density without voids.

C. Apply to achieve a thermal resistance R-value of 49, unless otherwise noted..

D. Patch damaged areas.

E. Where applied to voids and gaps assure space for expansion to avoid pressure on adjacent materials that may bind operable parts.

F. Trim excess away for applied trim or remove as required for continuous sealant bead.

3.04 FIELD QUALITY CONTROL

A. Field inspections and tests will be performed by an independent testing agency under provisions of Section 01 40 00 - Quality Requirements.

B. Coordination of ABAA Tests and Inspections:

1. Provide testing and inspection required by ABAA QAP.
2. Notify in ABAA writing of schedule for air barrier work. Allow adequate time for testing and inspection.
3. Cooperate with ABAA testing agency.
4. Allow access to air barrier work areas and staging.
5. Do not cover air barrier work until tested, inspected, and accepted.

3.05 PROTECTION

A. Do not permit subsequent construction work to disturb applied insulation.

END OF SECTION

SECTION 07 25 00
WEATHER BARRIERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Water-Resistive Barrier: Under exterior wall cladding, over sheathing or other substrate; not air tight or vapor retardant.

B. Vapor Retarders: Materials to make exterior walls, joints between exterior walls and roof, joints around frames of openings in exterior walls and [____] water vapor resistant and air tight.

C. Air Barriers: Materials that form a system to stop passage of air through exterior walls, joints between exterior walls and roof and joints around frames of openings in exterior walls.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Vapor retarder under concrete slabs on grade.

B. Section 06 10 00 - Rough Carpentry: Sheathing with integral water-resistive and air barrier.

C. Section 07 21 00 - Thermal Insulation: Vapor retarder installed in conjunction with batt insulation.

D. Section 07 21 19 - Foamed-In-Place Insulation: Insulation with integral water-resistive and air barrier.

E. Section 07 62 00 - Sheet Metal Flashing and Trim: Metal flashings installed in conjunction with weather barriers.

F. Section 07 92 00 - Joint Sealants: Sealing building expansion joints.

1.03 DEFINITIONS

A. Weather Barrier: Assemblies that form either water-resistive barriers, air barriers, or vapor retarders.

B. Air Barrier: Air tight barrier made of material that is relatively air impermeable but water vapor permeable, both to the degree specified, with sealed seams and with sealed joints to adjacent surfaces. Note: For the purposes of this specification, vapor impermeable air barriers are classified as vapor retarders.

C. Vapor Retarder: Air tight barrier made of material that is relatively water vapor impermeable, to the degree specified, with sealed seams and with sealed joints to adjacent surfaces.

1. Water Vapor Permeance: For purposes of conversion, 57.2 ng/(Pa s sq m) = 1 perm.

D. Water-Resistive Barrier: Water-shedding barrier made of material that is moisture resistant, to the degree specified, intended to be installed to shed water without sealed seams.

1.04 REFERENCE STANDARDS

A. ASTM D226/D226M - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing 2017.

B. ASTM D4397 - Standard Specification for Polyethylene Sheeting for Construction, Industrial, and Agricultural Applications 2016.

C. ICC-ES AC38 - Acceptance Criteria for Water-Resistive Barriers 2016.

D. ICC-ES AC148 - Acceptance Criteria for Flexible Flashing Materials 2017.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on material characteristics.

C. ABAA Field Quality Control Submittals: Submit third-party reports of testing and inspection required by ABAA QAP.

D. Manufacturer's Installation Instructions: Indicate preparation.

E. ABAA Manufacturer Qualification: Submit documentation of current evaluation of proposed manufacturer and materials.

F. ABAA Installer Qualification: Submit documentation of current contractor accreditation and current installer certification; keep copies of each contractor accreditation and installer certification on site during and after installation, and present on-site documentation upon request.

G. Testing Agency Qualification Statement.

1.06 **QUALITY ASSURANCE**

A. Air Barrier Association of America (ABAA) Quality Assurance Program (QAP); www.airbarrier.org/#sle:

1. Installer Qualification: Use accredited contractor, certified installers, evaluated materials, and third-party field quality control audit.

2. Manufacturer Qualification: Use evaluated materials from a single manufacturer regularly engaged in air barrier material manufacture, and use secondary materials approved in writing by primary material manufacturer.

1.07 **FIELD CONDITIONS**

A. Maintain temperature and humidity recommended by the materials manufacturers before, during and after installation.

PART 2 PRODUCTS

2.01 **WEATHER BARRIER ASSEMBLIES**

A. Water-Resistive Barrier: Provide on exterior walls under exterior stucco finish and below roofing as indicated below and on drawings.

1. Use asphalt felt unless otherwise indicated.

2. Under Portland cement stucco, use one layer of asphalt felt over Zip System Wall Sheathing.

3. Under ashalt roofing shingles. use two separate layers of asphalt felt.

B. Air Barrier:

1. Air Barrier at exterior walls is integral to Zip System Wall Panels, as indicated in Section 06 10 00 and on drawings.

2. Air Barrier at roof is integral in the installation of the closed-cell spray foam insulation, as indicated in Setion 07 21 19 and on drawings.

C. Interior Vapor Retarder:

1. On exposed soil in crawl space and below interior concrete floor slabs use vapor retarder sheet, mechanically fastened type.

2.02 **WATER-RESISTIVE BARRIER MATERIALS (NEITHER AIR BARRIER OR VAPOR RETARDER)**

A. Asphalt Felt: ASTM D226/D226M Type I felt (No.15) or as indicted in drawings.

B. Building Paper: Asphalt-saturated Kraft building paper complying with requirements of ICC-ES AC38 Grade D.

2.03 **VAPOR RETARDER MATERIALS (AIR BARRIER AND WATER-RESISTIVE)**

A. Vapor Retarder Sheet: ASTM D4397 polyethylene film reinforced with glass fiber square mesh, clear.

1. Thickness: 10 mil, 0.010 inch.
2. Water Vapor Permeance: As required by referenced standard for thickness specified. Max. .1 perm. Class I Vapor Retarder.
3. Seam and Perimeter Tape: Polyethylene self adhering type, mesh reinforced, 2 inches wide, compatible with sheet material.

2.04 **ACCESSORIES**

A. Sealants, Tapes, and Accessories for Sealing Weather Barrier and Sealing Weather Barrier to Adjacent Substrates: As specified or as recommended by weather barrier manufacturer.

B. Flexible Flashing: Sheathing fabric saturated with air barrier coating and complying with the applicable requirements of ICC-ES AC148.

C. Liquid Flashing: One part, fast curing, non-sag, elastomeric, gun grade, trowelable liquid flashing.

D. Stainless Steel Flashing: Flexible flashing with 8 mil, 0.008 inch thick sheet of Type 304 stainless steel, 8 mil, 0.008 inch of butyl adhesive and a siliconized release liner.

PART 3 EXECUTION

3.01 **EXAMINATION**

A. Verify that surfaces and conditions are ready to accept the work of this section.

3.02 **PREPARATION**

A. Remove projections, protruding fasteners, and loose or foreign matter that might interfere with proper installation.

B. Clean and prime substrate surfaces to receive adhesives in accordance with manufacturer's instructions.

3.03 **INSTALLATION**

A. Install materials in accordance with manufacturer's instructions.

B. Water-Resistive Barriers: Install continuous barrier over surfaces indicated, with sheets lapped to shed water but with seams not sealed.

C. Vapor Retarders: Install continuous air tight barrier over surfaces indicated, with sealed seams and with sealed joints to adjacent surfaces.

D. Apply sealants and adhesives within recommended application temperature ranges. Consult manufacturer if temperature is out of this range.

E. Mechanically Fastened Sheets - On Exterior:

1. Install sheets shingle-fashion to shed water, with seams generally horizontal.
2. Overlap seams as recommended by manufacturer but at least 6 inches.
3. Overlap at outside and inside corners as recommended by manufacturer but at least 12 inches.
4. Attach to framed construction with fasteners extending through sheathing into framing. Space fasteners at 12 to 18 inches on center along each framing member supporting sheathing.

5. For applications specified to be air tight, seal seams, laps, penetrations, tears, and cuts with self-adhesive tape; use only large-headed, gasketed fasteners recommended by the manufacturer.
6. Install water-resistive barrier over jamb flashings.
7. Install air barrier and vapor retarder UNDER jamb flashings.
8. Install head flashings under weather barrier.
9. At openings to be filled with frames having nailing flanges, wrap excess sheet into opening; at head, seal sheet over flange and flashing.

F. Mechanically Fastened Sheets - Vapor Retarder On Interior:

1. When insulation is to be installed in assembly, install vapor retarder over insulation.
2. Seal seams, laps, perimeter edges, penetrations, tears, and cuts with self-adhesive tape, making air tight seal.
3. Locate laps at a framing member; at laps fasten one sheet to framing member then tape overlapping sheet to first sheet.
4. Seal entire perimeter to structure, window and door frames, and other penetrations.
5. Where conduit, pipes, wires, ducts, outlet boxes, and other items are installed in insulation cavity, pass vapor retarder sheet behind item but over insulation and maintain air tight seal.

G. Self-Adhered Sheets:

1. Prepare substrate in manner recommended by sheet manufacturer; fill and tape joints in substrate and between dissimilar materials.
2. Lap sheets shingle-fashion to shed water and seal laps air tight.
3. Once sheets are in place, press firmly into substrate with resilient hand roller; ensure that laps are firmly adhered with no gaps or fishmouths.
4. Use same material, or other material approved by sheet manufacturer for the purpose, to seal to adjacent construction and as flashing.
5. At wide joints, provide extra flexible membrane allowing joint movement.

H. Coatings:

1. Prepare substrate in manner recommended by coating manufacturer; treat joints in substrate and between dissimilar materials as recommended by manufacturer.
2. Use flashing to seal to adjacent construction and to bridge joints.

I. Openings and Penetrations in Exterior Weather Barriers:

1. Install flashing over sills, covering entire sill frame member, extending at least 5 inches onto weather barrier and at least 6 inches up jambs; mechanically fasten stretched edges.
2. At openings to be filled with frames having nailing flanges, seal head and jamb flanges using a continuous bead of sealant compressed by flange and cover flanges with sealing tape at least 4 inches wide; do not seal sill flange.
3. At openings to be filled with non-flanged frames, seal weather barrier to each side of opening framing, using flashing at least 9 inches wide, covering entire depth of framing.
4. At head of openings, install flashing under weather barrier extending at least 2 inches beyond face of jambs; seal weather barrier to flashing.

5. At interior face of openings, seal gap between window/door frame and rough framing, using joint sealant over backer rod.
6. Service and Other Penetrations: Form flashing around penetrating item and seal to weather barrier surface.

3.04 **FIELD QUALITY CONTROL**

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Coordination of ABAA Tests and Inspections:

1. Provide testing and inspection required by ABAA QAP.
2. Notify ABAA in writing of schedule for air barrier work, and allow adequate time for testing and inspection.
3. Cooperate with ABAA testing agency.
4. Allow access to air barrier work areas and staging.
5. Do not cover air barrier work until tested, inspected, and accepted.

C. Do not cover installed weather barriers until required inspections have been completed.

D. Obtain approval of installation procedures by the weather barrier manufacturer based on a mock-up installed in place, prior to proceeding with remainder of installation.

3.05 **PROTECTION**

A. Do not leave materials exposed to weather longer than recommended by manufacturer.

B. Do not leave paper- or felt-based barriers exposed to weather for longer than one week.

END OF SECTION

SECTION 07 31 13
ASPHALT SHINGLES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Asphalt shingle roofing.

B. Flexible sheet membranes for eave protection, underlayment and valley protection.

C. Associated metal flashings and accessories.

1.02 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Roof sheathing.

B. Section 07 62 00 - Sheet Metal Flashing and Trim: Edge and cap flashings.

C. Section 07 71 23 - Manufactured Gutters and Downspouts.

1.03 REFERENCE STANDARDS

A. ASTM D226/D226M - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing 2017.

B. ASTM D3161/D3161M - Standard Test Method for Wind-Resistance of Steep Slope Roofing Products (Fan-Induced Method) 2016a.

C. ASTM D3462/D3462M - Standard Specification for Asphalt Shingles Made From Glass Felt and Surfaced with Mineral Granules 2016.

D. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement, Asbestos-Free 2007, with Editorial Revision (2012).

E. ASTM E108 - Standard Test Methods for Fire Tests of Roof Coverings 2017.

F. ASTM F1667 - Standard Specification for Driven Fasteners: Nails, Spikes, and Staples 2018a.

G. NRCA (RM) - The NRCA Roofing Manual 2018.

H. SMACNA (ASMM) - Architectural Sheet Metal Manual 2012.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data indicating material characteristics.

C. Samples: Submit two samples of each shingle color indicating color range and finish texture/pattern ; for color selection.

D. Manufacturer's Installation Instructions: Indicate installation criteria and procedures.

E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

F. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

G. Maintenance Materials: Furnish the following for Owner 's use in maintenance of project.

1. See Section 01 60 00 - Product Requirements, for additional provisions.

2. Extra Shingles: 200 sq ft of each type and color.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Asphalt Shingles:

1. Atlas Roofing Corporation www.atlasroofing.com/#sle.
2. GAF; Timberline HD Reflector Series: www.gaf.com/#sle.
3. IKO Industries Inc; Armourshake: www.iko.com/#sle.
4. Owens Corning Corp www.owenscorning.com/#sle.
5. Tamko Building Products; Heritage: www.tamko.com/.
6. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 **ASPHALT SHINGLES**

A. Asphalt Shingles: Asphalt-coated glass felt, mineral granule surfaced, complying with ASTM D3462.

1. Fire Resistance: Class A, complying with ASTM E108.
2. Wind Resistance: Class A, when tested in accordance with ASTM D3161.
3. Weight: 225 lb/100 sq ft.
4. Self-sealing type.
5. Style: Square.
6. Color: As selected by Architect.

2.03 **SHEET MATERIALS**

A. Eave Protection Membrane:

1. Eave Protection Membrane: Asphalt-saturated organic roofing felt, unperforated, complying with ASTM D226/D226M, Type I ("No.15").

B. Underlayment: Asphalt-saturated organic roofing felt, unperforated, complying with ASTM D226/D226M, Type I ("No.15").

2.04 **ACCESSORIES**

A. Roofing Nails: Standard round wire shingle type, galvanized steel, stainless steel, aluminum roofing nails or copper roofing nails, minimum 3/8 inch head diameter, 12 gage, 0.109 inch nail shank diameter, 1-1/2 inch long and complying with ASTM F1667.

B. Staples: Standard wire shingle type, of hot dipped zinc coated steel, 16 wire gage, 0.0508 inch diameter, 15/16 inch crown width, of sufficient length to penetrate through roof sheathing or 3/4 inch into roof sheathing or decking.

C. Plastic Cement: ASTM D4586/D4586M, asphalt roof cement.

2.05 **METAL FLASHINGS**

A. Metal Flashings: Provide sheet metal eave edge, gable edge, ridge, open valley flashing and other flashing indicated.

1. Form flashings to profiles indicated on drawings.
2. Form sections square and accurate to profile, in maximum possible lengths, free from distortion or defects detrimental to appearance or performance.
3. Hem exposed edges of flashings minimum 1/4 inch on underside.
4. Coat concealed surfaces of flashings with bituminous paint.

PART 3 EXECUTION

3.01 **EXAMINATION**

A. Verify existing conditions prior to beginning work.

B. Verify that roof deck is of sufficient thickness to accept fasteners.

C. Verify that roof penetrations and plumbing stacks are in place and flashed to deck surface.

D. Verify roof openings are correctly framed.

E. Verify deck surfaces are dry, free of ridges, warps, or voids.

3.02 **PREPARATION**

A. Seal roof deck joints wider than 1/16 inch as recommended by shingle manufacturer.

B. At areas where eave protection membrane is to be adhered to substrate, fill knot holes and surface cracks with latex filler.

C. Broom clean deck surfaces before installing underlayment or eave protection.

D. Install eave edge flashings tight with fascia boards, weather lap joints 2 inches and seal with plastic cement, and secure flange with nails spaced 12 inches on center.

3.03 **INSTALLATION - EAVE PROTECTION MEMBRANE**

A. Install eave protection membrane from eave edge to minimum 4 ft up-slope beyond interior face of exterior wall.

B. Install eave protection membrane in accordance with manufacturer's instructions and NRCA (RM) applicable requirements.

3.04 **INSTALLATION - UNDERLAYMENT**

A. Underlayment At Roof Slopes Up to 4:12: Install two layers of underlayment over entire roof area, with ends and edges weather lapped minimum 4 inches, stagger end laps of each consecutive layer, and nail in place.

B. Weather lap and seal watertight with plastic cement any items projecting through or mounted on roof.

3.05 **INSTALLATION - VALLEY PROTECTION**

A. Install valley protection in accordance with SMACNA (ASMM),

B. At Exposed Valleys: Install one layer of 26 gauge sheet metal flashing, minimum 24 inches wide, centered over open valley and crimped to guide water flow, weather lap joints minimum 2 inch wide band of lap cement along each edge of first layer, press roll roofing into cement, nail in place minimum 18 inches on center and 1 inch from edges. Install over Ice and Water Shield and 30# felt.

3.06 **INSTALLATION - METAL FLASHING AND ACCESSORIES**

A. Install flashings in accordance with manufacturer's instructions and NRCA (RM) applicable requirements.

B. Weather lap joints minimum 2 inches and seal weather tight with plastic cement.

C. Secure in place with nails at 18 inches on center, and conceal fastenings.

D. Items Projecting Through or Mounted on Roofing: Flash and seal weather tight with plastic cement.

3.07 **INSTALLATION - SHINGLES**

A. Install shingles in accordance with manufacturer's instructions manufacturer's instructions and NRCA (RM) applicable requirements.

1. Fasten individual shingles using two nails per shingle, or as required by manufacturer and local building code, whichever is greater.

2. Fasten strip shingles using four nails per strip, or as required by manufacturer and local building code, whichever is greater.

B. Place shingles in straight coursing pattern with 5 inch weather exposure to produce double thickness over full roof area, and provide double course of shingles at eaves.

C. Project first course of shingles 3/4 inch beyond fascia boards.

D. Extend shingles 1/2 inch beyond face of gable edge fascia boards.

E. Coordinate installation of roof mounted components or work projecting through roof with weather tight placement of counterflashings.

F. Complete installation to provide weather tight service.

3.08 **PROTECTION**

A. Do not permit traffic over finished roof surface.

END OF SECTION

SECTION 07 46 46
FIBER-CEMENT SIDING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fiber-cement siding.

1.02 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Siding substrate.

B. Section 06 10 00 - Rough Carpentry: Water-resistive barrier under siding.

C. Section 07 92 00 - Joint Sealants: Sealing joints between siding and adjacent construction and fixtures.

D. Section 09 91 13 - Exterior Painting: Field painting.

1.03 REFERENCE STANDARDS

A. ASTM C1186 - Standard Specification for Flat Fiber Cement Sheets 2008 (Reapproved 2016).

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit manufacturer's data sheets on each product to be used, including:

1. Manufacturer's requirements for related materials to be installed by others.
2. Preparation instructions and recommendations.
3. Storage and handling requirements and recommendations.
4. Installation methods, including nail patterns.

C. Maintenance Instructions: Periodic inspection recommendations and maintenance procedures.

D. Warranty: Submit copy of manufacturer’s warranty, made out in Owner ’s name, showing that it has been registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing work of the type specified in this section with minimum three years of experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store products under waterproof cover and elevated above grade, on a flat surface.

1.07 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 FIBER-CEMENT SIDING

A. Lap Siding: Individual horizontal boards made of cement and cellulose fiber formed under high pressure with integral surface texture, complying to ASTM C1186, Type A, Grade II; with machined edges, for nail attachment.

1. Style: Standard lap style.
2. Texture: Simulated cedar grain.
3. Length: 12 ft, nominal.

4. Width (Height): 5-1/4 inches.
5. Thickness: 5/16 inch, nominal.
6. Finish: Factory applied topcoat.
7. Color: As selected by Architect from manufacturers full range of available colors.
8. Warranty: 30 year limited; transferable.
9. Manufacturers:
    a. James Hardie Building Products, Inc www.jameshardie.com/#sle.
    b. Substitutions: See Section 01 60 00 - Product Requirements.

B. Panel Siding: Vertically oriented panels made of cement and cellulose fiber formed under high pressure with integral surface texture, complying to ASTM C1186, Type A, Grade II; with machined edges, for nail attachment.
1. Texture: Simulated cedar grain, vertically grooved.
2. Length (Height): 96 inches, nominal.
3. Width: 48 inches.
4. Thickness: 5/16 inch, nominal.
5. Finish: Factory applied topcoat.
6. Color: As selected by Architect from manufacturers full range of available colors.
7. Warranty: 30 year limited; transferable.
8. Manufacturers:
    a. James Hardie Building Products, Inc: www.jameshardie.com/#sle.
    b. Substitutions: See Section 01 60 00 - Product Requirements.

C. Soffit Panels: Panels made of cement and cellulose fiber formed under high pressure with integral surface texture, complying with ASTM C1186, Type A, Grade II; with machined edges, for nail attachment.
1. Texture: Smooth.
2. Length: 96 inches, nominal.
3. Width: 48 inches.
4. Thickness: 5/16 inch, nominal.
5. Finish: Factory applied topcoat.
6. Color: As selected by Architect from manufacturers full range of available colors.
7. Manufacturer: Same as siding.

2.02 **ACCESSORIES**

A. Trim: Same material and texture as siding.

B. Fasteners: Galvanized or corrosion resistant; length as required to penetrate minimum 1-1/4 inch.

C. Sealant: Elastomeric, polyurethane or silyl-terminated polyether/polyurethane, and capable of being painted.

PART 3 EXECUTION

3.01 **EXAMINATION**

A. Examine substrate, clean and repair as required to eliminate conditions that would be detrimental to proper installation.

B. Verify that water-resistive barrier has been installed over substrate completely and correctly.

C. Do not begin until unacceptable conditions have been corrected.

D. If substrate preparation is responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 **PREPARATION**

A. Install Sheet Metal Flashing:

1. Above door and window trim and casings.

2. Above horizontal trim in field of siding.

3.03 **INSTALLATION**

A. Install in accordance with manufacturer's instructions and recommendations.

1. Read warranty and comply with terms necessary to maintain warranty coverage.

2. Use trim details indicated on drawings.

3. Touch up field cut edges before installing.

4. Pre-drill nail holes if necessary to prevent breakage.

B. Over Wood and Wood-Composite Sheathing: Fasten as required by manufacturer. Where not indicated by manufacturer; fasten siding through sheathing into studs.

C. Allow space for thermal movement between both ends of siding panels that butt against trim; seal joint between panel and trim with specified sealant.

D. Joints in Horizontal Siding: Avoid joints in lap siding except at corners; where joints are inevitable stagger joints between successive courses.

E. Joints in Vertical Siding: Install Z-flashing in horizontal joints between successive courses of vertical siding.

F. Do not install siding less than 6 inches from surface of ground nor closer than 1 inch to roofs, patios, porches, and other surfaces where water may collect.

G. After installation, seal joints except lap joints of lap siding; seal around penetrations, and paint exposed cut edges.

3.04 **PROTECTION**

A. Protect installed products until Date of Substantial Completion.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 07 62 00
SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fabricated sheet metal items, including flashings and counterflashings.

B. Sealants for joints within sheet metal fabrications.

1.02 RELATED REQUIREMENTS

A. Section 03 10 00 - Concrete Forming and Accessories: Placement of recessed reglets in formwork.

B. Section 04 20 00 - Unit Masonry: Metal flashings embedded in masonry.

C. Section 06 10 00 - Rough Carpentry: Wood nailers for sheet metal work.

D. Section 07 31 13 - Asphalt Shingles: Non-metallic flashings associated with shingle roofing.

E. Section 07 71 23 - Manufactured Gutters and Downspouts.

F. Section 07 92 00 - Joint Sealants: Sealing non-lap joints between sheet metal fabrications and adjacent construction.

1.03 REFERENCE STANDARDS

A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2018.

B. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar 2015.

C. ASTM B32 - Standard Specification for Solder Metal 2008 (Reapproved 2014).

D. ASTM B370 - Standard Specification for Copper Sheet and Strip for Building Construction 2012.

E. ASTM B749 - Standard Specification for Lead and Lead Alloy Strip, Sheet, and Plate Products 2014.

F. ASTM C920 - Standard Specification for Elastomeric Joint Sealants 2018.

G. ASTM D226/D226M - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing 2017.

H. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement, Asbestos-Free 2007, with Editorial Revision (2012).

I. CDA A4050 - Copper in Architecture - Handbook current edition.

J. SMACNA (ASMM) - Architectural Sheet Metal Manual 2012.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.

C. Samples: Submit two samples 4 by 4 inch in size illustrating metal finish color.

1.05 QUALITY ASSURANCE

A. Perform work in accordance with SMACNA (ASMM) and CDA A4050 requirements and standard details, except as otherwise indicated.

B. Maintain one copy of each document on site.

1.06 **DELIVERY, STORAGE, AND HANDLING**

A. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.

B. Prevent contact with materials that could cause discoloration or staining.

PART 2 PRODUCTS

2.01 **SHEET MATERIALS**

A. Galvanized Steel: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 24 gage, (0.0239 inch) thick base metal.

B. Pre-Finished Galvanized Steel: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 24 gage, (0.0239) inch thick base metal, shop pre-coated with PVDF coating.

1. Color: As selected by Architect from manufacturer's standard colors.

C. Lead Sheet: ASTM B749, 0.047 inch minimum thickness; UNS Number L51121.

D. Stainless Steel: ASTM A666, Type 304 alloy, soft temper, 28 gage, (0.0156 inch) thick; smooth No. 4 - Brushed finish.

2.02 **FABRICATION**

A. Form sections true to shape, accurate in size, square, and free from distortion or defects.

B. Form pieces in longest possible lengths.

C. Hem exposed edges on underside 1/2 inch; miter and seam corners.

D. Form material with flat lock seams, except where otherwise indicated; at moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.

E. Fabricate corners from one piece with minimum 18 inch long legs; seam for rigidity, seal with sealant.

F. Fabricate vertical faces with bottom edge formed outward 1/4 inch and hemmed to form drip.

G. Fabricate flashings to allow toe to extend 2 inches over roofing gravel. Return and brake edges.

2.03 **ACCESSORIES**

A. Fasteners: Galvanized steel, with soft neoprene washers.

B. Underlayment: ASTM D226/D226M, organic roofing felt, Type I (No. 15).

C. Primer: Zinc chromate type.

D. Protective Backing Paint: Zinc molybdate alkyd.

E. Concealed Sealants: Non-curing butyl sealant.

F. Exposed Sealants: ASTM C920; elastomeric sealant, with minimum movement capability as recommended by manufacturer for substrates to be sealed; color to match adjacent material.

G. Plastic Cement: ASTM D4586/D4586M, Type I.

H. Reglets: Recessed type, galvanized steel; face and ends covered with plastic tape.

I. Solder: ASTM B32; Sn50 (50/50) type.

PART 3 EXECUTION

3.01 **EXAMINATION**

A. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.

B. Verify roofing termination and base flashings are in place, sealed, and secure.

3.02 **PREPARATION**

A. Install starter and edge strips, and cleats before starting installation.

B. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil.

3.03 **INSTALLATION**

A. Secure flashings in place using concealed fasteners, and use exposed fasteners only where permitted..

B. Apply plastic cement compound between metal flashings and felt flashings.

C. Fit flashings tight in place; make corners square, surfaces true and straight in planes, and lines accurate to profiles.

D. Seal metal joints watertight.

3.04 **FIELD QUALITY CONTROL**

A. See Section 01 40 00 - Quality Requirements, for field inspection requirements.

B. Inspection will involve surveillance of work during installation to ascertain compliance with specified requirements.

3.05 **SCHEDULE**

A. Through-Wall Flashing in Masonry:

B. Flashings Associated with Shingle Roofing, including Valley, Hip, Ridge, Eave, Gutter Edge, Gable Edge, Chimney:

C. Sheet Metal Roof Expansion Joint Covers, and Roof-to-Wall Joint Covers:

D. Counterflashings at Roofing Terminations (over roofing base flashings):

E. Roofing Penetration Flashings, for Pipes, Structural Steel, and Equipment Supports:

END OF SECTION

SECTION 07 71 23
MANUFACTURED GUTTERS AND DOWNSPOUTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pre-finished aluminum gutters and downspouts.

1.02 RELATED REQUIREMENTS

A. Section 05 50 00 - Metal Fabrications: Downspout boots.

B. Section 07 62 00 - Sheet Metal Flashing and Trim.

1.03 REFERENCE STANDARDS

A. AAMA 2603 - Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix) 2017a.

B. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate 2014.

C. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric) 2014.

D. SMACNA (ASMM) - Architectural Sheet Metal Manual 2012.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Comply with SMACNA (ASMM) for sizing components for rainfall intensity determined by a storm occurrence of 1 in 5 years.

B. Comply with applicable code for size and method of rain water discharge.

C. Maintain one copy of each document on site.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on prefabricated components.

C. Shop Drawings: Indicate locations, configurations, jointing methods, fastening methods, locations, and installation details.

D. Samples: Submit two samples, 4 inch long illustrating component design, finish, color, and configuration.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Stack material to prevent twisting, bending, or abrasion, and to provide ventilation. Slope to drain.

B. Prevent contact with materials that could cause discoloration, staining, or damage.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Gutters and Downspouts:

2.02 MATERIALS

A. Pre-Finished Aluminum Sheet: ASTM B209 (ASTM B209M); 0.032 inch thick.

1. Finish: Plain, shop pre-coated with modified silicone coating.

2. Color: As selected from manufacturer's standard colors.

2.03 COMPONENTS

A. Gutters: SMACNA square style profile standard Ogee curve face design

B. Downspouts: SMACNA Square profile.

C. Anchors and Supports: Profiled to suit gutters and downspouts.

1. Anchoring Devices: In accordance with SMACNA requirements.

2. Gutter Supports: Brackets.

3. Downspout Supports: Brackets.

D. Fasteners: Aluminum , with soft neoprene washers.

2.04 **ACCESSORIES**

A. Downspout Boots: Plastic.

2.05 **FABRICATION**

A. Form gutters and downspouts of profiles and size indicated.

B. Fabricate with required connection pieces.

C. Form sections square, true, and accurate in size, seamless in maximum possible lengths, free of distortion or defects detrimental to appearance or performance. Allow for expansion at joints.

D. Hem exposed edges of metal.

E. Fabricate gutter and downspout accessories; seal watertight.

2.06 **FINISHES**

A. Modified silicone polyester coating: Baked enamel system complying with AAMA 2603.

PART 3 EXECUTION

3.01 **EXAMINATION**

A. Verify existing conditions before starting work.

B. Verify that surfaces are ready to receive work.

3.02 **PREPARATION**

A. Paint concealed metal surfaces and surfaces in contact with dissimilar metals with protective backing paint to a minimum dry film thickness of 15 mil.

3.03 **INSTALLATION**

A. Install gutters, downspouts, and accessories in accordance with manufacturer's instructions.

B. Slope gutters 1/2 inch per 10 feet.

C. Connect downspouts to downspout boots at 6 inches above grade. Provide air gap. Seal connection watertight.

D. Connect downspouts to storm sewer system.

END OF SECTION

SECTION 07 84 00
FIRESTOPPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Firestopping systems.

B. Firestopping of all joints and penetrations in fire resistance rated and smoke resistant assemblies, whether indicated on drawings or not, and other openings indicated.

1.02 RELATED REQUIREMENTSL

A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 01 70 00 - Execution and Closeout Requirements: Cutting and patching.

C. Section 07 05 53 - Fire and Smoke Assembly Identification.

D. Section 09 21 16 - Gypsum Board Assemblies: Gypsum wallboard fireproofing.

1.03 REFERENCE STANDARDS

A. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials 2018c.

B. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems 2013a (Reapproved 2017).

C. ASTM E1966 - Standard Test Method for Fire-Resistive Joint Systems 2015.

D. ASTM E2174 - Standard Practice for On-Site Inspection of Installed Firestops 2018.

E. ASTM E2393 - Standard Practice for On-Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers 2010a (Reapproved 2015).

F. ASTM E2307 - Standard Test Method for Determining Fire Resistance of Perimeter Fire Barriers Using Intermediate-Scale, Multi-story Test Apparatus 2015b, with Editorial Revision (2016).

G. ASTM E2837 - Standard Test Method for Determining the Fire Resistance of Continuity Head-of-Wall Joint Systems Installed Between Rated Wall Assemblies and Nonrated Horizontal Assemblies 2013 (Reapproved 2017).

H. ITS (DIR) - Directory of Listed Products current edition.

I. FM (AG) - FM Approval Guide current edition.

J. UL 1479 - Standard for Fire Tests of Penetration Firestops Current Edition, Including All Revisions.

K. UL 2079 - Standard for Tests for Fire Resistance of Building Joint Systems Current Edition, Including All Revisions.

L. UL (DIR) - Online Certifications Directory Current Edition.

M. UL (FRD) - Fire Resistance Directory Current Edition.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Schedule of Firestopping: List each type of penetration, fire rating of the penetrated assembly and firestopping test or design number.

C. Product Data: Provide data on product characteristics, performance ratings and limitations.

D. Sustainable Design Submittal: Submit VOC content documentation for all non-preformed materials.

E. Manufacturer's Installation Instructions: Indicate preparation and installation instructions.

F. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.05 **QUALITY ASSURANCE**

A. Fire Testing: Provide firestopping assemblies of designs that provide the scheduled fire ratings when tested in accordance with methods indicated.

1. Listing in UL (FRD), FM (AG) or ITS (DIR) will be considered as constituting an acceptable test report.

2. Valid evaluation report published by ICC Evaluation Service, Inc. (ICC-ES) at www.icc-es.org will be considered as constituting an acceptable test report.

3. Submission of actual test reports is required for assemblies for which none of the above substantiation exists.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years experience.

C. Installer Qualifications: Company specializing in performing the work of this section and:

1. Trained by manufacturer.

2. Verification of minimum three years documented experience installing work of this type.

3. Verification of at least five satisfactorily completed projects of comparable size and type.

4. Licensed by local authorities having jurisdiction (AHJ).

1.06 **FIELD CONDITIONS**

A. Comply with firestopping manufacturer's recommendations for temperature and conditions during and after installation; maintain minimum temperature before, during, and for three days after installation of materials.

B. Provide ventilation in areas where solvent-cured materials are being installed.

PART 2 PRODUCTS

2.01 **MANUFACTURERS**

2.02 **MATERIALS**

A. Firestopping Materials: Any materials meeting requirements.

B. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Provide type of materials as required for tested firestopping assembly.

2.03 **FIRESTOPPING ASSEMBLY REQUIREMENTS**

A. Head-of-Wall Joint System Firestopping at Joints Between Fire-Rated Wall Assemblies and Non-Rated Horizontal Assemblies: Use system that has been tested according to ASTM E2837 to have fire resistance F Rating equal to required fire rating of floor or wall, whichever is greater.

B. Floor-to-Floor, Wall-to-Wall, and Wall-to-Floor Joints, Except Perimeter, Where Both Are Fire-Rated: Use system that has been tested according to ASTM E1966 or UL 2079 to have fire resistance F Rating equal to required fire rating of the assembly in which the joint occurs.

C. Through Penetration Firestopping: Use system that has been tested according to ASTM E814 to have fire resistance F Rating equal to required fire rating of penetrated assembly.

2.04 **FIRESTOPPING FOR FLOOR-TO-FLOOR, WALL-TO-FLOOR, AND WALL-TO-WALL JOINTS**

A. Gypsum Board Walls:

1. Wall to Wall Joints That Have Not Been Tested For Movement Capabilities (Static):

a. 1 Hour Construction: UL System WW-S-0063; Specified Technologies Inc. SpeedFlex TTG Track Top Gasket.

2. Wall to Wall Joints That Have Movement Capabilities (Dynamic):

a. 1 Hour Construction: UL System WW-D-0067; Hilti CP 606 Flexible Firestop Sealant.

2.05 **FIRESTOPPING FOR FLOOR-TO-WALL JOINTS**

2.06 **FIRESTOPPING PENETRATIONS THROUGH FRAMED FLOORS**

A. Metallic Pipe, Conduit, and Tubing Penetrations in Framed Floors:

1. 1 Hour Construction: UL System F-C-1053; Specified Technologies Inc. WF300 Intumescent Firestop Caulk (for wood frame construction).

2. 1 Hour Construction: UL System F-C-1162; Specified Technologies Inc. Closet Flange Firestop Gasket.

B. Non-Metallic Pipe, Conduit or Tubing in Framed Floors:

1. 1 Hour Construction: UL System F-C-2014; Specified Technologies Inc. WF300 Intumescent Firestop Caulk (for wood frame construction).

2. 1 Hour Construction: UL System F-C-2020; Specified Technologies Inc. LCC Intumescent Firestop Collars.

3. 1 Hour Construction: UL System F-C-2020; Specified Technologies Inc. SSC collars.

4. 1 Hour Construction: UL System F-C-2348; Specified Technologies Inc. RTC range-taking collar.

5. 1 Hour Construction: UL System F-C-2402; Specified Technologies Inc. Closet Flange Firestop Gasket.

C. Electrical Cable in Framed Floors:

1. 1 Hour Construction: UL System F-C-3010; Specified Technologies Inc. WF300 Intumescent Firestop Caulk (for wood frame construction).

D. Insulated Pipe in Framed Floors:

1. 1 Hour Construction: UL System F-C-5043; Specified Technologies Inc. WF300 Intumescent Firestop Caulk (for wood frame construction).

2.07 **FIRESTOPPING PENETRATIONS THROUGH GYPSUM BOARD WALLS**

A. Blank Openings:

1. 1 Hour Construction: UL System W-L-0020; Specified Technologies Inc. Composite Sheet.

2. 1 Hour Construction: UL System W-L-0032; Specified Technologies Inc. FP Intumescent Firestop Plug.

3. 1 Hour Construction: UL System W-L-0038; Specified Technologies Inc. FP Intumescent Firestop Plug.

4. 1 Hour Construction: UL System W-L-3334; Hilti CP 653 Speed Sleeve.

B. Penetrations By:

1. Multiple Penetrations in Large Openings:
    a. 1 Hour Construction: UL System W-L-1408; Hilti FS-ONE MAX Intumescent Firestop Sealant.
    b. 1 Hour Construction: UL System W-L-8013; Hilti CFS-BL Firestop Block.
    c. 1 Hour Construction: UL System W-L-8025; Specified Technologies Inc. LCI Intumescent Firestop Sealant.
    d. 1 Hour Construction: UL System W-L-8050; Specified Technologies Inc. SSB Intumescent Firestop pillows.
    e. 1 Hour Construction: UL System W-L-8071; Hilti FS-ONE MAX Intumescent Firestop Sealant.
    f. 1 Hour Construction: UL System W-L-8073; Specified Technologies Inc. Composite Sheet.
    g. 1 Hour Construction: UL System W-L-8079; Hilti FS-ONE MAX Intumescent Firestop Sealant.
2. Uninsulated Metallic Pipe, Conduit, and Tubing:
    a. 1 Hour Construction: UL System W-L-1042; Specified Technologies Inc. WF300 Intumescent Firestop Caulk (for wood frame construction).
    b. 1 Hour Construction: UL System W-L-1049; Specified Technologies Inc. SSS Intumescent Firestop Sealant.
    c. 1 Hour Construction: UL System W-L-1054; Hilti FS-ONE MAX Intumescent Firestop Sealant.
    d. 1 Hour Construction: UL System W-L-1090; Specified Technologies Inc. LC Endothermic Firestop Sealant.
    e. 1 Hour Construction: UL System W-L-1164; Hilti FS-ONE MAX Intumescent Firestop Sealant.
    f. 1 Hour Construction: UL System W-L-1222; Specified Technologies Inc. LCI Intumescent Firestop Sealant.
    g. 1 Hour Construction: UL System W-L-1477; Specified Technologies Inc. EZ Firestop Grommet.
    h. 1 Hour Construction: UL System W-L-1506; Hilti CFS-D Firestop Cable Disc.
3. Uninsulated Non-Metallic Pipe, Conduit, and Tubing:
    a. 1 Hour Construction: UL System W-L-2048; Specified Technologies Inc. SSW wrap strips.
    b. 1 Hour Construction: UL System W-L-2074; Specified Technologies Inc. SSC collars.
    c. 1 Hour Construction: UL System W-L-2078; Hilti CP 643N/644 Firestop Collar.
    d. 1 Hour Construction: UL System W-L-2128; Hilti FS-ONE MAX Intumescent Firestop Sealant.
    e. 1 Hour Construction: UL System W-L-2237; Specified Technologies Inc. LCC Intumescent Firestop Collars.
    f. 1 Hour Construction: UL System W-L-2241; Specified Technologies Inc. WF300 Intumescent Firestop Caulk (for wood frame construction).

g. 1 Hour Construction: UL System W-L-2243; Specified Technologies Inc. SSW wrap strips.

h. 1 Hour Construction: UL System W-L-2493; Specified Technologies Inc. RTC range-taking collar.

4. Electrical Cables Not In Conduit:

a. 1 Hour Construction: UL System W-L-3024; Specified Technologies Inc. SSP Firestop Putty.

b. 1 Hour Construction: UL System W-L-3065; Hilti FS-ONE MAX Intumescent Firestop Sealant, CP 606 Flexible Firestop Sealant, CD 601S Elastomeric Firestop Sealant, or CP 618 Firestop Putty Stick.

c. 1 Hour Construction: UL System W-L-3076; Specified Technologies Inc. SSS Intumescent Firestop Sealant.

d. 1 Hour Construction: UL System W-L-3084; Specified Technologies Inc. SSB Intumescent Firestop pillows.

e. 1 Hour Construction: UL System W-L-3135; Specified Technologies Inc. SSP Firestop Putty.

f. 1 Hour Construction: UL System W-L-3169; Specified Technologies Inc. LCI Intumescent Firestop Sealant.

g. 1 Hour Construction: UL System W-L-3218; Specified Technologies Inc. EZ-Path Series 33 Fire-Rated Pathway.

h. 1 Hour Construction: UL System W-L-3255; Specified Technologies Inc. EZ-Path Series 22 Fire-Rated Pathway.

i. 1 Hour Construction: UL System W-L-3256; Specified Technologies Inc. EZ-Path Series 22 Fire-Rated Pathway.

j. 1 Hour Construction: UL System W-L-3265; Specified Technologies Inc. EZ-Path Series 33 Fire-Rated Pathway.

k. 1 Hour Construction: UL System W-L-3303; Specified Technologies Inc. Ready Split Sleeve.

l. 1 Hour Construction: UL System W-L-3306; Specified Technologies Inc. EZ-Path Series 44 Fire-Rated Pathway.

m. 1 Hour Construction: UL System W-L-3334; Hilti CP 653 Speed Sleeve.

n. 1 Hour Construction: UL System W-L-3350; Specified Technologies Inc. LC Endothermic Firestop Sealant.

o. 1 Hour Construction: UL System W-L-3357; Specified Technologies Inc. FP Intumescent Firestop Plug.

p. 1 Hour Construction: UL System W-L-3358; Specified Technologies Inc. Ready Split Sleeve.

q. 1 Hour Construction: UL System W-L-3358; Specified Technologies Inc. Ready-Sleeve.

r. 1 Hour Construction: UL System W-L-3369; Specified Technologies Inc. EZ Firestop Grommet.

s. 1 Hour Construction: UL System W-L-3370; Specified Technologies Inc. EZ Firestop Grommet.

t. 1 Hour Construction: UL System W-L-3374; Specified Technologies Inc. FP Intumescent Firestop Plug.

u. 1 Hour Construction: UL System W-L-3376; Specified Technologies Inc. Ready-Sleeve.

v. 1 Hour Construction: UL System W-L-3377; Specified Technologies Inc. EZ-Path Series 22 Fire-Rated Pathway.

w. 1 Hour Construction: UL System W-L-3377; Specified Technologies Inc. EZ-Path Series 33 Fire-Rated Pathway.

x. 1 Hour Construction: UL System W-L-3378; Specified Technologies Inc. EZ Firestop Grommet.

y. 1 Hour Construction: UL System W-L-3379; Specified Technologies Inc. EZ Firestop Grommet.

z. 1 Hour Construction: UL System W-L-3390; Specified Technologies Inc. EZ-Path Series 44 Fire-Rated Pathway.

aa. 1 Hour Construction: UL System W-L-3393; Hilti CFS-SL RK Retrofit Sleeve Kit for existing cables.

bb. 1 Hour Construction: UL System W-L-3414; Hilti CFS-D Firestop Cable Disc.

5. Cable Trays with Electrical Cables:

a. 1 Hour Construction: UL System W-L-4008; Specified Technologies Inc. SSB Intumescent Firestop pillows.

b. 1 Hour Construction: UL System W-L-4011; Hilti CFS-BL Firestop Block.

c. 1 Hour Construction: UL System W-L-4060; Hilti FS-ONE MAX Intumescent Firestop Sealant.

6. Insulated Pipes:

a. 1 Hour Construction: UL System W-L-5014; Specified Technologies Inc. SSS Intumescent Firestop Sealant.

b. 1 Hour Construction: UL System W-L-5028; Hilti FS-ONE MAX Intumescent Firestop Sealant.

c. 1 Hour Construction: UL System W-L-5029; Hilti FS-ONE Intumescent Firestop Sealant.

d. 1 Hour Construction: UL System W-L-5121; Specified Technologies Inc. LCI Intumescent Firestop Sealant.

e. 1 Hour Construction: UL System W-L-5273; Specified Technologies Inc. LC Endothermic Firestop Sealant.

f. 1 Hour Construction: UL System W-L-5298; Specified Technologies Inc. WF300 Intumescent Firestop Caulk (for wood frame construction).

7. HVAC Ducts, Insulated:

a. 1 Hour Construction: UL System W-L-7164; Specified Technologies Inc. FyreFlange HVAC Firestop Angle.

b. 1 Hour Construction: UL System W-L-7238; Specified Technologies Inc. FyreFlange HVAC Firestop Angle.

c. 1 Hour Construction: UL System W-L-7156; Hilti FS-ONE MAX Intumescent Firestop Sealant.

2.08 **FIRESTOPPING SYSTEMS**

A. Firestopping: Any material meeting requirements.

1. Fire Ratings: Use system that is listed by FM (AG), ITS (DIR) or UL (FRD) and tested in accordance with ASTM E814, ASTM E119 or UL 1479 with F Rating equal to fire rating of penetrated assembly and minimum T Rating Equal to F Rating and in compliance with other specified requirements.

PART 3 EXECUTION

3.01 **EXAMINATION**

A. Verify openings are ready to receive the work of this section.

3.02 **PREPARATION**

A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other materials that could adversely affect bond of firestopping material.

B. Remove incompatible materials that could adversely affect bond.

C. Install backing materials to prevent liquid material from leakage.

3.03 **INSTALLATION**

A. Install materials in manner described in fire test report and in accordance with manufacturer's instructions, completely closing openings.

B. Do not cover installed firestopping until inspected by authorities having jurisdiction.

C. Install labeling required by code.

3.04 **FIELD QUALITY CONTROL**

A. Independent Testing Agency: AHJ will examine penetration firestopping in accordance with ASTM E2174, and ASTM E2393.

B. Repair or replace penetration firestopping and joints at locations where inspection results indicate firestopping or joints do not meet specified requirements.

3.05 **CLEANING**

A. Clean adjacent surfaces of firestopping materials.

3.06 **PROTECTION**

A. Protect adjacent surfaces from damage by material installation.

END OF SECTION

SECTION 07 91 00
PREFORMED JOINT SEALS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Precompressed foam seals.

B. Compression gaskets.

C. Preformed strip seals.

1.02 RELATED REQUIREMENTS

A. Section 07 92 00 - Joint Sealants: Liquid and mastic joint sealants and their backing materials.

1.03 REFERENCE STANDARDS

A. ASTM D1056 - Standard Specification for Flexible Cellular Materials--Sponge or Expanded Rubber 2014.

B. ASTM D2240 - Standard Test Method for Rubber Property--Durometer Hardness 2015e1.

C. ASTM D2628 - Standard Specification for Preformed Polychloroprene Elastomeric Joint Seals for Concrete Pavements 1991 (Reapproved 2016).

PART 2 PRODUCTS

2.01 PRECOMPRESSED FOAM SEALS

A. Precompressed Foam Seal: Urethane foam impregnated with water-repellent, with self-adhesive faces protected prior to installation by release paper.

1. Color: Black.
2. Size as required to provide weathertight seal when installed.
3. Calculate size according to manufacturer's recommendations.
4. Measure size of existing joints before selecting seal width.

2.02 COMPRESSION GASKETS

A. Compression Gasket: Extruded hollow polychloroprene (neoprene) gasket complying with ASTM D2628; not requiring blockout recess in substrate; not requiring vacuum to collapse seal for installation.

1. Color: Black.
2. Durometer Hardness, Type A: Within 55 to 65, when tested in accordance with ASTM D2240.
3. Calculate size in accordance with manufacturer's recommendations.

B. Compression Gasket: Extruded hollow gasket made of closed cell expanded rubber complying with ASTM D1056, with dense surface skin and serrated sidewalls.

1. Color: Black.
2. Durometer Hardness, Type OO: Within 35 to 65, when tested in accordance with ASTM D2240.
3. Calculate size in accordance with manufacturer's recommendations.
4. Adhesive: Epoxy sealant/adhesive recommended by gasket manufacturer.

2.03 PREFORMED STRIP SEALS

A. Preformed Strip Seal: Factory formed profile for adhered application to face of joint substrate.

1. Measure size of existing joints before selecting seal width.

2. Provide compatible materials for application as recommended by manufacturer.

2.04 **ACCESSORIES**

A. Adhesive: As recommended by seal manufacturer.

B. Masking Tape: Self-adhesive, nonabsorbent, non-staining, removable without adhesive residue, and compatible with surfaces adjacent to joints and strip seal.

C. Substrate Cleaner: Non-corrosive, non-staining type recommended by seal manufacturer; compatible with joint forming materials.

D. Primer: Type recommended by seal manufacturer to suit application; non-staining.

E. Backing Tape: Self-adhesive polyethylene tape with surface that seal will not adhere to.

PART 3 EXECUTION

3.01 **EXAMINATION**

A. Verify that joints are ready to receive this work.

B. Measure joint dimensions and verify that seal products are of the correct size to properly seal the joints.

3.02 **PREPARATION**

A. Properly prepare construction components adjacent to the work of this section to prevent damage and disfigurement due to this work.

3.03 **INSTALLATION**

A. Install in accordance with manufacturer's written instructions.

B. Precompressed Foam Seals:

1. Install only when ambient temperature is within recommended application temperature range of adhesive. Consult manufacturer when installing outside this temperature range.

2. Prepare joints and install seals in accordance with manufacturer's written recommendations.

3. Remove loose materials and foreign matter that could impair adhesion of sealant.

4. Do not stretch precompressed seal; avoid joints except at corners, ends, and intersections; install with face 1/8 to 1/4 inch below adjoining surface.

C. Compression Gaskets:

1. Install only when ambient temperature is within recommended application temperature range of adhesive. Consult manufacturer when installing outside this temperature range.

2. Prepare joints and install seals in accordance with manufacturer's written recommendations.

3. Remove loose materials and foreign matter that could impair adhesion of sealant.

4. Avoid joints except at ends, corners, and intersections; seal joints with adhesive; install with face 1/8 to 1/4 inch below adjoining surface.

D. Preformed Strip Seals:

1. Install when ambient temperature is within recommended application temperature range of adhesive, and consult with manufacturer before installing outside this temperature range.
2. Prepare joints and install seals in accordance with manufacturer's written recommendations.
3. Remove loose materials and foreign matter that could impair adhesion.
4. When installing over existing non-functioning sealant, remove portions of existing installation that protrude beyond surface; install backing tape on surface of existing sealant installation to prevent adhesion of strip seal.

3.04 **CLEANING**

A. Clean adjacent soiled surfaces.

3.05 **PROTECTION**

A. Protect joints from damage until adhesives have properly cured.

END OF SECTION

SECTION 07 92 00
JOINT SEALANTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Nonsag gunnable joint sealants.

B. Self-leveling pourable joint sealants.

C. Joint backings and accessories.

1.02 RELATED REQUIREMENTS

A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions: Additional requirements for sealants and primers.

B. Section 07 25 00 - Weather Barriers: Sealants required in conjunction with air barriers and vapor retarders.

C. Section 07 84 00 - Firestopping: Firestopping sealants.

D. Section 07 91 00 - Preformed Joint Seals: Precompressed foam, gaskets, and strip seals.

E. Section 07 95 13 - Expansion Joint Cover Assemblies: Sealants forming part of expansion joint cover assemblies.

F. Section 08 71 00 - Door Hardware: Setting exterior door thresholds in sealant.

G. Section 08 80 00 - Glazing: Glazing sealants and accessories.

H. Section 09 21 16 - Gypsum Board Assemblies: Sealing acoustical and sound-rated walls and ceilings.

I. Section 23 31 00 - HVAC Ducts and Casings: Duct sealants.

1.03 REFERENCE STANDARDS

A. ASTM C661 - Standard Test Method for Indentation Hardness of Elastomeric-Type Sealants by Means of a Durometer 2015.

B. ASTM C834 - Standard Specification for Latex Sealants 2017.

C. ASTM C919 - Standard Practice for Use of Sealants in Acoustical Applications 2012 (Reapproved 2017).

D. ASTM C920 - Standard Specification for Elastomeric Joint Sealants 2018.

E. ASTM C1193 - Standard Guide for Use of Joint Sealants 2016.

F. ASTM C1248 - Standard Test Method for Staining of Porous Substrate by Joint Sealants 2008 (Reapproved 2012).

G. ASTM C1311 - Standard Specification for Solvent Release Sealants 2014.

H. ASTM C1330 - Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants 2018.

I. ASTM D2240 - Standard Test Method for Rubber Property--Durometer Hardness 2015e1.

J. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers--Tension 2016.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data for Sealants: Submit manufacturer's technical data sheets for each product to be used, that includes the following.

1. Physical characteristics, including movement capability, VOC content, hardness, cure time, and color availability.
2. List of backing materials approved for use with the specific product.
3. Substrates that product is known to satisfactorily adhere to and with which it is compatible.
4. Substrates the product should not be used on.

1.05 **WARRANTY**

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Correct defective work within a five year period after Date of Substantial Completion.

C. Warranty: Include coverage for installed sealants and accessories that fail to achieve watertight seal , exhibit loss of adhesion or cohesion, or do not cure.

PART 2 PRODUCTS

2.01 **JOINT SEALANT APPLICATIONS**

A. Scope:

1. Exterior Joints: Seal open joints, whether or not the joint is indicated on drawings, unless specifically indicated not to be sealed. Exterior joints to be sealed include, but are not limited to, the following items.
    a. Wall expansion and control joints.
    b. Joints between door, window, and other frames and adjacent construction.
    c. Joints between different exposed materials.
    d. Openings below ledge angles in masonry.
    e. Other joints indicated below.
2. Interior Joints: Do not seal interior joints unless specifically indicated to be sealed. Interior joints to be sealed include, but are not limited to, the following items.
    a. Joints between door, window, and other frames and adjacent construction.
    b. In sound-rated wall and ceiling assemblies, gaps at electrical outlets, wiring devices, piping, and other openings; between wall/ceiling and other construction; and other flanking sound paths.
    c. Joints between casework; cabinetry and countertop, to wall joints.
    d. Joints at dwelling unit common walls to other walls and floor/ceilings
    e. Other joints indicated below.
3. Do not seal the following types of joints.
    a. Intentional weepholes in masonry.
    b. Joints indicated to be treated with manufactured expansion joint cover or some other type of sealing device.
    c. Joints where sealant is specified to be provided by manufacturer of product to be sealed.
    d. Joints where installation of sealant is specified in another section.
    e. Joints between suspended panel ceilings/grid and walls.

B. Exterior Joints: Use non-sag non-staining silicone sealant, unless otherwise indicated.

1. Lap Joints in Sheet Metal Fabrications: Butyl rubber, non-curing.

2. Control and Expansion Joints in Concrete Paving: Self-leveling polyurethane "traffic-grade" sealant.
3. Wiring Slots in Concrete Paving: Self-leveling epoxy sealant.

C. Interior Joints: Use non-sag polyurethane sealant, unless otherwise indicated.

1. Wall and Ceiling Joints in Non-Wet Areas: Acrylic emulsion latex sealant.
2. Wall and Ceiling Joints in Wet Areas: Non-sag polyurethane sealant for continuous liquid immersion.
3. Floor Joints in Wet Areas: Non-sag polyurethane "non-traffic-grade" sealant suitable for continuous liquid immersion.
4. Wall, Ceiling, and Floor Joints Where Tamper-Resistance is Required: Non-sag tamper-resistant silyl-terminated polyurethane sealant.
5. Joints between Fixtures in Wet Areas and Floors, Walls, and Ceilings: Mildew-resistant silicone sealant; white.
6. In Sound-Rated Assemblies: Acrylic emulsion latex sealant.
7. Narrow Control Joints in Interior Concrete Slabs: Self-leveling epoxy sealant.
8. Type [___] - Other Floor Joints: Self-leveling polyurethane "traffic-grade" sealant.

D. Interior Wet Areas: Bathrooms, restrooms and kitchens; fixtures in wet areas include plumbing fixtures, countertops, cabinets and other similar items.

E. Sound-Rated Assemblies: Walls and ceilings identified as "STC-rated", "sound-rated", or "acoustical".

F. Areas Where Tamper-Resistance is Required: As indicated on drawings.

2.02 JOINT SEALANTS - GENERAL

A. Sealants and Primers: Provide products with levels of volatile organic compound (VOC) content as indicated in Section 01 61 16.

B. Colors: to be selected by Architect from manufacturer's standard range

2.03 NONSAG JOINT SEALANTS

A. Non-Staining Silicone Sealant: ASTM C920, Grade NS, Uses M and A; not expected to withstand continuous water immersion or traffic.

1. Movement Capability: minimum.
2. Non-Staining To Porous Stone: Non-staining to light-colored natural stone when tested in accordance with ASTM C1248.
3. Dirt Pick-Up: Reduced dirt pick-up compared to other silicone sealants.
4. Color: Match adjacent finished surfaces.

B. Silicone Sealant: ASTM C920, Grade NS, Uses M and A; not expected to withstand continuous water immersion or traffic.

1. Movement Capability: Plus and minus 25 percent, minimum.
2. Color: Match adjacent finished surfaces.

C. Mildew-Resistant Silicone Sealant: ASTM C920, Grade NS, Uses M and A; single component, mildew resistant; not expected to withstand continuous water immersion or traffic.

1. Color: White.

D. Polymer Sealant: ASTM C920; single component, cured sealant is paintable and mold/mildew resistant, low odor and VOC, and ultraviolet (UV) resistant.

1. Color: White.

E. Hybrid Urethane Sealant: ASTM C920, Grade NS, Uses M and A; single component; not expected to withstand continuous water immersion or traffic.

1. Movement Capability: Plus and minus 35 percent, minimum.

2. Color: Match adjacent finished surfaces.

F. Tamper-Resistant, Silyl-Terminated Polyurethane (STPU) Sealant: ASTM C920, Grade NS, Uses M and A; single component; not expected to withstand continuous water immersion or traffic.

1. Movement Capability: Plus and minus 12-1/2 percent, minimum

2. Hardness Range: 25 to 30, Shore A, when tested in accordance with ASTM C661.

3. Color: Match adjacent finished surfaces.

G. Polyurethane Sealant: ASTM C920, Grade NS, Uses M and A; single or multi-component; not expected to withstand continuous water immersion or traffic.

1. Movement Capability: Plus and minus 25 percent, minimum.

2. Color: Match adjacent finished surfaces.

H. Polyurethane Sealant for Continuous Water Immersion: ASTM C920, Grade NS, Uses M and A; single or multi-component; explicitly approved by manufacturer for continuous water immersion; suitable for traffic exposure when recessed below traffic surface .

1. Movement Capability: Plus and minus 35 percent, minimum.

2. Color: Match adjacent finished surfaces.

I. Non-Sag "Traffic-Grade" Polyurethane Sealant: ASTM C920, Grade NS, Uses M and A; single or multi-component; explicitly approved by manufacturer for continuous water immersion and traffic without the necessity to recess sealant below traffic surface.

1. Movement Capability: Plus and minus 25 percent, minimum.

2. Hardness Range: 40 to 50, Shore A, when tested in accordance with ASTM C661.

3. Color: Match adjacent finished surfaces.

J. Tamper-Resistant Polyurethane Sealant: ASTM C920, Grade NS, Uses M, G, and A; single or multi-component; not expected to withstand continuous water immersion or traffic.

1. Movement Capability: Plus and minus 12-1/2 percent, minimum.

2. Hardness Range: 50 to 60, Shore A, when tested in accordance with ASTM C661.

3. Color: Match adjacent finished surfaces.

K. Acrylic Emulsion Latex: Water-based; ASTM C834, single component, non-staining, non-bleeding, non-sagging; not intended for exterior use.

1. Color: Standard colors matching finished surfaces, Type OP (opaque).

L. Non-Curing Butyl Sealant: Solvent-based; ASTM C1311; single component, non-sag, non-skinning, non-hardening, non-bleeding; vapor-impermeable; intended for fully concealed applications.

2.04 **SELF-LEVELING SEALANTS**

A. Self-Leveling Silicone Sealant: ASTM C920, Grade P, Uses M and A; single or multicomponent, explicitly approved by manufacturer for traffic exposure when recessed below traffic surface; not expected to withstand continuous water immersion.

1. Movement Capability: Plus 100 percent, minus 50 percent, minimum.
2. Color: To be selected by Architect from manufacturer's standard range.

B. Self-Leveling Polyurethane Sealant: ASTM C920, Grade P, Uses M and A; single or multi-component; explicitly approved by manufacturer for traffic exposure; not expected to withstand continuous water immersion .

1. Movement Capability: Plus and minus 25 percent, minimum.
2. Color: To be selected by Architect from manufacturer's standard range.

C. Self-Leveling Polyurethane Sealant for Horizontal Expansion Joints: ASTM C920, Grade P, Uses T, M and O; multi-component; explicitly approved by manufacturer for horizontal expansion joints.

1. Movement Capability: Plus and minus 25 percent, minimum.
2. Hardness Range: 30 to 35, Shore A, when tested in accordance with ASTM C661.
3. Color: To be selected by Architect from manufacturer's standard range.

D. Self-Leveling Polyurethane Sealant for Continuous Water Immersion: Polyurethane; ASTM C920, Grade P, Uses M and A; single or multi-component; explicitly approved by manufacturer for traffic exposure and continuous water immersion.

1. Movement Capability: Plus and minus 25 percent, minimum.
2. Color: To be selected by Architect from manufacturer's standard range.

E. Self-Leveling Silyl-Terminated Polyether/Polyurethane (STPE/STPU) Sealant: ASTM C920, Grade P, Uses M and A; single component; explicitly approved by manufacturer for traffic exposure; not expected to withstand continuous water immersion.

1. Movement Capability: Plus and minus 35 percent.
2. Color: To be selected by Architect from manufacturer's standard range.

F. Self-Leveling Polysulfide Sealant: ASTM C920, Grade P, Uses M and A; multicomponent; explicitly approved by manufacturer for traffic exposure and continuous water immersion.

1. Movement Capability: Plus and minus 25 percent.
2. Color: To be selected by Architect from manufacturer's standard range.

G. Rigid Self-Leveling Polyurethane Joint Filler: Two part, low viscosity, fast setting; intended for cracks and control joints not subject to significant movement.

1. Hardness Range: Greater than 100, Shore A, and 50 to 80, Shore D, when tested in accordance with ASTM C661.

H. Flexible Polyurethane Foam: Single-component, gun grade, and low-expanding.

1. Color: White.

I. Semi-Rigid Self-Leveling Epoxy Joint Filler: Epoxy or epoxy/polyurethane copolymer; intended for filling cracks and control joints not subject to significant movement; rigid enough to support concrete edges under traffic.

1. Composition: Multi-component, 100 percent solids by weight.
2. Durometer Hardness: Minimum of 85 for Type A or 35 for Type D, after seven days when tested in accordance with ASTM D2240.
3. Color: To be selected by Architect from manufacturer's standard colors.

4. Joint Width, Minimum: 1/8 inch.

J. Semi-Rigid Self-Leveling Polyurea Joint Filler: Two-component, 100 percent solids; intended for filling cracks and control joints not subject to significant movement; rigid enough to support concrete edges under traffic.

1. Durometer Hardness, Type A: 75, minimum, after seven days when tested in accordance with ASTM D2240.
2. Color: To be selected by Architect from manufacturer's standard colors.
3. Joint Width, Minimum: 1/8 inch.
4. Joint Width, Maximum: 3/4 inch.
5. Joint Depth: Provide product suitable for joints from 1/8 inch to 1 inch in depth excluding space for backer rod.

K. Semi-Self-Leveling Polyurethane Sealant: Intended for expansion joints in sidewalks, swimming pool decks, plazas, floors and other horizontal surfaces with up to 6 percent slope.

1. Composition: Single or multi-component.
2. Durometer Hardness, Type A: 35 to 45, minimum, when tested in accordance with ASTM D2240.
3. Color: To be selected by Architect from manufacturer's standard colors.

2.05 **ACCESSORIES**

A. Backer Rod: Cylindrical cellular foam rod with surface that sealant will not adhere to, compatible with specific sealant used, and recommended by backing and sealant manufacturers for specific application.

1. Type for Joints Not Subject to Pedestrian or Vehicular Traffic: ASTM C1330; Type O - Open Cell Polyurethane.
2. Type for Joints Subject to Pedestrian or Vehicular Traffic: ASTM C1330; Type B - Bi-Cellular Polyethylene.
3. Open Cell: 40 to 50 percent larger in diameter than joint width.
4. Closed Cell and Bi-Cellular: 25 to 33 percent larger in diameter than joint width.

B. Overlay Extrusion for Glazing System Joint Protection: Rubber profiled extrusions placed over joints in glazing system and provided with watertight seal.

1. Profile: As required to match existing metal glazing cap requirements.

C. Preformed Extruded Silicone Joint Seal: Pre-cured low-modulus silicone extrusion, in sizes to fit applications indicated on drawings, combined with a neutral-curing liquid silicone sealant for bonding joint seal to substrates.

1. Size: 1 inch wide, in rolls 100 feet long.
2. Thickness: 0.78 inch, with ridges along outside bottom edges for bonding area.
3. Color: As selected by Architect..
4. Durometer Hardness, Type A: 26 to 32, minimum, when tested in accordance with ASTM D2240.
5. Tensile Strength: 218 psi, in accordance with ASTM D412.
6. Elongation at Break: 554 percent, in accordance with ASTM D412.

D. Backing Tape: Self-adhesive polyethylene tape with surface that sealant will not adhere to and recommended by tape and sealant manufacturers for specific application.

E. Masking Tape: Self-adhesive, nonabsorbent, non-staining, removable without adhesive residue, and compatible with surfaces adjacent to joints and sealants.

F. Joint Cleaner: Non-corrosive and non-staining type, type recommended by sealant manufacturer; compatible with joint forming materials.

G. Primers: Type recommended by sealant manufacturer to suit application; non-staining.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that joints are ready to receive work.

B. Verify that backing materials are compatible with sealants.

C. Verify that backer rods are of the correct size.

3.02 PREPARATION

A. Remove loose materials and foreign matter that could impair adhesion of sealant.

B. Clean joints, and prime as necessary, in accordance with manufacturer's instructions.

C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.

D. Mask elements and surfaces adjacent to joints from damage and disfigurement due to sealant work; be aware that sealant drips and smears may not be completely removable.

E. Concrete Floor Joints That Will Be Exposed in Completed Work: Test joint filler in inconspicuous area to verify that it does not stain or discolor slab.

3.03 INSTALLATION

A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.

B. Perform installation in accordance with ASTM C1193.

C. Perform acoustical sealant application work in accordance with ASTM C919.

D. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer, except where specific dimensions are indicated.

E. Install bond breaker backing tape where backer rod cannot be used.

F. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.

G. Do not install sealant when ambient temperature is outside manufacturer's recommended temperature range, or will be outside that range during the entire curing period, unless manufacturer's approval is obtained and instructions are followed.

H. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.

I. Concrete Floor Joint Filler: After full cure, shave joint filler flush with top of concrete slab.

3.04 FIELD QUALITY CONTROL

A. Perform field quality control inspection/testing as specified in PART 1 under QUALITY ASSURANCE article.

B. Remove and replace failed portions of sealants using same materials and procedures as indicated for original installation.

C. Repair destructive test location damage immediately after evaluation and recording of results.

END OF SECTION

SECTION 07 95 13
EXPANSION JOINT COVER ASSEMBLIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Expansion joint cover assemblies for floor, wall, ceiling and soffit surfaces.

1.02 RELATED REQUIREMENTS

A. Section 03 10 00 - Concrete Forming and Accessories: Placement of joint cover assembly frames in formwork.

B. Section 04 20 00 - Unit Masonry: Placement of joint cover assembly frames in masonry.

C. Section 05 50 00 - Metal Fabrications: Custom fabricated metal expansion and control joint devices.

D. Section 07 62 00 - Sheet Metal Flashing and Trim: Roof expansion and control joint covers.

E. Section 07 91 00 - Preformed Joint Seals: Sealing expansion and control joints using preformed joint seals.

F. Section 07 92 00 - Joint Sealants: Sealing expansion and control joints using gunnable and pourable sealants.

G. Section 09 21 16 - Gypsum Board Assemblies: Gypsum board control joint trim.

H. Section 09 21 16 - Gypsum Board Assemblies: Placement of expansion joint assemblies in gypsum board walls and ceilings.

1.03 REFERENCE STANDARDS

A. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes 2014.

B. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric) 2013.

C. ASTM B308/B308M - Standard Specification for Aluminum-Alloy 6061-T6 Standard Structural Profiles 2010.

D. ITS (DIR) - Directory of Listed Products current edition.

E. UL (DIR) - Online Certifications Directory Current Edition.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Installation Templates: For frames and anchors to be embedded in concrete or masonry, furnish templates to relevant installers; include installation instructions and tolerances.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide joint assembly profiles, profile dimensions, anchorage devices and available colors and finish.

C. Shop Drawings: Indicate joint and splice locations, miters, layout of the work, affected adjacent construction and anchorage locations.

D. Samples: Submit two samples 3 inch long, illustrating profile, dimension, color, and finish selected.

E. Manufacturer's Installation Instructions: Indicate rough-in sizes and required tolerances for item placement.

PART 2 PRODUCTS

2.01 EXPANSION JOINT COVER ASSEMBLIES

A. Expansion Joint Cover Assemblies - General: Factory-fabricated and assembled; designed to completely fill joint openings, sealed to prevent passage of air, dust, water, smoke; suitable for traffic expected.

1. Joint Dimensions and Configurations: As indicated on drawings.
2. Joint Cover Sizes: Selected to suit joint width and configuration, based on manufacturer's published recommendations and limitations.
3. Lengths: Provide covers in full lengths required; avoid splicing wherever possible.
4. Anchors, Fasteners, and Fittings: Provided by cover manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that joint preparation and dimensions are acceptable and in accordance with manufacturer's requirements.

B. Verify that frames and anchors installed by others are in correct locations and suitable for installation of remainder of assembly.

3.02 INSTALLATION

A. Install components and accessories in accordance with manufacturer's instructions.

B. Align work plumb and level, flush with adjacent surfaces.

C. Rigidly anchor to substrate to prevent misalignment.

3.03 PROTECTION

A. Do not permit traffic over unprotected floor joint surfaces.

B. Provide strippable coating to protect finish surface.

END OF SECTION

SECTION 08 06 71
DOOR HARDWARE SCHEDULE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Preliminary schedule of door hardware sets for swinging, sliding, folding and other door types as indicated on drawings.

1.02 RELATED REQUIREMENTS

A. Section 08 71 00 - Door Hardware: Requirements to comply with in coordination with this section.

1.03 REFERENCE STANDARDS

A. BHMA A156.3 - American National Standard for Exit Devices 2014.

B. BHMA A156.5 - American National Standard for Cylinders and Input Devices for Locks 2014.

C. BHMA A156.13 - American National Standard for Mortise Locks & Latches Series 1000 2017.

D. BHMA A156.18 - American National Standard for Materials and Finishes 2016.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Comply with submittal requirements as indicated in Section 08 71 00.

PART 2 PRODUCTS

2.01 DESCRIPTION

A. Door hardware sets provided represent the design intent, they are only a guideline and should not be considered a detailed or complete hardware schedule.

1. Provide door hardware item(s) as required for similar purposes, even when item is not listed for a door in Door Hardware Schedule.

2. Necessary items that are not included in a Hardware Set should be added and have the appropriate additional hardware as required for proper application and functionality.

3. Door hardware supplier is responsible for providing proper size and hand of door for products required in accordance with Door Hardware Schedule and as indicated on drawings.

4. Quantities listed are for each Pair (PR) of doors, or for each Single (SGL) door, as indicated in hardware sets.I

5. Refer to drawings for Hardware Sets

2.02 LOCK FUNCTION CODES

A. Function Codes for Cylindrical Locks: Complying with BHMA A156.5.

1. Code F75; Passage: Latch retracted by knobs/levers at all times.

2. Code F76; Privacy Lock: Outside knob/lever locked by pushbutton on inside knob/lever. Rotating inside knob/lever or closing door releases/unlocks button. Emergency release in outside knob/lever.

3. Code F77; Patio/Inner Office Lock: Outside knob/lever locked by push button on inside knob/lever. Rotating inside knob/lever or closing door releases/unlocks button. Deadlocking latchbolt.

4. Code F78; Communicating Lock: Deadlocking latch bolt by knobs. Either knob is locked by turn button in opposite knob.
5. Code F80; Communicating Lock: Deadlocking latch bolt by levers except when either lever is locked by key in its own cylinder.
6. Code F82; Entry Lock: Push button locking. Button on inside locks outside knob/lever until unlocked by key or by rotating the inside knob/lever. Inside knob/lever always free. Deadlocking latch bolt.
7. Code F83; Exit Lock: Deadlocking latch bolt by levers except when outside lever is locked by turn button inside. Turn button must be manually unlocked to operate outside lever. Inside lever always free.
8. Code F84; Classroom Lock: Outside knob/lever locked/unlocked by key in outside knob/lever. Inside knob/lever always free. Deadlocking latchbolt.
9. Code F85: Classroom Lock with Hold Back Feature: Deadlocking latch bolt by knobs. Outside knob is locked by key in outside knob. Inside knob is always free. Latch may be held back by depressing latch and rotating key.
10. Code F86; Storeroom Lock: Outside knob/lever always locked/rigid. Latchbolt retracted by key in outside knob/lever or by rotating inside knob/lever. Inside knob/lever always free. Deadlocking latchbolt.
11. Code F88; Entry/Restroom Lock: Deadlocking latch bolt by levers except when outside lever is locked by key inside, then by key outside.
12. Code F90; Dormitory Lock: Deadlocking latch bolt by levers except when locked by push button in inside lever. Key in outside lever locks or unlocks outside lever and releases button. Closing door releases push button. Inside lever always free.
13. Code F91; Store Door Lock: Deadlocking latch bolt by levers. Key in either lever locks/unlocks both levers.
14. Code F92; Service Station Door Lock: Deadlocking latch bolt by lever from either side except when outside lever is locked by universal push button in inside lever. Inside lever always free. When outside lever is locked, latch bolt may be retracted by turning key or rotating inside lever. Turning key, rotating inside lever, or closing door releases universal push button and outside lever, except when Universal push button has been rotated to a position which keeps the outside lever locked at all times.
15. Code F109; Entry/Office Lock: Turn/Push button locking. Pushing and turning button on inside locks outside knob/lever requiring use of a key until button is manually unlocked. Push button locking. Pushing button locks the outside knob/lever until unlocked by key or by turning the inside knob/lever. Inside knob/lever always free.

B. Function Codes for Mortise Locks: Complying with BHMA A156.13.

C. Function Codes for Exit Devices: Complying with BHMA A156.3.

2.03 **FINISHES**

A. Finishes: Complying with BHMA A156.18.

END OF SECTION

SECTION 08 11 13
HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Non-fire-rated hollow metal doors and frames.

B. Thermally insulated hollow metal doors with frames.

1.02 RELATED REQUIREMENTS

A. Section 08 71 00 - Door Hardware.

1.03 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design 2010.

B. ANSI/SDI A250.3 - Test Procedure and Acceptance Criteria for Factory Applied Finish Coatings for Steel Doors and Frames 2007 (R2011).

C. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors 2011.

D. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100) 2017.

E. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames 2011.

F. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2018.

G. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable 2018.

H. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength 2018a.

I. ICC A117.1 - Accessible and Usable Buildings and Facilities 2017.

J. NAAMM HMMA 840 - Guide Specifications for Installation and Storage of Hollow Metal Doors and Frames 2007.

K. NAAMM HMMA 861 - Guide Specifications for Commercial Hollow Metal Doors and Frames 2014.

L. SDI 117 - Manufacturing Tolerances for Standard Steel Doors and Frames 2013.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes; and one copy of referenced standards/guidelines.

C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and any indicated finish requirements.

D. Samples: Submit two samples of metal, 2 inch by 2 inch in size showing factory finishes, colors, and surface texture.

E. Installation Instructions: Manufacturer's published instructions, including any special installation instructions relating to this project.

1.05 **DELIVERY, STORAGE, AND HANDLING**

A. Comply with NAAMM HMMA 840 or ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.

B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion and adverse effects on factory applied painted finish.

PART 2 PRODUCTS

2.01 **MANUFACTURERS**

A. Hollow Metal Doors and Frames:

1. Steelcraft, an Allegion brand; Graintech: www.allegion.com/#sle.
2. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 **PERFORMANCE REQUIREMENTS**

A. Requirements for Hollow Metal Doors and Frames:

1. Steel Sheet: Comply with one or more of the following requirements; galvannealed steel complying with ASTM A653/A653M, cold-rolled steel complying with ASTM A1008/A1008M, or hot-rolled pickled and oiled (HRPO) steel complying with ASTM A1011/A1011M, commercial steel (CS) Type B, for each.
2. Accessibility: Comply with ICC A117.1 and ADA Standards.

B. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with the specified requirements for each type; for instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.

2.03 **HOLLOW METAL DOORS**

A. Exterior Doors: Thermally insulated.

1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
    a. Level 1 - Standard-duty.
    b. Physical Performance Level C, 250,000 cycles; in accordance with ANSI/SDI A250.4.
    c. Model 1 - Full Flush.
    d. Door Face Metal Thickness: 16 gage, 0.053 inch, minimum.
2. Door Core Material: Manufacturers standard core material/construction and in compliance with requirements.
3. Door Thickness: 1-3/8 inch, nominal.
4. Door Face Sheets: Embossed with wood grain.
5. Weatherstripping: Refer to Section 08 71 00.
6. Door Finish: Factory finished.

2.04 **HOLLOW METAL FRAMES**

A. Comply with standards and/or custom guidelines as indicated for corresponding door in accordance with applicable door frame requirements.

B. Exterior Door Frames: Full profile/continuously welded type.

1. Frame Metal Thickness: 18 gage, 0.042 inch, minimum.

2. Frame Finish: Factory primed and field finished.
3. Weatherstripping: Separate, see Section 08 71 00.

2.05 **FINISHES**

A. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.

B. Factory Finish: Complying with ANSI/SDI A250.3, manufacturer's standard coating.

1. Color: As selected by Architect from manufacturer's standard range.

2.06 **ACCESSORIES**

A. Silencers: Resilient rubber, fitted into drilled hole; provide three on strike side of single door, three on center mullion of pairs, and two on head of pairs without center mullions.

B. Temporary Frame Spreaders: Provide for factory- or shop-assembled frames.

PART 3 EXECUTION

3.01 **EXAMINATION**

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

C. Verify that finished walls are in plane to ensure proper door alignment.

3.02 **INSTALLATION**

A. Install doors and frames in accordance with manufacturer's instructions and related requirements of specified door and frame standards or custom guidelines indicated.

B. Coordinate frame anchor placement with wall construction.

C. Install door hardware as specified in Section 08 71 00.

D. Touch up damaged factory finishes.

3.03 **TOLERANCES**

A. Clearances Between Door and Frame: Comply with related requirements of specified frame standards or custom guidelines indicated in accordance with SDI 117 or NAAMM HMMA 861.

B. Maximum Diagonal Distortion: 1/16 inch measured with straight edge, corner to corner.

3.04 **ADJUSTING**

A. Adjust for smooth and balanced door movement.

END OF SECTION

SECTION 08 14 05
WOOD DOORS-HARDBOARD FACING

PART 1 GENERAL

1.01 DESCRIPTION

A. Scope: includes all labor, materials, equipment, and incidentals required to manufacture and install all wood doors shown on the drawings and specified herein.

B. The General Conditions, the Supplementary General Conditions, and the General Requirements are a part of the requirements of this section.

1.02 REGULATIONS, REFERENCES, AND STANDARDS

A. Applicable sections and referenced sections of the following standards, latest edition in effect on date of Invitation for Bids, form a part of this specification.

1. American Society of Testing and Materials (ASTM)
2. Federal Specifications (FS)
3. Underwriter's Laboratory (UL)
4. Factory Mutual Laboratories (FML)
5. National Fire Protection Association (NFPA)

B. Specific reference is made to the following:

1. U.S. Department of Commerce, Commercial Standards (CS)
2. National Woodwork Manufacturer's Association (NWMA)
3. Architectural Woodwork Institute (AWI)

1.03 SHOP DRAWINGS

A. Submit shop drawings, include the following:

1. Each type of door and frame
2. Complete schedules

1.04 WARRANTY

A. Doors: shall be guaranteed against defect for a period of one year from date of acceptance.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Packaging: All doors shall be individually cartoned at the factory. Doors and cartons shall be numbered to correspond with shop drawing schedule showing location. When total number of doors exceed 20, individually cartoned doors shall be banded on skids.

B. Deliver: to the site in manufacturer's protective wrapping.

C. Handle: to the site in manufacturer's protective wrapping.

D. Store: in protected, dry area blocked up off the floor at least 4". Do not stack. store in an upright position and in a manner that will prevent buckling and warping. Damaged units shall be rejected.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Accepted manufacturers include: Masonite Mildred, Molded Panel Series Hollow Core Interior Doors.

B. Substitutions: See Section 01 60 00-Product Requirements.

2.02 COMPONENT PARTS

A. Door facings: See door schedule for where required.

1. Interior apartment doors: standard molded masonite textured hollow-core 6 panel, softwood edges, pre-primed.

2.03 **FABRICATION**

A. Interior Doors: Architectural Grade 3 ply with bonded stiles and rails.

1. Compatible hardwood stiles
2. Factory primed Doors

B. Allowable Tolerances:

1. Telegraphing: (show through) of stiles, rails, and core shall not exceed 1/100" in any 3" span.
2. Warp: for 1 3/4" door shall not exceed 3" in the plane of the door itself, or of any 42"x84" section.

C. All doors: shall be beveled 3 [illegible] pre fit 3/16" undersized on each edge and the width, 5/8" on the height (1/8" clearance at top and 2" at bottom).

D. All cutouts: for mortise hardware shall be made at the factory from hardware templates or physical samples furnished under other sections of these specifications. No cutouts shall be made until shop drawing work has been completed.

PART 3 EXECUTION

3.01 **FINISHING**

A. Seal: all edges/faces of all wood/MDF doors.

1. Stain and seal at stained doors.
2. Paint at interior doors per manufacturer instructions.

3.02 **EXAMINATION**

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

C. Do not install doors in frame openings that are not plumb or are out of tolerance for size or alignment.

3.03 **INSTALLATION**

A. Install doors in accordance with manufacturer's instructions and specified quality standards.

1. Install fire-rated doors in accordance with NFPA 80 requirements.
2. Install smoke and draft control doors in accordance with NFPA 105 requirements.
3. Install exterior doors in accordance with ASTM E2112.

B. Factory-Finished Doors: Do not field cut or trim; if fit or clearance is not correct, replace door.

C. Field-Finished Doors: Trimming to fit is acceptable.

1. Adjust width of non-rated doors by cutting equally on both jamb edges.
2. Trim door height by cutting bottom edges to a maximum of 3/4 inch.
3. Trim fire-rated doors in strict compliance with fire rating limitations.

D. Machine cut for hardware.

E. Coordinate installation of doors with installation of frames and hardware.

F. Coordinate installation of glazing.

3.04 **TOLERANCES**

A. Comply with specified quality standard for fit, clearance, and joinery tolerances.

B. Maximum Width Distortion (Cup): 1/8 inch measured with straight edge or taut string, edge to edge, over an imaginary 36 by 84 inch surface area.

3.05 **ADJUSTING**

A. Adjust doors for smooth and balanced door movement.

B. Adjust closers for full closure.

C. Seal: all wood edges of all wood doors.

1. Stain and seal at stained doors.
2. Stain and seal at plastic laminate faced doors
3. Paint at painted doors.

3.06 **SCHEDULE - SEE DRAWINGS**

A. Refer to Door and Frame Schedule as indicated in drawings.

END OF SECTION

SECTION 08 31 00
ACCESS DOORS AND PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Ceiling access door and frame units.

B. Floor access door and frame units, interior.

1.02 RELATED REQUIREMENTS

A. Section 08 71 00 - Door Hardware: Mortise cylinder and core hardware.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide sizes, types, finishes, hardware, scheduled locations, and details of adjoining work.

C. Shop Drawings: Indicate exact position of each access door and/or panel unit.

D. Manufacturer's Installation Instructions: Indicate installation requirements.

PART 2 PRODUCTS

2.01 ACCESS DOORS AND PANELS ASSEMBLIES

A. Ceiling-Mounted Units:

1. Location: As indicated on drawings.
2. Size - Lay-In Grid Ceilings: To match module of ceiling grid.
3. Size - Other Ceilings: as indicated in drawings
4. Door/Panel: Hinged, standard duty, with key-operated spring or cam lock and no handle.

B. Interior Floor-Mounted Access Units:

1. Location: As indicated on drawings.
2. Size: as indicated in drawings

2.02 WALL AND CEILING MOUNTED UNITS

A. Wall and Ceiling Mounted Units: Factory fabricated door and frame, fully assembled units with corner joints welded, filled and ground flush; square and without rack or warp; coordinate requirements with type of installation assembly being used for each unit.

1. Material: Steel.
2. Style: Exposed frame with door surface flush with frame surface.
3. Door Style: Single thickness with rolled or turned in edges.
4. Steel Finish: Primed.
5. Primed and Factory Finish: Polyester powder coat; color as selected by Architect from manufacturer's standard colors.
6. Door/Panel Size: As indicated on the drawings.
7. Hardware:
    a. Hinges for Non-Fire-Rated Units: Concealed, constant force closure spring type.
    b. Handle: Handle and key operated cam latch.
    c. Latch/Lock: Cylinder lock-operated cam latch, two keys for each unit.

1) Mortise cylinder and core as specified in Section 08 71 00.

d. Number of Locks/Latches Required: As recommended by manufacturer for size of unit.

e. Inside Latch Release: Mechanism that allows door/panel to be opened from inside.

2.03 **FLOOR ACCESS UNITS**

A. Floor Access Units: Factory fabricated, fully assembled units with corner joints welded, filled, and ground flush; square and without rack or warp; coordinate requirements with type of installation assembly being used for each unit.

1. Size: As indicated on the drawings.

2. Hardware: Steel, hot-dipped galvanized.

a. Hinges: Removable pin.

b. Lock: Cylinder lock with latch, two keys for each unit.

B. Interior Floor Access Units: Steel, minimum 1/4 inch thick must allow finish flooding to be installed on top of panel.

1. Design Load: Design to support live load of 150 lb/sq ft with deflection not to exceed 1/180 of span.

2. Operation: Manual opening, and manual closing.

3. Lift Handle: Recessed, non-removable with lock

4. Finish: Rust inhibiting primer.

PART 3 EXECUTION

3.01 **EXAMINATION**

A. Verify that rough openings are correctly sized and located.

B. Begin installation only after substrates have been properly prepared, and if the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 **PREPARATION**

A. Clean surfaces thoroughly prior to proceeding with this work.

B. Prepare surfaces using methods recommended by manufacturer for applicable substrates in accordance with project conditions.

3.03 **INSTALLATION**

A. Install units in accordance with manufacturer's instructions.

B. Install frames plumb and level in openings, and secure units rigidly in place.

C. Position units to provide convenient access to concealed equipment when necessary.

END OF SECTION

SECTION 08 54 00
COMPOSITE WINDOWS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Factory fabricated composite windows with fixed and operating sash.

B. Operating hardware.

C. Insect screens.

1.02 RELATED REQUIREMENTS

A. Section 07 25 00 - Weather Barriers: Perimeter air and vapor seal between composite window frame and adjacent construction.

B. Section 07 92 00 - Joint Sealants: Sealing joints between frames and adjacent construction.

C. Section 08 80 00 - Glazing.

1.03 REFERENCE STANDARDS

A. AAMA/WDMA/CSA 101/I.S.2/A440 - North American Fenestration Standard/Specification for windows, doors, and skylights 2017.

B. AAMA 502 - Voluntary Specification for Field Testing of Newly Installed Fenestration Products 2012.

C. AAMA 1503 - Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections 2009.

D. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements 2009 (Reapproved 2016).

E. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen 2004 (Reapproved 2012).

F. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference 2014.

G. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference 2000 (Reapproved 2016).

H. ASTM E783 - Standard Test Method for Field Measurement of Air Leakage Through Installed Exterior Windows and Doors 2002 (Reapproved 2018).

I. ASTM E1105 - Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference 2015.

J. ASTM E1332 - Standard Classification for Rating Outdoor-Indoor Sound Attenuation 2016.

K. ASTM F588 - Standard Test Methods for Measuring the Forced Entry Resistance of Window Assemblies, Excluding Glazing Impact 2017.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide component dimensions, anchorage and fasteners, glass, internal drainage details.

C. Shop Drawings: Indicate opening dimensions, framed opening tolerances, affected related work, installation requirements.

D. Submit two samples 12 inches square in size illustrating factory finished surfaces.

E. Test and Evaluation Reports: Submit certified label or test report on products as indicated under performance requirements to validate product compliance.

F. Manufacturer's Certificate: Certify that products of this section meet or exceed specified requirements.

G. Field Quality Control Submittals: Report of field testing for water penetration and air leakage.

H. Manufacturer's Qualification Statement.

I. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 **QUALITY ASSURANCE**

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.

1.06 **DELIVERY, STORAGE, AND HANDLING**

A. Protect finished surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond when exposed to sunlight or weather.

B. Jig, brace, and box the window frame assemblies for transport to minimize flexing of members or joints.

1.07 **FIELD CONDITIONS**

A. Do not install sealants when ambient temperature is less than 40 degrees F.

B. Maintain this minimum temperature during and after installation of sealants.

1.08 **WARRANTY**

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Correct defective work within a ten year period after Date of Substantial Completion.

C. Provide twenty year manufacturer warranty for insulated glass units from seal failure, interpane dusting or misting, and replacement of same. Include coverage for degradation of color finish.

PART 2 PRODUCTS

2.01 **MANUFACTURERS**

A. Composite Windows:

1. Andersen Windows, Inc; 100 Series Casement Window: www.andersenwindows.com/#sle.

2. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 **COMPOSITE WINDOW UNITS**

A. Composite Windows: Hollow, extruded composite material consisting of 40 percent wood fiber and 60 percent thermoplastic polymer by weight; factory fabricated; with vision glass, related flashings, anchorage and attachment devices.

1. Configuration: As indicated on drawings.

2. Window Product Type(s): FW - Fixed window and HS - Horizontal sliding window, in accordance with AAMA/WDMA/CSA 101/I.S.2/A440.
3. Interior Color: As selected by Architect from manufacturer's standard line.
4. Exterior Color: As selected by Architect from manufacturer's standard line.
5. Frame Depth: 3-1/4 inch, minimum.
6. Attachment Flange: Setback 1-3/8 inch, without stucco key.
7. Frame Joining System: Attachment system for horizontal and vertical multiple window frames in compliance with designated project requirements.
    a. Joining Strip: Kerfed and reinforced fiberglass strip, 3-11/64 inch wide by 1/2 inch thick for applying interior and exterior vinyl trim, end plugs, flange and gusset gasket, and galvanized steel gusset plates.
    b. Vinyl trim color to match exposed frame colors.
    c. Fasteners: Corrosion resistant screws as recommended by manufacturer for required applications.
8. Glass Stops: Same material and color as frame, sloped for wash, factory applied.

2.03 **COMPONENTS**

A. Insect Screen Frame: Aluminum frame of rectangular sections; fit with adjustable hardware; nominal size similar to operable glazed unit.
    1. Frame Color: Match window frame color.
B. Insect Screens: Fiberglass cloth mesh, secured with vinyl spline.
C. Operable Sash Weather Stripping: Polypropylene; permanently resilient, profiled to effect weather seal.
D. Venting or Stationary Sash Weather Stripping: Vinyl; permanently resilient, profiled to effect weather seal.
E. Fasteners: Stainless steel.

2.04 **PERFORMANCE REQUIREMENTS**

A. Comply with AAMA/WDMA/CSA 101/I.S.2/A440 requirements in accordance with the following:
    1. Performance Class (PC): LC.
    2. Performance Grade (PG): 25, with minimum design pressure (DP) of 25.06 psf.
B. Test and Evaluation Reports: Windows comply with AAMA/WDMA/CSA 101/I.S.2/A440 performance requirements as indicated by having AAMA, WDMA, or CSA certified label, or an independent test report for indicated products itemizing compliance and acceptable by authorities having jurisdiction.
C. Measure performance of units by testing in accordance with ASTM E330/E330M, using test pressure equal to 1.5 times the design wind pressure and 10 second duration of maximum load.
D. Deflection: Limit member deflection to 1/200 of the longer dimension with full recovery of glazing materials.
E. Assembly: To accommodate, without damage to components or deterioration of seals, movement between window and perimeter framing, deflection of lintel.

F. Overall Thermal Transmittance (U-value): 0.35, maximum, including glazing, measured on window sizes required for this project.

G. Forced Entry Resistance: Comply with ASTM F588 requirements for performance level 10 for window Type A.

H. Air Infiltration: Limit air infiltration through assembly to 0.3 cu ft/min/sq ft of wall area, measured at a reference differential pressure across assembly of 1.57 psf as measured in accordance with ASTM E283.

I. Vapor Seal: No vapor seal failure at interior static pressure of 1 inch, 72 degrees F, and 40 percent relative humidity.

J. Condensation Resistance Factor: CRF when measured in accordance with AAMA 1503.

K. Water Leakage: None, when measured in accordance with ASTM E331.

L. System Internal Drainage: Drain water entering joints, condensation occurring in glazing channels, or migrating moisture occurring within system, to the exterior by a weep drainage network.

M. Air and Vapor Seal: Maintain continuous air and vapor barrier throughout assembly, primarily in line with inside pane of glass and heel bead of glazing compound. Position thermal insulation on exterior face of air and vapor barrier materials.

N. Design Temperature Range: 120 degrees F.

O. Acoustic Performance: Minimum outdoor-indoor transmission class (OITC) rating of 34, when tested in accordance with ASTM E90 and ASTM E1332.

2.05 **GLASS AND GLAZING MATERIALS**

A. Glass and Glazing Materials: As specified in Section 08 80 00 and of types as indicated.

1. Glass in Exterior Lights: As indicated.

2.06 **HARDWARE**

A. Horizontal Sliding Sash: Extruded PVC interfacing tracks, limit stops in head and sill track.

B. Finish For Exposed Hardware: Match window finish.

2.07 **FABRICATION**

A. Factory fabricate framing, mullions and sash members with rigid corners and joints. Supplement frame sections with internal reinforcement where required for structural rigidity.

B. Form sills and stools in one piece. Slope sills for wash.

C. Fabricate components with minimum clearances and shim spacing around perimeter of window assembly, and allowing for installation and dynamic movement of perimeter seal.

D. Arrange fasteners to be concealed from view.

E. Permit internal drainage weep holes and channels to migrate moisture to exterior. Provide internal drainage of glazing spaces to exterior through weep holes.

F. Assemble insect screen frame, miter and reinforced frame corners. Fit mesh taut into frame and secure. Fit frame with four spring loaded steel pin retainers.

G. Double weatherstrip operable units.

H. Factory glaze window units.

PART 3 EXECUTION

3.01 **EXAMINATION**

A. Verify wall openings and adjoining air and vapor seal materials are ready to receive work of this Section.

3.02 **INSTALLATION**

A. Install composite window units in accordance with manufacturer's instructions.

B. Attach window frame and shims to perimeter of opening to accommodate construction tolerances and other irregularities.

C. Align window plumb and level, free of warp or twist. Maintain dimensional tolerances and alignment with adjacent work.

D. Provide thermal isolation where components penetrate or disrupt building insulation. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

E. Coordinate installation with seal of perimeter air and vapor barrier materials as specified in Section 07 25 00.

F. Install operating hardware.

G. Install glass and infill panels in accordance with Section 08 80 00, to glazing method required to achieve performance criteria.

3.03 **TOLERANCES**

A. Maximum Variation from Level or Plumb: 1/16 inch per 3 ft or 1/2 inch per 100 ft, non-cumulative, whichever is less.

3.04 **FIELD QUALITY CONTROL**

A. See Section 01 40 00 - Quality Requirements, for independent field testing and inspection requirements, and requirements for monitoring quality of specified product installations.

B. Provide field testing of installed composite windows by independent laboratory in accordance with AAMA 502 and AAMA/WDMA/CSA 101/I.S.2/A440 during construction process and before installation of interior finishes.

1. Field test for water penetration in accordance with ASTM E1105 using Procedure B - cyclic static air pressure difference; test pressure shall not be less than 1.9 psf.

2. Field test for air leakage in accordance with ASTM E783 with uniform static air pressure difference of 6.27 psf.

a. Maximum allowable rate of air leakage is 1.5 times specified rate of 0.10 cfm/sq ft as indicated in AAMA/WDMA/CSA 101/I.S.2/A440.

C. Repair or replace fenestration components that have failed designated field testing, and retest to verify performance complies with specified requirements.

3.05 **ADJUSTING**

A. Adjust hardware for smooth operation and secure weathertight closure.

3.06 **CLEANING**

A. See Section 01 74 19 - Construction Waste Management and Disposal, for additional requirements.

B. Remove protective material from pre-finished surfaces.

C. Wash surfaces by method recommended and acceptable to window manufacturer; rinse and wipe surfaces clean.

D. Remove excess glazing sealant by moderate use of mineral spirits or other solvent acceptable to sealant manufacturer.

END OF SECTION

SECTION 08 71 00
DOOR HARDWARE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Hardware for wood, hollow metal and steel doors.

B. Hardware for fire-rated doors.

C. Thresholds.

D. Weatherstripping and gasketing.

1.02 RELATED REQUIREMENTS

A. Section 06 20 00 - Finish Carpentry: Wood door frames.

B. Section 07 92 00 - Joint Sealants: Sealants for setting exterior door thresholds.

C. Section 08 06 71 - Door Hardware Schedule: Schedule of door hardware sets.

D. Section 08 11 13 - Hollow Metal Doors and Frames.

1.03 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design 2010.

B. BHMA (CPD) - Certified Products Directory 2017.

C. BHMA A156.1 - American National Standard for Butts and Hinges 2016.

D. BHMA A156.2 - American National Standard for Bored and Preassembled Locks & Latches 2017.

E. BHMA A156.5 - American National Standard for Cylinders and Input Devices for Locks 2014.

F. BHMA A156.6 - American National Standard for Architectural Door Trim 2015.

G. BHMA A156.7 - American National Standard for Template Hinge Dimensions 2016.

H. BHMA A156.14 - American National Standard for Sliding and Folding Door Hardware 2013.

I. BHMA A156.16 - American National Standard for Auxiliary Hardware 2013.

J. BHMA A156.17 - American National Standard for Self Closing Hinges & Pivots 2014.

K. BHMA A156.20 - American National Standard for Strap and Tee Hinges, and Hasps 2006 (Reaffirmed 2012).

L. BHMA A156.21 - American National Standard for Thresholds 2014.

M. BHMA A156.22 - American National Standard for Door Gasketing and Edge Seal Systems, Builders Hardware Manufacturers Association 2017.

N. BHMA A156.28 - American National Standard for Recommended Practices for Mechanical Keying Systems 2013.

O. BHMA A156.36 - American National Standard for Auxiliary Locks 2016.

P. BHMA A156.115 - American National Standard for Hardware Preparation in Steel Doors and Steel Frames 2016.

Q. BHMA A156.115W - Hardware Preparation in Wood Doors with Wood or Steel Frames 2006.

R. DHI (KSN) - Keying Systems and Nomenclature 1989.

S. DHI WDHS.3 - Recommended Locations for Architectural Hardware for Flush Wood Doors 1993; also in WDHS-1/WDHS-5 Series, 1996.

T. ICC A117.1 - Accessible and Usable Buildings and Facilities 2017.

U. ITS (DIR) - Directory of Listed Products current edition.

V. NFPA 80 - Standard for Fire Doors and Other Opening Protectives 2019.

W. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies 2017.

X. UL (DIR) - Online Certifications Directory Current Edition.

Y. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the manufacture, fabrication, and installation of products that door hardware is installed on.

B. Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.

C. Furnish templates for door and frame preparation to manufacturers and fabricators of products requiring internal reinforcement for door hardware.

D. Keying Requirements Meeting:

1. Schedule meeting at project site prior to Contractor occupancy.
2. Attendance Required:
    a. Contractor.
    b. Owner.
    c. Architect.
3. Agenda:
    a. Establish keying requirements.
    b. Verify locksets and locking hardware are functionally correct for project requirements.
    c. Establish keying submittal schedule and update requirements.
4. Incorporate "Keying Requirements Meeting" decisions into keying submittal upon review of door hardware keying system including, but not limited to, the following:
    a. Key control system requirements.
5. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.
6. Deliver established keying requirements to manufacturers.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's catalog literature for each type of hardware, marked to clearly show products to be furnished for this project, and includes construction details, material descriptions, finishes, and dimensions and profiles of individual components.

C. Shop Drawings - Door Hardware Schedule: Submit detailed listing that includes each item of hardware to be installed on each door. Use door numbering scheme as included in Contract Documents.

1. Prepared by or under supervision of Architectural Hardware Consultant (AHC).
2. Provide complete description for each door listed.
3. Provide manufacturer's and product names, and catalog numbers; include functions, types, styles, sizes and finishes of each item.
4. Include account of abbreviations and symbols used in schedule.

D. Samples for Verification:

1. Submit minimum size of 2 by 4 inch for sheet samples, and minimum length of 4 inch for other products.
2. Submit one (1) [____] sample of hinge, latchset, lockset and [_____] illustrating style, color, and finish.
3. Return full-size samples to Contractor.
4. Submit product description with samples.

E. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

F. Maintenance Data: Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.

1. Submit manufacturer's parts lists and templates.
2. Bitting List: List of combinations as furnished.

G. Keying Schedule:

1. Submit three (3) copies of Keying Schedule in compliance with requirements established during Keying Requirements Meeting unless otherwise indicated.

1.06 **DELIVERY, STORAGE, AND HANDLING**

A. Package hardware items individually; label and identify each package with door opening code to match door hardware schedule.

PART 2 PRODUCTS

2.01 **DESIGN AND PERFORMANCE CRITERIA**

A. Provide specified door hardware as required to make doors fully functional, compliant with applicable codes, and secure to extent indicated.

B. Provide individual items of single type, of same model, and by same manufacturer.

C. Provide door hardware products that comply with the following requirements:

1. Applicable provisions of federal, state and local codes.
2. Accessibility: ADA Standards and ICC A117.1.
3. Fire-Rated Doors: NFPA 80, listed and labeled by qualified testing agency for fire protection ratings indicated, based on testing at positive pressure in accordance with NFPA 252 or UL 10C.
4. Hardware on Fire-Rated Doors: Listed and classified by UL (DIR), ITS (DIR) or testing firm acceptable to authorities having jurisdiction as suitable for application indicated.
5. Listed and certified compliant with specified standards by BHMA (CPD).
6. Auxiliary Hardware: BHMA A156.16.
7. Straps and Tee Hinges: BHMA A156.20.
8. Hardware Preparation for Steel Doors and Steel Frames: BHMA A156.115.

9. Hardware Preparation for Wood Doors with Wood or Steel Frames: BHMA A156.115W.

D. Lock Function: Provide lock and latch function numbers and descriptions of manufacturer's series. Refer to Door Hardware Schedule as indicated in drawings

E. Fasteners:

1. Provide fasteners of proper type, size, quantity, and finish that comply with commercially recognized standards for proposed applications.

a. Aluminum fasteners are not permitted.

b. Provide phillips flat-head screws with heads finished to match door surface hardware unless otherwise indicated.

2. Fire-Rated Applications: Comply with NFPA 80.

a. Provide wood or machine screws for hinges mortised to doors or frames, strike plates to frames, and closers to doors and frames.

b. Provide steel through bolts for attachment of surface mounted closers, hinges, or exit devices to door panels unless proper door blocking is provided.

2.02 **HINGES**

A. Hinges: Comply with BHMA A156.1, Grade 1.

1. Self Closing Hinges: Comply with BHMA A156.17.

2. Butt Hinges: Comply with BHMA A156.1 and BHMA A156.7 for templated hinges.

a. Provide hinge width required to clear surrounding trim.

3. Provide hinges on every swinging door.

4. Provide five-knuckle full mortise butt hinges unless otherwise indicated.

5. Provide following quantity of butt hinges for each door:

a. Doors up to 60 inches High: Two hinges.

b. Doors From 60 inches High up to 90 inches High: Three hinges.

c. Doors 90 inches High up to 120 inches High: Four hinges.

d. Doors over 120 inches High: One additional hinge per each additional 30 inches in height.

e. Dutch Doors: Two hinges each leaf.

2.03 **TRACK AND HANGERS**

A. Sliding and Bifolding Door Hardware: Comply with BHMA A156.14.

1. Provide track, hanger fasteners, guides, and pulls; size track and hangers in accordance with manufacturer's recommendations for weight of doors.

2. Provide one pull for each pair of panels hinged together.

3. Provide flush cup pull on each sliding panel.

B. Face-Mounted Barn Door Hardware:

1. Provide stainless steel, round track rail, track fasteners, guides, latches and pulls; size rail and hangers in accordance with manufacturer's recommendations for weight of doors.

2. Track Finish: As selected by Architect.

C. Door Weight: Medium; medium frequency of use with 150 to 200 lbs door weight.

2.04 **LOCK CYLINDERS**

A. Lock Cylinders: Provide key access on outside of each lock, unless otherwise indicated.

1. Provide standard, electronic, conventional, full size interchangeable core (FSIC) and small format interchangeable core (SFIC) type cylinders, Grade 1, with six-pin core in compliance with BHMA A156.5 at locations indicated.
2. Provide cylinders from same manufacturer as locking device.
3. Provide cams and/or tailpieces as required for locking devices.
4. Within specific Door Sections, when provisions for lock cylinder are being referenced to this Section, provide specified lock cylinder and keyed to building keying system, unless otherwise indicated.

2.05 **CYLINDRICAL LOCKS**

A. Cylindrical Locks (Bored): Comply with BHMA A156.2, Grade 1, 4000 Series.

1. Bored Hole: 2-1/8 inch diameter.
2. Latchbolt Throw: 1/2 inch, minimum.
3. Backset: 2-3/4 inch unless otherwise indicated.
4. Strikes: Provide manufacturer's standard strike for each latchset or lockset with strike box and curved lip extending to protect frame in compliance with indicated requirements.
    a. Finish: To match lock or latch.
5. Trim: Provide lever handle or pull trim on outside of each lock, unless otherwise indicated.

2.06 **AUXILIARY LOCKS (DEADLOCKS)**

A. Auxiliary Locks (Deadlocks): Comply with BHMA A156.36, Grade 1.

1. Type: Bored (cylindrical).
2. Application: Bored.
3. Backset: 2-3/4 inch, unless otherwise indicated.
4. Bolt Throw: 1/2 inch, with latch made of hardened steel.
5. Provide strike that matches frame.

2.07 **PROTECTION PLATES**

A. Protection Plates: Comply with BHMA A156.6.

B. Metal Properties: Aluminum.

1. Metal, Standard Duty: Thickness 0.05 inch, minimum.

C. Plastic Properties:

1. Plastic, Flexible PVC: Thickness 0.060 inch, minimum.

D. Edges: Beveled, on four sides unless otherwise indicated.

E. Fasteners: Countersunk screw fasteners.

2.08 **FLOOR STOPS**

A. Floor Stops: Comply with BHMA A156.16, Grade 1 and Resilient Material Retention Test as described in this standard.

1. Provice floor stoped as indicated in drawings; be cautious not to create a tripping hazard.

2. Type: Manual hold-open, with dome floor stop.
3. Material: Aluminum housing with rubber insert.

2.09 **WALL STOPS**

A. Wall Stops: Comply with BHMA A156.16, Grade 1 and Resilient Material Retention Test as described in this standard.

1. Provide wall stops as indicated on drawings to prevent damage to wall surface upon opening door.
2. Type: Bumper, convex, wall stop.
3. Material: Aluminum housing with rubber insert.

2.10 **THRESHOLDS**

A. Thresholds: Comply with BHMA A156.21.

1. Provide threshold at each exterior door, unless otherwise indicated.
2. Type: Flat surface.
3. Material: Aluminum.
4. Threshold Surface: Fluted horizontal grooves across full width.
5. Field cut threshold to profile of frame and width of door sill for tight fit.
6. Provide non-corroding fasteners at exterior locations.

2.11 **WEATHERSTRIPPING AND GASKETING**

A. Weatherstripping and Gasketing: Comply with BHMA A156.22.

1. Head and Jamb Type: Adjustable.
2. Door Sweep Type: Encased in retainer.
3. Material: Aluminum, with brush weatherstripping.
4. Provide weatherstripping on each exterior door at head, jambs, and meeting stiles of door pairs, unless otherwise indicated; .
5. Provide door bottom sweep on each exterior door, unless otherwise indicated.

2.12 **ROLLER LATCH**

A. Roller Latch: Provide on doors that are not frequently used and need to latch, and on doors that must stay in closed position within the frame.

1. Location: Mount roller latch at top of door with strike plate fastened to head of door frame.
2. Material: Aluminum.

2.13 **VIEWER**

A. Viewer: Provide at inside of door at height indicated in drawings to see who is on outside of door.

1. Material: Aluminum.

2.14 **KEY CONTROL SYSTEMS**

A. Key Control Systems: Comply with guidelines of BHMA A156.28.

1. Provide keying information in compliance with DHI (KSN) standards.
2. Keying: Grand master keyed.
3. Include construction keying and control keying with removable core cylinders.

4. Supply keys in following quantities:
    a. 5 Grand Master keys per each grandmaster system
    b. 6 each Construction Master keys.
    c. 15 each Construction keys.
    d. 2 each Construction Control keys.
    e. 2 each Control keys if new system.
5. Key Management System: For each keyed lock on project, provide one set of consecutively numbered duplicate key tags with hanging hole and snap catch.
6. Provide key collection envelopes, receipt cards, and index cards in quantity suitable to manage number of keys.
7. Deliver keys with identifying tags to Owner by security shipment direct from hardware supplier.
8. Permanent Keys and Cores: Stamped with applicable key marking for identification. Do not include actual key cuts within visual key control marks or codes. Stamp permanent keys "Do Not Duplicate."

2.15 **FIRE DEPARTMENT LOCK BOX**

A. Fire Department Lock Box:
    1. Confirm requirements with Pueblo Regional Fire Dept.
    2. Heavy-duty, surface mounted, solid stainless-steel box with hinged door and interior gasket seal; single drill resistant lock with dust covers and tamper alarm.
    3. Capacity: Holds 10 keys.
    4. Finish: Manufacturer's standard dark bronze.
    5. lock box to be installed in each Water Entry Room

2.16 **FINISHES**

A. Finishes: Identified in Section 08 0671 - Door Hardware Schedule.

PART 3 EXECUTION

3.01 **EXAMINATION**

A. Verify that doors and frames are ready to receive this work; labeled, fire-rated doors and frames are properly installed, and dimensions are as indicated on shop drawings.

B. Verify that electric power is available to power operated devices and of correct characteristics.

3.02 **INSTALLATION**

A. Install hardware in accordance with manufacturer's instructions and applicable codes.

B. Install hardware on fire-rated doors and frames in accordance with applicable codes and NFPA 80.

C. Use templates provided by hardware item manufacturer.

D. Do not install surface mounted items until application of finishes to substrate are fully completed.

E. Door Hardware Mounting Heights: Distance from finished floor to center line of hardware item. As indicated in following list; unless noted otherwise in Door Hardware Schedule or on drawings.

1. For Steel Doors and Frames: Refer to Section 08 11 13.
2. For Wood Doors: Install in compliance with DHI WDHS.3 recommendations.
3. Mounting heights in compliance with ADA Standards:
    a. Locksets: 40-5/16 inch.
    b. Push Plates/Pull Bars: 42 inch.
    c. Deadlocks (Deadbolts): 48 inch.
    d. Exit Devices: 40-5/16 inch.
    e. Door Viewer: 43 inch; standard height 60 inch.

F. Set exterior door thresholds with full-width bead of elastomeric sealant at each point of contact with floor providing a continuous weather seal; anchor thresholds with stainless steel countersunk screws.
    1. Refer to Section 07 92 00 for additional requirements.

3.03 **FIELD QUALITY CONTROL**

A. Perform field inspection and testing under provisions of Section 01 40 00 - Quality Requirements.

3.04 **ADJUSTING**

A. Adjust work under provisions of Section 01 70 00 - Execution and Closeout Requirements.

B. Adjust hardware for smooth operation.

C. Adjust gasketing for complete, continuous seal; replace if unable to make complete seal.

3.05 **CLEANING**

A. Clean finished hardware in accordance with manufacturer's written instructions after final adjustments have been made.

B. Clean adjacent surfaces soiled by hardware installation.

C. Replace items that cannot be cleaned to manufacturer's level of finish quality at no additional cost.

D. See Section 01 74 19 - Construction Waste Management and Disposal, for additional requirements.

3.06 **PROTECTION**

A. Protect finished Work under provisions of Section 01 70 00 - Execution and Closeout Requirements.

B. Do not permit adjacent work to damage hardware or finish.

END OF SECTION

SECTION 08 80 00
GLAZING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Insulating glass units.

B. Glazing units.

C. Glazing compounds and accessories.

1.02 RELATED REQUIREMENTS

A. Section 07 25 00 - Weather Barriers.

B. Section 07 92 00 - Joint Sealants: Sealants for other than glazing purposes.

C. Section 08 11 13 - Hollow Metal Doors and Frames: Glazed lites in doors and borrowed lites.

D. Section 10 28 00 - Toilet, Bath, and Laundry Accessories: Mirrors.

1.03 REFERENCE STANDARDS

A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials current edition.

B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test 2015.

C. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers 2005 (Reapproved 2015).

D. ASTM C920 - Standard Specification for Elastomeric Joint Sealants 2018.

E. ASTM C1036 - Standard Specification for Flat Glass 2016.

F. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass 2018.

G. ASTM C1172 - Standard Specification for Laminated Architectural Flat Glass 2014.

H. ASTM C1193 - Standard Guide for Use of Joint Sealants 2016.

I. ASTM C1376 - Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass 2015.

J. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings 2016.

K. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation 2010.

L. GANA (SM) - GANA Sealant Manual 2008.

M. NFRC 100 - Procedure for Determining Fenestration Product U-factors 2017.

N. NFRC 200 - Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence 2014, with Errata (2017).

O. NFRC 300 - Test Method for Determining the Solar Optical Properties of Glazing Materials and Systems 2017.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data on Insulating Glass Unit and Glazing Unit Glazing Types: Provide structural, physical and environmental characteristics, size limitations, special handling and installation requirements.

C. Product Data on Glazing Compounds and Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.

D. Certificate: Certify that products of this section meet or exceed specified requirements.

E. Shop drawings: indicate type and location of all glazing.

1.05 **FIELD CONDITIONS**

A. Do not install glazing when ambient temperature is less than 40 degrees F.

B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

PART 2 PRODUCTS

2.01 **PERFORMANCE REQUIREMENTS - EXTERIOR GLAZING ASSEMBLIES**

A. Provide type and thickness of exterior glazing assemblies to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of glass.

1. Comply with ASTM E1300 for design load resistance of glass type, thickness, dimensions, and maximum lateral deflection of supported glass.

2. Provide glass edge support system sufficiently stiff to limit the lateral deflection of supported glass edges to less than 1/175 of their lengths under specified design load.

3. Glass thicknesses listed are minimum.

B. Vapor Retarder and Air Barrier Seals: Provide completed assemblies that maintain continuity of building enclosure vapor retarder and air barrier.

1. In conjunction with vapor retarder and joint sealer materials described in other sections.

C. Thermal and Optical Performance: Provide exterior glazing products with performance properties as indicated. Performance properties are in accordance with manufacturer's published data as determined with the following procedures and/or test methods:

1. Center of Glass U-Value: Comply with NFRC 100 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.

2. Center of Glass Solar Heat Gain Coefficient (SHGC): Comply with NFRC 200 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.

3. Solar Optical Properties: Comply with NFRC 300 test method.

2.02 **GLASS MATERIALS**

A. Float Glass: Provide float glass based glazing unless otherwise indicated.

1. Annealed Type: ASTM C1036, Type I - Transparent Flat, Class 1 - Clear, Quality - Q3.

2. Kind HS - Heat-Strengthened Type: Complies with ASTM C1048.

3. Kind FT - Fully Tempered Type: Complies with ASTM C1048.

4. Fully Tempered Safety Glass: Complies with ANSI Z97.1 or 16 CFR 1201 criteria for safety glazing used in hazardous locations.

5. Heat-Soak Testing (HST): Provide HST of fully tempered glass used on canopy, point-supported, spider wall, high-risk, sloping overhead, horizontal overhead, free-standing

glass protective barrier or other demanding applications of project, to reduce risks of spontaneous breakage due to nickel sulfide (NiS) induced fractures in accordance with industry established testing requirements.

6. Impact Resistant Safety Glass: Complies with ANSI Z97.1 - Class B, or 16 CFR 1201 - Category I criteria.
7. Tinted Type: ASTM C1036, Class 2 - Tinted, Quality - Q3, with color and performance characteristics as indicated.
8. Thicknesses: As indicated; provide greater thickness as required for exterior glazing wind load design.

B. Laminated Glass: Float glass laminated in accordance with ASTM C1172.

1. Laminated Safety Glass: Complies with ANSI Z97.1 - Class B or 16 CFR 1201 - Category I impact test requirements.

2.03 **INSULATING GLASS UNITS**

A. Insulating Glass Units: Types as indicated.

1. Durability: Certified by an independent testing agency to comply with ASTM E2190.
2. Coated Glass: Comply with requirements of ASTM C1376 for pyrolytic (hard-coat) or magnetic sputter vapor deposition (soft-coat) type coatings on flat glass; coated vision glass, Kind CV; coated overhead glass, Kind CO; or coated spandrel glass, Kind CS.
3. Spacer Color: White.
4. Edge Seal:
    a. Dual-Sealed System: Provide polyisobutylene sealant as primary seal applied between spacer and glass panes, and silicone, polysulfide or polyurethane sealant as secondary seal applied around perimeter.
    b. Color: Black.
5. Purge interpane space with dry air, hermetically sealed.
6. Capillary Tubes: Provide tubes from air space for insulating glass units without inert type gas that have a change of altitude greater than 2500 feet between point of fabrication and point of installation to permit pressure equalization of air space.
    a. Capillary Tubes: Tubes to remain open and be of length and material type in accordance with insulating glass fabricator's requirements.

B. Type IG-1 - Insulating Glass Units: Vision glass, double glazed.

1. Applications: Exterior glazing unless otherwise indicated.
2. Space between lites filled with air.
3. Outboard Lite: Annealed float glass, 1/4 inch thick, minimum.
    a. Tint: Clear.
    b. Coating: Low-E (passive type), on #2 surface.
4. Inboard Lite: Annealed float glass, 1/4 inch thick, minimum.
    a. Tint: Clear.
5. Total Thickness: 1 inch.
6. Thermal Transmittance (U-Value), Summer - Center of Glass: as indicated on drawings, nominal.
7. Visible Light Transmittance (VLT):

8. Solar Heat Gain Coefficient (SHGC): as indicated on drawings, nominal.

C. Type IG-5 - Insulating Glass Units: Safety glazing.

1. Applications:

a. Glazed lites in exterior doors.

b. Other locations required by applicable federal, state, and local codes and regulations.

2. Space between lites filled with air.

3. Glass Type: Same as Type IG-1 except use fully tempered float glass for both outboard and inboard lites.

4. Total Thickness: 1 inch.

5. Thermal Transmittance (U-Value), Summer - Center of Glass: as indicated on drawings

6. Solar Heat Gain Coefficient (SHGC): as indicated on drawings, nominal.

2.04 **GLAZING COMPOUNDS**

A. Type GC-2 - Butyl Sealant: Single component; ASTM C920 Grade NS, Class 12-1/2, Uses M and A, Shore A hardness of 10 to 20; black color.

B. Type GC-5 - Silicone Sealant: Single component; neutral curing; capable of water immersion without loss of properties; non-bleeding, non-staining; ASTM C920 Type S, Grade NS, Class 25, Uses M, A, and G; with cured Shore A hardness range of 15 to 25; color as selected.

2.05 **ACCESSORIES**

A. Setting Blocks: Silicone, with 80 to 90 Shore A durometer hardness; ASTM C864 Option II. Length of 0.1 inch for each square foot of glazing or minimum 4 inch by width of glazing rabbet space minus 1/16 inch by height to suit glazing method and pane weight and area.

B. Glazing Tape, Back Bedding Mastic Type: Preformed, butyl-based, 100 percent solids compound with integral resilient spacer rod applicable to application indicated; 5 to 30 cured Shore A durometer hardness; coiled on release paper; black color.

C. Glazing Splines: Resilient silicone extruded shape to suit glazing channel retaining slot; ASTM C864 Option II; color black.

D. Glazing Clips: Manufacturer's standard type.

PART 3 EXECUTION

3.01 **VERIFICATION OF CONDITIONS**

A. Verify that openings for glazing are correctly sized and within tolerances, including those for size, squareness, and offsets at corners.

B. Verify that the minimum required face and edge clearances are being provided.

C. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and support framing is ready to receive glazing system.

D. Verify that sealing between joints of glass framing members has been completed effectively.

E. Proceed with glazing system installation only after unsatisfactory conditions have been corrected.

3.02 **PREPARATION**

A. Clean contact surfaces with appropriate solvent and wipe dry within maximum of 24 hours before glazing. Remove coatings that are not tightly bonded to substrates.

B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.

C. Prime surfaces scheduled to receive sealant where required for proper sealant adhesion.

3.03 **INSTALLATION, GENERAL**

A. Install glazing in compliance with written instructions of glass, gaskets, and other glazing material manufacturers, unless more stringent requirements are indicated, including those in glazing referenced standards.

B. Install glazing sealants in accordance with ASTM C1193, GANA (SM), and manufacturer's instructions.

C. Do not exceed edge pressures around perimeter of glass lites as stipulated by glass manufacturer.

D. Set glass lites of system with uniform pattern, draw, bow, and similar characteristics.

E. Set glass lites in proper orientation so that coatings face exterior or interior as indicated.

F. Prevent glass from contact with any contaminating substances that may be the result of construction operations such as, and not limited to the following; weld splatter, fire-safing, plastering, mortar droppings, etc.

3.04 **INSTALLATION - DRY GLAZING METHOD (GASKET GLAZING)**

A. Application - Exterior and/or Interior Glazed: Set glazing infills from either the exterior or the interior of the building.

B. Place setting blocks at 1/4 points with edge block no more than 6 inch from corners.

C. Rest glazing on setting blocks and push against fixed stop with sufficient pressure on gasket to attain full contact.

D. Install removable stops without displacing glazing gasket; exert pressure for full continuous contact.

3.05 **INSTALLATION - DRY GLAZING METHOD (TAPE AND GASKET SPLINE GLAZING)**

A. Application - Exterior Glazed: Set glazing infills from the exterior of the building.

B. Cut glazing tape to length; install on glazing pane. Seal corners by butting tape and sealing junctions with butyl sealant.

C. Place setting blocks at 1/4 points with edge block no more than 6 inch from corners.

D. Rest glazing on setting blocks and push against fixed stop with sufficient pressure to attain full contact.

E. Install removable stops without displacing glazing spline. Exert pressure for full continuous contact.

F. Carefully trim protruding tape with knife.

3.06 **INSTALLATION - DRY GLAZING METHOD (TAPE AND TAPE)**

A. Application - Interior Glazed: Set glazing infills from the interior of the building.

B. Cut glazing tape to length and set against permanent stops, projecting 1/16 inch above sight line.

C. Place setting blocks at 1/4 points with edge block no more than 6 inch from corners.

D. Rest glazing on setting blocks and push against tape for full contact at perimeter of pane or unit.

E. Place glazing tape on free perimeter of glazing in same manner described above.

F. Install removable stop without displacement of tape. Exert pressure on tape for full continuous contact.

G. Carefully trim protruding tape with knife.

3.07 **INSTALLATION - WET GLAZING METHOD (SEALANT AND SEALANT)**

A. Application - Exterior Glazed: Set glazing infills from the exterior of the building.

B. Place setting blocks at 1/4 points and install glazing pane or unit.

C. Install removable stops with glazing centered in space by inserting spacer shims both sides at 24 inch intervals, 1/4 inch below sight line.

D. Fill gaps between glazing and stops with sealant to depth of bite on glazing, but not more than 3/8 inch below sight line to ensure full contact with glazing and continue the air and vapor seal.

E. Apply sealant to uniform line, flush with sight line. Tool or wipe sealant surface smooth.

3.08 **INSTALLATION - WET GLAZING METHOD (COMPOUND AND COMPOUND)**

A. Application - Interior Glazed: Set glazing infills from the interior of the building.

B. Install glazing resting on setting blocks. Install applied stop and center pane by use of spacer shims at 24 inch centers, kept 1/4 inch below sight line.

C. Locate and secure glazing pane using glazers' clips.

D. Fill gaps between glazing and stops with glazing compound until flush with sight line. Tool surface to straight line.

3.09 **INSTALLATION - WET/DRY GLAZING METHOD (PREFORMED TAPE AND SEALANT)**

A. Application - Exterior Glazed: Set glazing infills from the exterior of the building.

B. Cut glazing tape to length and set against permanent stops, 3/16 inch below sight line. Seal corners by butting tape and dabbing with butyl sealant.

C. Apply heel bead of butyl sealant along intersection of permanent stop with frame ensuring full perimeter seal between glass and frame to complete the continuity of the air and vapor seal.

D. Place setting blocks at 1/4 points with edge block no more than 6 inch from corners.

E. Rest glazing on setting blocks and push against tape and heel bead of sealant with sufficient pressure to attain full contact at perimeter of pane or glass unit.

F. Install removable stops, with spacer strips inserted between glazing and applied stops 1/4 inch below sight lines.

1. Place glazing tape on glazing pane of unit with tape flush with sight line.

G. Fill gap between glazing and stop with sealant to depth equal to bite of frame on glazing, but not more than 3/8 inch below sight line.

H. Apply cap bead of sealant along void between the stop and the glazing, to uniform line, flush with sight line. Tool or wipe sealant surface smooth.

3.10 **INSTALLATION - WET/DRY GLAZING METHOD (TAPE AND SEALANT)**

A. Application - Interior Glazed: Set glazing infills from the interior of the building.

B. Cut glazing tape to length and install against permanent stops, projecting 1/16 inch above sight line.

C. Place setting blocks at 1/4 points with edge block no more than 6 inch from corners.

D. Rest glazing on setting blocks and push against tape to ensure full contact at perimeter of pane or unit.

E. Install removable stops, spacer shims inserted between glazing and applied stops at 24 inch intervals, 1/4 inch below sight line.

F. Fill gaps between pane and applied stop with sealant to depth equal to bite on glazing, to uniform and level line.

G. Carefully trim protruding tape with knife.

3.11 **INSTALLATION - BUTT JOINT GLAZING METHOD (SEALANT ONLY)**

A. Application - Exterior Glazed: Set glazing infills from exterior side of building.

B. Temporarily brace glass in position for duration of glazing process; mask edges of glass at adjoining glass edges and between glass edges and framing members.

C. Temporarily secure a small diameter non-adhering foamed rod on back side of joint.

D. Apply sealant to open side of joint in continuous operation; thoroughly fill joint without displacing foam rod, and then tool sealant surface smooth to concave profile.

E. Permit sealant to cure then remove foam backer rod, and then apply sealant to opposite side, tool smooth to concave profile.

F. Remove masking tape.

3.12 **INSTALLATION - PRESSURE GLAZED SYSTEMS**

A. Application - Exterior Glazed: Set glazing infills from exterior side of building.

B. Place setting blocks at 1/4 points with edge block no more than 6 inch from corners.

C. Rest glazing on setting blocks and push against fixed stop with sufficient pressure on gasket to attain full contact.

D. Install pressure plates without displacing glazing gasket; exert pressure for full continuous contact.

E. Install cover plate.

3.13 **CLEANING**

A. See Section 01 74 19 - Construction Waste Management and Disposal, for additional requirements.

B. Remove excess glazing materials from finish surfaces immediately after application using solvents or cleaners recommended by manufacturers.

C. Remove non-permanent labels immediately after glazing installation is complete.

D. Clean glass and adjacent surfaces after sealants are fully cured.

E. Clean glass on both exposed surfaces not more than 4 days prior to Date of Substantial Completion in accordance with glass manufacturer's written recommendations.

3.14 **PROTECTION**

A. After installation, mark pane with an 'X' by using removable plastic tape or paste; do not mark heat absorbing or reflective glass units.

B. Remove and replace glass that is damaged during construction period prior to Date of Substantial Completion.

END OF SECTION

SECTION 08 83 00
MIRRORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Glass mirrors.

1. Annealed float glass.
2. Tempered safety glass.

1.02 RELATED REQUIREMENTS

A. Section 06 20 00 - Finish Carpentry: Wood mirror frames.

B. Section 10 28 00 - Toilet, Bath, and Laundry Accessories: Metal mirror frames.

1.03 REFERENCE STANDARDS

A. ASTM C920 - Standard Specification for Elastomeric Joint Sealants 2018.

B. ASTM C1036 - Standard Specification for Flat Glass 2016.

C. ASTM C1193 - Standard Guide for Use of Joint Sealants 2016.

D. GANA (GM) - GANA Glazing Manual 2008.

E. GANA (SM) - GANA Sealant Manual 2008.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data on Mirror Types: Submit structural, physical and environmental characteristics, size limitations, special handling and installation requirements.

C. Product Data on Glazing Compounds: Submit chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.

D. Manufacturer's Certificate: Certify that mirrors, meets or exceeds specified requirements.

E. Maintenance Materials: Furnish the following for Owner 's use in maintenance of project.

1. See Section 01 60 00 - Product Requirements, for additional provisions.

1.05 QUALITY ASSURANCE

A. Perform Work in accordance with GANA (GM) and GANA (SM) for glazing installation methods.

B. Fabricate, store, transport, receive, install, and clean mirrors in accordance with recommendations of GANA (TIPS).

1.06 FIELD CONDITIONS

A. Do not install mirrors when ambient temperature is less than 50 degrees F.

B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

PART 2 PRODUCTS

2.01 MATERIALS

A. Mirror Design Criteria: Select materials and/or provide supports as required to limit mirror material deflection to 1/200, or to the flexure limit of glass, with full recovery of glazing materials, whichever is less.

B. Mirror Glass: Clear, annealed float glass; ASTM C1036, with copper and silver coatings, and protective overcoating.

1. Thickness: 1/4 inch.
2. Edges: Arrised.
3. Size: As noted on drawings.

2.02 **GLAZING COMPOUNDS**

A. Acrylic Sealant: ASTM C920, Type S, Grade NS, Class 12-1/2, Uses M and A; single component, solvent curing, non-bleeding; cured Shore A hardness of 15 to 25; clear color.

B. Polysulfide Sealant: ASTM C920, Type M, Grade NS, Class 25, Uses M and A ; two component; chemical curing, non-sagging type; cured Shore A hardness of 15 to 25; color as selected.

C. Polyurethane Sealant: ASTM C920, Type S, Grade NS, Class 25, Uses M and A; single component, chemical curing, non-staining, non-bleeding, Shore A Hardness Range 20 to 35; [_____] color.

D. Silicone Sealant: ASTM C920, Type S, Grade NS, Class 25, Uses M and A; single component; chemical or solvent curing; non-bleeding, non-staining, cured Shore A hardness of 15 to 25; [_____] color.

2.03 **ACCESSORIES**

A. Setting Blocks: Neoprene, 80 to 90 Shore A durometer hardness.

B. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness.

C. Glazing Tape: Preformed butyl compound; 10 to 15 Shore A durometer hardness; on release paper.

D. Glazing Clips: Manufacturer's standard type.

E. Mirror Attachment Accessories: Stainless steel clips.

F. Mirror Adhesive: Silicone pre-polymer based, chemically compatible with mirror coating and wall substrate.

1. Application Temperature: Minus 35 to 140 degrees F at contact surfaces.
2. Volatile Organic Content (VOC): Less than 7 percent by weight.

G. Rolled Formed Frame: One piece, roll-formed angle frame, stainless steel, Type 430, satin finish, with welded frame corners, ground and polished smooth.

H. Channel Frame: One piece, channel frame, stainless steel, Type 430, satin finish, 1/2 inch by 1/2 inch by 3/8 inch deep with 90 degree mitered corners.

PART 3 EXECUTION

3.01 **EXAMINATION**

A. Verify that openings for mirrored glazing are correctly sized and within tolerance.

B. Verify that surfaces of mirror frames or recesses are clean, free of obstructions, and ready for installation of mirrors.

3.02 **PREPARATION**

A. Clean contact surfaces with solvent and wipe dry.

B. Seal porous mirror frames or recesses with substrate compatible primer or sealer. Prime surfaces scheduled to receive sealant.

C. Prepare installation in accordance with ASTM C1193 for solvent release sealants, and install sealant in accordance with manufacturer's instructions.

3.03 **INSTALLATION**

A. Set mirrors plumb and level, and free of optical distortion.

B. Set mirrors with edge clearance free of surrounding construction including countertops or backsplashes.

C. Installation in Frames:

1. Cut glazing tape to length and set against permanent stops, projecting 1/16 inch above sight line.

2. Place setting blocks at 1/4 points with edge block no more than 6 inches from corners.

3. Rest mirrors on setting blocks and push against tape to ensure full contact at perimeter of pane or unit.

4. Place glazing tape on free perimeter of mirrors in same manner described above.

5. Install removable stop without displacement of tape. Exert pressure on tape for full continuous contact.

6. Trim protruding tape edge.

3.04 **CLEANING**

A. Remove wet glazing materials from finish surfaces.

B. Remove labels after work is complete.

C. Clean mirrors and adjacent surfaces.

END OF SECTION

SECTION 09 05 61
COMMON WORK RESULTS FOR FLOORING PREPARATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. This section applies to floors identified in contract documents that are receiving the following types of floor coverings:

1. Resilient tile and sheet.
2. Broadloom carpet.

B. Removal of existing floor coverings.

C. Preparation of new and existing concrete floor slabs for installation of floor coverings.

D. Testing of concrete floor slabs for moisture and alkalinity (pH).

E. Remediation of concrete floor slabs due to unsatisfactory moisture or alkalinity (pH) conditions.

1. Contractor shall perform all specified remediation of concrete floor slabs. If such remediation is indicated by testing agency's report and is due to a condition not under Contractor's control or could not have been predicted by examination prior to entering into the contract, a contract modification will be issued.

F. Patching compound.

G. Remedial floor coatings.

H. Remedial floor sheet membrane.

I. Preparation of new wood-based floors and subfloors for installation of new floor coverings.

1.02 RELATED REQUIREMENTS

A. Section 01 40 00 - Quality Requirements: Additional requirements relating to testing agencies and testing.

B. Section 03 30 00 - Cast-in-Place Concrete: Moisture emission reducing curing and sealing compound for slabs to receive adhered flooring, to prevent moisture content-related flooring failures; to remain in place, not to be removed.

C. Section 03 30 00 - Cast-in-Place Concrete: Concrete admixture for slabs to receive adhered flooring, to prevent moisture content-related flooring failures.

D. Section 03 30 00 - Cast-in-Place Concrete: Limitations on curing requirements for new concrete floor slabs.

E. Section 03 54 00 - Cast Underlayment: Self-leveling underlayment applied as remediation treatment.

1.03 REFERENCE STANDARDS

A. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or (50-mm) Cube Specimens) 2016a.

B. ASTM C472 - Standard Test Methods for Physical Testing of Gypsum, Gypsum Plasters and Gypsum Concrete 1999 (Reapproved 2014).

C. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring 2017.

D. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride 2016a.

E. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes 2017.

F. RFCI (RWP) - Recommended Work Practices for Removal of Resilient Floor Coverings 2011.

1.04 **ADMINISTRATIVE REQUIREMENTS**

A. Coordinate scheduling of cleaning and testing, so that preliminary cleaning has been completed for at least 24 hours prior to testing.

1.05 **SUBMITTALS**

A. Visual Observation Report: For existing floor coverings to be removed.

B. Floor Covering and Adhesive Manufacturers' Product Literature: For each specific combination of substrate, floor covering, and adhesive to be used; showing:

1. Moisture and alkalinity (pH) limits and test methods.
2. Manufacturer's required bond/compatibility test procedure.

C. Testing Agency's Report:

1. Description of areas tested; include floor plans and photographs if helpful.
2. Summary of conditions encountered.
3. Moisture and alkalinity (pH) test reports.
4. Copies of specified test methods.
5. Recommendations for remediation of unsatisfactory surfaces.
6. Submit report to Architect.
7. Submit report not more than two business days after conclusion of testing.

D. Adhesive Bond and Compatibility Test Report.

E. Copy of RFCI (RWP).

1.06 **QUALITY ASSURANCE**

A. Moisture and alkalinity (pH) testing shall be performed by an independent testing agency employed and paid by Contractor.

B. Contractor may perform adhesive and bond test with Contractor's own personnel or hire a testing agency.

C. Testing Agency Qualifications: Independent testing agency experienced in the types of testing specified.

1. Submit evidence of experience consisting of at least 3 test reports of the type required, with project Owner's project contact information.

D. Contractor's Responsibility Relating to Independent Agency Testing:

1. Provide access for and cooperate with testing agency.
2. Confirm date of start of testing at least 10 days prior to actual start.
3. Allow at least 4 business days on site for testing agency activities.
4. Achieve and maintain specified ambient conditions.
5. Notify Architect when specified ambient conditions have been achieved and when testing will start.

1.07 **DELIVERY, STORAGE, AND HANDLING**

A. Deliver, store, handle, and protect products in accordance with manufacturer's instructions and recommendations.

B. Deliver materials in manufacturer's packaging; include installation instructions.

C. Keep materials from freezing.

1.08 **FIELD CONDITIONS**

A. Maintain ambient temperature in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 65 degrees F or more than 85 degrees F.

B. Maintain relative humidity in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 40 percent and not more than 60 percent.

PART 2 PRODUCTS

2.01 **MATERIALS**

A. Patching Compound: Floor covering manufacturer's recommended product, suitable for conditions, and compatible with adhesive and floor covering. In the absence of any recommendation from flooring manufacturer, provide a product with the following characteristics:

1. Cementitious moisture-, mildew-, and alkali-resistant compound, compatible with floor, floor covering, and floor covering adhesive, and capable of being feathered to nothing at edges.

2. Compressive Strength: 3000 psi, minimum, after 28 days, when tested in accordance with ASTM C109/C109M or ASTM C472, whichever is appropriate.

B. Alternate Flooring Adhesive: Floor covering manufacturer's recommended product, suitable for the moisture and pH conditions present; low-VOC. In the absence of any recommendation from flooring manufacturer, provide a product recommended by adhesive manufacturer as suitable for substrate and floor covering and for conditions present.

C. Remedial Floor Coating: Single- or multi-layer coating or coating/overlay combination intended by its manufacturer to resist water vapor transmission to degree sufficient to meet flooring manufacturer's emission limits, resistant to the level of alkalinity (pH) found, and suitable for adhesion of flooring without further treatment.

1. Thickness: 1/8 inch, maximum.

D. Remedial Floor Sheet Membrane: Pre-formed multi-ply sheet membrane installed over concrete subfloor and intended by its manufacturer to resist water vapor transmission to degree sufficient to meet flooring manufacturer's emission limits, resistant to the level of alkalinity (pH) found, and suitable for adhesion of flooring without further treatment.

1. Thickness: 28 mil (0.028 inch).

2. Tape: Types recommended by underlayment manufacturer to install membrane and cover seams.

PART 3 EXECUTION

3.01 **CONCRETE SLAB PREPARATION**

A. Follow recommendations of testing agency.

B. Perform following operations in the order indicated:

1. Preliminary cleaning.

2. Moisture vapor emission tests; 3 tests in the first 1000 square feet and one test in each additional 1000 square feet, unless otherwise indicated or required by flooring manufacturer.

3. Internal relative humidity tests; in same locations as moisture vapor emission tests, unless otherwise indicated.
4. Alkalinity (pH) tests; in same locations as moisture vapor emission tests, unless otherwise indicated.
5. Specified remediation, if required.
6. Patching, smoothing, and leveling, as required.
7. Other preparation specified.
8. Adhesive bond and compatibility test.
9. Protection.

C. Remediations:

1. Active Water Leaks or Continuing Moisture Migration to Surface of Slab: Correct this condition before doing any other remediation; re-test after correction.
2. Excessive Moisture Emission or Relative Humidity: If an adhesive that is resistant to the level of moisture present is available and acceptable to flooring manufacturer, use that adhesive for installation of the flooring; if not, apply remedial floor coating or remedial sheet membrane over entire suspect floor area.
3. Excessive Alkalinity (pH): If remedial floor coating is necessary to address excessive moisture, no additional remediation is required; if not, if an adhesive that is resistant to the level present is available and acceptable to the flooring manufacturer, use that adhesive for installation of the flooring; otherwise, apply a skim coat of specified patching compound over entire suspect floor area.

3.02 REMOVAL OF EXISTING FLOOR COVERINGS

A. Comply with local, State, and federal regulations and recommendations of RFCI Recommended Work Practices for Removal of Resilient Floor Coverings, as applicable to floor covering being removed.

B. Dispose of removed materials in accordance with local, State, and federal regulations and as specified.

3.03 PRELIMINARY CLEANING

A. Clean floors of dust, solvents, paint, wax, oil, grease, asphalt, residual adhesive, adhesive removers, film-forming curing compounds, sealing compounds, alkaline salts, excessive laitance, mold, mildew, and other materials that might prevent adhesive bond.

B. Do not use solvents or other chemicals for cleaning.

3.04 MOISTURE VAPOR EMISSION TESTING

A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.

B. Where this specification conflicts with the referenced test method, comply with the requirements of this section.

C. Test in accordance with ASTM F1869 and as follows.

D. Plastic sheet test and mat bond test may not be substituted for the specified ASTM test method, as those methods do not quantify the moisture content sufficiently.

E. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if test values exceed 3 pounds per 1000 square feet per 24 hours.

F. Report: Report the information required by the test method.

3.05 INTERNAL RELATIVE HUMIDITY TESTING

A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.

B. Where this specification conflicts with the referenced test method, comply with the requirements of this section.

C. Test in accordance with ASTM F2170 Procedure A and as follows.

D. Testing with electrical impedance or resistance apparatus may not be substituted for the specified ASTM test method, as the values determined are not comparable to the ASTM test values and do not quantify the moisture content sufficiently.

E. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if any test value exceeds 75 percent relative humidity.

F. Report: Report the information required by the test method.

3.06 ALKALINITY TESTING

A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.

B. The following procedure is the equivalent of that described in ASTM F710, repeated here for the Contractor's convenience.

C. Use a wide range alkalinity (pH) test paper, its associated chart, and distilled or deionized water.

D. Place several drops of water on a clean surface of concrete, forming a puddle approximately 1 inch in diameter. Allow the puddle to set for approximately 60 seconds, then dip the alkalinity (pH) test paper into the water, remove it, and compare immediately to chart to determine alkalinity (pH) reading.

E. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if alkalinity (pH) test value is over 10.

3.07 PREPARATION

A. See individual floor covering section(s) for additional requirements.

B. Comply with recommendations of testing agency.

C. Comply with requirements and recommendations of floor covering manufacturer.

D. Fill and smooth surface cracks, grooves, depressions, control joints and other non-moving joints, and other irregularities with patching compound.

E. Do not fill expansion joints, isolation joints, or other moving joints.

3.08 ADHESIVE BOND AND COMPATIBILITY TESTING

A. Comply with requirements and recommendations of floor covering manufacturer.

3.09 APPLICATION OF REMEDIAL FLOOR COATING

A. Comply with requirements and recommendations of coating manufacturer.

3.10 INSTALLATION OF REMEDIAL FLOOR SHEET MEMBRANE

A. Install in accordance with sheet membrane manufacturer's instructions.

3.11 PROTECTION

A. Cover prepared floors with building paper or other durable covering.

END OF SECTION

SECTION 09 21 16
GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Performance criteria for gypsum board assemblies.

B. Metal stud wall framing.

C. Metal channel ceiling framing.

D. Gypsum sheathing.

E. Cementitious backing board.

F. Gypsum wallboard.

G. Joint treatment and accessories.

H. Textured finish system.

I. Acoustic (sound-dampening) wall and ceiling board.

1.02 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Building framing and sheathing.

B. Section 06 10 00 - Rough Carpentry: Wood blocking product and execution requirements.

C. Section 07 21 00 - Thermal Insulation: Acoustic insulation.

D. Section 07 25 00 - Weather Barriers: Water-resistive barrier over sheathing.

E. Section 07 84 00 - Firestopping: Top-of-wall assemblies at fire rated walls.

F. Section 07 92 00 - Joint Sealants: Sealing acoustical gaps in construction other than gypsum board or plaster work.

G. Section 09 22 16 - Non-Structural Metal Framing.

1.03 REFERENCE STANDARDS

A. ANSI A108.11 - American National Standard Specifications for Interior Installation of Cementitious Backer Units 2010 (Reaffirmed 2016).

B. ANSI A118.9 - American National Standard Specifications for Test Methods and Specifications for Cementitious Backer Units 1999 (Reaffirmed 2016).

C. ASTM C208 - Standard Specification for Cellulosic Fiber Insulating Board 2012, with Editorial Revision (2017).

D. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board 2015.

E. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members 2014, with Editorial Revision (2015).

F. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products 2017.

G. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board 2018b.

H. ASTM C954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness 2015.

I. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs 2016.

J. ASTM C1047 - Standard Specification for Accessories For Gypsum Wallboard and Gypsum Veneer Base 2014a.

K. ASTM C1280 - Standard Specification for Application of Exterior Gypsum Panel Products for Use as Sheathing 2018.

L. ASTM C1288 - Standard Specification for Discrete Non-Asbestos Fiber-Cement Interior Substrate Sheets 2017.

M. ASTM C1325 - Standard Specification for Non-Asbestos Fiber-Mat Reinforced Cementitious Backer Units 2017a.

N. ASTM C1396/C1396M - Standard Specification for Gypsum Board 2017.

O. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber 2016.

P. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements 2009 (Reapproved 2016).

Q. ASTM E413 - Classification for Rating Sound Insulation 2016.

R. GA-216 - Application and Finishing of Gypsum Panel Products 2016.

1.04 **SUBMITTALS**

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate special details associated with fireproofing and acoustic seals.

C. Product Data: Provide data on metal framing, gypsum board, accessories and joint finishing system.

D. Product Data: Provide manufacturer's data on partition head to structure connectors, showing compliance with requirements.

E. Test Reports: For stud framing products that do not comply with ASTM C645 or ASTM C754, provide independent laboratory reports showing maximum stud heights at required spacings and deflections.

PART 2 PRODUCTS

2.01 **GYPSUM BOARD ASSEMBLIES**

A. Provide completed assemblies complying with ASTM C840 and GA-216.

1. See PART 3 for finishing requirements.

B. Interior Partitions, Indicated as Acoustic: Provide completed assemblies with the following characteristics:

1. Acoustic Attenuation: STC of 50-54 calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.

C. Fire Rated Assemblies: Provide completed assemblies with the following characteristics:

1. Fire Rated Partitions: UL listed assembly No. U311 and U387; 1 hour rating.

2. Fire Rated Ceilings: One (1) hour fire rating.

3. UL Assembly Numbers: Provide construction equivalent to that listed for the particular assembly in the current UL (FRD).

2.02 **METAL FRAMING MATERIALS**

A. Non-Loadbearing Framing System Components: ASTM C645; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 for the spacing indicated, with maximum deflection of wall framing of L/120 at 5 psf.

1. Studs: "C" shaped with flat or formed webs with knurled faces.
2. Runners: U shaped, sized to match studs.
3. Ceiling Channels: C-shaped.
4. Furring: Hat-shaped sections, minimum depth of 7/8 inch.
5. Resilient Furring Channels: Single or double leg configuration; 1/2 inch channel depth.

2.03 **BOARD MATERIALS**

A. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.

1. Application: Use for vertical surfaces and ceilings, unless otherwise indicated.
2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
    a. Mold resistant board is required where noted in drawings..
3. At Assemblies Indicated with Fire-Rating: Use type required by indicated tested assembly; if no tested assembly is indicated, use Type X board, UL or WH listed.
4. Thickness:
    a. Vertical Surfaces: 5/8 inch or as indicaged in drawings
    b. Ceilings: 1/2 inch or as indI cared in drawings

B. Backing Board For Wet Areas: One of the following products:

1. Application: Surfaces behind tub and shower enclosure in wet areas including tub and shower surrounds.
2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
3. ANSI Cement-Based Board: Non-gypsum-based; aggregated Portland cement panels with glass fiber mesh embedded in front and back surfaces complying with ANSI A118.9 or ASTM C1325.
    a. Thickness: 1/2 inch.
4. ASTM Cement-Based Board: Non-gypsum-based, cementitious board complying with ASTM C1288.
    a. Thickness: 1/2 inch.

C. Acoustical Fiberboard: ASTM C208 cellulosic fiberboard without facing or coating; square edged.

1. Thickness: 1/2 inch.
2. In 1-Hour Fire-Rated Partitions: UL listed for assembly used.
3. Products:
    a. Blue Ridge Fiberboard, a W.R. Meadows Company; Soundstop: www.wrmeadows.com/#sle.
    b. Substitutions: See Section 01 60 00 - Product Requirements.

D. Exterior Sheathing Board: Sizes to minimize joints in place; ends square cut.

1. Application: Exterior sheathing, use only where indicated on drawings
2. Edges: Square.

2.04 **GYPSUM WALLBOARD ACCESSORIES**

A. Acoustic Insulation: As specified in Section 07 21 00.

B. Acoustic Sealant: Acrylic emulsion latex or water-based elastomeric sealant; do not use solvent-based non-curing butyl sealant.

C. Water-Resistive Barrier: As specified in Section 07 25 00.

D. Beads, Joint Accessories and Other Trim: ASTM C1047, rigid plastic, galvanized steel or rolled zinc, unless noted otherwise.

1. Bullnose Corner Beads with Paper Face: 3/4 inch radius.
2. L-Trim with Tear-Away Strip: Sized to fit 1/2 inch thick gypsum wallboard.
3. Expansion Joints:
    a. Type: V-shaped PVC with tear away fins.
    b. Type: V-shaped metal with factory-installed protective tape.
    c. Type: Accordian profile with factory-installed protective tape.
    d. Type: Off-angle inside corner expansion.

E. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.

1. Paper Tape: 2 inch wide, creased paper tape for joints and corners, except as otherwise indicated.
2. Joint Compound: Drying type, vinyl-based, ready-mixed.
3. Joint Compound: Setting type, field-mixed.

F. Finishing Compound: Surface coat and primer, takes the place of skim coating.

G. High Build Drywall Surfacer: Vinyl acrylic latex-based coating for spray application, designed to take the place of skim coating and separate paint primer in achieving Level 5 finish.

H. Textured Finish Materials: Latex-based compound; plain.

I. Screws for Fastening of Gypsum Panel Products to Cold-Formed Steel Studs Less than 0.033 inch in Thickness and Wood Members: ASTM C1002; self-piercing tapping screws, corrosion resistant.

J. Screws for Fastening of Gypsum Panel Products to Steel Members from 0.033 to 0.112 inch in Thickness: ASTM C954; steel drill screws, corrosion resistant.

K. Anchorage to Substrate: Tie wire, nails, screws, and other metal supports, of type and size to suit application; to rigidly secure materials in place.

PART 3 EXECUTION

3.01 **EXAMINATION**

A. Verify that project conditions are appropriate for work of this section to commence.

3.02 **FRAMING INSTALLATION**

A. Metal Framing: Install in accordance with ASTM C754 and manufacturer's instructions.

B. Suspended Ceilings and Soffits: Space framing and furring members as indicated.

C. Studs: Space studs as indicated.

1. Extend partition framing to structure where indicated and to ceiling in other locations.

2. Partitions Terminating at Ceiling: Attach ceiling runner securely to ceiling track in accordance with manufacturer's instructions.

3.03 **ACOUSTIC ACCESSORIES INSTALLATION**

A. Acoustic Insulation: Place tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.

B. Acoustic Sealant: Install in accordance with manufacturer's instructions.

3.04 **BOARD INSTALLATION**

A. Comply with ASTM C840, GA-216 and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.

B. Fire-Rated Construction: Install gypsum board in strict compliance with requirements of assembly listing.

C. Exterior Sheathing: Comply with ASTM C1280. Install sheathing vertically, with edges butted tight and ends occurring over firm bearing.

1. Paper-Faced Sheathing: Immediately after installation, protect from weather by application of water-resistive barrier.

D. Cementitious Backing Board: Install over steel framing members, wood framing members and plywood substrate where indicated, in accordance with ANSI A108.11 and manufacturer's instructions.

E. Installation on Metal Framing: Use screws for attachment of gypsum board [_____] .

F. Installation on Wood Framing: For rated assemblies, comply with requirements of listing authority. For non-rated assemblies, install as follows:

1. Single-Layer Applications: Screw attachment.

3.05 **INSTALLATION OF TRIM AND ACCESSORIES**

A. Control Joints: Place control joints consistent with lines of building spaces and as indicated.

1. Not more than 30 feet apart on walls and ceilings over 50 feet long.

B. Corner Beads: Install at external corners, using longest practical lengths.

C. Edge Trim: Install at locations where gypsum board abuts dissimilar materials.

3.06 **JOINT TREATMENT**

A. Paper Faced Gypsum Board: Use paper joint tape, embed with drying type joint compound and finish with drying type joint compound.

B. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:

1. Level 3: Walls to receive textured wall finish.

2. Level 1: Fire rated wall areas above finished ceilings, whether or not accessible in the completed construction.

C. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.

1. Feather coats of joint compound so that camber is maximum 1/32 inch.

D. Where Level 5 finish is indicated, spray apply high build drywall surfacer over entire surface after joints have been properly treated; achieve a flat and tool mark-free finish.

3.07 **TEXTURE FINISH**

A. Apply finish texture coating by means of spraying apparatus in accordance with manufacturer's instructions and to match approved sample.

3.08 **TOLERANCES**

A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet in any direction.

END OF SECTION

SECTION 09 22 16
NON-STRUCTURAL METAL FRAMING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Metal ceiling and soffit framing.

B. Framing accessories.

1.02 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Wood blocking within stud framing.

B. Section 06 10 00 - Rough Carpentry: Wall sheathing.

C. Section 07 21 00 - Thermal Insulation: Acoustic insulation.

D. Section 07 25 00 - Weather Barriers.

E. Section 07 62 00 - Sheet Metal Flashing and Trim: Head and sill flashings

F. Section 07 84 00 - Firestopping: Sealing top-of-wall assemblies at fire rated walls.

G. Section 07 92 00 - Joint Sealants: Sealing acoustical gaps in construction other than gypsum board or plaster work.

H. Section 08 31 00 - Access Doors and Panels.

I. Section 09 21 16 - Gypsum Board Assemblies: Execution requirements for anchors for attaching work of this section.

J. Section 09 22 36 - Lath.

1.03 REFERENCE STANDARDS

A. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members 2014, with Editorial Revision (2015).

B. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products 2017.

C. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements 2009 (Reapproved 2016).

D. ASTM E413 - Classification for Rating Sound Insulation 2016.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Shop Drawings:

1. Indicate prefabricated work, component details, stud layout, framed openings, anchorage to structure, acoustic details, type and location of fasteners, accessories and items of other related work.

2. Describe method for securing studs to tracks, splicing, and for blocking and reinforcement of framing connections.

C. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

PART 2 PRODUCTS

2.01 FRAMING MATERIALS

A. Fire Rated Assemblies: Comply with applicable code and as indicated on drawings.

B. Non-Loadbearing Framing System Components: ASTM C645; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 for the spacing indicated, with maximum deflection of wall framing of L/240 at 5 psf.

1. Furring: Hat-shaped sections, minimum depth of 7/8 inch.
2. Resilient Furring Channels: Single leg configuration; 1/2 inch channel depth.
    a. Products:
        1) ClarkDietrich; RC Deluxe Resilient Channel: www.clarkdietrich.com/#sle.
        2) Substitutions: See Section 01 60 00 - Product Requirements.

C. Non-Loadbearing Framing Accessories:

1. Acoustic Insulation: As specified in Section 07 21 00.

2.02 **FABRICATION**

A. Fabricate assemblies of framed sections to sizes and profiles required.

B. Fit, reinforce, and brace framing members to suit design requirements.

PART 3 EXECUTION

3.01 **EXAMINATION**

A. Verify existing conditions before starting work.

B. Verify that rough-in utilities are in proper location.

3.02 **INSTALLATION OF STUD FRAMING, NOTE: METAL STUDS ARE NOT USED IN PROJECT. INSTALL BLOCKING AND FURRING AS INDICATED BELOW AND ON PLANS**

A. Extend partition framing where indicated.

B. At partitions indicated with an acoustic rating:

1. Provide components and install as required to produce STC rating of 50, based on published tests by manufacturer conducted in accordance with ASTM E90 with STC rating calculated in accordance with ASTM E413.

C. Coordinate installation of bucks, anchors, and blocking with electrical, mechanical, and other work to be placed within or behind stud framing.

D. Blocking: Use wood blocking secured to studs. Provide blocking for support of plumbing fixtures, toilet partitions, wall cabinets, toilet accessories, hardware and opening frames.

E. Furring: Install at spacing and locations shown on drawings. Lap splices a minimum of 6 inches.

3.03 **CEILING AND SOFFIT FURRING**

A. Install furring after work above ceiling or soffit is complete. Coordinate the location of hangers with other work.

Securely fix carrying channels to hangers to prevent turning or twisting and to transmit full load to hangers.

B. Place furring channels perpendicular to carrying channels, not more than 2 inches from perimeter walls, and rigidly secure. Lap splices securely.

3.04 **TOLERANCES**

A. Maximum Variation From True Position: 1/8 inch in 10 feet.

B. Maximum Variation From Plumb: 1/8 inch in 10 feet.

END OF SECTION

SECTION 09 22 36
LATH

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Metal lath for cement and gypsum plaster.

1.02 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Sheathing on exterior walls.

B. Section 06 10 00 - Rough Carpentry: Water-resistive barrier under exterior plaster and stucco.

C. Section 09 24 00 - Cement Plastering.

1.03 REFERENCE STANDARDS

A. ASTM C841 - Standard Specification for Installation of Interior Lathing and Furring 2003 (Reapproved 2018).

B. ASTM C847 - Standard Specification for Metal Lath 2018.

C. ASTM C954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness 2015.

D. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs 2016.

E. ASTM C1063 - Standard Specification for Installation of Lathing and Furring to Receive Interior and Exterior Portland Cement-Based Plaster 2019.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on furring and lathing components, structural characteristics, material limitations, and finish.

1.05 QUALITY ASSURANCE

A. Maintain one copy of each installation standard referenced on site throughout the duration of lathing and plastering work.

B. Installer Qualifications: Company specializing in performing the work of this section with at least three years of documented experience.

PART 2 PRODUCTS

2.01 FRAMING AND LATH ASSEMBLIES

A. Provide completed assemblies with the following characteristics:

1. Maximum Deflection of Vertical Assemblies: 1:360 under lateral point load of 100 lbs.

2. Maximum Deflection of Horizontal Assemblies: 1:240 deflection under dead loads and wind uplift.

2.02 LATH

A. Beads, Screeds, Joint Accessories, and Other Trim: Depth governed by plaster thickness, and maximum possible lengths.

1. Material: Formed sheet steel with rust inhibitive primer, expanded metal flanges.

2. Casing Beads with Weep Holes: Square edges.

3. Corner Beads: Radiused corners.
4. Expansion Joints: Accordion profile with factory-installed protective tape, 2 inch wide flanges.
5. Base Screeds: Bevelled edges.
6. Control Joints: Accordion profile with factory-installed protective tape, 2 inch flanges.

2.03 **ACCESSORIES**

A. Anchorage: Tie wire, nails, and other metal supports, of type and size to suit application; to rigidly secure materials in place, galvanized.

B. Fasteners: Self-piercing tapping screws; ASTM C1002 or ASTM C954.

C. Tie Wire: Annealed galvanized steel.

PART 3 EXECUTION

3.01 **EXAMINATION**

A. Verify existing conditions before starting work.

B. Verify that substrates are ready to receive work and conditions are suitable for application.

C. For exterior plaster and stucco on stud walls, verify that water-resistive barrier has been installed over sheathing substrate completely and correctly.

D. Do not begin until unacceptable conditions have been corrected.

E. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 **INSTALLATION - GENERAL**

A. Install interior lath and furring for gypsum plaster in accordance with ASTM C841.

B. Install metal lath and furring for Portland cement plaster in accordance with ASTM C1063.

3.03 **CONTROL AND EXPANSION JOINT INSTALLATION**

A. Locate joints as indicated on drawings and comply with ASTM C1063.

1. Area of plaster panel not to exceed 144 sq ft for vertical surfaces.
2. Area of plaster panel not to exceed 100 sq ft for horizontal, curved or angled surfaces.
3. Spacing between control joints not to exceed 18 ft in each direction.
4. Area bounded by control joints not to exceed a length-to-width ratio of 2-1/2 to 1.

B. Install expansion joints where an expansion joint occurs in base exterior wall.

C. Install prefabricated joint accessories in accordance with ASTM C1063.

D. Construct expansion joints of back-to-back casing beads with a backer rod and sealant, set 1/4 inch apart.

3.04 **LATH INSTALLATION**

A. Apply lath taut, with long dimension perpendicular to supports.

B. Lap or nest ends of metal lath in accordance with ASTM C841.

C. Secure end laps with tie wire where they occur between supports.

D. Attach lath to wood supports using nails at maximum dimensions as recommended by Metal Math Manufacturer Association, MLMA

E. Attach metal lath to concrete using wire loops. Attach anchors to backup surface; space at maximum 24 inches on center.

F. Continuously reinforce internal angles with corner mesh, except where the metal lath returns 3 inches from corner to form the angle reinforcement; fasten at perimeter edges only.

G. Place corner bead at external wall corners; fasten at outer edges of lath only.

H. Place base screeds at termination of plaster areas; secure rigidly in place.

I. Place lath vertically above each top corner and each side of door frames to 6 inches above ceiling line.

J. Place casing beads at terminations of plaster finish. Butt and align ends. Secure rigidly in place.

K. Place additional strip mesh diagonally at corners of lathed openings. Secure rigidly in place.

3.05 **TOLERANCES**

A. Maximum Variation from True Lines and Levels: 1/8 inch in 10 feet.

B. Maximum Variation from True Position: 1/8 inch.

END OF SECTION

SECTION 09 24 00
CEMENT PLASTERING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Cement plastering.

1.02 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Wood stud framing for plaster.

B. Section 07 25 00 - Weather Barriers.

C. Section 07 84 00 - Firestopping: Sealing top-of-wall assemblies and through-wall penetrations at fire rated walls.

D. Section 09 22 36 - Lath: Lath, furring, beads, screeds, and joint accessories for plaster base.

E. Section 09 91 13 - Exterior Painting.

1.03 REFERENCE STANDARDS

A. ASTM C926 - Standard Specification for Application of Portland Cement-Based Plaster 2018a.

B. ASTM C932 - Standard Specification for Surface-Applied Bonding Compounds for Exterior Plastering 2006 (Reapproved 2013).

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittals procedures.

B. Product Data: Provide data on plaster materials and trim accessories.

C. Evaluation Service Reports: Show compliance with specified requirements.

D. Samples:

1. Submit two samples, 3 sq. inch in size illustrating finish color and texture.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing the work of this section with minimum three years documented experience.

B. Copies of Documents at Project Site: Maintain at the project site a copy of each referenced document that prescribes execution requirements.

1.06 FIELD CONDITIONS

A. Exterior Plaster Work: Do not apply plaster when substrate or ambient air temperature is 40 degrees F or lower, or when temperature is expected to drop below 40 degrees F within 48 hours of application.

PART 2 PRODUCTS

2.01 CEMENT PLASTER APPLICATIONS

A. Lath Plaster Base: Metal lath.

1. Plaster Type: Factory prepared plaster mix.

2. Number of Coats: Three.

3. First Coat: Apply to a nominal thickness of 3/8 inch.

4. Second Coat: Apply to a nominal thickness of 3/8 inch.

5. Leveling Coat: Apply to a nominal thickness of 1/32 to 1/16 inch.

6. Finish: Acrylic.

2.02 **FACTORY PREPARED CEMENT PLASTER**

2.03 **ACCESSORIES**

A. Lath: As specified in Section 09 22 36.

B. Beads, Screeds, and Joint Accessories: As specified in Section 09 22 36.

C. Bonding Compound: Provide type recommended for bonding plaster to solid surfaces, complying with ASTM C932.

D. Reinforcing Mesh: 4.5 oz/sq yd alkali-resistant mesh.

E. Water Resistive Barrier: As specified in Section 07 25 00

F. Foam architectural details:

1. Foam: ESP foam 1.0 lb./sq. ft. min. density

2. Foam mesh: alkali resistant 4.5 oz. woven glass fiber fabrics specially manufactured by Omega Products Industries Inc.

PART 3 EXECUTION

3.01 **EXAMINATION**

A. Verify existing conditions are acceptable prior to starting this work.

B. Verify lath is flat, secured to substrate, and joint and surface perimeter accessories are properly in place.

C. Verify mechanical and electrical equipment and services located within areas to receive this work have been properly tested and approved.

3.02 **PREPARATION**

A. Roughen smooth concrete surfaces and apply bonding compound in accordance with manufacturer's written installation instructions.

3.03 **MIXING**

A. Mix only as much plaster as can be used prior to initial set.

B. Mix materials dry, to uniform color and consistency, before adding water.

C. Protect mixtures from frost or freezing temperatures, contamination, and excessive evaporation.

3.04 **APPLICATION**

A. Apply plaster in accordance with manufacturer's written instructions and comply with ASTM C926.

B. Base Coats:

1. Apply base coat(s) to fully embed lath and to specified thickness.

2. Follow guidelines in ASTM C926 and manufacturer's written installation instructions for moist curing base coats and application of subsequent coats.

C. Leveling Coat:

1. Apply leveling coat to specified thickness.

2. Fully embed reinforcing mesh in leveling coat.

D. Finish Coats:

1. Cement Plaster:

a. Apply with sufficient material and pressure to ensure complete coverage of base to specified thickness.

b. Apply desired surface texture while mix is still workable.

2. Primer and Acrylic Coatings:

a. Remove surface contaminants such as dust and dirt without damaging substrate.

b. Apply primer in accordance with manufacturer's instructions.

c. Apply finish coating in number of coats and to thickness recommended by manufacturer.

E. Foam Architectural Details:

1. Lath Wrapped Foam Details: Attach foam shape to wall using mechanical attachment prior to application of base coat. Lath foam shape using approved metal lath and corner aid.

3.05 **TOLERANCES**

A. Maximum Variation from True Flatness: 1/4 inch in 10 feet.

3.06 **REPAIR**

A. Patching: Remove loose, damaged or defective plaster and replace with plaster of same composition; finish to match surrounding area.

END OF SECTION

SECTION 09 65 00
RESILIENT FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Resilient sheet flooring.

B. Resilient tile flooring.

C. Resilient base.

D. Resilient stair accessories.

E. Installation accessories.

1.02 RELATED REQUIREMENTS

A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 03 30 00 - Cast-in-Place Concrete: Restrictions on curing compounds for concrete slabs and floors.

C. Section 03 54 00 - Cast Underlayment.

D. Section 09 05 61 - Common Work Results for Flooring Preparation: Independent agency testing of concrete slabs, removal of existing floor coverings, cleaning, and preparation.

E. Section 26 05 26 - Grounding and Bonding for Electrical Systems: Grounding and bonding of static control flooring to building grounding system.

1.03 REFERENCE STANDARDS

A. ASTM F970 - Standard Test Method for Measuring Recovery Properties of Floor Coverings after Static Loading 2017.

B. ASTM F1303 - Standard Specification for Sheet Vinyl Floor Covering with Backing 2004 (Reapproved 2014).

C. ASTM F1700 - Standard Specification for Solid Vinyl Floor Tile 2013a.

D. ASTM F1861 - Standard Specification for Resilient Wall Base 2016.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.

C. Shop Drawings: Indicate seaming plans and floor patterns.

D. Selection Samples: Submit manufacturer's complete set of color samples for Architect 's initial selection.

E. Verification Samples: Submit two samples, 12 sq. inch in size illustrating color and pattern for each resilient flooring product specified.

F. Sustainable Design Submittal: Submit VOC content documentation for flooring and adhesives.

G. Certification: Prior to installation of flooring, submit written certification by flooring manufacturer and adhesive manufacturer that condition of sub-floor is acceptable.

H. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.

I. Maintenance Materials: Furnish the following for Owner 's use in maintenance of project.

1. See Section 01 60 00 - Product Requirements, for additional provisions.
2. Extra Flooring Material: quantity equivalent to 1% of each type and color.
3. Extra Wall Base: quantity equivalent to 1% of each type and color.
4. Extra Stair Materials: Quantity equivalent to 5 percent of each type and color.

1.05 **QUALITY ASSURANCE**

A. Manufacturer Qualifications: Company specializing in manufacturing specified flooring with minimum three years documented experience.

B. Installer Qualifications: Company specializing in installing specified flooring with minimum three years documented experience.

C. Testing Agency Qualifications: Independent firm specializing in performing concrete slab moisture testing and inspections of the type specified in this section.

1.06 **DELIVERY, STORAGE, AND HANDLING**

A. Upon receipt, immediately remove any shrink-wrap and check materials for damage and the correct style, color, quantity and run numbers.

B. Store all materials off of the floor in an acclimatized, weather-tight space.

C. Maintain temperature in storage area between 55 degrees F and 90 degrees F.

D. Protect roll materials from damage by storing on end.

E. Do not double stack pallets.

1.07 **FIELD CONDITIONS**

A. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 70 degrees F to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F.

PART 2 PRODUCTS

2.01 **SHEET FLOORING**

A. Vinyl Sheet Flooring - Type SV-1: Color and pattern throughout wear layer thickness, with backing.

1. Minimum Requirements: Comply with ASTM F1303, Type II, with Class A fibrous backing.
2. VOC Content Limits: As specified in Section 01 61 16.
3. Wear Layer Thickness: 0.050 inch minimum.
4. Total Thickness: 0.080 inch minimum.
5. Sheet Width: 72 inch minimum.
6. Static Load Resistance: 125 psi minimum, when tested as specified in ASTM F970.
7. Seams: Heat welded.
8. Color: To be selected by Architect from manufacturer's full range.

B. Welding Rod: Solid bead in material compatible with flooring, produced by flooring manufacturer for heat welding seams, and in color matching field color.

2.02 **TILE FLOORING**

A. Vinyl Tile - Type LVT-1: Printed film type, with transparent or translucent wear layer.

1. Minimum Requirements: Comply with ASTM F1700, of Class corresponding to type specified.

2. VOC Content Limits: As specified in Section 01 61 16.
3. Wear Layer Thickness: 0.020 inch.
4. Total Thickness: 0.125 inch.
5. Color: To be selected by Architect from manufacturer's full range.

2.03 **STAIR COVERING**

A. Stair Treads: Vinyl; full width and depth of stair tread in one piece; tapered thickness.
   1. Manufacturers:
      a. Burke Flooring; Ascend Stair Treads: www.burkeflooring.com/#sle.
      b. Substitutions: See Section 01 60 00 - Product Requirements.
   2. Nosing: Square.
   3. Texture: Smooth.
   4. Color: To be selected by Architect from manufacturer's full range.

B. Stair Risers: Full height and width of tread in one piece, matching treads in material and color.
   1. Manufacturers:
      a. Burke Flooring; Ascend Risers: www.burkeflooring.com/#sle.
      b. Substitutions: See Section 01 60 00 - Product Requirements.
   2. Thickness: 0.080 inch.

C. Stair Stringers: Full height in one piece and in maximum available lengths, matching treads in material and color.
   1. Nominal Thickness: 0.080 inch.

2.04 **RESILIENT BASE**

A. Resilient Base - Type RB-1: ASTM F1861, Type TP, rubber, thermoplastic; top set Style B, Cove.
   1. Height: 4 inch.
   2. Thickness: 0.125 inch.
   3. Finish: Satin.
   4. Color: To be selected by Architect from manufacturer's full range.

2.05 **ACCESSORIES**

A. Subfloor Filler: White premix latex; type recommended by adhesive material manufacturer.

B. Primers, Adhesives and Seam Sealer: Waterproof; types recommended by flooring manufacturer.
   1. VOC Content Limits: As specified in Section 01 61 16.

C. Moldings, Transition and Edge Strips: Same material as flooring.

D. Sealer and Wax: Types recommended by flooring manufacturer.

E. Sound Control Underlayment:
   1. Manufacturers:
      a. USG Levelrock Brand SAM-N25 Ultra Sound Attenuation Mat.
      b. Substitutions: See Section 01 60 00 - Product Requirements.

2. Thickness: 5/16 inch, nominal.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.

B. Cementitious Sub-floor Surfaces: Verify that substrates are dry enough and ready for resilient flooring installation by testing for moisture and pH.

1. Test in accordance with Section 09 05 61.

2. Obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.

C. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

A. Prepare floor substrates for installation of flooring in accordance with Section 09 05 61.

3.03 INSTALLATION - GENERAL

A. Starting installation constitutes acceptance of sub-floor conditions.

B. Install in accordance with manufacturer's written instructions.

C. Adhesive-Applied Installation:

1. Place copper grounding strip in conductive adhesive and apply additional adhesive to top side of strip before installing static control flooring. Allow strip to extend beyond flooring in accordance with static control flooring manufacturer's instructions. Refer to Section 26 05 26 for grounding and bonding to building grounding system.

2. Fit joints and butt seams tightly.

3. Set flooring in place, press with heavy roller to attain full adhesion.

D. Where type of floor finish, pattern, or color are different on opposite sides of door, terminate flooring under centerline of door.

E. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated.

1. Resilient Strips: Attach to substrate using adhesive.

F. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.

G. Install flooring in recessed floor access covers, maintaining floor pattern.

3.04 INSTALLATION - SOUND CONTROL UNDERLAYMENT

A. Install in accordance with underlayment manufacturer's instructions.

3.05 INSTALLATION - SHEET FLOORING

A. Lay flooring with joints and seams parallel to longer room dimensions, to produce minimum number of seams. Lay out seams to avoid widths less than 1/3 of roll width; match patterns at seams.

B. Seams are prohibited in bathrooms, kitchens, toilet rooms and custodial closets.

C. Cut sheet at seams in accordance with manufacturer's instructions.

D. Seal seams by heat welding where indicated.

3.06 **INSTALLATION - TILE FLOORING**

A. Mix tile from container to ensure shade variations are consistent when tile is placed, unless otherwise indicated in manufacturer's installation instructions.

B. Lay flooring with joints and seams parallel to building lines to produce symmetrical pattern.

C. Install square tile to ashlar pattern. Allow minimum 1/2 full size tile width at room or area perimeter.

D. Install plank tile with a random offset of at least 6 inches from adjacent rows.

3.07 **INSTALLATION - RESILIENT BASE**

A. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches between joints.

B. Miter internal corners. At external corners, 'V' cut back of base strip to 2/3 of its thickness and fold. At exposed ends, use premolded units.

C. Install base on solid backing. Bond tightly to wall and floor surfaces.

D. Scribe and fit to door frames and other interruptions.

3.08 **INSTALLATION - STAIR COVERINGS**

A. Install stair coverings in one piece for full width and depth of tread.

B. Install stringers configured tightly to stair profile.

C. Adhere over entire surface. Fit accurately and securely.

3.09 **CLEANING**

A. Remove excess adhesive from floor, base, and wall surfaces without damage.

B. Clean in accordance with manufacturer's written instructions.

3.10 **PROTECTION**

A. Prohibit traffic on resilient flooring for 48 hours after installation.

END OF SECTION

SECTION 09 68 16
SHEET CARPETING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Carpet, stretched-in with cushion underlay and direct-glued.

B. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 01 74 19 - Construction Waste Management and Disposal: Reclamation/Recycling of new carpet scrap, new cushion scrap, removed carpet and removed carpet cushion.

C. Section 03 30 00 - Cast-in-Place Concrete: Restrictions on curing compounds for concrete slabs and floors to receive adhesive-applied carpet.

D. Section 03 54 00 - Cast Underlayment.

E. Section 09 05 61 - Common Work Results for Flooring Preparation: Independent agency testing of concrete slabs, removal of existing floor coverings, cleaning, and preparation.

1.03 REFERENCE STANDARDS

A. CRI 104 - Standard for Installation of Commercial Carpet 2015.

B. CRI (GLP) - Green Label Plus Testing Program - Certified Products Current Edition.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation.

C. Samples: Submit two samples 12 by 12 inch in size illustrating color and pattern for each carpet and cushion material specified.

D. Sustainable Design Submittal: Submit VOC content documentation for adhesives.

E. Manufacturer's Installation Instructions: Indicate special procedures.

F. Concrete Sub-floor Test Report: Submit a copy of the moisture and alkalinity (pH) test reports.

G. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.

H. Maintenance Materials: Furnish the following for Owner 's use in maintenance of project.

1. See Section 01 60 00 - Product Requirements, for additional requirements.

2. Extra Carpet: quantity equivalent to 1% of each type, color, and pattern installed.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing specified carpet with minimum three years documented experience.

1.06 FIELD CONDITIONS

A. Store materials in area of installation for minimum period of 24 hours prior to installation.

B. Maintain minimum 70 degrees F ambient temperature 24 hours prior to, during and 24 hours after installation.

C. Ventilate installation area during installation and for 72 hours after installation.

PART 2 PRODUCTS

2.01 CARPET

A. Carpet, Type CPT-1: Tufted, nylon.

1. VOC Content: Comply with Section 01 61 16.
2. VOC Content: Provide CRI (GLP) certified product; in lieu of labeling, independent test report showing compliance is acceptable.
3. Gage: 1/10 inch.
4. Stitches: 7.4 per inch.
5. Pile Weight: 30 oz/sq yd.
6. Density Factor: 6000 kilotex.
7. Primary Backing:
    a. Material: Polypropylene.
8. 50% Recycled Material

2.02 CUSHION

A. Cushion Modified polyurethane

1. VOC Content: Comply with Section 01 61 16.
2. diamond 3/8" Apollo 6 Pad

2.03 ACCESSORIES

A. Sub-Floor Filler: Type recommended by carpet manufacturer.

B. Tackless Strip: Carpet gripper, of type recommended by carpet manufacturer to suit application, with attachment devices.

C. Base Gripper: Tackless strip type, with special lipped edge, color as selected.

D. Moldings and Edge Strips: Vinyl, color as selected.

E. Adhesives:

1. Compatible with materials being adhered; maximum VOC content as specified in Section 01 61 16.

F. Seam Adhesive: Recommended by carpet manufacturer.

G. Carpet Adhesive: Recommended by carpet manufacturer; releasable type.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that sub-floor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive carpet.

B. Verify that sub-floor surfaces are dust-free and free of substances that could impair bonding of adhesives to sub floor surfaces.

C. Cementitious Sub-floor Surfaces: Verify that substrates are dry enough and ready for flooring installation by testing for moisture and alkalinity (pH).

1. Test in accordance with Section 09 05 61.
2. Obtain instructions if test results are not within limits recommended by flooring material manufacturer and adhesive materials manufacturer.

D. Verify that required floor-mounted utilities are in correct location.

3.02 **PREPARATION**

A. Prepare floor substrates for installation of flooring in accordance with Section 09 05 61.

3.03 **INSTALLATION - GENERAL**

A. Starting installation constitutes acceptance of sub-floor conditions.

B. Install carpet and cushion in accordance with manufacturer's instructions and CRI 104 (Commercial).

C. Verify carpet match before cutting to ensure minimal variation between dye lots.

D. Lay out carpet and locate seams in accordance with shop drawings.

1. Locate seams in area of least traffic, out of areas of pivoting traffic, and parallel to main traffic.
2. Do not locate seams perpendicular through door openings.
3. Align run of pile in same direction as anticipated traffic and in same direction on adjacent pieces.
4. Locate change of color or pattern between rooms under door centerline.
5. Provide monolithic color, pattern, and texture match within any one area.

E. Install carpet tight and flat on subfloor, well fastened at edges, with a uniform appearance.

3.04 **STRETCHED-IN CARPET**

A. Install tackless strips with pins facing the wall around entire perimeter, except across door openings. Use edge strip where carpet terminates at other floor coverings.

B. Space tackless strips slightly less than carpet thickness away from vertical surfaces, but not more than 3/8 inch.

C. Install cushion in maximum size pieces using spot adhesive to adhere to sub-floor.

D. Lay out cushion so that seams will be perpendicular to, or offset from, minimum 6 inches from carpet seams.

E. Butt cushion edges together and tape seams.

F. Trim cushion tight to edge of tackless strip and around projections and contours.

G. Double cut carpet seams, with accurate pattern match. Make cuts straight, true, and unfrayed. Apply seam adhesive to all cut edges immediately.

H. Join seams by hand sewing. Form seams straight, not overlapped or peaked, and free of gaps.

I. Following seaming, hook carpet onto tackless strip at one edge, power stretch, and hook firmly at other edges. Follow manufacturer's recommendations for method and amount of stretch.

J. Trim carpet neatly at walls and around interruptions. Tuck edges into space between tackless strip and wall.

K. Complete installation of edge strips, concealing exposed edges. Bind cut edges where not concealed by edge strips.

3.05 **DIRECT-GLUED CARPET**

A. Double cut carpet seams, with accurate pattern match. Make cuts straight, true, and unfrayed. Apply seam adhesive to cut edges of woven carpet immediately.

B. Apply contact adhesive to floor uniformly at rate recommended by manufacturer. After sufficient open time, press carpet into adhesive.

C. Apply seam adhesive to the base of the edge glued down. Lay adjoining piece with seam straight, not overlapped or peaked, and free of gaps.

D. Roll with appropriate roller for complete contact of adhesive to carpet backing.

E. Trim carpet neatly at walls and around interruptions.

F. Complete installation of edge strips, concealing exposed edges. Bind cut edges where not concealed by edge strips.

3.06 **CLEANING**

A. Remove excess adhesive from floor and wall surfaces without damage.

B. Clean and vacuum carpet surfaces.

END OF SECTION

SECTION 09 91 13
EXTERIOR PAINTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints.

C. Scope: Finish exterior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated, including the following:

1. Both sides and edges of plywood backboards for electrical and telecom equipment before installing equipment.
2. Exposed surfaces of steel lintels and ledge angles.
3. Mechanical and Electrical:
    a. On the roof and outdoors, paint equipment that is exposed to weather or to view, including factory-finished materials.

D. Do Not Paint or Finish the Following Items:

1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
2. Items indicated to receive other finishes.
3. Items indicated to remain unfinished.
4. Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.
5. Non-metallic roofing and flashing.
6. Stainless steel, anodized aluminum, bronze, terne coated stainless steel, zinc, and lead.
7. Marble, granite, slate, and other natural stones.
8. Floors, unless specifically indicated.
9. Ceramic and other types of tiles.
10. Brick, glass unit masonry, architectural concrete, cast stone, integrally colored plaster and stucco.
11. Glass.
12. Concealed pipes, ducts, and conduits.

1.02 RELATED REQUIREMENTS

A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 05 50 00 - Metal Fabrications: Shop-primed items.

C. Section 09 91 23 - Interior Painting.

D. Section 09 93 00 - Staining and Transparent Finishing. Wood substrates.

E. Section 09 96 00 - High-Performance Coatings.

F. Section 21 05 53 - Identification for Fire Suppression Piping and Equipment: Painted identification.

G. Section 21 05 53 - Identification for Fire Suppression Piping and Equipment: Color coding scheme for items to be painted under this section.

H. Section 22 05 53 - Identification for Plumbing Piping and Equipment: Painted identification.

I. Section 22 05 53 - Identification for Plumbing Piping and Equipment: Color coding scheme for items to be painted under this section.

J. Section 23 05 53 - Identification for HVAC Piping and Equipment: Painted identification.

K. Section 23 05 53 - Identification for HVAC Piping and Equipment: Color coding scheme for items to be painted under this section.

L. Section 26 05 53 - Identification for Electrical Systems: Painted identification.

M. Section 26 05 53 - Identification for Electrical Systems: Color coding scheme for items to be painted under this section.

1.03 **DEFINITIONS**

A. Comply with ASTM D16 for interpretation of terms used in this section.

1.04 **REFERENCE STANDARDS**

A. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications 2016.

B. ASTM D4258 - Standard Practice for Surface Cleaning Concrete for Coating 2005 (Reapproved 2017).

C. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials 2016.

D. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual Current Edition.

E. SSPC-SP 1 - Solvent Cleaning 2015, with Editorial Revision (2016).

F. SSPC-SP 2 - Hand Tool Cleaning 1982, with Editorial Revision (2004).

G. SSPC-SP 6 - Commercial Blast Cleaning 2007.

H. SSPC-SP 13 - Surface Preparation of Concrete 1997 (Reaffirmed 2003).

1.05 **SUBMITTALS**

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide complete list of products to be used, with the following information for each:

1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").

2. MPI product number (e.g. MPI #47).

3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.

C. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.

1. Where sheen is specified, submit samples in only that sheen.

2. Allow 30 days for approval process, after receipt of complete samples by Architect.

3. Paint color submittals will not be considered until color submittals for major materials not to be painted, such as masonry, have been approved.

D. Maintenance Data: Submit data including finish schedule showing where each product/color/finish was used, product technical data sheets, material safety data sheets

(MSDS), care and cleaning instructions, touch-up procedures, repair of painted and finished surfaces and color samples of each color and finish used.

E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Section 01 60 00 - Product Requirements, for additional provisions.
2. Extra Paint and Finish Materials: 1 gallon of each color; from the same product run, store where directed.
3. Label each container with color in addition to the manufacturer's label.

1.06 **DELIVERY, STORAGE, AND HANDLING**

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.07 **FIELD CONDITIONS**

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Do not apply exterior paint and finishes during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.

D. Minimum Application Temperatures for Latex Paints: 50 degrees F for exterior; unless required otherwise by manufacturer's instructions.

E. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 **PAINTS AND FINISHES - GENERAL**

A. Paints and Finishes: Ready mixed, unless required to be a field-catalyzed paint.

1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
2. Supply each paint material in quantity required to complete entire project's work from a single production run.
3. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.

B. Volatile Organic Compound (VOC) Content: Comply with Section 01 61 16.

C. Flammability: Comply with applicable code for surface burning characteristics.

D. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.

E. Colors: To be selected from manufacturer's full range of available colors.

1. Selection to be made by Architect after award of contract.
2. Allow for minimum of three colors for each system per each building type, unless otherwise indicated, without additional cost to Owner.

2.02 **PAINT SYSTEMS - EXTERIOR**

A. Paint E-OP - Exterior Surfaces to be Painted, Unless Otherwise Indicated: Including concrete, concrete masonry units, primed wood and primed metal.

1. Two top coats and one coat primer.
2. Top Coat(s): Exterior Latex; MPI #10, 11, 15, 119, or 214.
3. Top Coat Sheen:
    a. Satin: MPI gloss level 4; use this sheen at all locations.
4. Primer: As recommended by top coat manufacturer for specific substrate.

B. Paint E-TR-C - Transparent Finish on Concrete Floors:

1. 1 coat stain.
2. Stain: Semi-Transparent Stain for Concrete Floors; MPI #58.
3. Sealer: Water Based Sealer for Concrete Floors; MPI #99.
4. Sealer Sheen:
    a. Satin: MPI gloss level 4; use this sheen at all locations.

2.03 **PRIMERS**

A. Primers: Provide the following unless other primer is required or recommended by manufacturer of top coats.

1. Alkali Resistant Water Based Primer; MPI #3.
2. Interior/Exterior Latex Block Filler; MPI #4.
3. Anti-Corrosive Alkyd Primer for Metal; MPI #79.
4. Interior/Exterior Quick Dry Alkyd Primer for Metal; MPI #76.
5. Alkyd Primer for Galvanized Metal.
6. Water Based Primer for Galvanized Metal; MPI #134.
7. Rust-Inhibitive Water Based Primer; MPI #107.
8. Interior/Exterior Quick Dry Primer for Aluminum; MPI #95.
9. Stain Blocking Primer; MPI #136.
10. Latex Primer for Exterior Wood; MPI #6.
11. Alkyd/Oil Primer for Exterior Wood; MPI #5.
12. Bonding Primer, Water Based; MPI #17.
13. Acrylic Surface Conditioner

2.04 **ACCESSORY MATERIALS**

A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.

B. Patching Material: Latex filler.

C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.01 **EXAMINATION**

A. Do not begin application of paints and finishes until substrates have been properly prepared.

B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially effect proper application.

D. Test shop-applied primer for compatibility with subsequent cover materials.

E. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:

1. Exterior Plaster and Stucco: 12 percent.
2. Fiber Cement Siding: 12 percent.
3. Masonry, Concrete, and Concrete Masonry Units: 12 percent.
4. Exterior Wood: 15 percent, measured in accordance with ASTM D4442.
5. Concrete Floors and Traffic Surfaces: 8 percent.

3.02 **PREPARATION**

A. Clean surfaces thoroughly and correct defects prior to application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces for finishing.

D. Seal surfaces that might cause bleed through or staining of topcoat.

E. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

F. Concrete:

1. Remove release agents, curing compounds, efflorescence, and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.
2. Clean surfaces with pressurized water. Use pressure range of 1,500 to 4,000 psi at 6 to 12 inches. Allow to dry.
3. Clean concrete according to ASTM D4258. Allow to dry.
4. Prepare surface as recommended by top coat manufacturer and according to SSPC-SP 13.

G. Masonry:

1. Remove efflorescence and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces or if alkalinity of mortar joints exceed that permitted in manufacturer's written instructions. Allow to dry.
2. Prepare surface as recommended by top coat manufacturer.
3. Clean surfaces with pressurized water. Use pressure range of 600 to 1,500 psi at 6 to 12 inches. Allow to dry.

H. Fiber Cement Siding: Remove dirt, dust and other foreign matter with a stiff fiber brush. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.

I. Exterior Plaster: Fill hairline cracks, small holes, and imperfections with exterior patching plaster. Make smooth and flush with adjacent surfaces. Wash and neutralize high alkali surfaces.

J. Concrete Floors and Traffic Surfaces: Remove contamination, acid etch, and rinse floors with clear water. Verify required acid-alkali balance is achieved. Allow to dry.

K. Galvanized Surfaces:

1. Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.

2. Prepare surface according to SSPC-SP 2.

L. Ferrous Metal:

1. Solvent clean according to SSPC-SP 1.

2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.

3. Remove rust, loose mill scale, and other foreign substances using using methods recommended in writing by paint manufacturer and blast cleaning according to SSPC-SP 6 "Commercial Blast Cleaning". Protect from corrosion until coated.

M. Exterior Wood Surfaces to Receive Opaque Finish: Remove dust, grit, and foreign matter. Seal knots, pitch streaks, and sappy sections. Fill nail holes with tinted exterior calking compound after prime coat has been applied. Back prime concealed surfaces before installation.

N. Glue-Laminated Beams: Prior to finishing, wash surfaces with solvent, remove grease and dirt.

O. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.

3.03 **APPLICATION**

A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.

B. Exterior Wood to Receive Opaque Finish: If final painting must be delayed more than 2 weeks after installation of woodwork, apply primer within 2 weeks and final coating within 4 weeks.

C. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".

D. Where adjacent sealant is to be painted, do not apply finish coats until sealant is applied.

E. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

F. Apply each coat to uniform appearance.

G. Dark Colors and Deep Clear Colors: Regardless of number of coats specified, apply additional coats until complete hide is achieved.

H. Sand wood and metal surfaces lightly between coats to achieve required finish.

I. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

J. Wood to Receive Transparent Finishes: Tint fillers to match wood. Work fillers into the grain before set. Wipe excess from surface.

K. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 **FIELD QUALITY CONTROL**

A. See Section 01 40 00 - Quality Requirements, for general requirements for field inspection.

3.05 **CLEANING**

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.06 **PROTECTION**

A. Protect finishes until completion of project.

B. Touch-up damaged finishes after Substantial Completion.

3.07 **COLOR SCHEDULE**

END OF SECTION

SECTION 09 91 23
INTERIOR PAINTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints.

C. Materials for backpriming woodwork.

D. Scope: Finish interior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated.

1. Both sides and edges of plywood backboards for electrical and telecom equipment before installing equipment.

E. Do Not Paint or Finish the Following Items:

1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
2. Items indicated to receive other finishes.
3. Items indicated to remain unfinished.
4. Fire rating labels, equipment serial number and capacity labels, bar code labels, and operating parts of equipment.
5. Stainless steel, anodized aluminum, bronze, terne coated stainless steel, and lead items.
6. Marble, granite, slate, and other natural stones.
7. Floors, unless specifically indicated.
8. Ceramic and other tiles.
9. Brick, architectural concrete, cast stone, integrally colored plaster and stucco.
10. Glass.
11. Concrete masonry units in utility, mechanical, and electrical spaces.
12. Acoustical materials, unless specifically indicated.
13. Concealed pipes, ducts, and conduits.

1.02 RELATED REQUIREMENTS

A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 09 91 13 - Exterior Painting.

C. Section 09 93 00 - Staining and Transparent Finishing: Wood substrates.

D. Section 09 96 00 - High-Performance Coatings.

1.03 DEFINITIONS

A. Comply with ASTM D16 for interpretation of terms used in this section.

1.04 REFERENCE STANDARDS

A. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications 2016.

B. ASTM D4258 - Standard Practice for Surface Cleaning Concrete for Coating 2005 (Reapproved 2017).

C. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials 2016.

D. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual Current Edition.

E. SSPC-SP 1 - Solvent Cleaning 2015, with Editorial Revision (2016).

F. SSPC-SP 6 - Commercial Blast Cleaning 2007.

G. SSPC-SP 13 - Surface Preparation of Concrete 1997 (Reaffirmed 2003).

1.05 **SUBMITTALS**

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide complete list of products to be used, with the following information for each:

1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").

2. MPI product number (e.g. MPI #47).

3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.

C. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.

1. Where sheen is specified, submit samples in only that sheen.

2. Allow 30 days for approval process, after receipt of complete samples by Architect.

3. Paint color submittals will not be considered until color submittals for major materials not to be painted, such as masonry, have been approved.

D. Certification: By manufacturer that paints and finishes comply with VOC limits specified.

E. Maintenance Data: Submit data including finish schedule showing where each product/color/finish was used, product technical data sheets, material safety data sheets (MSDS), care and cleaning instructions, touch-up procedures, repair of painted and finished surfaces and color samples of each color and finish used.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Section 01 60 00 - Product Requirements, for additional provisions.

2. Extra Paint and Finish Materials: 1 gallon of each color; from the same product run, store where directed.

3. Label each container with color in addition to the manufacturer's label.

1.06 **DELIVERY, STORAGE, AND HANDLING**

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.07 **FIELD CONDITIONS**

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Do not apply materials when relative humidity exceeds 85 percent; at temperatures less than 5 degrees F above the dew point; or to damp or wet surfaces.

D. Minimum Application Temperatures for Paints: 50 degrees F for interiors unless required otherwise by manufacturer's instructions.

E. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Provide paints and finishes used in any individual system from the same manufacturer; no exceptions.

2.02 PAINTS AND FINISHES - GENERAL

A. Paints and Finishes: Ready mixed, unless intended to be a field-catalyzed paint.

1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.

2. Supply each paint material in quantity required to complete entire project's work from a single production run.

3. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.

B. Volatile Organic Compound (VOC) Content: Comply with Section 01 61 16.

C. Flammability: Comply with applicable code for surface burning characteristics.

D. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.

E. Colors: To be selected from manufacturer's full range of available colors.

1. Selection to be made by Architect after award of contract.

2. Allow for minimum of three colors for each system, unless otherwise indicated, without additional cost to Owner.

2.03 PAINT SYSTEMS - INTERIOR

A. Paint I-OP - Interior Surfaces to be Painted, Unless Otherwise Indicated: Including gypsum board, concrete, concrete masonry units, wood, plaster, uncoated steel, shop primed steel, galvanized steel and aluminum.

1. Two top coats and one coat primer.

2. Top Coat(s): Institutional Low Odor/VOC Interior Latex; MPI #143, 144, 145, 146, 147, or 148.

3. Top Coat Sheen:

a. Flat: MPI gloss level 1; use this sheen for ceilings and other overhead surfaces.

b. Semi-Gloss: MPI gloss level 5; use this sheen at all locations.

4. Primer: As recommended by top coat manufacturer for specific substrate.

B. Paint I-OP-MD-DT - Medium Duty Door/Trim: For surfaces subject to frequent contact by occupants, including metals and wood:

1. Medium duty applications include doors, door frames, railings, handrails, guardrails and balustrades.
2. Two top coats and one coat primer.
3. Top Coat(s): High Performance Architectural Interior Latex; MPI #139, 140, or 141.
4. Top Coat Sheen:
    a. Semi-Gloss: MPI gloss level 5; use this sheen at all locations.

C. Paint I-TR-C - Transparent Finish on Concrete Floors.
1. 1 coat stain.
2. Stain: Semi-Transparent Stain for Concrete Floors; MPI #58.
3. Sealer: Water Based Sealer for Concrete Floors; MPI #99.
4. Sealer Sheen:
    a. Gloss: MPI gloss level 6; use this sheen at all locations.

2.04 **PRIMERS**

A. Primers: Provide the following unless other primer is required or recommended by manufacturer of top coats.
1. Alkali Resistant Water Based Primer; MPI #3.
2. Interior Institutional Low Odor/VOC Primer Sealer; MPI #149.
3. Interior/Exterior Latex Block Filler; MPI #4.
4. Concrete Floor Primer, Waterborne.
5. Interior Latex Primer Sealer; MPI #50.
6. Interior Drywall Primer Sealer.
7. Anti-Corrosive Alkyd Primer for Metal; MPI #79.
8. Interior Rust-Inhibitive Water Based Primer; MPI #107.
9. Interior/Exterior Quick Dry Alkyd Primer for Metal; MPI #76.
10. Interior Water Based Primer for Galvanized Metal; MPI #134.
11. Alkyd Primer for Galvanized Metal.
12. Interior/Exterior Quick Dry Primer for Aluminum; MPI #95.
13. Interior Alkyd Enamel Undercoat; MPI #46.
14. Interior Latex Enamel Undercoat.
15. Stain Blocking Primer; MPI #136.
16. Stain Blocking Primer, Water Based; MPI #137.
17. Latex Primer for Interior Wood; MPI #39.
18. Bonding Primer, Water Based; MPI #17.

2.05 **ACCESSORY MATERIALS**

A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.

B. Patching Material: Latex filler.

C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.01 **EXAMINATION**

A. Do not begin application of paints and finishes until substrates have been properly prepared.

B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially effect proper application.

D. Test shop-applied primer for compatibility with subsequent cover materials.

E. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:

1. Gypsum Wallboard: 12 percent.
2. Plaster and Stucco: 12 percent.
3. Masonry, Concrete, and Concrete Masonry Units: 12 percent.
4. Interior Wood: 15 percent, measured in accordance with ASTM D4442.
5. Concrete Floors and Traffic Surfaces: 8 percent.

3.02 **PREPARATION**

A. Clean surfaces thoroughly and correct defects prior to application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.

D. Seal surfaces that might cause bleed through or staining of topcoat.

E. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

F. Concrete:

1. Remove release agents, curing compounds, efflorescence, and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.
2. Clean surfaces with pressurized water. Use pressure range of 1,500 to 4,000 psi at 6 to 12 inches. Allow to dry.
3. Clean concrete according to ASTM D4258. Allow to dry.
4. Prepare surface as recommended by top coat manufacturer and according to SSPC-SP 13.

G. Masonry:

H. Concrete Floors and Traffic Surfaces: Remove contamination, acid etch, and rinse floors with clear water. Verify required acid-alkali balance is achieved. Allow to dry.

I. Gypsum Board: Fill minor defects with filler compound. Spot prime defects after repair.

J. Plaster: Fill hairline cracks, small holes, and imperfections with latex patching plaster. Make smooth and flush with adjacent surfaces. Wash and neutralize high alkali surfaces.

K. Aluminum: Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.

L. Galvanized Surfaces:

1. Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.

M. Ferrous Metal:

1. Solvent clean according to SSPC-SP 1.
2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.
3. Remove rust, loose mill scale, and other foreign substances using using methods recommended in writing by paint manufacturer and blast cleaning according to SSPC-SP 6 "Commercial Blast Cleaning". Protect from corrosion until coated.

N. Wood Surfaces to Receive Opaque Finish: Wipe off dust and grit prior to priming. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats. Back prime concealed surfaces before installation.

O. Glue-Laminated Beams: Prior to finishing, wash surfaces with solvent, remove grease and dirt.

P. Wood Doors to be Field-Finished: Seal wood door top and bottom edge surfaces with tinted primer.

3.03 **APPLICATION**

A. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".

B. Where adjacent sealant is to be painted, do not apply finish coats until sealant is applied.

C. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

D. Apply each coat to uniform appearance in thicknesses specified by manufacturer.

E. Dark Colors and Deep Clear Colors: Regardless of number of coats specified, apply as many coats as necessary for complete hide.

F. Sand wood and metal surfaces lightly between coats to achieve required finish.

G. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

H. Wood to Receive Transparent Finishes: Tint fillers to match wood. Work fillers into the grain before set. Wipe excess from surface.

I. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 **FIELD QUALITY CONTROL**

A. See Section 01 40 00 - Quality Requirements, for general requirements for field inspection.

3.05 **CLEANING**

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.06 **PROTECTION**

A. Protect finishes until completion of project.

B. Touch-up damaged finishes after Substantial Completion.

END OF SECTION

SECTION 09 93 00
STAINING AND TRANSPARENT FINISHING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface preparation.

B. Field application of stains and transparent finishes.

1.02 RELATED REQUIREMENTS

A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 09 91 13 - Exterior Painting: Stains and transparent finishes for concrete substrates.

C. Section 09 91 23 - Interior Painting: Stains and transparent finishes for concrete substrates.

1.03 DEFINITIONS

A. Comply with ASTM D16 for interpretation of terms used in this section.

1.04 REFERENCE STANDARDS

A. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications 2016.

B. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials 2016.

C. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual Current Edition.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide complete list of products to be used, with the following information for each:

1. Manufacturer's name, product name and/or catalog number, and general product category.
2. MPI product number (e.g. MPI #33).
3. Manufacturer's installation instructions.
4. If proposal of substitutions is allowed under submittal procedures, explanation of substitutions proposed.

C. Samples: Submit two samples, illustrating selected colors and sheens for each system with specified coats cascaded. Submit on actual wood substrate to be finished, 4 x 4 inch in size.

D. Certification: By manufacturer that stains and transparent finishes comply with VOC limits specified.

E. Manufacturer's Instructions: Indicate special surface preparation procedures.

F. Maintenance Data: Submit data including finish schedule showing where each product/color/finish was used, product technical data sheets, safety data sheets (SDS), care and cleaning instructions, touch-up procedures and color samples of each color and finish used.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Section 01 60 00 - Product Requirements, for additional provisions.

2. Extra Stain and Transparent Finish Materials: 1 gallon of each color and type; from the same product run, store where directed.

3. Label each container with color and type in addition to the manufacturer's label.

1.06 **DELIVERY, STORAGE, AND HANDLING**

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of stain or transparent finish, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Stain and Transparent Finish Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.07 **FIELD CONDITIONS**

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by manufacturer of stains and transparent finishes.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Do not apply materials when relative humidity exceeds 85 percent; at temperatures less than 5 degrees F above the dew point; or to damp or wet surfaces.

D. Minimum Application Temperature: 50 degrees F unless required otherwise by manufacturer's instructions.

E. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 **MANUFACTURERS**

A. Provide finishes used in any individual system from the same manufacturer; no exceptions.

2.02 **STAINS AND TRANSPARENT FINISHES - GENERAL**

A. Finishes:

1. Provide finishes capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.

2. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.

3. Supply each finish material in quantity required to complete entire project's work from a single production run.

4. Do not reduce, thin, or dilute finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.

B. Volatile Organic Compound (VOC) Content: Comply with Section 01 61 16.

C. Flammability: Comply with applicable code for surface burning characteristics.

D. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.

E. Colors: To be selected from manufacturer's full range of available colors.

1. Selection to be made by Architect after award of contract.

2. Extend colors to surface edges; colors may change at any edge as directed by Architect.

2.03 **EXTERIOR STAIN AND TRANSPARENT FINISH SYSTEMS**

A. Finish on Wood:

1. Stain: Exterior Solid Stain for Wood, Water Based; MPI #16.
2. Stain: Exterior Semi-Transparent Stain for Wood, Water Based; MPI #156.
3. Stain: Exterior Semi-Transparent Stain for Wood, Solvent Based; MPI #13.
4. Stain: Exterior Semi-Transparent Stain for Wood Decks, Solvent Based or Water Based; MPI #33.
5. Top Coat(s): Exterior Clear Water Based Varnish with UV Inhibitor
6. Top Coat(s): Exterior Clear Alkyd Varnish with UV Inhibitor
7. Top Coat Sheen:
    a. Semi-Gloss: MPI gloss level 5; use this sheen at all locations.

2.04 **INTERIOR STAIN AND TRANSPARENT FINISH SYSTEMS**

A. Finish on Wood - Vertical Surfaces and Trim

1. Stain: Semi-Transparent Stain for Wood, Solvent Based; MPI #90.
2. Stain: Semi-Transparent Stain for Wood, Water Based; MPI #186.
3. Sealer: Alkyd, Sanding Sealer, Clear; MPI #102.
4. Sealer: Lacquer, Sanding Sealer, White; MPI #24.
5. Top Coat(s): Polyurethane Varnish, Oil Modified; MPI #56 or 57.
6. Top Coat(s): Alkyd Varnish; MPI #73 or 75.
7. Top Coat(s): Polyurethane Varnish, High Build.
8. Top Coat(s): Clear Water Based Varnish; MPI #128, 129, or 130.
9. Top Coat(s): Clear Lacquer; MPI #85, 86, or 87.
10. Top Coat Sheen:
    a. Semi-Gloss: MPI gloss level 5; use this sheen at all locations.

2.05 **ACCESSORY MATERIALS**

A. Accessory Materials: Cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of finished surfaces.

B. Patching Material: Latex filler.

C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.01 **EXAMINATION**

A. Do not begin application of stains and finishes until substrates have been properly prepared.

B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially effect proper application.

D. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:

1. Wood: 15 percent, measured in accordance with ASTM D4442.

3.02 **PREPARATION**

A. Clean surfaces thoroughly and correct defects prior to application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.

D. Seal surfaces that might cause bleed through or staining of topcoat.

E. Wood Surfaces to Receive Opaque Finish: Wipe off dust and grit prior to priming. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats. Back prime concealed surfaces before installation.

F. Wood Surfaces to Receive Transparent Finish: Wipe off dust and grit prior to sealing, seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after sealer has dried; sand lightly between coats. Prime concealed surfaces with gloss varnish reduced 25 percent with thinner.

G. Wood Doors to be Field-Finished: Seal wood door top and bottom edge surfaces with clear sealer.

3.03 **APPLICATION**

A. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".

B. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

C. Apply each coat to uniform appearance in thicknesses specified by manufacturer.

D. Sand wood surfaces lightly between coats to achieve required finish.

E. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

F. Wood to Receive Transparent Finishes: Tint fillers to match wood. Work fillers into the grain before set. Wipe excess from surface.

G. Reinstall items removed prior to finishing.

3.04 **FIELD QUALITY CONTROL**

A. See Section 01 40 00 - Quality Requirements, for general requirements for field inspection.

3.05 **CLEANING**

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.06 **PROTECTION**

A. Protect finishes until completion of project.

B. Touch-up damaged finishes after Substantial Completion.

END OF SECTION

SECTION 09 96 00
HIGH-PERFORMANCE COATINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. High performance coatings.

B. Surface preparation.

1.02 RELATED REQUIREMENTS

A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 09 91 13 - Exterior Painting.

1.03 REFERENCE STANDARDS

A. MPI (APL) - Master Painters Institute Approved Products List; Master Painters and Decorators Association Current Edition.

B. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual Current Edition.

C. SSPC-SP 1 - Solvent Cleaning 2015, with Editorial Revision (2016).

D. SSPC-SP 2 - Hand Tool Cleaning 1982, with Editorial Revision (2004).

E. SSPC-SP 6 - Commercial Blast Cleaning 2007.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Provide complete list of all products to be used, with the following information for each:

1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
2. MPI product number (e.g. MPI #47).
3. Cross-reference to specified coating system(s) product is to be used in; include description of each system.
4. Manufacturer's installation instructions.
5. If proposal of substitutions is allowed under submittal procedures, explanation of all substitutions proposed.

C. Samples: Submit two samples 8 by 8 inch in size illustrating colors available for selection.

D. Manufacturer's Certificate: Certify that high-performance coatings comply with VOC limits specified.

E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

F. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

G. Maintenance Data: Include cleaning procedures and repair and patching techniques.

H. Maintenance Materials: Furnish the following for Owner 's use in maintenance of project.

1. Extra Coating Materials: 1 gallon of each type and color.
2. Label each container with manufacturer's name, product number, color number, and room names and numbers where used.

1.05 QUALITY ASSURANCE

A. Maintain one copy of each referenced document that applies to application on site.

B. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

C. Applicator Qualifications: Company specializing in performing the work of this section with minimum 3 years documented experience.

1.06 **DELIVERY, STORAGE, AND HANDLING**

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of coating, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Coating Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.07 **FIELD CONDITIONS**

A. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

B. Do not apply exterior coatings during rain or snow, or when relative humidity is outside the humidity ranges required by the coating product manufacturer.

C. Do not install materials when temperature is below 55 degrees F or above 90 degrees F.

D. Maintain this temperature range, 24 hours before, during, and 72 hours after installation of coating.

E. Restrict traffic from area where coating is being applied or is curing.

1.08 **WARRANTY**

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a one year period after Date of Substantial Completion.

C. Warranty: Include coverage for bond to substrate.

PART 2 PRODUCTS

2.01 **MANUFACTURERS**

A. Only materials (primers, coatings, etc.) listed in the latest edition of the MPI Approved Product List (APL) are acceptable for use on this project.

B. High-Performance Coatings:

1. Tnemec Company, Inc: www.tnemec.com/#sle.

2. Substitutions: Section 01 60 00 - Product Requirements.

2.02 **HIGH-PERFORMANCE COATINGS**

A. MPI Standards: Provide products that comply with MPI standards indicated and are listed in "MPI Approved Products List."

B. Provide coating systems that meet the following minimum performance criteria, unless more stringent criteria are specified:

1. Special Coating products of Tnemec Company, Inc. are listed in the Coating Schedule, Section 09 96 00.01 as a standard of quality and performance, and it is not the intent of the specifier that these materials are to be used to the exclusion of equivalent products of other manufacturers.

2. Only coatings that meet or exceed the performance of these specified coatings may be submitted for use. No substitutions will be considered that change the generic chemistry of the coatings specified.

2.03 **TOP COAT MATERIALS**

A. Coatings - General: Provide complete multi-coat systems formulated and recommended by manufacturer for the applications indicated, in the thicknesses indicated; number of coats specified does not include primer or filler coat.

B. Shellac: Pure, white type.

2.04 **ACCESSORY MATERIALS**

A. Accessory Materials: Provide all primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of coated surfaces.

PART 3 EXECUTION

3.01 **EXAMINATION**

A. Verify existing conditions before starting work.

B. Do not begin application of coatings until substrates have been properly prepared.

C. Verify that substrate surfaces are ready to receive work as instructed by the coating manufacturer. Obtain and follow manufacturer's instructions for examination and testing of substrates.

D. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

E. Test shop-applied primer for compatibility with subsequent cover materials.

F. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:

1. Cementitious Substrates: Do not begin application until substrate has cured 28 days minimum and measured moisture content is not greater than 12 percent.

2. Plaster and Stucco: 12 percent.

3. Masonry, Concrete, and Concrete Unit Masonry: 12 percent.

4. Concrete Floors and Traffic Surfaces: 8 percent.

5. Wood: Do not begin application if substrate has moisture content over 12 percent.

G. Proceed with coating application only after unacceptable conditions have been corrected.

1. Commencing coating application constitutes Contractor's acceptance of substrates and conditions.

3.02 **PREPARATION**

A. Clean surfaces of loose foreign matter.

B. Remove substances that would bleed through finished coatings. If unremovable, seal surface with shellac.

C. Remove finish hardware, fixture covers, and accessories and store.

D. Aluminum: Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.

E. Galvanized Surfaces:

1. Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.

2. Prepare surface according to SSPC-SP 2.

F. Ferrous Metal:

1. Solvent clean according to SSPC-SP 1.

2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.

3. Remove rust, loose mill scale, and other foreign substances using using methods recommended in writing by paint manufacturer and blast cleaning according to SSPC-SP 6 "Commercial Blast Cleaning", and protect from corrosion until coated.

G. Protect adjacent surfaces and materials not receiving coating from spatter and overspray; mask if necessary to provide adequate protection. Repair damage.

3.03 **PRIMING**

A. Apply primer to all surfaces, unless specifically not required by coating manufacturer. Apply in accordance with coating manufacturer's instructions.

3.04 **COATING APPLICATION**

A. Apply coatings in accordance with manufacturer's written instructions, to thicknesses specified and recommendations in "MPI Architectural Painting and Specification Manual".

B. Apply in uniform thickness coats, without runs, drips, pinholes, brush marks, or variations in color, texture, or finish. Finish edges, crevices, corners, and other changes in dimension with full coating thickness.

3.05 **FIELD QUALITY CONTROL**

A. See Section 01 40 00 - Quality Requirements, for general requirements for field inspection.

3.06 **CLEANING**

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

B. Clean surfaces immediately of overspray, splatter, and excess material.

C. After coating has cured, clean and replace finish hardware, fixtures, and fittings previously removed.

D. See Section 01 74 19 - Construction Waste Management and Disposal, for additional requirements.

3.07 **PROTECTION**

A. Protect finished work from damage.

END OF SECTION

SYSTEM #2 – INTERIOR STEEL – COLUMNS, HOLLOW METAL DOORS AND FRAMES, MISC. METAL FINISHES

Surface Preparation: SSPC-SP2-3

Field Primer: Series 135-Color @ 4.0 mils DFT

Intermediate: Series 1081-Color @ 2.0 – 3.0 mils DFT

Finish Coat: Series 1081-Color @ 2.0 – 3.0 mils DFT

SYSTEM #3 –EXTERIOR STEEL

Surface Preparation: SSPC-SP2-3.

Spot Primer: Series 1 Omnithane @ 2.5 – 3.5 mils DFT

Intermediate: Series 27 Typoxy @ 4.0 – 6.0 mils DFT

Finish Coat: Series 1075U Endura-Shield II @ 2.0 – 3.0 mils DFT

END OF SECTION

SECTION 10 28 00
TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Commercial toilet accessories.

B. Residential toilet, shower, and bath accessories.

C. Under-lavatory pipe supply covers.

1.02 RELATED REQUIREMENTS

A. Section 08 83 00 - Mirrors: Other mirrors.

1.03 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design 2010.

B. ASTM B456 - Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium 2017.

C. ASTM C1036 - Standard Specification for Flat Glass 2016.

D. ASTM C1503 - Standard Specification for Silvered Flat Glass Mirror 2018.

E. ASTM C1822 - Standard Specification for Insulating Covers on Accessible Lavatory Piping 2015.

F. ICC A117.1 - Accessible and Usable Buildings and Facilities 2017.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit data on accessories describing size, finish, details of function, and attachment methods.

C. Manufacturer's Installation Instructions: Indicate special procedures and conditions requiring special attention.

PART 2 PRODUCTS

2.01 MATERIALS

A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.

B. Mirror Glass: Annealed float glass, ASTM C1036 Type I, Class 1, Quality Q2, with silvering, protective and physical characteristics complying with ASTM C1503.

2.02 FINISHES

A. Stainless Steel: Satin finish, unless otherwise noted.

B. Chrome/Nickel Plating: ASTM B456, SC 2, polished finish, unless otherwise noted.

2.03 COMMERCIAL TOILET ACCESSORIES

A. Mirrors: Stainless steel framed, 1/4 inch thick annealed float glass; ASTM C1036.

B. Grab Bars: Stainless steel, smooth surface.

1. Standard Duty Grab Bars:

a. Push/Pull Point Load: 250 pound-force, minimum.

b. Dimensions: 1-1/4 inch outside diameter, minimum 0.05 inch wall thickness, exposed flange mounting, 1-1/2 inch clearance between wall and inside of grab bar.

c. Finish: Satin.

d. Length and Configuration: As indicated on drawings.

2.04 **RESIDENTIAL TOILET, SHOWER, AND BATH ACCESSORIES**

A. Medicine Cabinet: Stainless steel cabinet, shelves, door, hinge, and mirror frame, reversible type, fully recessed.

B. Toilet Paper Holder: Surface mounted, single roll, concealed attachment.

1. Material: Stainless steel; satin finish.

2. Type: Spring-loaded spindle with brackets.

C. Towel Bar: Round tubular bar; rectangular mounting posts, concealed attachment.

1. Mounting Post Material: Stainless steel; satin finish.

2. Bar Material: Stainless steel; satin finish.

3. Length: 24 inches or as iindicated on drawings

4. 3/4" diameter

D. Shower Curtain Rod: Straight tube, 1-1/4 inch diameter, with 3" O. D. mounting flanges for attachment.

1. Material: Stainless steel; satin finish.

2. Length: 72 inches.

3. MIn. 20 vegetables steel.flange with satin finish designed for exposed fasteners

E. Robe Hook: Single-prong, concealed attachment.

1. Material: Stainless steel; satin finish.

2.05 **UNDER-LAVATORY PIPE AND SUPPLY COVERS**

A. Under-Lavatory Pipe and Supply Covers:

1. Insulate exposed drainage piping including hot, cold, and tempered water supplies under lavatories or sinks to comply with ADA Standards.

2. Exterior Surfaces: Smooth non-absorbent, non-abrasive surfaces.

3. Construction: 1/8 inch flexible PVC.

4. Color: White.

5. Fasteners: Reusable, snap-locking fasteners with no sharp or abrasive external surfaces.

PART 3 EXECUTION

3.01 **EXAMINATION**

A. Verify existing conditions before starting work.

B. Verify exact location of accessories for installation.

C. Verify that field measurements are as indicated on drawings.

D. See Section 06 10 00 for installation of blocking, reinforcing plates and concealed anchors in walls and ceilings.

3.02 **PREPARATION**

A. Deliver inserts and rough-in frames to site for timely installation.

B. Provide templates and rough-in measurements as required.

3.03 **INSTALLATION**

A. Install accessories in accordance with manufacturers' instructions in locations indicated on drawings.

B. Install plumb and level, securely and rigidly anchored to substrate.

C. Mounting Heights: As required by accessibility regulations, unless otherwise indicated.

1. Grab Bars: As indicated on drawings.
2. Mirrors: height as indicated on drawings measured from floor to bottom of mirrored surface.
3. Other Accessories: As indicated on drawings.

3.04 **PROTECTION**

A. Protect installed accessories from damage due to subsequent construction operations.

END OF SECTION

SECTION 10 44 00
FIRE PROTECTION SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fire extinguishers.

B. Self-service reloadable fire extinguishers

C. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Wood blocking product and execution requirements.

B. Section 09 91 23 - Interior Painting: Field paint finish.

1.03 REFERENCE STANDARDS

A. FM (AG) - FM Approval Guide current edition.

B. NFPA 10 - Standard for Portable Fire Extinguishers 2017.

C. UL (DIR) - Online Certifications Directory Current Edition.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide extinguisher operational features.

C. Shop Drawings: Indicate locations of individual fire extinquishers.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

E. Maintenance Data: Include test, refill or recharge schedules and re-certification requirements.

1.05 FIELD CONDITIONS

A. Do not install extinguishers when ambient temperature may cause freezing of extinguisher ingredients.

PART 2 PRODUCTS

2.01 FIRE EXTINGUISHERS

A. Fire Extinguishers - General: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.

1. Provide extinguishers labeled by UL (DIR) or FM (AG) for purpose specified and as indicated.

B. FFFP - Foam Type Fire Extinguishers: Stainless steel tank, with pressure gauge.

1. Class: A:B type.

2. Size: 2.5 pound.

3. Temperature range: 40 degrees F to 120 degrees F.

2.02 SELF-SERVICE RELOADABLE FIRE EXTINGUISHERS

A. Self-Service Reloadable Fire Extinguishers - General: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.

1. Provide extinguishers labeled by UL (DIR) or FM (AG) for purpose specified and as indicated.

B. Multipurpose Monoammonium Phosphate Dry Chemical Type Fire Extinguishers: Polymeric body, including discharge head, carbon dioxide cartridge, extinguisher agent cartridge and valve assembly.

1. Pressurization: Non-pressurized until pressurized by carbon dioxide cartridge activation.
2. Class: 3A:40B:C type.
3. Size: 5 pound.
4. Temperature range: Minus 40 degrees F to 120 degrees F.

2.03 **ACCESSORIES**

A. Extinguisher Brackets: Formed steel, chrome-plated.

PART 3 EXECUTION

3.01 **EXAMINATION**

A. Verify existing conditions before starting work.

3.02 **INSTALLATION**

A. Install in accordance with manufacturer's instructions.

B. Secure rigidly in place.

C. Place extinguishers on wall brackets.

3.03 **MAINTENANCE**

A. See Section 01 70 00 - Execution and Closeout Requirements, for additional requirements relating to maintenance service.

3.04 **MAINTENANCE - SELF-SERVICE FIRE EXTINGUISHERS**

A. Monthly Inspections: Inspect self-service fire extinguishers on monthly basis in accordance with manufacturer’s instructions, and requirements of the authorities having jurisdiction (AHJ).

B. Annual Inspections: Inspect self-service fire extinguishers on annual basis in accordance with manufacturer’s instructions, and requirements of the authorities having jurisdiction (AHJ).

C. Inspection Certification Tag: Provide new tag indicating acceptable condition of fire extinguisher, date of inspection, and name of self-service inspector for each inspection.

END OF SECTION

SECTION 10 56 17
WALL MOUNTED STANDARDS AND SHELVING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Shelf standards, brackets, and accessories.

B. Closet rods for mounting on brackets.

C. Shelves.

D. See drawings for locations and configurations.

1.02 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Wood blocking in walls for attachment of standards.

B. Section 06 20 00 - Finish Carpentry: Wood shelves.

C. Section 09 21 16 - Gypsum Board Assemblies: Blocking in metal stud walls for attachment of standards.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used.

C. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.

D. Maintenance Materials: Furnish the following for Owner 's use in maintenance of project.

1. See Section 01 60 00 - Product Requirements, for additional provisions.

2. Extra Brackets: Ten of each size of standard straight bracket.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Store products under cover and elevated above grade.

B. Store products in manufacturer's unopened packaging until ready for installation.

PART 2 PRODUCTS

2.01 MATERIALS

A. Regular-Duty Shelf Brackets:

1. Load Capacity: Recommended by manufacturer for loading of 120 to 320 pounds per pair of standards.

2. Material: per-finished metal

3. Lengths: required to support shelving indicated.

4. Finish: Powder-coated, color as selected from manufacturers full line.

5. Brackets: 16 gage, 0.0598 inch sheet steel, reinforced, locking into slots; size to suit shelves; same finish as standards unless not available.

6. Bracket Quantity: Provide one bracket for each 18 inches of standard length.

B. Closet Rods: Wood dowel for wall mounting in flange fittings.

1. Type: Round wood dowel, standard duty; 1-1/16 inch outside diameter, 0.087 inch wall thickness.

2. Length: As required for application, up to 12 feet.

3. Provide mounting fittings to suit application.

C. Wood Shelves: 3\4" Particle board shelves, with edges sanded and eased.

1. Thickness: 3/4 inch, nominal.
2. Finish: Painted.

D. Fasteners: Screws as recommended by manufacturer for intended application or as otherwise required by project conditions.

PART 3 EXECUTION

3.01 **EXAMINATION**

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 **PREPARATION**

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 **INSTALLATION**

A. Install in accordance with manufacturer's instructions.

B. Mount standards to solid backing capable of supporting intended loads.

C. Install brackets, shelving, and accessories.

3.04 **PROTECTION**

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 11 30 13
RESIDENTIAL APPLIANCES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Kitchen appliances to be contractor provided and installed.

1.02 REFERENCE STANDARDS

A. UL (DIR) - Online Certifications Directory Current Edition.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's data indicating dimensions, capacity, and operating features of each piece of residential equipment specified.

C. Copies of Warranties: Submit manufacturer warranty and ensure that forms have been completed in Owner 's name and registered with manufacturer.

1.04 QUALITY ASSURANCE

A. Electric Appliances: Listed and labeled by UL (DIR) and complying with NEMA Standards (National Electrical Manufacturers Association).

1.05 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 KITCHEN APPLIANCES

A. Provide Equipment Eligible for Energy Star Rating: Energy Star Rated.

B. Provide Equipment as indicated in drawings.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify utility rough-ins are provided and correctly located.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

3.03 ADJUSTING

A. Adjust equipment to provide efficient operation.

3.04 CLEANING

A. Remove packing materials from equipment and properly discard.

B. Wash and clean equipment.

END OF SECTION

SECTION 12 21 13
HORIZONTAL LOUVER BLINDS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Horizontal slat louver blinds.

B. Operating hardware.

1.02 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Concealed wood blocking for attachment of headrail brackets.

1.03 REFERENCE STANDARDS

A. WCMA A100.1 - Safety of Window Covering Products 2018.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the placement of concealed blocking to support blinds. See Section 06 10 00.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data indicating physical and dimensional characteristics.

C. Shop Drawings: Indicate opening sizes, tolerances required, method of attachment, clearances, and operation.

D. Samples: Submit two samples, 4 inch long illustrating slat materials and finish, cord type and color.

E. Manufacturer's Installation Instructions: Indicate special procedures.

F. Maintenance Materials: Furnish the following for Owner 's use in maintenance of project.

1. See Section 01 60 00 - Product Requirements, for additional provisions.
2. Extra Blind Assemblies: One of each size.
3. Extra Slats: 20 of each type and size.
4. Extra Lift Cords, Control Cords, and Wands: One of each type.

PART 2 PRODUCTS

2.01 BLINDS

A. Description: Horizontal slat louvers hung from full-width headrail with full-width bottom rail.

B. Manual Operation: Control of raising and lowering by cord with full range locking; blade angle adjustable by control wand.

C. Metal Slats: Spring tempered pre-finished aluminum; square slat corners, with manufacturing burrs removed.

1. Width: 1/2 inch.
2. Color: As selected by Architect.

D. Slat Support: Woven polypropylene cord, ladder configuration.

1. Head Rail: Pre-finished, formed steel box, with end caps; internally fitted with hardware, pulleys, and bearings for operation; same depth as width of slats.
   a. Color: Same as slats.
2. Bottom Rail: Pre-finished, formed steel; with end caps.

a. Color: Same as headrail.

3. Lift Cord: Braided nylon; continuous loop; complying with WCMA A100.1.
4. Control Wand: Extruded hollow plastic; hexagonal shape.
   a. Non-removable type.
   b. Length of window opening height less 3 inch.
   c. Color: Clear.
5. Headrail Attachment: Ceiling brackets.
6. Accessory Hardware: Type recommended by blind manufacturer and including the following:
   a. Lift Cord Safety Cleat:
      1) Install one (1) within ADA reach ranges at max. 48 inches AFF at all windows located on the first floor
      2) Install one (1) at 59 inches AFF at all windows indicated on drawings to have window blinds

2.02 **FABRICATION**

A. Determine sizes by field measurement.

B. Fabricate blinds to fit within openings with uniform edge clearance of 1/4 inch.

C. Fabricate blinds to cover window frames completely.

D. At openings requiring multiple blind units, provide separate blind assemblies with space of 1/4 inch between blinds, located at window mullion centers.

PART 3 EXECUTION

3.01 **EXAMINATION**

A. Verify that openings are ready to receive the work.

B. Ensure structural blocking and supports are correctly placed. See Section 06 10 00.

3.02 **INSTALLATION**

A. Install blinds in accordance with manufacturer's instructions.

B. Secure in place with flush countersunk fasteners.

C. Place intermediate head supports at 30 inch on center.

3.03 **TOLERANCES**

A. Maximum Variation of Gap at Window Opening Perimeter: 1/4 inch.

B. Maximum Offset From Level: 1/8 inch.

3.04 **ADJUSTING**

A. Adjust blinds for smooth operation.

3.05 **CLEANING**

A. Clean blind surfaces just prior to occupancy.

B. See Section 01 74 19 - Construction Waste Management and Disposal, for additional requirements.

END OF SECTION

SECTION 12 35 30
RESIDENTIAL CASEWORK

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Kitchen cabinets.

B. Vanity cabinets.

C. Casework hardware.

1.02 RELATED REQUIREMENTS

A. Section 07 92 00 - Joint Sealants: Sealing joints between casework and countertops and adjacent walls, floors, and ceilings.

B. Section 12 36 00 - Countertops.

1.03 REFERENCE STANDARDS

A. BHMA A156.9 - American National Standard for Cabinet Hardware 2015.

B. KCMA A161.1 - Performance and Construction Standard for Kitchen and Vanity Cabinets 2017.

C. KCMA (DIR) - Directory of Certified Cabinet Manufacturers Current Edition.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide component dimensions and construction details.

C. Shop Drawings: Indicate casework locations, large scale plans, elevations, clearances required, rough-in and anchor placement dimensions and tolerances.

D. Samples: Submit two wood samples, 4x4 inch in size, illustrating each color of finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Residential Casework:

1. Kraftmaid Cabinetry, Inc www.kraftmaid.com/#sle.
2. Crystal Cabinet Works, https://crystalcabinets.com/.
3. Crestwood, Inc.; https://crestwood-inc.com/
4. Evans Cabinet Corp.; http://www.evanscabinet.com/
5. Crown Cabinet; www.crowncabinets.com
6. Mid Continent Cabinetry; www.midcontinentcabinetry.com
7. Substitutions: See Section 01 60 00 - Product Requirements.

2.02 COMPONENTS

A. Cabinet Construction: Softwood lumber framing and particle board, tempered hardboard gables; red oak solid wood and veneer species.

1. 3/4 inch by 2 inch wide stile and rails, all mortised and tenoned, glued and pinned together.

B. Countertops: As specified in Section 12 36 00.

C. Door and Drawer Fronts: Solid wood, oak stiles and rails surrounding oak veneer plywood with felt silencers.

D. Bolts, Nuts, Washers and Screws: Of size and type to suit application.

E. Concealed Joint Fasteners: Threaded steel.

2.03 **HARDWARE**

A. Hardware: Manufacturer's standard.

B. Shelf Standards and Rests: Vertical steel standards with rubber button fitted steel rests.

C. Drawer and Door Pulls: provide routed integrated finger pulls in doors and drawers

D. Drawer Slides: Extension arms, steel and ball bearing construction.

E. Hinges: Offset pin.

2.04 **FABRICATION**

A. Shop assemble casework for delivery to site in units easily handled and to permit passage through building openings.

B. Fabricate corners and joints without gaps or inaccessible spaces or areas where dirt or moisture could accumulate.

C. Fabricate each unit to be rigid and not dependent on building structure for rigidity.

D. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

2.05 **FINISHES**

A. Exposed To View Surfaces: Stain, seal, and varnish of color as selected by Architect from manufacturer's full range

B. Interior Surfaces: Stain, seal, and varnish of color as selected by Architect from manufacturer's full range.

PART 3 EXECUTION

3.01 **EXAMINATION**

A. Verify adequacy of support framing.

3.02 **INSTALLATION**

A. Install casework, components and accessories in accordance with manufacturer's instructions.

B. Set casework items plumb and square, securely anchored to building structure.

C. Carefully scribe casework abutting other components, with maximum gaps of 1/32 inch. Use filler strips; not additional overlay trim for this purpose.

D. Close ends of units, back splashes, shelves and bases.

3.03 **ADJUSTING**

A. Adjust doors, drawers, hardware, fixtures, and other moving or operating parts to function smoothly.

3.04 **CLEANING**

A. Clean casework, countertops, shelves, and hardware.

3.05 **PROTECTION**

A. Do not permit finished casework to be exposed to continued construction activity.

END OF SECTION

SECTION 12 36 00
COUNTERTOPS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Countertops for architectural cabinet work.

B. Countertops for manufactured casework.

C. Wall-hung counters and vanity tops.

1.02 RELATED REQUIREMENTS

A. Section 123200 - Manufactured Wood Casework.

B. Section 12 35 30 - Residential Casework.

1.03 REFERENCE STANDARDS

A. ANSI A208.1 - American National Standard for Particleboard 2009.

B. ANSI A208.2 - American National Standard for Medium Density Fiberboard for Interior Use 2009.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2018b.

D. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards 2014, with Errata (2016).

E. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 3.1 2016, with Errata (2017).

F. NEMA LD 3 - High-Pressure Decorative Laminates 2005.

G. PS 1 - Structural Plywood 2009.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used, including:

1. Preparation instructions and recommendations.
2. Storage and handling requirements and recommendations.
3. Specimen warranty.

C. Shop Drawings: Complete details of materials and installation ; combine with shop drawings of cabinets and casework specified in other sections.

D. Selection Samples: For each finish product specified, color chips representing manufacturer's full range of available colors and patterns.

E. Sustainable Design Submittal: Documentation for sustainably harvested wood-based components.

F. Maintenance Data: Manufacturer's instructions and recommendations for maintenance and repair of countertop surfaces.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.06 FIELD CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

PART 2 PRODUCTS

2.01 COUNTERTOPS

A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.

B. Plastic Laminate Countertops: High-pressure decorative laminate (HPDL) sheet bonded to substrate.

1. Laminate Sheet, Type PL-1: NEMA LD 3, Grade HGS, 0.048 inch nominal thickness.

a. Surface Burning Characteristics: Flame spread index of 25, maximum; smoke developed index of 450, maximum; when tested in accordance with ASTM E84.

b. NSF approved for food contact.

c. Finish: Matte or suede, gloss rating of 5 to 20.

d. Surface Color and Pattern: As selected by Architect from the manufacturer's full line.

2. Exposed Edge Treatment: Postformed laminate; front edge substrate built up to minimum 1-1/4 inch thick with raised radiused edge, integral coved backsplash with radiused top edge.

3. Back and End Splashes: Same material, same construction.

4. Fabricate in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 11 - Countertops, Custom Grade.

2.02 MATERIALS

A. Wood-Based Components:

1. Wood fabricated from old growth timber is not permitted.

2. Provide sustainably harvested wood, certified or labeled as specified in Section 01 60 00 - Product Requirements.

B. Plywood for Supporting Substrate: PS 1 Exterior Grade, A-C veneer grade, minimum 5-ply; minimum 3/4 inch thick; join lengths using metal splines.

C. Particleboard for Supporting Substrate: ANSI A208.1 Grade 2-M-2, 45 pcf minimum density; minimum 3/4 inch thick; join lengths using metal splines.

D. Medium Density Fiberboard for Supporting Substrate: ANSI A208.2.

E. Adhesives: Chemical resistant waterproof adhesive as recommended by manufacturer of materials being joined.

F. Joint Sealant: Mildew-resistant silicone sealant, white.

2.03 FABRICATION

A. Fabricate tops and splashes in the largest sections practicable, with top surface of joints flush.

1. Join lengths of tops using best method recommended by manufacturer.

2. Fabricate to overhang fronts and ends of cabinets 1 inch except where top butts against cabinet or wall.

3. Prepare all cutouts accurately to size; replace tops having improperly dimensioned or unnecessary cutouts or fixture holes.

B. Provide back/end splash wherever counter edge abuts vertical surface unless otherwise indicated.

1. Secure to countertop with concealed fasteners and with contact surfaces set in waterproof glue.

2. Height: 4 inches, unless otherwise indicated.

C. Wall-Mounted Counters: Provide skirts, aprons, brackets and braces as indicated on drawings, finished to match.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

C. Verify that wall surfaces have been finished and mechanical and electrical services and outlets are installed in proper locations.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

A. Securely attach countertops to cabinets using concealed fasteners. Make flat surfaces level; shim where required.

B. Attach plastic laminate countertops using screws with minimum penetration into substrate board of 5/8 inch.

C. Seal joint between back/end splashes and vertical surfaces.

1. Where applied cove molding is not indicated use specified sealant.

3.04 TOLERANCES

A. Variation From Horizontal: 1/8 inch in 10 feet, maximum.

B. Offset From Wall, Countertops: 1/8 inch maximum; 1/16 inch minimum.

C. Field Joints: 1/8 inch wide, maximum.

3.05 CLEANING

A. Clean countertops surfaces thoroughly.

3.06 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 23 08 00
COMMISSIONING OF HVAC

PART 1 GENERAL

1.01 SUMMARY

A. See Section 01 91 13 - General Commissioning Requirements for overall objectives; comply with the requirements of Section 01 91 13.

B. This section covers the Contractor 's responsibilities for commissioning; each subcontractor or installer responsible for the installation of a particular system or equipment item to be commissioned is responsible for the commissioning activities relating to that system or equipment item.

C. The Commissioning Authority (CA) directs and coordinates all commissioning activities and provides Prefunctional Checklists and Functional Test Procedures for Contractor 's use.

D. The entire HVAC system is to be commissioned, including commissioning activities for the following specific items:

1. Other equipment and systems explicitly identified elsewhere in Contract Documents as requiring commissioning.

E. The Prefunctional Checklist and Functional Test requirements specified in this section are in addition to, not a substitute for, inspection or testing specified in other sections.

1.02 REFERENCE STANDARDS

A. ASHRAE Guideline 1.1 - The HVAC&R Technical Requirements for the Commissioning Process 2007, with Errata (2012).

1.03 SUBMITTALS

A. Updated Submittals: Keep the Commissioning Authority informed of all changes to control system documentation made during programming and setup; revise and resubmit when substantial changes are made.

B. DRAFT Prefunctional Checklists and Functional Test Procedures for Control System: Detailed written plan indicating the procedures to be followed to test, checkout and adjust the control system prior to full system Functional Testing; include at least the following for each type of equipment controlled:

1. System name.
2. List of devices.
3. Step-by-step procedures for testing each controller after installation, including:
    a. Process of verifying proper hardware and wiring installation.
    b. Process of downloading programs to local controllers and verifying that they are addressed correctly.
    c. Process of performing operational checks of each controlled component.
    d. Plan and process for calibrating valve and damper actuators and all sensors.
    e. Description of the expected field adjustments for transmitters, controllers and control actuators should control responses fall outside of expected values.
4. Copy of proposed log and field checkout sheets to be used to document the process; include space for initial and final read values during calibration of each point and space to specifically indicate when a sensor or controller has “passed” and is operating within the contract parameters.
5. Description of the instrumentation required for testing.

6. Indicate what tests on what systems should be completed prior to TAB using the control system for TAB work. Coordinate with the Commissioning Authority and TAB contractor for this determination.

C. Startup Reports, Prefunctional Checklists, and Trend Logs: Submit for approval of Commissioning Authority.

D. HVAC Control System O&M Manual Requirements. In addition to documentation specified elsewhere, compile and organize at minimum the following data on the control system:

1. Specific step-by-step instructions on how to perform and apply all functions, features, modes, etc. mentioned in the controls training sections of this specification and other features of this system. Provide an index and clear table of contents. Include the detailed technical manual for programming and customizing control loops and algorithms.
2. Full as-built set of control drawings.
3. Full as-built sequence of operations for each piece of equipment.
4. Full points list; in addition to the information on the original points list submittal, include a listing of all rooms with the following information for each room:
    a. Floor.
    b. Room number.
    c. Room name.
    d. Air handler unit ID.
    e. Reference drawing number.
    f. Air terminal unit tag ID.
    g. Heating and/or cooling valve tag ID.
    h. Minimum air flow rate.
    i. Maximum air flow rate.
5. Full print out of all schedules and set points after testing and acceptance of the system.
6. Full as-built print out of software program.
7. Electronic copy on disk of the entire program for this facility.
8. Marking of all system sensors and thermostats on the as-built floor plan and HVAC drawings with their control system designations.
9. Maintenance instructions, including sensor calibration requirements and methods by sensor type, etc.
10. Control equipment component submittals, parts lists, etc.
11. Warranty requirements.
12. Copies of all checkout tests and calibrations performed by the Contractor (not commissioning tests).
13. Organize and subdivide the manual with permanently labeled tabs for each of the following data in the given order:
    a. Sequences of operation.
    b. Control drawings.
    c. Points lists.

d. Controller and/or module data.

e. Thermostats and timers.

f. Sensors and DP switches.

g. Valves and valve actuators.

h. Dampers and damper actuators.

i. Program setups (software program printouts).

E. Project Record Documents: See Section 01 78 00 for additional requirements.

1. Submit updated version of control system documentation, for inclusion with operation and maintenance data.

2. Show actual locations of all static and differential pressure sensors (air, water and building pressure) and air-flow stations on project record drawings.

F. Draft Training Plan: In addition to requirements specified in Section 01 79 00, include:

1. Follow the recommendations of ASHRAE Guideline 1.1.

2. Control system manufacturer's recommended training.

3. Demonstration and instruction on function and overrides of any local packaged controls not controlled by the HVAC control system.

G. Training Manuals: See Section 01 79 00 for additional requirements.

1. Provide three extra copies of the controls training manuals in a separate manual from the O&M manuals.

PART 2 PRODUCTS

2.01 TEST EQUIPMENT

A. Provide all standard testing equipment required to perform startup and initial checkout and required functional performance testing; unless otherwise noted such testing equipment will NOT become the property of Owner .

B. Equipment-Specific Tools: Where special testing equipment, tools and instruments are specific to a piece of equipment, are only available from the vendor, and are required in order to accomplish startup or Functional Testing, provide such equipment, tools, and instruments as part of the work at no extra cost to Owner ; such equipment, tools, and instruments are to become the property of Owner .

PART 3 EXECUTION

3.01 PREPARATION

A. Cooperate with the Commissioning Authority in development of the Prefunctional Checklists and Functional Test Procedures.

B. Furnish additional information requested by the Commissioning Authority.

C. Prepare a preliminary schedule for HVAC pipe and duct system testing, flushing and cleaning, equipment start-up and testing, adjusting, and balancing start and completion for use by the Commissioning Authority; update the schedule as appropriate.

D. Notify the Commissioning Authority when pipe and duct system testing, flushing, cleaning, startup of each piece of equipment and testing, adjusting, and balancing will occur; when commissioning activities not yet performed or not yet scheduled will delay construction notify ahead of time and be proactive in seeing that the Commissioning Authority has the scheduling information needed to efficiently execute the commissioning process.

E. Put all HVAC equipment and systems into operation and continue operation during each working day of testing, adjusting, and balancing and commissioning, as required.

F. Provide test holes in ducts and plenums where directed to allow air measurements and air balancing; close with an approved plug.

G. Provide temperature and pressure taps in accordance with Contract Documents.

3.02 **INSPECTING AND TESTING - GENERAL**

A. Submit startup plans, startup reports, and Prefunctional Checklists for each item of equipment or other assembly to be commissioned.

B. Perform the Functional Tests directed by the Commissioning Authority for each item of equipment or other assembly to be commissioned.

C. Provide two-way radios for use during the testing.

D. Valve/Damper Stroke Setup and Check:

1. For all valve/damper actuator positions checked, verify the actual position against the control system readout.

2. Set pump/fan to normal operating mode.

3. Command valve/damper closed; visually verify that valve/damper is closed and adjust output zero signal as required.

4. Command valve/damper open; verify position is full open and adjust output signal as required.

5. Command valve/damper to a few intermediate positions.

6. If actual valve/damper position does not reasonably correspond, replace actuator or add pilot positioner (for pneumatics).

E. Isolation Valve or System Valve Leak Check: For valves not by coils.

1. With full pressure in the system, command valve closed.

2. Use an ultra-sonic flow meter to detect flow or leakage.

F. Deficiencies: Correct deficiencies and re-inspect or re-test, as applicable, at no extra cost to Owner .

3.03 **TAB COORDINATION**

A. TAB: Testing, adjusting, and balancing of HVAC.

B. Coordinate commissioning schedule with TAB schedule.

C. Review the TAB plan to determine the capabilities of the control system toward completing TAB.

D. Provide all necessary unique instruments and instruct the TAB technicians in their use; such as handheld control system interface for setting terminal unit boxes, etc.

E. Have all required Prefunctional Checklists, calibrations, startup and component Functional Tests of the system completed and approved by the Commissioning Authority prior to starting TAB.

F. Provide a qualified control system technician to operate the controls to assist the TAB technicians or provide sufficient training for the TAB technicians to operate the system without assistance.

3.04 **CONTROL SYSTEM FUNCTIONAL TESTING**

A. Prefunctional Checklists for control system components will require a signed and dated certification that all system programming is complete as required to accomplish the

requirements of Contract Documents and the detailed Sequences of Operation documentation submittal.

B. Do not start Functional Testing until all controlled components have themselves been successfully Functionally Tested in accordance with Contract Documents.

C. Using a skilled technician who is familiar with this building, execute the Functional Testing of the control system as required by the Commissioning Authority.

D. Functional Testing of the control system constitutes demonstration and trend logging of control points monitored by the control system.

1. The scope of trend logging is partially specified; trend log up to 50 percent more points than specified at no extra cost to Owner .

2. Perform all trend logging specified in Prefunctional Checklists and Functional Test procedures.

E. Functionally Test integral or stand-alone controls in conjunction with the Functional Tests of the equipment they are attached to, including any interlocks with other equipment or systems; further testing during control system Functional Test is not required unless specifically indicated below.

F. Demonstrate the following to the Commissioning Authority during testing of controlled equipment; coordinate with commissioning of equipment.

1. Setpoint changing features and functions.

2. Sensor calibrations.

G. Demonstrate to the Commissioning Authority:

1. That all specified functions and features are set up, debugged and fully operable.

2. That scheduling features are fully functional and setup, including holidays.

3. That all graphic screens and value readouts are completed.

4. Correct date and time setting in central computer.

5. That field panels read the same time as the central computer; sample 10 percent of field panels; if any of those fail, sample another 10 percent; if any of those fail test all remaining units at no extra cost to Owner .

6. Functionality of field panels using local operator keypads and local ports (plug-ins) using portable computer/keypad; demonstrate 100 percent of panels and 10 percent of ports; if any ports fail, sample another 10 percent; if any of those fail, test all remaining units at no extra cost to Owner .

7. Power failure and battery backup and power-up restart functions.

8. Global commands features.

9. Security and access codes.

10. Occupant over-rides (manual, telephone, key, keypad, etc.).

11. O&M schedules and alarms.

12. Occupancy sensors and controls.

13. All control strategies and sequences not tested during controlled equipment testing.

H. If the control system, integral control components, or related equipment do not respond to changing conditions and parameters appropriately as expected, as specified and according to acceptable operating practice, under any of the conditions, sequences, or modes tested,

correct all systems, equipment, components, and software required at no additional cost to Owner .

3.05 **OPERATION AND MAINTENANCE MANUALS**

A. See Section 01 78 00 for additional requirements.

B. Add design intent documentation furnished by Architect to manuals prior to submission to Owner .

C. Submit manuals related to items that were commissioned to Commissioning Authority for review; make changes recommended by Commissioning Authority.

D. Commissioning Authority will add commissioning records to manuals after submission to Owner .

3.06 **DEMONSTRATION AND TRAINING**

A. See Section 01 79 00 for additional requirements.

B. Demonstrate operation and maintenance of HVAC system to Owner ' personnel; if during any demonstration, the system fails to perform in accordance with the information included in the O&M manual, stop demonstration, repair or adjust, and repeat demonstration. Demonstrations may be combined with training sessions if appropriate.

C. These demonstrations are in addition to, and not a substitute for, Prefunctional Checklists and demonstrations to the Commissioning Authority during Functional Testing.

D. Provide classroom and hands-on training of Owner 's designated personnel on operation and maintenance of the HVAC system, control system, and all equipment items indicated to be commissioned. Provide the following minimum durations of training:

E. TAB Review: Instruct Owner 's personnel for minimum 2 hours, after completion of TAB, on the following:

1. Review final TAB report, explaining the layout and meanings of each data type.
2. Discuss any outstanding deficient items in control, ducting or design that may affect the proper delivery of air or water.
3. Identify and discuss any terminal units, duct runs, diffusers, coils, fans and pumps that are close to or are not meeting their design capacity.
4. Discuss any temporary settings and steps to finalize them for any areas that are not finished.
5. Other salient information that may be useful for facility operations, relative to TAB.

F. HVAC Control System Training: Perform training in at least three phases:

1. Phase 1 - Basic Control System: Provide minimum of 2 hours of actual training on the control system itself. Upon completion of training, each attendee, using appropriate documentation, should be able to perform elementary operations and describe general hardware architecture and functionality of the system.
    a. This training may be held on-site or at the manufacturer's facility.
    b. If held off-site, the training may occur prior to final completion of the system installation.
    c. For off-site training, Contractor shall pay expenses of up to two attendees.
2. Phase 2 - Integrating with HVAC Systems: Provide minimum of 2 hours of on-site, hands-on training after completion of Functional Testing. Include instruction on:

a. The specific hardware configuration of installed systems in this facility and specific instruction for operating the installed system, including interfaces with other systems, if any.

b. Security levels, alarms, system start-up, shut-down, power outage and restart routines, changing setpoints and alarms and other typical changed parameters, overrides, freeze protection, manual operation of equipment, optional control strategies that can be considered, energy savings strategies and set points that if changed will adversely affect energy consumption, energy accounting, procedures for obtaining vendor assistance, etc.

c. Trend logging and monitoring features (values, change of state, totalization, etc.), including setting up, executing, downloading, viewing both tabular and graphically and printing trends; provide practice in setting up trend logging and monitoring during training session.

d. Every display screen, allowing time for questions.

e. Point database entry and modifications.

3. Phase 3 - Post-Occupancy: Six months after occupancy conduct minimum of [____] hours of training. Tailor training session to questions and topics solicited beforehand from Owner . Also be prepared to address topics brought up and answer questions concerning operation of the system.

G. Provide the services of manufacturer representatives to assist instructors where necessary.

H. Provide the services of the HVAC controls instructor at other training sessions, when requested, to discuss the interaction of the controls system as it relates to the equipment being discussed.

END OF SECTION

PART 1 GENERAL

1.01 GENERAL

A. Provisions of the General Conditions, Supplementary Conditions and Division 1 - General Requirements, and applicable provisions elsewhere in the Contract Documents apply to the work of Division 26 - Electrical.

B. Articles contained in this section apply to all Division 26 Sections.

C. New materials and equipment shall be approved and labeled or listed by Underwriters Laboratories or an equivalent testing facility wherever such labels or listings are available.

1.02 SUMMARY OF WORK

A. Work Included: Unless specified otherwise, provide all labor, materials and equipment necessary for completely finished and operational systems. Provide all minor incidental items such as offsets, fittings, etc. required as part of the work even though not specified or indicated.

B. Description of Systems: The work of Division 26 includes but is not limited to:
   1. Service and Power Distribution
   2. Interior and Exterior Lighting

C. Related Requirements:
   1. General Requirements: Division 1 - All Sections
   2. Division 26: All Sections
   3. Mechanical and Electrical Coordination: Section 23 05 00.

D. Work Under Other Divisions:
   1. Painting Except Electrical Identification Systems: Section 09 91 00.
   2. Wall Openings and Chases: Under the applicable Division according to information furnished under Division 26.
   3. Fixed Concrete Bases for Electrical Equipment: Section 03 30 00. Anchor bolts, setting diagrams, base size and other required information furnished under Division 26.

E. Examination: Examine work preceding or interfacing with the work of Division 26 Sections and report any known or observed defects that affect the work to the General Contractor. Do not proceed with the work until the defects are corrected. No waiver of responsibility for defective work will be allowed due to failure to report unfavorable conditions affecting the work.

F. Existing Utilities: Are indicated as accurately as possible on the Drawings. Work on utilities encountered and not indicated on the Drawings will be directed by change order

after being brought to the attention of the Architect. Close openings and repair damage in an acceptable manner to utilities encountered.

1.03 COORDINATION

A. General: Coordinate and order the progress of Electrical work to conform to the progress of the work of the other trades. Complete the entire installation as soon as the condition of the building will permit.

B. Installation Procedures: Confer and cooperate with other trades and coordinate the work in proper relation with theirs. Coordinate ceiling cavity space carefully with other trades.

C. Coordination with Mechanical Work: Section 23 05 00.

D. Utility Interruptions: Coordinate electric utility interruptions with the Owner and Utility Company. Plan work so that duration of the interruption is kept to a minimum.

E. Cutting and Patching: Section 26 05 10.

F. Drawings and Specifications: The Drawings and Specifications are complementary; what is called for in either of these is binding as though called for by both. The Electrical Drawings indicate the general design and arrangement of lines, equipment, systems, etc. Information shown is diagrammatic in character and does not necessarily indicate every required offset, fitting, etc. Do not scale Drawings for dimensions. Take dimensions, locations, levels, etc. from Architectural Drawings and equipment to be furnished. No extra compensation will be allowed on account of differences between actual dimensions and those indicated on the Drawings.

G. Discrepancies:
   1. Examine Drawings and Specifications for other parts of the work, and if any discrepancies occur between the plans for the work of this Division and the plans for the work of others, report such discrepancies to the General Contractor and obtain written instructions for any changes necessary.

   2. Make changes, at no additional cost to the Owner, to the work of Division 26 made necessary by the failure or neglect to report such discrepancies. However, it is not the intent of the Specifications that the Contractor be responsible for the correct design of the electrical system.

H. Order of Precedence: The precedence of electrical construction documents is as follows:
   1. Addenda and modifications to the Drawings and Specifications take precedence over the original Drawings and Specifications.
   2. Should there be a conflict within the Specifications or with Drawings of the same scale, the more stringent or higher quality requirement shall apply.
   3. In the Drawings, the precedence shall be Drawings of larger scale over those of smaller scale, figured dimensions over scaled dimensions and noted material over graphic indications.
   4. Should a conflict arise between the Drawings and the Specifications, the

Specifications shall have precedence.

5. Should there be a conflict in the dimensions or locations between Electrical Drawings and Architectural Drawings, the Architectural Drawings shall have precedence.

1.04 SUBMITTALS

A. Submit samples, shop drawings and product data as required by various sections of Division 26 in accordance with Section 01 33 23. Make submittals to Architect. Do not make submittals directly to Engineer. Include one additional copy above the requirements of Section 01 33 23.

1.05 QUALITY ASSURANCE

A. Preparation: Base final installation of materials and equipment on actual dimensions and conditions at the project site. Field measure for materials or equipment requiring exact fit.

B. Workmanship: Perform work in accordance with good commercial practice. The good appearance of finished work shall be of equal importance with its mechanical efficiency.

C. Supervision: Be responsible for and coordinate the work of all sub-contractors working under Division 26.

D. Properly locate anchors chases, recesses and openings required for the proper installation of the work. Arrange with the proper contractors for the building of anchors, etc. and for the leaving of the required chases, recesses and openings.

E. Install equipment and material in accordance with manufacturer's instructions unless specifically indicated otherwise, or where local codes or regulations take precedence.

1.06 REGULATORY REQUIREMENTS

A. Pay for permit and inspection fee costs applicable to work of Division 26.

B. Comply with State and local requirements and ordinances. Comply with requirements of the Utility Companies. Call for inspections required by local building inspection authority. Submit certificate of occupancy or final acceptance by inspection authority.

C. Applicable Building Codes and Ordinances: Including but not limited to the following:
   1. IRC, 2015 Edition
   2. IBC, 2015 Edition
   3. Governing Fire Department Requirements
   4. Utility Company Requirements
   5. State of Colorado Energy Standards
   6. State Department of Labor Requirements
   7. State Department of Health Requirements
   8. National Fire Protection Association Standards
   9. State and Federal Safety and Health Laws

10. NFPA 70 2017 Edition - National Electrical Code
11. NFPA 72 2013 Edition - National Fire Alarm Code
12. NFPA 101 - Life Safety Code
13. Enterprise Green Communities Certification

D. Discrepancies: If discrepancies occur between these Specifications, local codes, local Utility requirements, etc., the most stringent requirements shall apply.

1.07 REFERENCE STANDARDS

A. References:
   1. For products or workmanship specified by association, trade, or Federal Standards, comply with the requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
   2. The date of the standard is that in effect at the bid date, or date of Owner/Architect Agreement when there are no bids, except when a specific date is specified.
   3. When required by individual Specification Section, obtain copy of standard. Maintain copy at job site during work until Substantial Completion.

1.08 DELIVERY, STORAGE AND HANDLING

A. Deliver and store materials and equipment in manufacturer's unopened containers fully identified with manufacturer's name, trade name, type, class, grade, size, and color.

B. Protection: Store materials and equipment off the ground and under cover, protected from damage.

C. Large Items: Make arrangements with other contractors on the job for introduction into the building for equipment too large to pass through finished openings.

D. Acceptance: Check and sign for materials to be furnished by others for installations under Division 26 upon delivery. Assume responsibility for the storage and safekeeping of such material from time of delivery until final acceptance.

1.09 CLEANING

A. Cleaning: Comply with Section 01 74 23. Clean exposed surfaces of conduit, hangers, lighting fixtures, and other electrical equipment of grease, dirt, etc. Clean the inside of panelboard enclosures prior to installing the front cover. Remove shipping labels. Carefully and thoroughly clean all items of equipment. At completion of the work, remove rubbish and debris resulting from the operations and leave equipment spaces clean and ready for use.

1.10 PROJECT RECORD DOCUMENTS

A. Job Site Documents: Maintain at job site, one record copy of the following:
   1. Drawings
   2. Specifications

3. Addenda
4. Reviewed Shop Drawings
5. Change Orders

B. Do not use record documents for construction purposes. Maintain documents in clean, dry, legible condition, apart from documents used for construction.

C. Record Information: Label each document “Record Document”. Mark information with contrasting color using ink. Keep each record current. Do not permanently conceal any work until required information is recorded.

D. Record the following Information on the Specifications:
1. Manufacturer, trade name, catalog number and supplier of each product or item of equipment actually installed.
2. Changes by change order or field order.
3. Other matters not originally specified.

E. Record the following information on the Drawings:
1. Horizontal and vertical location of underground utilities.
2. Location of internal utilities and appurtenances concealed in construction.
3. Field changes of dimension and detail.
4. Changes by change order or field order.
5. Details not on original Contract Drawings.

F. Shop Drawings: Maintain Shop Drawings as record documents recording changes made after review as specified for Drawings above.

G. Submittal: At completion of project, deliver Project Record Documents to General Contractor.

1.11 OPERATING AND MAINTENANCE DATA

A. General: Comply with Section 01 77 10.

B. Submission: Submit (3) typed and bound copies of Operating and Maintenance Manual, 8 ½" x 11" in size, to the Architect for approval prior to scheduling any systems demonstration to the Owner.

C. Requirement Contents: Manual shall have index and tab dividers for each major equipment section. Include as minimum the following data:

1. Alphabetical list of system components, with name, address, and 24 hour telephone number of the company responsible for servicing each item during the first year of operation.

2. Operating Instructions for complete System including:
a. Emergency procedures for fire or failure of major equipment.
b. Major start, operation and shutdown procedures.

3. Maintenance Instructions Including:
   a. Tags and other identified equipment lists.
   b. Proper lubricants and lubricating instruction for each piece of equipment.
   c. Necessary cleaning, replacement and/or adjustment schedule.

4. Product Data on Each Piece of Equipment Including:
   a. Installation Instructions
   b. Drawings and Specifications
   c. Parts Lists
   d. Complete wiring diagrams (as built)
   e. Marked or changed prints locating concealed parts and variations from the original system design.

5. Floor plans and/or wiring diagrams indicating component parts and system wiring.

1.12 WARRANTIES

A. Warranty: Provide a written warranty to the Owner covering the entire electrical work (except lamps) to be free from defective materials, equipment and workmanship for a period of one year after date of acceptance. Refer to Section 26 50 00 for specific warranty requirements for fluorescent ballasts. During this period, provide labor and materials required to repair or replace defects and pay for any damage to other work resulting there from, at no additional cost to the Owner. Provide certificates for such items of equipment which have warranties in excess of one year. Submit to the General Contractor for transmittal to the Owner.

1.13 CERTIFICATES, KEYS, AND SPARE PARTS

A. Certificates: Upon completion of the work, secure in triplicate, certificates from any State or Local governing bodies having jurisdiction in dictating that the work is in strict accordance with applicable codes and deliver same to the General Contractor for transmittal to the Owner.

B. Keys: Upon completion of the work, submit keys for electrical equipment, panels, etc. to the General Contractor. Obtain receipt for same.

C. Spare Parts: Upon completion of the work, submit spare parts to the Owner. Obtain receipt for same. Store where directed or as specified.

1.14 ELECTRICAL SERVICE MAINTENANCE

A. Include (2) complete service and maintenance calls plus emergency calls spaced at reasonable intervals throughout the one year warranty period. Maintain a log of corrective actions taken at each service call.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Conduit

B. Wires and Cables

C. Boxes

D. Cabinets

E. Wiring Devices

1.02 RELATED SECTIONS

A. Section 31 00 00: Earthwork

B. Section 03 30 00: Cast-in-Place Concrete

C. Section 08 31 16: Access Panels

D. Section 09 91 00: Painting

1.03 DESCRIPTION

A. Install wiring in complete raceway systems unless specifically indicated otherwise.

B. Provide galvanized rigid conduit throughout except as allowed below:
   1. Electrical metallic tubing thinwall may be installed concealed in furred ceilings and walls, embedded in poured concrete walls and floors, embedded in poured gypsum, or exposed at least 5 feet above the floor, provided such areas are dry.
   2. Use plastic conduit or corrosion protected GRC for locations in or directly below concrete slab-on-grade, in earth or gravel.
   3. Electrical non-metallic tubing may be used in non-plenum ceiling spaces, stud and hollow masonry partitions.
   4. Non-Metallic Cable may be utilized in Residential Units for branch circuit requirements ONLY!

C. Circuits #4 and larger are classified as feeder circuits.

D. Circuits #6 and smaller are classified as branch circuits.

E. Conductors installed in high ambient conditions such as near boiler breeching, directly under roofing, exposed on roof, etc., shall be rated 90 degrees C minimum.

F. Low voltage wire and cables may be installed in accessible ceiling locations without conduit if cable is approved for use in environmental air plenums.

1.04 REFERENCES

A. American National Standards Institute (ANSI)

1. C-80.1 Galvanized Rigid Conduit
2. C-80.3 Electrical Metallic Tubing

B. Federal Specifications

1. W-S 896E Switch, Toggle, and Locks
2. WW-C 581-d Specification for Galvanized Rigid Conduit
3. WW-C 563 Specification for Electrical Metallic Tubing

C. National Electrical Manufacturer's Association (NEMA)

1. WD 1-79 General Purpose Wiring Devices
2. TC-6 Schedule 40 Polyvinyl Chloride Conduit
3. RN1-74 PVC Externally Coated Rigid Conduit

D. Underwriters Laboratories, Inc. (UL)

1. UL 514-79 Outlet Boxes and Fittings
2. UL 817-77 Cord Sets and Power Supply Cords
3. UL 894-77 Switches for use in Hazardous Locations
4. UL 493-72 Ground Fault Circuit Interrupters

1.05 SUBMITTALS

A. Submit shop drawings and product data under provisions of Section 01 32 19.

B. Submit product data for all plenum rated cable installed.

C. Submit product data for low voltage switching equipment.

D. Submit shop drawings and product data for modular wiring.

E. Submit product data for aluminum wire.

PART 2 PRODUCTS

2.01 CONDUIT

A. Galvanized Rigid Conduit: Fed. Spec. WW-C581-d, and ANSI C-80.1.

B. Electrical Metallic Tubing: Fed. Spec. WW-C563, and ANSI C-80.3.

C. Plastic Conduit: Rigid heavy wall, Schedule 40, meeting NEMA Standard TC-6.

D. Plastic Coated GRC: Fed. Spec., ANSI and NEMA Standard RN1-1974 for PVC externally coated conduit min. 20 mil thickness.

E. EMT Fittings: Set screw or compression gland type only.

F. Conduit Bushings: Metal insulating type, including grounding bushings, on 1-1/4" and larger; non-metallic insulating type, 1" and smaller. Metal insulating type bushing to have molded phenolic insulation equivalent to OZ specification grade.

G. Liquid-tight Flexible Conduit: Constructed of a galvanized steel core with PVC cover; Anaconda Seal-tite or equivalent. Use fittings of same manufacturer as conduit.

2.02 WIRE AND CABLE

A. Feeder Conductors: Compacted strand, AA8000 grade aluminum, or copper, minimum insulation rating 75 degrees C (THW, THWN, THWN-2, XHHW, XHHW2).

B. Branch Circuit Conductors: Copper, #12 minimum, THWN or THHN insulated only for Commercial Space (Site Laundry) or #14 minimum NMC for Unit Branch Circuits.

C. Other class 1 control circuits may be #16.

D. Wiring in Fluorescent Fixtures: 90 degrees C rated, approved for use (THHN, THW).

E. MC Cable: Interlocking aluminum or galvanized steel armor over THHN insulated copper conductors with green equipment ground wire. Color code conductors as directed under Article 3.02 of this Section.

2.03 OUTLET, JUNCTION, AND PULLBOXES

A. Boxes Up to 150 Cubic Inches: Standard, one piece, zinc-coated, or cadmium plated steel.

B. Lighting Fixture Outlet Boxes: Not less than 4 inches octagonal with 3/8" no-bolt fixture studs.

C. Junction Boxes for Recessed Fixtures: Four inches square minimum with blank cover.

D. Wiring Device Outlets: Four inch minimum with appropriate ring or Steel City series GW tile box. Sectional switch boxes not permitted.

2.04 CABINETS

A. Metal construction; conforming to National Electrical Code; finish painted; equipped with locking door; concealed flush hinges, lock, and catch assembly. All locks keyed alike.

B. Backboard: Three quarter inch plywood, one piece per cabinet. Finish matte black.

2.05 MANUFACTURERS - WIRING DEVICES

A. Hubbell

B. Arrow-Hart

C. Pass & Seymour

D. General Electric

E. Bryant

F. Eagle

G. Leviton

H. Substitutions: Under provisions of the Information for Bidders.

2.06 WIRING DEVICES

A. Provide Ivory Colored Devices. Final Approval by Architect

B. Wall Switches: Fed. Spec. W-S 896E and NEMA Standard Test WD-1. All switches rated 20 ampere minimum, AC quiet type.

C. Receptacles: NEMA Standard Test WD-1. Provide commercial grade or better, in NEMA configuration (Min. 5252 class) only.

D. Heavy-duty Duplex Receptacles: 20 amp where wired to a dedicated circuit.

E. Pilot Switches: An assembly of wall switch and 120 volt pilot light mounted in a two gang box with a two gang plate.

F. Weatherproof Receptacles: An assembly of GFCI receptacle as indicated on Contract Drawings. Weatherproof while in use expandable Heavy Duty Assembly. TayMac #ML500Z, or specifically approved equivalent.

2.07 DEVICE PLATES

A. Provide a device plate for each outlet installed, and blank plates or covers for junction boxes or empty outlets.

B. Flush Device Plates: Smooth ivory plastic with metal, oval head screws finished to match plate. Color to match device.

C. Surface Plates: Galvanized steel, 1.25 oz/sq.ft. minimum coating, pressure formed with round corners for smooth edge and fit to box.

PART 3 EXECUTION

3.01 PREPARATION

A. Supports:
   1. Support raceways, cabinets, boxes etc., in accordance with Section 26 05 03, Supporting Devices.
   2. Where outlets are installed in steel stud type systems, provide additional cross bracing, bridging, and/or straps as required to make the outlet completely rigid prior

to application of the wall facing material.

B. Sleeves:
   1. Install sleeves where raceways pass through concrete construction. Locate sleeves accurately.
   2. Have a man present during the pouring of concrete to make sure the location of sleeves is not disturbed during the pour.
   3. Provide pipe sleeves through concrete floors with top of sleeves a minimum of ½ inch above finished floor surface. Block outs for multiple conduits or individual conduits not allowed.

C. Excavation and Backfill:
   1. Be responsible for all trenching and backfilling in connection with the electrical work. Backfill earth in thin layers, compacting in accordance with Section 022000, Earthwork.
   2. Lay all raceways on solid earth. Remove all rocks and stones from bottom of trench and backfill material.
   3. When trenching is routed through specially treated areas, such as blacktop, etc., be responsible for restoring the surface to its original condition.
   4. Verify locations of all existing and/or new underground utilities prior to trenching and, if damaged, replace immediately in an approved manner at no expense to Owner.

D. Cutting and Patching:
   1. Coordinate and supervise all cutting and patching under this Division. Do not cut without the approval of the Architect as to location, method, and extent of the cutting.
   2. Patching in every instance consists of completing the work to match and blend in with adjoining existing work insofar as methods, materials, colors, and workmanship are concerned. Patches which are clearly obvious on completion will be rejected and ordered redone.
   3. Execute patching by craftsmen qualified and skilled in the particular type of work involved.
   4. Cut openings for which sleeves are omitted with rotary type drill or other approved method. Hole cut with pneumatic hammer will not be accepted.
   5. Pay all costs of cutting and/or patching caused by improper coordination.

3.02 INSTALLATION

A. Conduits:
   1. Install raceways concealed except at surface cabinets, for motor and equipment connections, and in mechanical areas. Install embedded raceways with 1 inch minimum encasement. Lay out work in advance to avoid excessive concentrations of multiple conduit runs and so as not to endanger the strength of any structural member or unduly interfere with other trades. Install 1 inch and larger raceways in or through structural members (beams, slabs, etc.) Only when approved by the Architect. Secure embedded conduits prior to concrete placement.
   2. Take particular care when installing plastic conduits to permit the movement due to their high coefficient of expansion. Install underground conduits 30 inches minimum below grade. Provide conduits installed below concrete slab with complete earth cover.
   3. Install steel elbows in runs of plastic conduit greater than 100 feet or runs containing

more than two quarter bends.

4. Cross expansion joints with expansion fittings and bonding conductor.
5. Space supports for exposed raceways and raceways installed above accessible ceilings not more than 7 feet on center.
6. Route exposed conduit parallel or perpendicular to walls and structural members, with neat right angle bends or change direction with conduit fitting.
7. Install conduits at least 6 inches from parallel runs of flues, steam lines, or other heated lines.
8. Effectively seal conduit penetrations through fire walls and floors through the use of rated fittings such as OZ 'CFSF' series fittings or equivalent.
9. Provide waterproofing for all conduits, outlets, fittings, etc., which penetrate the roof by use of flashing and counter flashing or pitch pockets.
10. Provide double locknuts and bushings on all rigid conduit terminations.
11. Provide short extensions of flexible liquid-tight metallic conduit for makeup of motor, transformer, or equipment conn.
12. Limit telephone raceways to not more than 270 degrees of offsets and bends between any two outlets.

B. Wire and Cable:
1. Do not install wire in incomplete conduit runs nor until after concrete work and/or plastering is completed.
2. Make branch circuit conductor terminations with insulated pressure type connectors such as Ideal Industries 'Wing Nut', '3M Company Scotchlok', or' Buchanan B-Cap'.
3. Provide #10 AWG minimum wire for branch circuits whose length from panel to first outlet exceeds 75 feet for 120 volt circuits.
4. Color code power and signal conductors. Sizes #6 and smaller, factory colored. Sized larger than #6 may be color coded by field painting or color taping of exposed ends.

120/240V
Phase A - Black
Phase B - Red
Neutral - White
Ground – Green

A system of numbers may be used for signal circuits in lieu of color coding.

5. Provide an insulated equipment grounding conductor in all feeder and power branch circuits. Size conductor to table 250-95 of the NEC unless indicated otherwise on the Contract Drawings.
6. Provide insulating grommets as mfgr'd. By Arlington Industries or equivalent, in steel stud openings when installing MC or NM cables through pre-punched or field punched stud openings.
7. Terminate aluminum conductors only with tin-plated aluminum bodied compression connectors. Prefill with anti-oxidant compound prior to installation.
8. Aluminum conductors may be connected to copper conductors at termination points for use with other than compression lugs by the use of reducing connectors such as T&B 60900 series compression sleeves, or may be adapted by compression pig-tail adapters such as T&B 61900 series, or solid compression adapters such as 'Burndy AYP Hyplug', or 'Anderson Versa Plug'.
9. Bolt aluminum lugs to equipment with properly sized high strength aluminum bolt or an assembly of plated steel bolt, flat washer, and plated Belleville washer.

C. Outlets and Boxes
   1. Install flush boxes plumb, within 1/8 inch of finished surface. Install exposed boxes plumb, securely anchored to ceiling or wall.
   2. Install outlets serving recessed fixtures in non-accessible ceilings at ceiling level within 6 inches of edge of opening.
   3. Adjust height of outlets in concrete block walls (consistent in one direction) to course out. Coordinate heights of outlets of all systems in any single viewing location, including electrical outlets specified under Divisions.
   4. Coordinate locations of junction boxes and pull boxes with other trades so that boxes as accessible remain so.

D. Cabinets
   1. Coordinate depth of flush cabinets with wall thickness prior to purchase.
   2. Set enclosure at maximum 6 feet 3 inches above the floor.

E. Wiring Devices and Plates:
   1. Where device plate does not cover the outlet opening, grout/patch opening, or use special oversize device plate. Sectional device plates are not permitted.
   2. Provide telephone plates with bushed center hole or telephone jack opening in finish to match other plates in area.

F. Empty Raceway Systems:
   1. Provide a pulling string, such as installed by a jetliner gun or equivalent, in all completed conduit runs. Terminate strings in outlet or pull boxes, or secured to end of conduit by a metal ring in greater diameter than the conduit when no box is provided at the conduit termination.
   2. Provide blank plates or cover on flush outlets. Provide galvanized blank covers on surface outlets.

G. Systems Identification:
   1. Identify empty conduit systems for future use at ends not terminating in a box with a suitable tag and string inside of conduit, held in place with a plastic push penny and plastic bushing. Provide sufficient information to fully identify conduit use and termination points.
   2. Identify junction and pillboxes with labels of embossed metal or plastic tape affixed to their cover and side. Identify the electrical system it serves, i.e., Emergency Power, etc.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Electrical connections to equipment specified under other Sections or furnished by Owner.

1.02 RELATED WORK

A. Division 23 - Mechanical Equipment.

1.03 REFERENCE

A. FS W-C-596 - Electrical Power Connector, Plug, Receptacle and Cable Outlet.

B. NEMA WD 1 - General Purpose Wiring Devices.

C. NEMA WD 5 - Specific Purpose Wiring Devices.

PART 2 PRODUCTS

2.01 MATERIALS

A. Conform to Section 26 05 11 - Basic Materials and Methods

2.02 CORDS AND CAPS

A. Straight-blade Attachment Plugs: NEMA WD-1

B. Locking-blade Attachment Plug: NEMA WD 5.

C. Attachment Plug Configuration: Match receptacle configuration at outlet provided for equipment.

D. Cord Construction: Oil-resistant thermoset insulated Type SJO SO multi-conductor flexible cord with identified equipment grounding conductor, suitable for extra hard usage in damp location.

E. Cord Size: Suitable for connected load of equipment and rating of branch overcurrent protection.

PART 3 EXECUTION

3.01 INSPECTION

A. Verify that equipment is ready for electrical connection, wiring and energization.

3.02 PREPARATION

A. Review equipment submittals prior to installation and electrical rough-in. Verify location, size, and type of connections. Coordinate details of equipment connections with supplier and installer.

3.03 INSTALLATION

A. Use wire and cable with insulation suitable for temperature encountered in heat-producing equipment.

B. Make conduit connections to equipment using flexible conduit. Use liquid tight, flexible, conduit in damp or wet locations.

C. Install pre-finished cord set where connection with attachment plug is indicated or specified, or use attachment plug with suitable strain-relief clamps.

D. Provide suitable strain-relief clamps for cord connections to outlet boxes and equipment connection boxes.

E. Make wiring connections in control panel or in wiring compartment of pre-wired equipment in accordance with manufacturer's instructions. Provide interconnecting wiring where indicated.

F. Install disconnect switches, controllers, control stations, and control devices such as limit switches and temperature switches as indicated. Connect with conduit and wiring as indicated.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Conduit Supports.

B. Box and Cabinet Supports.

C. Anchors.

D. Cable Supports.

PART 2 PRODUCTS

2.01 CONDUIT SUPPORTS

A. Single Runs: Galvanized one hole or two straps, lay-in adjustable hangers, clevis hangers, or bolted split stamped galvanized steel hangers.

B. Multiple Runs: Rack on channel supports. Vertical Runs: Channel support.

2.02 BOX AND CABINET SUPPORTS

A. Flush Wall Outlet Boxes: Galvanized one piece stamped steel stud bridges.

B. Flush Ceiling Outlet Boxes: Adjustable steel channel fasteners.

C. Outlets in Ceiling Cavity: Spring steel clips designed to attach to drop wires attached to structure or directly attached to structure. Attaching to drop wires supporting suspended ceilings is not permitted.

D. Flush Cabinets in Stud Walls: Channel support, bridging studs top and bottom. Surface Mounted Cabinets: Minimum of four anchors.

2.03 ANCHORS

A. Hollow Masonry: Toggle bolts or spider type expansion anchors.

B. Solid Masonry: Lead expansion anchors or preset inserts.

C. Metal Surfaces: Machine screws, bolts or welded studs.

D. Concrete Surfaces: Self-drilling anchors or powder driven studs.

PART 3 EXECUTION

3.01 PREPARATION

A. Obtain permission from the Architect before using powder actuated anchors or

drilling structural members.

B. Lay out to maintain headroom, neat mechanical appearance, and to support equipment loads required.

3.02 INSTALLATION

A. Support exposed metallic conduits and metallic conduits installed above accessible ceilings not more than 7 feet on center. Support conduits from building roof or floor structure. Do not support from ceiling suspension support systems.

B. Support boxes independent of conduit unless a cast box is connected to galvanized rigid conduits where conduit is supported within 12 inches of box.

C. Support surface mounted cabinets with a minimum of four anchors.

D. Support electrical non-metallic tubing a maximum of 3 feet on center.

END OF SECTION

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawing and general provisions of the Contract, including General and Supplementary Conditions and Division 1 - General Requirements, apply to this Section.

B. Section 26 05 00 – Common Work Results applies to work of this Section.

1.02 SECTION INCLUDES

A. Metal Building Frames.

B. Electrical Power Systems.

C. Raceways and Enclosures.

D. Service Equipment.

1.03 REFERENCES

A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

B. Institute of Electrical and Electronics Engineers (IEEE):
   1. ANSI/IEEE 142, 1982 (Revised 1991), Recommended Practice for Grounding of Industrial and Commercial Power Systems" (copyrighted by IEEE, ANSI approved).

C. Underwriters Laboratories, Inc. (UL):
   1. UL 467, 1984 (Revised 2007), "Grounding and Bonding Equipment".
   2. UL 486 A, 1908 (Revised 2003), "Wired Connectors and Soldering Lugs for Use with Copper Conductors".

D. American Society for Testing Materials (ASTM):
   1. ASTM B3, 1981 (Revised 2007), "Standard Specification for Soft or Annealed Copper Wire".
   2. ASTM B8, 1986, (Revised 2011) "Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-hard, or Soft".
   3. ASTM B33, 1981 (Revised 2010), "Standard Specification for Tinned Soft or annealed Copper Wire for Electrical Purposes".

PART 2 PRODUCTS

2.01 CONDUCTORS

A. General: Grounding conductors shall be stranded, medium drawn copper or as shown on the drawings or required by this specification.

B. Conductivity: Copper conductors shall have a conductivity of not less than 98 percent at

20 degrees C. Conductor resistance values shall be in accordance with the value in IPECEA S-68-516.

C. Stranded Conductors: Stranded conductors shall comply with the following requirements:
   1. Individual Conductors: ASTM B-3.
   2. Stranded Assembly: ASTM B-8.

D. Insulation: Provide insulation same as specified in section 26 05 00.

2.02 BONDING JUMPERS

A. Flexible Bonding Cable: Provide flexible flat cable constructed of 480 strands of 30 gauge copper wires, 3/4 inch wide by 1/8 inch thick.

B. Flexible Bonding Strips: Provide flexible flat conductor, constructed of 480 strands of 30 gauge bare copper wires with bolt hole ends. Strap size shall be 3/4 inch wide by 10 inches long.

2.03 CONNECTORS

A. Exothermic Welds: Exothermic welds shall be a thermite reaction system employing copper oxide and aluminum powder reaction to melt and fuse copper conductors into welded connections.

B. Cable to Cable Connector:
   1. Connector shall be copper alloy, “U” bolt type.
   2. Acceptable Manufacturer: OZ Gedney - Type ABG or CG.

C. Pipe Connectors:
   1. Connectors shall be copper alloy, “U” bolt type.
   2. Acceptable Manufacturer: OZ Gedney - Type ABG or CG.

D. Ground Bushings:
   1. Bushings shall be malleable iron, cadmium plated, insulated throat with screw type wire connector.
   2. Acceptable Manufacturer: OZ Gedney - Type IGB.

PART 3 EXECUTION

3.01 PREPARATION

A. Examine areas and conditions under which the work is to be installed, and notify General Contractor, in writing, of any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected.

3.02 COORDINATION

A. Coordinate with other work to ensure that installation is not vulnerable to physical damage.

3.03 SAFETY GROUNDING SYSTEM

A. Ground service equipment, conduit systems, supports, cabinets, raised computer floor, equipment, fixtures, etc., and the grounded circuit conductor in accordance with the NEC. Provide bonding jumpers, grounding bushings, clamps, etc., as required for a complete grounding system. Route grounding conductors to provide the shortest and most direct path. Install grounding conductors in conduit. Bond conduit enclosing the grounding electrode conductor to the conductor at both ends.

B. Provide a grounding electrode system consisting of connection to the metallic water pipe (provide jumper around water meter) and a made electrode consisting of not less than 20 feet of not less than #4 bare copper conductor embedded in 2 inch minimum concrete at the bottom of the building footer (UFER Ground per NEC Article 250).

C. Provide a separate grounding conductor, securely grounded, on each run of non-metallic conduit and flexible conduits.

D. Provide a green or bare grounding jumper from the ground screw of outlet boxes to the ground screw of wiring devices.

3.04 INSTALLATION

A. Comply with applicable requirements of UL 467, ANSI/IEEE 80, and applicable NEMA standards, to ensure that products fulfill requirements.

B. Exothermic Welds:
   1. Provide exothermic welds for the following:
      a. Cable to Cable (below grade).
      b. Cable to Structural Steel.
   2. Comply with AWS Code for procedures, appearance, and quality of welds, and for methods used in correcting welding work. The manufacturer’s specific instructions and molds shall be used for every weld.

C. Connectors: Provide mechanical connections for the following:
   1. Cable to Pipe.
   2. Cable to Ground Bus or as otherwise noted on the Drawings.

D. Bonding Jumpers: Bonding jumper shall be installed where continuity of piping of metal must be maintained or as required by the NEC.

E. Ground Bushings: Where a conduit enters a metal enclosure without a ground bus, a ground bushing shall be provided to terminate ground conductor.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Sleeves.
   2. Mechanical sleeve seals.
   3. Fire stopping relating to electrical work.
   4. Fire stopping accessories.

1.2 REFERENCES

A. ASTM International:
   1. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
   2. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
   3. ASTM E814 - Standard Test Method for Fire Tests of Through-Penetration Fire Stops.
   4. ASTM E1966 - Standard Test Method for Fire-Resistive Joint Systems.

B. FM Global:
   1. FM - Approval Guide, A Guide to Equipment, Materials & Services Approved By Factory Mutual Research For Property Conservation.

C. National Fire Protection Association:
   1. NFPA 70 - National Electrical Code.

D. Underwriters Laboratories Inc.:
   1. UL 263 - Fire Tests of Building Construction and Materials.
   2. UL 723 - Tests for Surface Burning Characteristics of Building Materials.
   3. UL 1479 - Fire Tests of Through-Penetration Firestops.
   4. UL 2079 - Tests for Fire Resistance of Building Joint Systems.
   5. UL - Fire Resistance Directory.

E. Intertek Testing Services (Warnock Hersey Listed):
   1. WH - Certification Listings.

1.3 DEFINITIONS

A. Firestopping (Through-Penetration Protection System): Sealing or stuffing material or assembly placed in spaces between and penetrations through building materials to arrest movement of fire, smoke, heat, and hot gases through fire rated construction.

1.4 SYSTEM DESCRIPTION

A. Fire stopping Materials: to achieve fire ratings as noted on Drawings or not less than 1 hour fire rating.
   1. Ratings may be 3-hours for fire stopping in through-penetrations of 4-hour fire rated assemblies unless otherwise required by applicable codes.

1.5 SUBMITTALS

A. Section 01 33 23 – Shop Drawings and Samples: Requirements for Shop Drawings.

B. Fires topping Product Data: Submit data on product characteristics, performance and limitation criteria.

C. Manufacturer's Fire stopping Installation Instructions: Submit preparation and installation instructions.

1.6 QUALITY ASSURANCE

A. Through Penetration Fire stopping of Fire Rated Assemblies: UL 1479 with 0.10 inch water gage minimum positive pressure differential to achieve fire F-Ratings and temperature T-Ratings as indicated on Drawings, but not less than 1-hour.
   1. Wall Penetrations: Not less than 1-hour.
   2. Floor and Roof Penetrations: Fire F-Ratings and temperature T-Ratings not less than 1-hour.

B. Through Penetration Firestopping of Non-Fire Rated Floor [and Roof] Assemblies: Materials to resist free passage of flame and products of combustion.
   1. Noncombustible Penetrating Items: Noncombustible materials for penetrating items connecting maximum of three stories.
   2. Penetrating Items: Materials approved by authorities having jurisdiction for penetrating items connecting maximum of two stories.

C. Surface Burning Characteristics: 25/450 flame spread/smoke developed index when tested in accordance with ASTM E84.

1.7 DELIVERY, STORAGE AND HANDLING

A. Section 01 50 13 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Accept materials on site in original factory packaging, labeled with manufacturer's identification.

C. Protect from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original packaging.

1.8 ENVIRONMENTAL REQUIREMENTS

A. Section 01 50 13 - Product Requirements: Environmental conditions affecting products on site.

B. Do not apply fire stopping materials when temperature of substrate material and ambient air is below 60 degrees F.

C. Maintain this minimum temperature before, during, and for minimum 3 days after installation of firestopping materials.

D. Provide ventilation in areas to receive solvent cured materials.

PART 2 PRODUCTS

2.1 SLEEVES

A. Sleeves for Through Non-fire Rated Floors: 18 gauge thick galvanized steel.

B. Sleeves for Through Non-fire Rated Beams, Walls, Footings, and Potentially Wet Floors: Steel pipe or 18 gauge thick galvanized steel.

C. Sleeves for Through Fire Rated and Fire Resistive Floors and Walls, and Fire Proofing: Prefabricated fire rated sleeves including seals, UL listed.

D. Stuffing fire-stopping Insulation: Glass fiber type, non-combustible.

2.2 FIRESTOPPING

A. Manufacturers:
1. Dow Corning Corp.
2. Fire Trak Corp
3. Hilti Corp.
4. International Protective Coating Corp.
5. 3M fire Protection Products.

B. Specified Technology, Inc Substitutions:

C. Product Description: Different types of products by multiple manufacturers are acceptable as required to meet specified system description and performance requirements; provide only one type for each similar application.
1. Silicone Firestopping Elastomeric Firestopping: Single component silicone elastomeric compound and compatible silicone sealant.
2. Foam Firestopping Compounds: Single component foam compound.

3. Formulated Firestopping Compound of Incombustible Fibers: Formulated compound mixed with incombustible non-asbestos fibers.
4. Fiber Stuffing and Sealant Firestopping: Composite of mineral fiber stuffing insulation with silicone elastomer for smoke stopping.
5. Mechanical Firestopping Device with Fillers: Mechanical device with incombustible fillers and silicone elastomer, covered with sheet stainless steel jacket, joined with collars, penetration sealed with flanged stops.
6. Intumescent Firestopping: Intumescent putty compound which expands on exposure to surface heat gain.
7. Firestop Pillows: Formed mineral fiber pillows.

D. Color: By Architect.

2.3 FIRESTOPPING ACCESSORIES

A. Primer: Type recommended by firestopping manufacturer for specific substrate surfaces and suitable for required fire ratings.

B. Dam Material: Permanent:
1. Mineral fiberboard.
2. Mineral fiber matting.
3. Sheet metal.
4. Plywood or particle board.
5. Alumina silicate fire board.

C. Installation Accessories: Provide clips, collars, fasteners, temporary stops or dams, and other devices required to position and retain materials in place.

D. General:
1. Furnish UL listed products Select products with rating not less than rating of wall or floor being penetrated.

E. Non-Rated Surfaces:
1. Stamped steel, chrome plated, hinged, split ring escutcheons or floor plates or ceiling plates for covering openings in occupied areas where conduit is exposed.
2. For exterior wall openings below grade, furnish modular mechanical type seal consisting of interlocking synthetic rubber links shaped to continuously fill annular space between conduit and cored opening or water-stop type wall sleeve.

PART 3 EXECUTION

3.1 EXAMINATION

A. Administrative Requirements: Verification of existing conditions before starting work.

B. Verify openings are ready to receive sleeves.

C. Verify openings are ready to receive fire stopping.

3.2 INSTALLATION

A. Install material at fire rated construction perimeters and openings containing penetrating sleeves, piping, ductwork, conduit and other items, requiring fire stopping.

B. Apply primer where recommended by manufacturer for type of fire stopping material and substrate involved, and as required for compliance with required fire ratings.

C. Apply fire stopping material in sufficient thickness to achieve required fire and smoke rating.

D. Place foamed material in layers to ensure homogenous density, filling cavities and spaces. Place sealant to completely seal junctions with adjacent dissimilar materials.

E. Fire Rated Surface:
   1. Seal opening at floor, wall, and roof as follows:
      a. Install sleeve through opening and extending beyond minimum of 1 inch on both sides of building element.
      b. Size sleeve allowing minimum of 1 inch void between sleeve and building element.
      c. Pack void with backing material.
      d. Seal ends of sleeve with UL listed fire resistive silicone compound to meet fire rating of structure penetrated.
   2. Where cable tray, conduit, wireway, penetrates fire rated surface, install fire stopping product in accordance with manufacturer's instructions.

F. Non-Rated Surfaces:
   1. Seal opening through non-fire rated wall, floor, and roof opening as follows:
      a. Install sleeve through opening and extending beyond minimum of 1 inch on both sides of building element.
      b. Size sleeve allowing minimum of 1 inch void between sleeve and building element.

c. Install type of fire stopping material recommended by manufacturer.

2. Install escutcheons floor plates where conduit, penetrates non-fire rated surfaces in occupied spaces. Occupied spaces include rooms with finished ceilings and where penetration occurs below finished ceiling.
3. Exterior wall openings below grade: Assemble rubber links of mechanical seal to size of conduit and tighten in place, in accordance with manufacturer's instructions.
4. Interior partitions: Seal pipe penetrations at laboratories, computer rooms, telecommunication rooms, data room. Apply sealant to both sides of penetration to completely fill annular space between sleeve and conduit.

3.3 INSTALLATION - SLEEVES

A. Exterior watertight entries: Seal with adjustable interlocking rubber links.

B. Conduit penetrations not required to be watertight: Sleeve and fill with silicon foam.

C. Set sleeves in position in forms. Provide reinforcing around sleeves.

D. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.

E. Extend sleeves through floors 1 inch above finished floor level. Caulk sleeves.

F. Where conduit or raceway penetrates floor, ceiling, or wall, close off space between conduit or raceway and adjacent work with fire stopping insulation and caulk. Provide close fitting metal collar or escutcheon covers at both sides of penetration.

G. Install stainless steel escutcheons at finished surfaces.

3.4 FIELD QUALITY CONTROL

A. Section 01 77 10 - Execution and Closeout Requirement: Field inspecting, testing, adjusting, and balancing.

B. Inspect installed fire stopping for compliance with specifications and submitted schedule.

3.5 CLEANING

A. Section 01 77 10 - Execution and Closeout Requirements: Requirements for cleaning.

B. Clean adjacent surfaces of fire stopping materials.

3.6 PROTECTION OF FINISHED WORK

A. Section 01 77 10 - Execution and Closeout Requirements: Requirements for protecting finished Work.

B. Protect adjacent surfaces from damage by material installation.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Directory Cards.

B. Engraved Nameplates.

C. Tape Labels.

PART 2 PRODUCTS

2.01 MATERIALS

A. Engraved Plastic Nameplates: Black letters on a white background with self-adhesive back.

B. Engraved Metal Nameplates: Black paint filled engraving on a brushed aluminum or stainless steel

C. Adhesive Tape Labels: Black imprinted letters on a clear tape as made by a tape imprinting machine such as the Brother “P-Touch” or approved equivalent.

D. Directory Cards: Manufacturer’s standard pre-printed form under clear plastic protective cover.

E. Device Plate Engraving: Laser etching, nominal 1/8 inch high lettering on plastic or nylon plates; black paint filled engraving on metal plates.

PART 3 EXECUTION

3.01 PREPARATION

A. No temporary type of markings which are visible on equipment are permitted. Repaint trims, housing, etc. where such markings cannot readily be removed. Defaced finishes must be refinished.

B. Thoroughly clean surface to which pressure sensitive type tape labels are applied to assure adherence of label.

3.02 INSTALLATION

A. Do not use abbreviations in labeling without specific permission.

B. Label panelboards as designated on electrical drawings.

C. Directory cards, nameplates, and labels shall indicate the general area and type of electrical load served by each circuit.

3.03 SCHEDULE OF LABELS

A. Provide ½ inch minimum height letters engraved in plastic laminate nameplates to identify the equipment item for:
1. Branch and distribution panelboards.
2. Lighting and/or power control cabinets.
3. Telephone cabinets.

B. Provide 1/4 inch minimum height letters engraved in plastic laminate nameplates, or adhesive labels to identify circuits, switches, or circuit breakers in:
1. Service equipment.
2. Separately mounted motor starters.
3. Disconnect switches.
4. Miscellaneous contactors and relays.
5. Time clocks.

C. Provide 1/8 inch minimum height laser etched or engraved device plates identifying function or equipment controlled for:
1. Light switches controlling lights that are out of sight.
2. Remote test/indicator devices associated with smoke detectors.

D. Provide neatly typed directories or identification labels. Use 12 or 15 pitch type as appropriate to assure adequate information is included in small spaces. Use on:
1. Branch circuit panelboard directories.
2. Terminal strips.

E. Identify on panel schedule or adjacent to specific breakers, which circuits serve unit emergency equipment in conformance with Article 700-12(e.).

END OF SECTION

SECTION 26 24 16 – ELECTRICAL SERVICE AND DISTRIBUTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Service Equipment.

B. Load Centers.

C. Safety Switches.

1.02 REFERENCES

A. Black Hills Guidelines.

1.01 DESCRIPTION

A. Arrange with utility company to provide 120/240/1Ph-3w Service Transformers and final connection requirements of Service Lateral. Consult with utility company as to the extent of their work and costs involved.

B. Distribute power to all loads from New Building Service Entrance Meterstacks. Sizes as indicated on Drawings and Specifications herein.

1.02 SUBMITTALS

A. Submit product data under provisions of Section 01 32 19 - Submittals.
B. Submit product data for:

1. Service Equipment.
2. Load Centers.
3. Safety Switches.

1.03 OPERATING AND MAINTENANCE DATA

A. Submit provisions of Section 26 05 00.
B. Submit product data for:
1. Service Equipment.
2. Load Centers.

PART 2 PRODUCTS

2.01 MANUFACTURERS – SERVICE EQUIPMENT, LOAD CENTERS, DISC. SWITCHES

A. Square D.

B. Siemens.

C. General Electric.

D. Cutler Hammer.

E. Substitutions: Under provisions of the Information for Bidders.

2.02 SERVICE EQUIPMENT

A. Meterstack: Size and Configuration per Construction Documents. Nema 3R Enclosure(s). Equipment to have 'SUSE' Label.

B. Short Circuit Rating: Not less than 22,000 amps. RMS symmetrical throughout unless indicated otherwise on Construction Documents.

1. Main Overcurrent Device: Main Circuit Breakers or Main Lugs as indicated on the Contract Documents.

2.03 LOAD CENTERS

A. Enclosure: Dead front, flush mounted as indicated on panel schedules. Provide directory card under protective plastic.

B. Bussing: Copper or aluminum. Provide equipment ground bus, insulated neutral bus.

C. Breakers: Thermal magnetic, plug-in breakers. Multi-pole breakers must have common trip. Tie handles are not permitted. Breakers for 120/208 volt service to be rated at 10,000 A.I.C. at 120/240 volts, unless noted otherwise. "Series Rating with Service Entrance Equipment Main and Feeder Breakers is allowed. Identify as required by the NEC.

2.04 SAFETY SWITCHES

A. Type: Enclosed, fusible and non-fusible, heavy duty, UL labeled an in proper NEMA type enclosure for the environment in which it is installed. Operating handles must be capable of being locked in the off position.

B. Motor Disconnects: Horsepower rated, non-fusible, except where two or more motors and/or other loads are connected to the same circuit.

PART 3 EXECUTION

3.01 PREPARATION

A. Excavation:

1. Perform all trenching and backfilling required by work performed under this Division as herein specified and under the supervision of the General Contractor. Excavate trenches to a depth required for the utilities involved. Grade the trench bottom true and free from stones and soft spots.

2. Perform all excavation and backfill to meet the requirements Aquila Excavation Guidelines.

B. Backfill: After approval by Architect, backfill, tamp, and compact to insure against the possibility of differential settling. Use approved backfill material that is free of stones. Repair any trenches where settlement occurs and restore the surface. Dispose of surplus backfill as approved by Architect.

C. Verify location of existing and new utilities and, if damaged by the Contractor, replace at Contractor's own expense.

3.02 INSTALLATION

A. Install conductors and raceways under provisions of Section 26 05 10.

B. Meterstacks:

1. Mount against wall aligning top surfaces of all sections.
2. Verify wall space Width and Height) prior to installation of equipment. A unistrut rack system may be required due to second floor overhangs. Construct such that the structure is on a concrete base and attached to the building at the top.

C. Load Centers:

1. Mount branch circuit panels 6 feet 3 inches (to top of trim) above finished floor.
2. Verify depth of walls for flush panels PRIOR to purchase. Notify Architect of conflict.
3. Install feeder conductors in panels to provide a minimum of 12 inches of exposed conductor between the conduit bushing and the final termination.
4. Identify conductor color coding used. Provide tape label or other permanent means to indicate colors by phase and affix to inside of panel door.
5. Identify on panel schedule or adjacent to specific breakers, which circuits serve unit emergency equipment in conformance with Article 700-12(f).

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Interior Lighting.

B. Exterior Lighting.

1.02 RELATED SECTIONS

A. Section 03 30 00: Cast-in-Place Concrete for Bases for Lighting Poles.

1.03 DESCRIPTION

A. Provide all luminaries, lighting equipment, and components shown on the plans, listed in the Fixture Schedule, and specified herein. Furnish complete with suspension accessories, canopies, plaster frames, recessing boxes, etc.

B. Deliver luminaries and lighting equipment to the building complete with accessories, canopies, plaster frames, recessing boxes, etc.

C. Furnish and install lamps and accessory wiring as required.

1.04 REFERENCES

A. ANSI C82.2 - Specifications for Electronic Fluorescent Lamp Ballasts.

B. ANSI C82.4 - Specifications for High Intensity Discharge Lamp Ballasts (Multiple Supply Type).

C. FS W-F-414 - Fixture, Lighting (Fluorescent, Alternating Current, Pendant Mounting).

1.05 SUBMITTALS

A. Submit product data under provision of Section 01 32 19.

B. Submit product data for: Luminaires, poles, special suspension systems, etc.

1.06 EXTRA MATERIALS

A. Provide Owner with additional fixture lenses on the basis of 5% of the number installed with a minimum of one of each type.

1.07 WARRANTY

A. Warrant fluorescent ballasts and lamps for a minimum of two years.
B. Warrant LED Lamps for a minimum of 5 years.
C. Warrant LED drivers for minimum of 5 years.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Specific types of manufacturers are listed in the Lighting Fixture Schedule. Fixtures shall bear name of manufacturer.

B. Substitutions: Under the provision of the Information for Bidders subject to limitations listed on Fixture Schedule.

2.02 EXTERIOR FIXTURES

A. Fixtures: Types specified on plans and Fixture Schedule.

B. Assembly to provide reliable starting down to -20 degrees F.

C. Fixtures shall be UL approved for locations installed, i.e., damp locations or wet locations, and so labeled.

2.03 LIGHTING STANDARDS

A. Poles: Designed to withstand 100 mph winds with fixtures specified. Furnish with anchor bolts, template, bolt covers, ground lug. Finish in exterior metal finishing paint.

B. Hand hole: Provide near pole base with gasketed cover.

2.04 MANUFACTURERS - LAMPS

A. General Electric.

B. Osram/Sylvania.

C. Philips.

D. Substitutions: Under provisions of the Information for Bidders.

2.05 FLUORESCENT LAMPS

A. All 260 425 430 800 1500 ma, shall be of the same manufacturer.

B. Two foot nominal 17 watt program start:
1. Minimum initial lumens -2850.
2. Relative color temperature - 3000 degrees Kelvin.
3. Minimum color rendering index (CRI) - 82.

C. Other fluorescent lamps: As indicated on Fixture Schedule. Where available, provide relative color to the basic rapid start lamp.

2.06 MANUFACTURERS - ELECTRONIC FLUORESCENT BALLASTS

A. Valmont.

B. Advance.

C. Motorola.

D. Substitutions: Under provisions of the Information for Bidders.

2.07 BALLASTS

A. Nominal 260ma Program Start: Nominal 60Hz, AC solid state totally electronic with maximum 1.5 crest factor, having less than 10% total harmonic distortion, and suitable for NEMA Class 2 installation.

PART 3 EXECUTION

3.01 PREPARATION

A. Coordinate locations of interior fixtures with Architectural Reflected Ceiling Plans. Coordinate recessed fixtures for ceiling cavity clearance and suspended ceiling construction prior to delivery to job site. Pay extra costs resulting from failure of Contractor to properly coordinate.

B. Verify that fluorescent fixture lenses meet specifications prior to installation. Replace lenses not meeting specification. Pay extra costs associated with lens replacement.

3.02 INSTALLATION

A. Space recessed portion of enclosures other than at points of support at least ½ inch from combustible materials. Tap connections in 3.8 inch flexible metal conduit not less than 4 feet, nor more than 6 feet in length.

B. Install surface mounted fixtures in a rigid manner.

C. Install exterior poles plumb. Use double nut method of aligning poles. Grout in space between pole base and top of concrete base.

D. Connect equipment ground conductor to inside of pole.

E. Install bolt covers securely.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Conduits and Boxes.

1.02 SYSTEM DESCRIPTION

A. Provide telephone raceways, outlets, device plates, and terminal cabinets in conformance with respective Sections. Consult with the telephone company, and comply with their requirements.

PART 2 PRODUCTS

2.01 MATERIALS

A. Conform to Section 26 05 11: Basic Materials and Methods.

PART 3 EXECUTION

3.01 INSTALLATION

A. Conduit runs less than 100 feet from point-to-point shall not contain more than 2 - 90 degree standard factory bends, or 3 - 90 degree, 24 inch radius bends.

B. Conduit runs exceeding 100 feet from point-to-point or exceeding 2 - 90 degree bends shall contain accessible pull boxes.

C. Feeder conduits to telephone terminals shall enter top or bottom on the extreme right or left side of box.

D. Cast conduit fittings (LB’s etc.) not permitted.

E. Provide a polyethylene pulling string in all completed raceways.

END OF SECTION

DIVISION 28 ELECTRICAL - MOUNTAIN VIEW TOWNHOMES
SECTION 28 31 06 – FIRE SPRINKLER MONITORING SYSTEM

PART 1 GENERAL

1.1. SUMMARY

A. This Section covers fire sprinkler monitoring systems, including initiating devices, notification appliances, controls, and supervisory devices.

B. Work covered by this section includes the furnishing of labor, equipment, and materials for installation of the fire alarm system as indicated on the drawings and specifications.

C. The Fire Sprinkler Monitoring System shall consist of all necessary hardware equipment and software programming to perform the following functions:

1. Fire Sprinkler Monitoring system detection and notification operations.
2. System to be a networked system with network cards in each panel.

1.2. SCOPE OF WORK

A. Provide new Fire Sprinkler Monitoring System as described on Contract Documents and as required to comply with currently enforceable codes. The system shall be complete in every respect and be certified for proper design and operation.

B. Coordinate with mechanical documents to determine quantity and location of all water flow/tamper switches. Provide control of these, and additional detection as required by the Building Code.

1.3. ACCEPTABLE EQUIPMENT AND SERVICE PROVIDERS

A. Manufacturers: SimplexGrinnell or approved equivalent.

B. Request for Substitutions: Submit to the Engineer of Record request for Substitutions 7 working days prior to bid. Approved alternates will be listed in an addendum.

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1.4. RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this section.

B. The work covered by this section is to be coordinated with related work as specified elsewhere in the specifications. Requirements of the following sections apply:

1. Division 26: "Basic Electrical Materials and Methods."

2. Division 26: "Wiring Methods."
3. Division 21: "Fire Suppression".
4. Division 21: "Fire Protection".
5. Division 23: "HVAC Systems".

C. The system and all associated operations shall be in accordance with the following:

1. Requirements of the following Model Building Code: IBC, 2015 Edition
2. Requirements of the following Model Fire Code: IFC, 2015 Edition
3. Requirements of the following Model Mechanical Code: IMC, 2015 Edition
4. NFPA 72, National Fire Alarm Code, 2016 Edition
5. NFPA 70, National Electrical Code, 2017 Edition
6. NFPA 90A, Standard for the Installation of Air Conditioning and Ventilating Systems, 2018 Edition
7. Local Jurisdictional Adopted Codes and Standards
8. ADA Accessibility Guidelines

1.5. SYSTEM DESCRIPTION

A. General: Provide a complete, non-coded addressable, microprocessor-based fire Sprinkler Monitoring system with initiating devices, notification appliances, and monitoring and control devices as indicated on the drawings and as specified herein.

B. Software: The fire sprinkler monitoring system shall allow for loading and editing instructions and operating sequences as necessary.

1. The system shall be capable of on-site programming to accommodate system expansion and facilitate changes in operation.
2. All software operations shall be stored in a non-volatile programmable memory within the fire alarm control unit. Loss of primary and secondary power shall not erase the instructions stored in memory.
3. Remote panel site-specific software and executive firmware downloads shall be capable of being performed via TCP/IP.
4. Panels shall automatically store all program changes to the panel’s non-volatile memory each time a new program is downloaded.
5. Panels shall provide electronic file storage with a means to retrieve a record copy of the site-specific software and up to 9 previous revisions. Sufficient file storage shall be provided for other related system documentation such as record drawings, record of completion, owner’s

manuals, testing and maintenance records, etc.

C. History Logs: The system shall provide a means to recall alarms and trouble conditions in chronological order for the purpose of recreating an event history. A separate alarm and trouble log shall be provided.

D. Wiring/Signal Transmission:

1. Transmission shall be hard-wired, using individual addressable signal transmission, dedicated to fire alarm service only.

2. System connections for signaling line circuits shall be Class B, Style 4;notification appliance circuits shall be Class B, Style Y.

E. Remote Access:

1. Fire Sprinkler Monitoring Panel (FSMP)shall provide the necessary hardware to provide a remote service access feature using Ethernet and TCP/IP communications protocol compatible with IEEE Standard 802.3. The Remote Access feature shall provide automatic notification of system faults and remote diagnostics of system status for responding technicians prior to arrival on site.

2. A standard RJ-45 Ethernet connection shall connect to the owners Ethernet network. Provisions for that connection must be provided at each fire alarm control panel as part of the contract.

3. The internet remote access service function shall provide automated real time off-site reporting of discrete system events to a remote service support center with details of internal (FSMP) fault conditions allowing a pre-site visit analysis of repair requirements.

F. Required Functions: The following are required system functions and operating features:

1. Priority of Signals: Fire alarm events have highest priority. Subsequent alarm events are queued in the order received and do not affect existing alarm conditions. Priority Two, Supervisory and Trouble events have second-, third-, and fourth-level priority, respectively. Signals of a higher-level priority take precedence over signals of lower priority even though the lower-priority condition occurred first. Annunciate all events regardless of priority or order received.

2. Noninterfering: An event on one zone does not prevent the receipt of signals from any other zone. All zones are manually resettable from the Control Panel after the initiating device or devices are restored to normal. The activation of an addressable device does not prevent the receipt of signals from subsequent addressable device activations.

3. Transmission to an approved Supervising Station: Automatically route alarm, supervisory, and trouble signals to an approved supervising station

service provider, under another contract.

4. Annunciation: Operation of alarm and supervisory initiating devices shall be annunciated at the (FSMP) and the remote Panel(s), indicating the type of device, the operational state of the device (i.e alarm, trouble or supervisory) and shall display the custom label associated with the device.

5. General Alarm: A system general alarm shall include:

   a) Indication of alarm condition at the FSMP and the annunciator(s).

   b) Identification of the device /zone that is the source of the alarm at the FSMP and the remote panel(s).

   c) Operation of audible and visible notification appliances until silenced at FSMP.

   d) Initiation of smoke control sequence.

   e) Transmission of signal to the supervising station.

6. Supervisory Operations: Upon activation of a supervisory device such as a fire pump power failure, low air pressure switch, and tamper switch, the system shall operate as follows:

   a) Activate the system supervisory service audible signal and illuminate the LED at the control unit and the remote annunciator.

   b) Pressing the Supervisory Acknowledge Key will silence the supervisory audible signal while maintaining the Supervisory LED "on" indicating off-normal condition.

   c) Record the event in the FSMP historical log.

   d) Transmission of supervisory signal to the supervising station.

   e) Restoring the condition shall cause the Supervisory LED to clear and restore the system to normal.

7. Alarm Silencing: If the "Alarm Silence" button is pressed, all audible and visible alarm signals shall cease operation.

8. System Reset

   a) The "System Reset" button shall be used to return the system to its normal state. Display messages shall provide operator assurance of the sequential steps ("IN PROGRESS", "RESET COMPLETED") as they occur. The system shall verify all circuits or devices are restored prior to resetting the system to avoid the potential for re-alarming the system. The display message shall indicate "ALARM PRESENT, SYSTEM RESET ABORTED."

   b) Should an alarm condition continue, the system will remain in an alarmed state.

9. A manual evacuation (drill) switch shall be provided to operate the notification appliances without causing other control circuits to be activated.

10. WALKTEST: The system shall have the capacity of 8 programmable passcode protected one person testing groups, such that only a portion of the system need be disabled during testing. The actuation of the "enable one person test" program at the control unit shall activate the "One Person Testing" mode of the system as follows:

    a) The city circuit connection and any suppression release circuits shall be bypassed for the testing group.

    b) Control relay functions associated with one of the 8 testing groups shall be bypassed.

    c) The control unit shall indicate a trouble condition.

    d) The alarm activation of any initiating device in the testing group shall cause the audible notification appliances assigned only to that group to sound a code to identify the device or zone.

    e) The unit shall automatically reset itself after signaling is complete.

    f) Any opening of an initiating device or notification appliance circuit wiring shall cause the audible signals to sound for 4 seconds indicating the trouble condition.

11. Install Mode: The system shall have provide the capability to group all non-commissioned points and devices into a single "Install Mode" trouble condition allowing an operator to more clearly identify event activations from commissioned points and devices and in occupied areas.

    a) It shall be possible to individually remove points from Install Mode as required for phased system commissioning.

    b) It shall be possible to retrieve an Install Mode report listing that includes a list of all points assigned to the Install Mode. Panels not having an install mode shall be reprogrammed to remove any non-commissioned points and devices.

12. Service Gateway: A Service Gateway software application shall be provided that allows an authorized service person to remotely query panel status during testing, commissioning, and service, without the need to return to the panel using standard email or instant messaging tools. For systems without a service gateway application the service provider shall provide a minimum of two technicians for any system testing or commissioning.

G. Analog Smoke Sensors:

1. Monitoring: FSMP shall individually monitor sensors for calibration, sensitivity, and alarm condition, and shall individually adjust for sensitivity.

The control unit shall determine the condition of each sensor by comparing the sensor value to the stored values.

2. Environmental Compensation: The FSMP shall maintain a moving average of the sensor's smoke chamber value to automatically compensate for dust, dirt, and other conditions that could affect detection operations.

3. Programmable Sensitivity: Photoelectric Smoke Sensors shall have 7 selectable sensitivity levels ranging from 0.2% to 3.7%, programmed and monitored from the FSMP.

4. Sensitivity Testing Reports: The FSMP shall provide sensor reports that meet NFPA 72 calibrated test method requirements. The reports shall be viewed on a CRT Display or printed for annual recording and logging of the calibration maintenance schedule.

5. The FSMP shall automatically indicate when an individual sensor needs cleaning. The system shall provide a means to automatically indicate when a sensor requires cleaning. When a sensor's average value reaches a predetermined value, (3) progressive levels of reporting are provided. The first level shall indicate if a sensor is close to a trouble reporting condition and will be indicated on the FACP as "ALMOST DIRTY." This condition provides a means to alert maintenance staff of a sensor approaching dirty without creating a trouble in the system. If this indicator is ignored and the second level is reached, a "DIRTY SENSOR" condition shall be indicated at the FACP and subsequently a system trouble is reported to the Supervising Station. The sensor base LED shall glow steady giving a visible indication at the sensor location. The "DIRTY SENSOR" condition shall not affect the sensitivity level required to alarm the sensor. If a "DIRTY SENSOR" is left unattended, and its average value increases to a third predetermined value, an "EXCESSIVELY DIRTY SENSOR" trouble condition shall be indicated at the control unit.

6. The FSMP shall continuously perform an automatic self-test on each sensor that will check sensor electronics and ensure the accuracy of the values being transmitted. Any sensor that fails this test shall indicate a "SELF TEST ABNORMAL" trouble condition.

7. Multi-Sensors shall combine photoelectric smoke sensing and heat sensing technologies. An alarm shall be determined by either smoke detection, with selectable sensitivity from 0.2 to 3.7 %/ft obscuration; or heat detection, selectable as fixed temperature or fixed with selectable rate-of-rise; or based on an analysis of the combination of smoke and heat activity.

8. Programmable bases. It shall be possible to program relay and sounder bases to operate independently of their associated sensor.

9. Magnet test activation of smoke sensors shall be distinguished by its label and history log entry as being activated by a magnet.

H. Smoke Detectors: A maintenance and testing service providing the following shall be included with the base bid:

1. Biannual sensitivity reading and logging for each smoke sensor.
2. Scheduled biannual threshold adjustments to maintain proper sensitivity for each smoke sensor.
3. Threshold adjustment to any smoke sensor that has alarmed the system without the presence of particles of combustion.
4. Scheduled biannual cleaning or replacement of each smoke detector or sensor within the system.
5. Semi-annual functional testing of each smoke detector or sensor using the manufacturer's calibrated test tool.
6. Written documentation of all testing, cleaning, replacing, threshold adjustment, and sensitivity reading for each smoke detector or sensor device within the system.
7. The initial service included in the bid price shall provide the above listed procedures for a period of five years after owner acceptance of the system.

I. Audible Alarm Notification: By horns in areas as indicated on drawings.

J. Fire Suppression Control; Provide UL Listed Clean Agent Fire Suppression Control within the Data Center per NFPA 2000 sequence of operation.

K. Fire Suppression Monitoring:

1. Water flow: Activation of a water flow switch shall initiate general alarm operations.
2. Sprinkler valve tamper switch: The activation of any valve tamper switch shall activate system supervisory operations.

L. Power Requirements

1. The control unit shall receive AC power via a dedicated fused disconnect circuit.
2. The system shall be provided with sufficient battery capacity to operate the entire system upon loss of normal AC power in a normal supervisory mode for a period of 24 hours with 5 minutes of alarm operation at the end of this period. The system shall automatically transfer to battery standby upon power failure. All battery charging and recharging operations shall be automatic.
3. All circuits requiring system-operating power shall be 24 VDC and shall be individually fused at the control unit.
4. The incoming power to the system shall be supervised so that any power

failure will be indicated at the control unit. A green "power on" LED shall be displayed continuously at the user interface while incoming power is present.

5. The system batteries shall be supervised so that a low battery or a depleted battery condition, or disconnection of the battery shall be indicated at the control unit and displayed for the specific fault type.

6. The system shall support 100% of addressable devices in alarm or operated at the same time, under both primary (AC) and secondary (battery) power conditions.

1.6. SUBMITTALS

A. General: Submit the following according to Conditions of Contract .

1. Product data sheets for system components highlighted to indicate the specific products, features, or functions required to meet this specification.

2. Wiring diagrams from manufacturer.

3. Shop drawings showing system details including location of FSMP, all devices, circuiting and details of graphic annunciator.

4. System power and battery charts with performance graphs and voltage drop calculations to assure that the system will operate in accordance with the prescribed backup time periods and under all voltage conditions per UL and NFPA standards.

5. System operation description including method of operation and supervision of each type of circuit and sequence of operations for all manually and automatically initiated system inputs and outputs. A list of all input and output points in the system shall be provided with a label indicating location or use of IDC, SLC, NAC, relay, sensor, and auxiliary control circuits.

6. Operating instructions for FSMP.

7. Operation and maintenance data for inclusion in Operating and Maintenance Manual. Include data for each type product, including all features and operating sequences, both automatic and manual. Provide the names, addresses, and telephone numbers of service organizations.

8. Product certification signed by the manufacturer of the fire alarm system components certifying that their products comply with indicated requirements.

9. Record of field tests of system.

B. Submission to Authority Having Jurisdiction: In addition to routine submission of the above material, make an identical submission to the authority having

jurisdiction. Include copies of shop drawings as required to depict component locations to facilitate review. Upon receipt of comments from the Authority, make resubmissions, if required, to make clarifications or revisions to obtain approval.

1.7. QUALITY ASSURANCE

A. Installer Qualifications: A factory authorized installer is to perform the work of this section.

B. Each and every item of the Fire Alarm System shall be listed under the appropriate category by Underwriters Laboratories, Inc. (UL), and shall bear the "UL" label.

1.8. MAINTENANCE SERVICE

A. Maintenance Service Contract: Provide maintenance of fire alarm systems and equipment for a period of 12 months, using factory-authorized service representatives.

B. Basic Services: Systematic, routine maintenance visits at times scheduled with the Owner. In addition, respond to service calls within 24 hours of notification of system trouble. Adjust and replace defective parts and components with original manufacturer's replacement parts, components, and supplies.

C. Additional Services: Perform services within the above 12-month period not classified as routine maintenance or as warranty work when authorized in writing. Compensation for additional services must be agreed upon in writing prior to performing services.

PART 2 – PRODUCTS

2.1. FIRE ALARM CONTROL PANEL (FSMP) Simplex 4010ES (BLDG C1) 4007ES (ALL OTHER BUILDINGS.

A. General: Comply with UL 864, "Control Units and Accessories for Fire Alarm Systems".

B. The following FSMP hardware shall be provided:

1. Power Limited base panel with platinum cabinet and door, 120 VAC input power.

2. 248 point capacity where (1) point equals (1) monitor (input) or (1) control (output).

3. From all battery charging circuits in the system provide battery voltage and ammeter readouts on the FSMP LCD Display.

4. Municipal City Circuit Connection with Disconnect switch, 24VDC Remote

Station (reverse polarity), local energy, shunt master box, or a form "C" contact output.

5. Three (4) Class B or A (Style Y/Z) Notification Appliance Circuits (NAC; rated 3A@24VDC, resistive).

6. Provide Intelligent Remote Battery Charger for charging up to 110Ah batteries.

7. Power Supplies with integral intelligent Notification Appliance Circuit Class B for system expansion.

8. Programmable DACT for either Common Event Reporting or per Point Reporting.

9. Service Port Modem for dial in passcode access to all fire control panel information.

10. Provide Simplex 4010ES (BLDG C1) & 4007ES (ALL OTHER BLDGS).

C. Cabinet: Lockable steel enclosure. Arrange unit so all operations required for testing or for normal care and maintenance of the system are performed from the front of the enclosure.

D. Alphanumeric Display and System Controls: Panel shall include an 80 character LCD display to indicate alarm, supervisory, and component status messages and shall include a keypad for use in entering and executing control commands.

2.2. GRAPHIC MAP

A. Provide a scaled drawing depicting the physical construction of the building and interior rooms and showing all Fire Alarm System initiating devices and locations of control equipment. Provide a legend for all symbols used on the map.

B. Graphic Map shall be printed in color and shall be professionally framed.

C. Map shall be oriented in the same direction as the drawing. (eg. If map is located on the north wall, the “up” direction shall be north. If map is located on the west wall, north shall be to the right side of the map.)

D. Locate map adjacent to the remote annunciator.

2.3. ADDRESSABLE MANUAL PULL STATIONS

A. Description: Addressable double-action type, red LEXAN, with molded, raised-letter operating instructions of contrasting color. Station will mechanically latch upon operation and remain so until manually reset by opening with a key common with the control units.

B. Provide Simplex 4099-9003.

C. Protective Shield: Where required, as indicated on the drawings, provide a tamperproof, clear LEXAN shield and red frame that easily fits over manual pull stations. When shield is lifted to gain access to the station, a battery powered piercing warning horn shall be activated. The horn shall be silenced by lowering and realigning the shield. The horn shall provide 85dB at 10 feet and shall be powered by a 9 VDC battery.

2.4. SMOKE SENSORS

A. General: Comply with UL 268, "Smoke Detectors for Fire Protective Signaling Systems." Include the following features:

1. Plug-In Arrangement: Sensor and associated electronic components are mounted in a module that connects to a fixed base with a twist-locking plug connection. Base shall provide break-off plastic tab that can be removed to engage the head/base locking mechanism. No special tools shall be required to remove head once it has been locked.

2. Each sensor base shall contain an LED that will flash each time it is scanned by the Control Unit (once every 4 seconds). In alarm condition, the sensor base LED shall be on steady.

3. Each sensor base shall contain a magnetically actuated test switch to provide for easy alarm testing at the sensor location.

4. Each sensor shall be scanned by the Control Unit for its type identification to prevent inadvertent substitution of another sensor type. Upon detection of a "wrong device", the control unit shall operate with the installed device at the default alarm settings for that sensor; 2.5% obscuration for photoelectric sensor, 135-deg F and 15-deg F rate-of-rise for the heat sensor, but shall indicate a "Wrong Device" trouble condition.

5. The sensor's electronics shall be immune from nuisance alarms caused by EMI and RFI.

6. Sensors include a communication transmitter and receiver in the mounting base having a unique identification and capability for status reporting to the FACP. Sensor address shall be located in base to eliminate false addressing when replacing sensors.

7. Provide Simplex 4098-9714 Smoke Sensor and 4098-9733 Thermal Sensor.

B. Type: Smoke sensors shall be of the photoelectric or combination photoelectric / heat type.

C. Bases: Relay output, sounder and isolator bases shall be supported alternatives to the standard base. Simplex 408-9792.

D. Duct Smoke Sensor: Photoelectric type, with sampling tube of design and

dimensions as recommended by the manufacturer for the specific duct size and installation conditions where applied. Sensor includes relay as required for fan shutdown.

1. Environmental compensation, programmable sensitivity settings, status testing, and monitoring of sensor dirt accumulation for the duct smoke sensor shall be provided by the FACP.
2. The Duct Detector shall provide a supervised relay driver circuit for driving up to 15 relays with a single "Form C" contact rated at 7A@ 28VDC or 10A@ 120VAC. This auxiliary relay output shall be fully programmable. Relay shall be mounted within 3 feet of HVAC control circuit.
3. Duct Housing shall provide a relay control trouble indicator Yellow LED.
4. Duct Housing shall have a transparent cover to monitor for the presence of smoke and for maintenance purposes.
5. Duct Housing shall provide two (2) Test Ports for measuring airflow and for testing. These ports will allow aerosol injection in order to test the activation of the duct smoke sensor.
6. Duct Housing shall provide a magnetic test area and Red sensor status LED.
7. For maintenance purposes, it shall be possible to clean the duct housing sampling tubes by accessing them through the duct housing front cover.
8. Each duct smoke sensor shall have a Remote Test Station with an alarm LED and test switch.
9. Provide Simplex 4098-9756.
10. Where indicated provide a NEMA 4X weatherproof duct housing enclosure that shall provide for the circulation of conditioned air around the internally mounted addressable duct sensor housing to maintain the sensor housing at its rated temperature range. The housing shall be UL Listed to Standard 268A.

2.5. HEAT SENSORS

A. Thermal Sensor: Combination fixed-temperature and rate-of-rise unit with plug-in base and alarm indication lamp; 135-deg F fixed-temperature setting except as indicated.

B. Thermal sensor shall be of the epoxy encapsulated electronic design. It shall be thermistor-based, rate-compensated, self-restoring and shall not be affected by thermal lag.

C. Sensor fixed temperature sensing shall be independent of rate-of-rise sensing and programmable to operate at 135-deg F or 155-deg F. Sensor rate-of-rise

temperature detection shall be selectable at the FACP for either 15-deg F or 20-deg F per minute.

D. Sensor shall have the capability to be programmed as a utility monitoring device to monitor for temperature extremes in the range from 32-deg F to 155-deg F.

E. Provide Simplex 4098-9733.

2.6. ADDRESSABLE CIRCUIT INTERFACE MODULES

A. Addressable Circuit Interface Modules: Arrange to monitor or control one or more system components that are not otherwise equipped for addressable communication.

B. Addressable Circuit Interface Modules will be capable of mounting in a standard electric outlet box. Modules will include cover plates to allow surface or flush mounting.

C. There shall be the following types of modules:

1. Type 1: Line Powered Monitor Circuit Interface Module

a) This type of module is an individually addressable module that has both its power and its communications supplied by the two wire signaling line circuit. It provides location specific addressability to an initiating device by monitoring normally open dry contacts.

b) This module shall provide location specific addressability for up to five initiating devices by monitoring normally closed or normally open dry contact security devices.

c) Provide Simplex 4090-9001.

2. Type 2: Line Powered Control Circuit Interface Module

a) This module shall provide control and status tracking of a Form "C" contact. The two-wire signaling line circuit shall supply power and communications to the module.

b) Provide Simplex 4090-9002.

2.7. ALARM NOTIFICATION APPLIANCES

A. Visible/Only: Strobe shall be listed to UL 1971. The V/O enclosure shall mount directly to standard single gang, double gang or 4" square electrical box. V/O appliances shall be provided with different minimum flash intensities of 15cd, 75cd and 110cd. Provide a label inside the strobe lens to indicate the listed candela rating of the specific Visible/Only appliance.

B. Audible/Visible: Combination Audible/Visible (A/V) Notification Appliances shall be listed to UL 1971 and UL 464. The strobe light shall consist of a xenon flash

tube and associated lens/reflector system. Provide a label inside the strobe lens to indicate the listed candela rating of the specific strobe. The horn shall have a minimum sound pressure level of 85 dBA @ 24VDC. The audible/visible enclosure shall mount directly to standard single gang, double gang or 4" square electrical box.

C. Notification Appliance Circuit provides synchronization of strobes at a rate of 1Hz and operates horns with a Temporal Code Pattern operation. The synchronization across all notification appliance circuits shall be provided.

PART 3 – EXECUTION

3.1. INSTALLATION, GENERAL

A. Install system components and all associated devices in accordance with applicable NFPA Standards and manufacturer's recommendations.

B. Installation personnel shall be supervised by persons who are qualified and experienced in the installation, inspection, and testing of fire alarm systems. Examples of qualified personnel shall include, but not be limited to, the following:

Factory trained and certified personnel.

1. National Institute of Certification in Engineering Technologies (NICET) fire alarm level II certified personnel.
2. Personnel licensed or certified by state or local authority.

3.2. EQUIPMENT INSTALLATION

A. Furnish and install a complete Fire Sprinkler Monitoring System as described herein and as shown on the plans. Include sufficient control unit(s), annunciator(s), manual stations, automatic fire detectors, smoke detectors, audible and visible notification appliances, wiring, terminations, electrical boxes, ethernet drops, and all other necessary material for a complete operating system.

B. Water-Flow and Valve Supervisory Switches: Connect for each sprinkler valve required to be supervised.

C. Device Location-Indicating Lights: Locate in the public space immediately adjacent to the device they monitor.

D. Install manual station with operating handle no higher than 48 inches (1.22 m) above floor and per NFPA approved elevation. Install wall mounted audible and visual notification appliances not less than 80 inches (2.03 m) above floor to bottom of lens and not greater than 96 inches (2.44 m) above floor to bottom of lens.

E. Make conduit and wiring connections to door release devices, sprinkler flow switches, sprinkler valve tamper switches, fire suppression system control panels, duct smoke detectors.

F. Automatic Detector Installation: Conform to NFPA 72.

3.3. PREPARATION

A. Coordinate work of this Section with other affected work and construction schedule.

3.4. WIRING INSTALLATION

A. System Wiring: Wire and cable shall be a type listed for its intended use by an approval agency acceptable to the Authority Having Jurisdiction and shall be installed in accordance with the appropriate articles from the current approved edition of NFPA 70: National Electric Code (NEC).

B. Contractor shall obtain from the Fire Sprinkler Monitoring System Manufacturer written instruction regarding the appropriate wire/cable to be used for this installation. No deviation from the written instruction shall be made by the Contractor without the prior written approval of the Fire Sprinkler Monitoring System Manufacturer.

C. Color Coding: Color-code fire alarm conductors differently from the normal building power wiring. Use one color code for alarm initiating device circuits wiring and a different color code for supervisory circuits. Color-code notification appliance circuits differently from alarm-initiating circuits. Paint fire alarm system junction boxes and covers red.

D. Mount end-of-line device in box with last device or separate box adjacent to last device for Class "B" supervision.

E. Provide Digital Cell Communicator for 4010ES Fire Sprinkler Monitoring Panel in Building C1.

3.5. FIELD QUALITY CONTROL

A. Manufacturer's Field Services: Provide services of a factory-authorized service representative to supervise the field assembly and connection of components and the pretesting, testing, and adjustment of the system.

B. Service personnel shall be qualified and experienced in the inspection, testing, and maintenance of fire alarm systems. Examples of qualified personnel shall be permitted to include, but shall not be limited to, individuals with the following qualifications:

1. Factory trained and certified.

2. National Institute for Certification in Engineering Technologies (NICET) fire alarm certified.
3. International Municipal Signal Association (IMSA) fire alarm certified.
4. Certified by a state or local authority.
5. Trained and qualified personnel employed by an organization listed by a national testing laboratory for the servicing of fire alarm systems.

C. Pretesting: Determine, through pretesting, the conformance of the system to the requirements of the Drawings and Specifications. Correct deficiencies observed in pretesting. Replace malfunctioning

D. Inspection:

1. Inspect equipment installation, interconnection with system devices, mounting locations, and mounting methods.
2. Verify that units and controls are properly installed, connected, and labeled and that interconnecting wires and terminals are identified.

E. Acceptance Operational Tests:

1. Perform operational system tests to verify conformance with specifications:
   a) Each alarm initiating device installed shall be operationally tested. Each device shall be tested for alarm and trouble conditions. Contractor shall submit a written certification that the Fire Alarm System installation is complete including all punch-list items. Test battery operated emergency power supply. Test emergency power supply to minimum durations specified. Test Supervising Station Signal Transmitter. Coordinate testing with Supervising Station monitoring firm/entity.
   b) Test each Notification Appliance installed for proper operation. Submit written report indicating sound pressure levels at specified distances.
   c) Test Fire Sprinkler Monitoring Panels.
2. Provide minimum 10 days notice of acceptance test performance schedule to Owner, and local Authority Having Jurisdiction.

F. Retesting: Correct deficiencies indicated by tests and completely retest work affected by such deficiencies. Verify by the system test that the total system meets the Specifications and complies with applicable standards.

G. Report of Tests and Inspections: Provide a written record of inspections, tests, and detailed test results in the form of a test log. Use NFPA 72 Forms for documentation.

H. Final Test, Record of Completion, and Certificate of Occupancy:

1. Test the system as required by the Authority Having Jurisdiction in order to obtain a certificate of occupancy. Provide completed NFPA 72 Record of Completion form to Owner and AHJ.

3.6. CLEANING AND ADJUSTING

A. Cleaning: Remove paint splatters and other spots, dirt, and debris. Clean unit internally using methods and materials recommended by manufacturer.

B. Occupancy Adjustments: When requested within one year of date of Substantial Completion, provide on-site assistance in adjusting sound pressure levels and adjusting controls and sensitivities to suit actual occupied conditions. Provide up to three visits to the site for this purpose.

3.7. TRAINING

A. Provide the services of a factory-authorized service representative to demonstrate the system and train Owner's maintenance personnel as specified below.

1. Train Owner's maintenance personnel in the procedures and schedules involved in operating, troubleshooting, servicing, and preventive maintaining of the system. Provide a minimum of 8 hours' training.

2. Schedule training with the Owner at least seven days in advance.

3.8 SERVICE AGREEMENT

A. Provide an Alternate Price for a 5 Year Service Contract.

END OF SECTION

SECTION 31 10 00
SITE CLEARING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Clearing and protection of vegetation.

B. Removal of existing debris.

1.02 RELATED REQUIREMENTS

A. Section 01 10 00 - Summary: Limitations on Contractor 's use of site and premises.

B. Section 01 10 00 - Summary: Sequencing and staging requirements.

C. Section 01 50 00 - Temporary Facilities and Controls: Site fences, security, protective barriers, and waste removal.

D. Section 01 57 13 - Temporary Erosion and Sediment Control.

E. Section 01 70 00 - Execution and Closeout Requirements: Project conditions; protection of bench marks, survey control points, and existing construction to remain; reinstallation of removed products.

F. Section 01 74 19 - Construction Waste Management and Disposal: Limitations on disposal of removed materials; requirements for recycling.

G. Section 02 41 00 - Demolition: Removal of built elements and utilities.

H. Section 31 22 00 - Grading: Topsoil removal.

I. Section 31 22 00 - Grading: Fill material for filling holes, pits, and excavations generated as a result of removal operations.

J. Section 31 23 23 - Fill: Fill material for filling holes, pits, and excavations generated as a result of removal operations.

K. Section 31 23 23 - Fill: Filling holes, pits, and excavations generated as a result of removal operations.

1.03 QUALITY ASSURANCE

A. Clearing Firm: Company specializing in the type of work required.

1. Minimum of 5 years of documented experience.

PART 2 PRODUCTS -- NOT USED

PART 3 EXECUTION

3.01 SITE CLEARING

A. Comply with other requirements specified in Section 01 70 00.

B. Minimize production of dust due to clearing operations; do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.

3.02 EXISTING UTILITIES AND BUILT ELEMENTS

A. Coordinate work with utility companies; notify before starting work and comply with their requirements; obtain required permits.

B. Protect existing utilities to remain from damage.

C. Do not disrupt public utilities without permit from authority having jurisdiction.

D. Protect existing structures and other elements that are not to be removed.

3.03 VEGETATION

A. Scope: Remove trees, shrubs, brush, and stumps in areas to be covered by building structure, paving, playing fields, lawns, and planting beds.

B. Do not remove or damage vegetation beyond the following limits:

1. 40 feet outside the building perimeter.
2. 10 feet each side of surface walkways, patios, surface parking, and utility lines less than 12 inches in diameter.
3. 15 feet each side of roadway curbs and main utility trenches.
4. 25 feet outside perimeter of pervious paving areas that must not be compacted by construction traffic.
5. Exception: Specific trees and vegetation indicated on drawings to be removed.
6. Exception: Selective thinning of undergrowth specified elsewhere.

C. Install substantial, highly visible fences at least 3 feet high to prevent inadvertent damage to vegetation to remain:

1. At vegetation removal limits.

D. In areas where vegetation must be removed but no construction will occur other than pervious paving, remove vegetation with minimum disturbance of the subsoil.

E. Vegetation Removed: Do not burn, bury, landfill, or leave on site, except as indicated.

1. Chip, grind, crush, or shred vegetation for mulching, composting, or other purposes; preference should be given to on-site uses.
2. Trees: Sell if marketable; if not, treat as specified for other vegetation removed; remove stumps and roots to depth of 18 inches.
3. Sod: Re-use on site if possible; otherwise sell if marketable, and if not, treat as specified for other vegetation removed.

F. Restoration: If vegetation outside removal limits or within specified protective fences is damaged or destroyed due to subsequent construction operations, replace at no cost to Owner .

3.04 **DEBRIS**

A. Remove debris, junk, and trash from site.

B. Leave site in clean condition, ready for subsequent work.

C. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION

SECTION 31 22 00
GRADING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Removal of topsoil.

B. Rough grading the site for site structures.

C. Finish grading.

1.02 RELATED REQUIREMENTS

A. Section 31 10 00 - Site Clearing.

B. Section 31 23 16 - Excavation.

C. Section 31 23 16.13 - Trenching: Trenching and backfilling for utilities.

D. Section 31 23 16.26 - Rock Removal.

E. Section 31 23 23 - Fill: Filling and compaction.

1.03 SUBMITTALS

A. Project Record Documents: Accurately record actual locations of utilities remaining by horizontal dimensions, elevations or inverts, and slope gradients.

1.04 QUALITY ASSURANCE

A. Perform Work in accordance with City of Pueblo, Public Works Department standards.

1. Maintain one copy on site.

PART 2 PRODUCTS

2.01 MATERIALS

A. Topsoil: See Section 31 23 23.

B. Other Fill Materials: See Section 31 23 23.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that survey bench mark and intended elevations for the Work are as indicated.

B. Verify the absence of standing or ponding water.

3.02 PREPARATION

A. Identify required lines, levels, contours, and datum.

B. Stake and flag locations of known utilities.

C. Locate, identify, and protect from damage above- and below-grade utilities to remain.

D. Notify utility company to remove and relocate utilities.

E. Provide temporary means and methods to remove all standing or ponding water from areas prior to grading.

F. Protect site features to remain, including but not limited to bench marks, survey control points, existing structures, fences, sidewalks, paving and curbs, from damage by grading equipment and vehicular traffic.

G. Protect trees to remain by providing substantial fencing around entire tree at the outer tips of its branches; no grading is to be performed inside this line.

H. Protect plants, lawns, rock outcroppings and other features to remain as a portion of final landscaping.

3.03 **ROUGH GRADING**

A. Remove topsoil from areas to be further excavated, re-landscaped, or re-graded, without mixing with foreign materials.

B. Do not remove topsoil when wet.

C. Remove subsoil from areas to be further excavated, re-landscaped, or re-graded.

D. Do not remove wet subsoil , unless it is subsequently processed to obtain optimum moisture content.

E. When excavating through roots, perform work by hand and cut roots with sharp axe.

F. See Section 31 23 23 for filling procedures.

G. Benching Slopes: Horizontally bench existing slopes greater than 1:4 to key fill material to slope for firm bearing.

H. Stability: Replace damaged or displaced subsoil to same requirements as for specified fill.

I. Remove and replace soils deemed unsuitable by classification and which are excessively moist due to lack surface water control.

3.04 **SOIL REMOVAL AND STOCKPILING**

A. Stockpile excavated topsoil on site, refer to Soils Engineer recommendation in Geo-Tech Report

B. Stockpile excavated subsoil on site Soils Engineer recommendation in Geo-Tech Report.

C. Stockpiles: Use areas designated on site; pile depth not to exceed 8 feet; protect from erosion.

3.05 **FINISH GRADING**

A. Before Finish Grading:

1. Verify building and trench backfilling have been inspected.

2. Verify subgrade has been contoured and compacted.

B. Remove debris, roots, branches, stones, in excess of 1/2 inch in size. Remove soil contaminated with petroleum products.

C. In areas where vehicles or equipment have compacted soil, scarify surface to depth of 3 inches.

D. Place topsoil in areas indicated.

E. Place topsoil during dry weather.

F. Remove roots, weeds, rocks, and foreign material while spreading.

G. Near plants spread topsoil manually to prevent damage.

H. Fine grade topsoil to eliminate uneven areas and low spots. Maintain profiles and contour of subgrade.

I. Lightly compact placed topsoil.

J. Maintain stability of topsoil during inclement weather. Replace topsoil in areas where surface water has eroded thickness below specifications.

3.06 **TOLERANCES**

A. Top Surface of Subgrade: Plus or minus 0.10 foot (1-3/16 inches) from required elevation.

B. Top Surface of Finish Grade: Plus or minus 0.04 foot (1/2 inch).

3.07 **REPAIR AND RESTORATION**

A. Existing Facilities, Utilities, and Site Features to Remain: If damaged due to this work, repair or replace to original condition.

B. Trees to Remain: If damaged due to this work, trim broken branches and repair bark wounds; if root damage has occurred, obtain instructions from Architect as to remedy.

C. Other Existing Vegetation to Remain: If damaged due to this work, replace with vegetation of equivalent species and size.

3.08 **FIELD QUALITY CONTROL**

A. See Section 31 23 23 for compaction density testing.

3.09 **CLEANING**

A. Remove unused stockpiled topsoil and subsoil. Grade stockpile area to prevent standing water.

B. Leave site clean and raked, ready to receive landscaping.

END OF SECTION

SECTION 31 23 16
EXCAVATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Excavating for building volume below grade, footings, pile caps, slabs-on-grade, paving, site structures and utilities within the building.

B. Trenching for utilities outside the building to utility main connections.

C. Temporary excavation support and protection systems.

1.02 RELATED REQUIREMENTS

A. Document : Geotechnical report; bore hole locations and findings of subsurface materials.

B. Section 01 57 13 - Temporary Erosion and Sediment Control: Slope protection and erosion control.

C. Section 01 70 00 - Execution and Closeout Requirements: Project conditions; protection of bench marks, survey control points, and existing construction to remain; reinstallation of removed products; temporary bracing and shoring. General requirements for dewatering of excavations and water control.

D. Section 02 41 00 - Demolition: Shoring and underpinning existing structures.

E. Section 21 05 53 - Identification for Fire Suppression Piping and Equipment: Underground warning tapes at underground fire suppression lines.

F. Section 22 05 53 - Identification for Plumbing Piping and Equipment: Underground warning tapes at underground plumbing lines.

G. Section 23 05 53 - Identification for HVAC Piping and Equipment: Underground warning tapes at underground HVAC lines.

H. Section 26 05 53 - Identification for Electrical Systems: Underground warning tapes at underground electrical lines.

I. Section 31 10 00 - Site Clearing: Vegetation and existing debris removal.

J. Section 31 22 00 - Grading: Soil removal from surface of site.

K. Section 31 22 00 - Grading: Grading.

L. Section 31 23 16.13 - Trenching: Excavating for utility trenches outside the building to utility main connections.

M. Section 31 23 16.26 - Rock Removal: Removal of rock during excavating.

N. Section 31 23 23 - Fill: Fill materials, backfilling, and compacting.

O. Section 31 37 00 - Riprap.

1.03 REFERENCE STANDARDS

A. 29 CFR 1926 - U.S. Occupational Safety and Health Standards current edition.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Temporary Support and Excavation Protection Plan.

C. Project Record Documents: Record drawings at project closeout according to 01 70 00 - Execution and Closeout Requirements. Show locations of installed support materials left in place, including referenced locations and depths, on drawings.

D. Shoring Installer's Qualification Statement.

E. Field Quality Control Submittals: Document visual inspection of load-bearing excavated surfaces.

1.05 **QUALITY ASSURANCE**

A. Temporary Support and Excavation Protection Plan:

1. Indicate sheeting, shoring, and bracing materials and installation required to protect excavations and adjacent structures and property.

2. Include drawings and calculations for bracing and shoring.

3. Bracing and shoring design to meet requirements of OSHA's Excavation Standard, 29 CFR 1926, Subpart P.

B. Designer Qualifications: For design of temporary shoring and bracing, employ a company experienced in design of this type of work and licensed in the State in which the Project is located.

C. Shoring Installer Qualifications: Company specializing in performing the shoring and bracing work of this section with minimum 5 years of documented experience.

PART 2 PRODUCTS

2.01 **MATERIALS**

A. Bedding and Fill to Correct Over-Excavation:

1. See Section 31 23 23 for bedding and corrective fill materials at general excavations.

2. See Section 31 23 16.13 for bedding and corrective fill materials at utility trenches.

B. Underground Warning Tapes:

1. See Section for 21 05 53 underground warning tapes at underground fire suppression lines.

2. See Section for 22 05 53 underground warning tapes at underground plumbing lines.

3. See Section for 23 05 53 underground warning tapes at underground HVAC lines.

4. See Section for 26 05 53 underground warning tapes at underground electrical lines.

PART 3 EXECUTION

3.01 **EXAMINATION**

A. Verify that survey bench mark and intended elevations for the work are as indicated.

B. Survey existing adjacent structures and improvements and establish exact elevations at fixed points to act as benchmarks.

1. Resurvey benchmarks during installation of excavation support and protection systems and notify Owner if any changes in elevations or positions occur or if cracks, sags, or other damage is evident in adjacent construction.

C. Determine the prevailing groundwater level prior to excavation. If the proposed excavation extends less than 1 foot into the prevailing groundwater, control groundwater intrusion with perimeter drains routed to sump pumps, or as directed by Architect. If the proposed excavation extends more than 1 foot into the prevailing groundwater, control groundwater intrusion with a comprehensive dewatering procedures, or as directed by Geotechnical Engineer.

3.02 **PREPARATION**

A. Identify required lines, levels, contours, and datum locations.

B. See Section 31 10 00 for clearing, grubbing, and removal of existing debris.

C. See Section 31 22 00 for topsoil removal.

D. Locate, identify, and protect utilities that remain and protect from damage.

E. Notify utility company to remove and relocate utilities.

F. Protect bench marks, survey control points, existing structures, fences, sidewalks, paving and curbs from excavating equipment and vehicular traffic.

G. Protect plants, lawns, rock outcroppings and other features to remain.

H. Grade top perimeter of excavation to prevent surface water from draining into excavation. Provide temporary means and methods, as required, to maintain surface water diversion until no longer needed, or as directed by Architect.

3.03 TEMPORARY EXCAVATION SUPPORT AND PROTECTION

A. Excavation Safety: Comply with OSHA's Excavation Standard, 29 CFR 1926, Subpart P.

1. Excavations in stable rock or in less than 5 feet in depth in ground judged as having no cave-in potential do not require excavation support and protection systems.

2. Depending upon excavation depth, time that excavation is open, soil classification, configuration and slope of excavation sidewalls, design and provide an excavation support and protection system that meets the requirements of 29 CFR 1926, Subpart P:

a. Sloping and benching systems.

b. Support systems, shield systems, and other protective systems.

B. Leave excavation support and protection systems, used as formwork or within 10 feet of existing foundations, permanently in place, unless otherwise noted.

1. Cut off top 4 feet below grade, abandon remainder.

C. Excavation support and protection systems not required to remain in place may be removed subject to approval of Owner or Owner's Representative.

1. Remove temporary shoring and bracing in a manner to avoid harmful disturbance to underlying soils and damage to buildings, structures, pavements, facilities and utilities.

3.04 EXCAVATING

A. Excavate to accommodate new structures and construction operations.

1. Excavate to the length and width required to safely install, adjust, and remove any forms, bracing, or supports necessary for the installation of the work.

2. Cut utility trenches wide enough to allow inspection of installed utilities.

3. Hand trim excavations. Remove loose matter.

B. Notify Architect of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.

C. Do not interfere with 45 degree bearing splay of foundations.

D. Remove lumped subsoil, boulders, and rock up to 1/3 cubic yard measured by volume. See Section 31 23 16.26 for removal of larger material.

E. Provide temporary means and methods, as required, to remove all water from excavations until directed by Architect. Remove and replace soils deemed suitable by classification and which are excessively moist due to lack of dewatering or surface water control.

3.05 SUBGRADE PREPARATION

A. See Section 31 23 23 for subgrade preparation at general excavations.

B. See Section 31 23 16.13 for subgrade preparation at utility trenches.

3.06 **FILLING AND BACKFILLING**

A. Do not fill or backfill until all debris, water, unsatisfactory soil materials, obstructions, and deleterious materials have been removed from excavation.

B. Install underground warning tape at buried utilities according to Sections 21 05 53, 22 05 53, 23 05 53 and 26 05 53.

C. See Section 31 23 23 for fill, backfill, and compaction requirements at general excavations.

D. See Section 31 23 16.13 for fill, backfill, and compaction requirements at utility trenches.

E. See Section 31 22 00 for rough and final grading and topsoil replacement requirements.

3.07 **REPAIR**

A. Correct areas that are over-excavated and load-bearing surfaces that are disturbed; see Section 31 23 23.

3.08 **FIELD QUALITY CONTROL**

A. See Section 01 40 00 - Quality Requirements, for general requirements for field inspection and testing.

B. Provide for visual inspection of load-bearing excavated surfaces by Architect before placement of foundations.

3.09 **CLEANING**

A. Stockpile excavated material to be re-used in area designated on site in accordance with Section 31 22 00.

B. Remove excavated material that is unsuitable for re-use from site.

C. Remove excess excavated material from site.

3.10 **PROTECTION**

A. Divert surface flow from rains or water discharges from the excavation.

B. Prevent displacement of banks and keep loose soil from falling into excavation; maintain soil stability.

C. Protect open excavations from rainfall, runoff, freezing groundwater, or excessive drying so as to maintain foundation subgrade in satisfactory, undisturbed condition.

D. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.

E. Keep excavations free of standing water and completely free of water during concrete placement.

END OF SECTION

SECTION 31 23 16.13
TRENCHING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Backfilling and compacting for utilities outside the building to utility main connections.

1.02 RELATED REQUIREMENTS

A. Document _____-_____: Geotechnical report; bore hole locations and findings of subsurface materials.

B. Section 03 30 00 - Cast-in-Place Concrete.

C. Section 31 22 00 - Grading: Site grading.

D. Section 31 23 16 - Excavation: Building and foundation excavating.

E. Section 31 23 16.26 - Rock Removal: Removal of rock during excavating.

F. Section 31 23 23 - Fill: Backfilling at building and foundations.

G. Section 33 41 00 - Subdrainage: Filter aggregate and filter fabric for foundation drainage systems.

1.03 DEFINITIONS

A. Finish Grade Elevations: Indicated on drawings.

B. Subgrade Elevations: Indicated on drawings.

1.04 REFERENCE STANDARDS

A. AASHTO T 180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18 in.) Drop 2018.

B. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)) 2012, with Editorial Revision (2015).

C. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN m/m3)) 2012, with Editorial Revision (2015).

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Materials Sources: Submit name of imported materials source.

C. Fill Composition Test Reports: Results of laboratory tests on proposed and actual materials used.

D. Compaction Density Test Reports.

1.06 DELIVERY, STORAGE, AND HANDLING

A. When necessary, store materials on site in advance of need.

B. When fill materials need to be stored on site, locate stockpiles where indicated.

1. Separate differing materials with dividers or stockpile separately to prevent intermixing.
2. Prevent contamination.
3. Protect stockpiles from erosion and deterioration of materials.

PART 2 PRODUCTS

2.01 FILL MATERIALS

A. General Fill - Fill Type [____]: Conforming to City of Pueblo Public Works Department standard.

B. Structural Fill - Fill Type [____]: Conforming to Soils Engineer recommendation in Geo-Tech Report standard.

C. Granular Fill - Fill Type [____]: Coarse aggregate, conforming to Soils Engineer recommendation in Geo-Tech Report standard.

D. Sand - Fill Type [____]: Conforming to Soils Engineer recommendation in Geo-Tech Report standard.

E. Topsoil: See Section 31 22 00.

2.02 **ACCESSORIES**

A. Geotextile Fabric: Non-biodegradable, woven

2.03 **SOURCE QUALITY CONTROL**

A. See Section 01 40 00 - Quality Requirements, for general requirements for testing and analysis of soil material.

B. Where fill materials are specified by reference to a specific standard, test and analyze samples for compliance before delivery to site.

C. If tests indicate materials do not meet specified requirements, change material and retest.

PART 3 EXECUTION

3.01 **EXAMINATION**

A. Verify that survey bench marks and intended elevations for the work are as indicated.

3.02 **PREPARATION**

A. Identify required lines, levels, contours, and datum locations.

B. See Section 31 22 00 for additional requirements.

C. Grade top perimeter of trenching area to prevent surface water from draining into trench. Provide temporary means and methods, as required, to maintain surface water diversion until no longer needed, or as directed by the Architect.

3.03 **TRENCHING**

A. Notify Architect of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.

B. Slope banks of excavations deeper than 4 feet to angle of repose or less until shored.

C. Do not interfere with 45 degree bearing splay of foundations.

D. Cut trenches wide enough to allow inspection of installed utilities.

E. Hand trim excavations. Remove loose matter.

F. Remove large stones and other hard matter that could damage piping or impede consistent backfilling or compaction.

G. Remove lumped subsoil, boulders, and rock up to 1/3 cubic yard measured by volume. See Section 31 23 16.26 for removal of larger material.

H. Remove excavated material that is unsuitable for re-use from site.

I. Stockpile excavated material to be re-used in area designated on site.

J. Remove excess excavated material from site.

K. Provide temporary means and methods, as required, to remove all water from trenching until directed by the Architect. Remove and replace soils deemed unsuitable by classification and which are excessively moist due to lack of dewatering or surface water control.

L. Determine the prevailing groundwater level prior to trenching. If the proposed trench extends less than 1 foot into the prevailing groundwater, control groundwater intrusion with perimeter drains routed to sump pumps, or as directed by the Architect.

3.04 PREPARATION FOR UTILITY PLACEMENT

A. Cut out soft areas of subgrade not capable of compaction in place. Backfill with general fill.

B. Compact subgrade to density equal to or greater than requirements for subsequent fill material.

C. Until ready to backfill, maintain excavations and prevent loose soil from falling into excavation.

3.05 BACKFILLING

A. Backfill to contours and elevations indicated using unfrozen materials.

B. Fill up to subgrade elevations unless otherwise indicated.

C. Employ a placement method that does not disturb or damage other work.

D. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet, frozen or spongy subgrade surfaces.

E. Maintain optimum moisture content of fill materials to attain required compaction density.

F. Granular Fill: Place and compact materials in equal continuous layers not exceeding 6 inches compacted depth.

G. Soil Fill: Place and compact material in equal continuous layers not exceeding 8 inches compacted depth.

H. Slope grade away from building minimum 2 inches in 10 feet, unless noted otherwise. Make gradual grade changes. Blend slope into level areas.

I. Correct areas that are over-excavated.

1. Other areas: Use general fill, flush to required elevation, compacted to minimum 97 percent of maximum dry density.

J. Compaction Density Unless Otherwise Specified or Indicated:

1. Under paving, slabs-on-grade and similar construction: 95 percent of maximum dry density.

2. At other locations: 95 percent of maximum dry density.

K. Reshape and re-compact fills subjected to vehicular traffic.

3.06 BEDDING AND FILL AT SPECIFIC LOCATIONS

A. Use general fill unless otherwise specified or indicated.

B. Utility Piping, Conduits, Duct Bank and [_____] and [_____]:

C. Utility Piping and Conduits:

1. Bedding: Use general fill

2. Compact in maximum 8 inch lifts to 95 percent of maximum dry density.

D. At Pipe Culverts:

1. Bedding: Use general fill.

2. Compact in maximum 8 inch lifts to 95 percent of maximum dry density.

3.07 **TOLERANCES**

A. Top Surface of General Backfilling: Plus or minus 1 inch from required elevations.

B. Top Surface of Backfilling Under Paved Areas: Plus or minus 1 inch from required elevations.

3.08 **FIELD QUALITY CONTROL**

A. See Section 01 40 00 - Quality Requirements, for general requirements for field inspection and testing.

B. Evaluate results in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D1557 ("modified Proctor"), AASHTO T 180 or ASTM D698 ("standard Proctor").

C. If tests indicate work does not meet specified requirements, remove work, replace and retest.

D. Frequency of Tests: [_____].

3.09 **CLEANING**

A. Leave unused materials in a neat, compact stockpile.

B. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.

C. Leave borrow areas in a clean and neat condition. Grade to prevent standing surface water.

END OF SECTION

SECTION 31 23 16.26
ROCK REMOVAL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Removal of discovered rock during excavation.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete.

B. Section 31 23 23 - Fill: Fill materials.

1.03 DEFINITIONS

A. Site Rock: Solid mineral material with a volume in excess of 1/3 cubic yard or solid material that cannot be removed with a 3/4 cubic yard capacity power shovel without drilling.

B. Trench Rock: Solid mineral material with a volume in excess of 1/6 cubic yard or solid material that cannot be removed with a capacity power shovel without drilling.

C. Rock: Solid mineral material of a size that cannot be removed with a capacity power shovel.

PART 2 PRODUCTS

2.01 MATERIALS TBD

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify site conditions and note subsurface irregularities affecting work of this section.

3.02 PREPARATION

A. Identify required lines, levels, contours, and datum.

3.03 ROCK REMOVAL

A. Excavate and remove rock by mechanical methods only; use of explosives is prohibited.

B. Mechanical Methods: Drill holes and utilize expansive tools to fracture rock.

C. Form level bearing at bottom of excavations.

D. Remove shaled layers to provide sound and unshattered base for footings.

E. In utility trenches, excavate to 6 inches below invert elevation of pipe and 24 inches wider than pipe diameter.

F. Remove excavated materials from site.

G. Correct unauthorized rock removal in accordance with backfilling and compacting requirements of Section 31 23 23.

3.04 FIELD QUALITY CONTROL

A. Independent agency field inspection will be provided under provisions of Section 01 40 00 - Quality Requirements.

END OF SECTION

SECTION 31 23 23
FILL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Filling, backfilling, and compacting for building volume below grade.

B. Backfilling and compacting for utilities outside the building to utility main connections.

C. Filling holes, pits, and excavations generated as a result of removal (demolition) operations.

1.02 RELATED REQUIREMENTS

A. Document : Geotechnical report; bore hole locations and findings of subsurface materials.

B. Section 01 57 13 - Temporary Erosion and Sediment Control: Slope protection and erosion control.

C. Section 03 30 00 - Cast-in-Place Concrete.

D. Section 31 22 00 - Grading: Removal and handling of soil to be re-used.

E. Section 31 22 00 - Grading: Site grading.

F. Section 31 23 16 - Excavation: Removal and handling of soil to be re-used.

G. Section 31 23 16.13 - Trenching: Excavating for utility trenches outside the building to utility main connections.

H. Section 31 23 16.26 - Rock Removal: Removal of rock during excavating.

I. Section 31 37 00 - Riprap.

J. Section 32 14 13 - Precast Concrete Unit Paving: Leveling bed placement under pavers.

1.03 DEFINITIONS

A. Finish Grade Elevations: Indicated on drawings.

B. Subgrade Elevations: Indicated on drawings.

1.04 REFERENCE STANDARDS

A. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)) 2012, with Editorial Revision (2015).

B. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN m/m3)) 2012, with Editorial Revision (2015).

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data for Manufactured Fill.

C. Shop Drawings for Manufactured Fill.

1. Submit plan, section, and profile drawings. Indicate size, type, location, and orientation of each geofoam block.

2. Submit location and type of connectors.

3. Indicate proposed weighting or guying.

D. Materials Sources: Submit name of imported materials source.

E. Fill Composition Test Reports: Results of laboratory tests on proposed and actual materials used, including manufactured fill.

F. Compaction Density Test Reports.

G. Designer's Qualification Statement.

H. Manufacturer's Qualification Statement.

I. Testing Agency Qualification Statement.

J. Specimen Warranty.

1.06 **QUALITY ASSURANCE**

A. Designer Qualifications: Perform design of structural fill under direct supervision of a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.

B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than ten years of documented experience.

C. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

D. Copies of Documents at Project Site: Maintain at the project site a copy of each referenced document that prescribes execution requirements.

1.07 **DELIVERY, STORAGE, AND HANDLING**

A. When necessary, store materials on site in advance of need.

B. When fill materials need to be stored on site, locate stockpiles where designated.

1. Separate differing materials with dividers or stockpile separately to prevent intermixing.

2. Prevent contamination.

3. Protect stockpiles from erosion and deterioration of materials.

1.08 **WARRANTY**

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 **FILL MATERIALS**

A. General Fill - Fill Type [____]: Conforming to City of Pueblo Public Works Department and Soils Engineer recommendation in Geo-Tech Report standard.

B. Structural Fill - Fill Type [____]: Conforming to City of Pueblo Public Works Department standard Soils Engineer recommendation in Geo-Tech Report.

C. Granular Fill - Fill Type [____]: Coarse aggregate, conforming to City of Pueblo Public Works Department standard and Soils Engineer recommendation in Geo-Tech Report.

D. Sand - Fill Type [____]: Conforming to City of Pueblo Public Works Department standard and Soils Engineer recommendation in Geo-Tech Report.

E. Topsoil: See Section 31 22 00.

2.02 **ACCESSORIES**

A. Geotextile Fabric: Non-biodegradable, woven

B. Vapor Retarder: 10 mil thick, polyethylene.

2.03 **SOURCE QUALITY CONTROL**

A. See Section 01 40 00 - Quality Requirements, for general requirements for testing and analysis of soil material.

B. Where fill materials are specified by reference to a specific standard, test and analyze samples for compliance before delivery to site.

C. If tests indicate materials do not meet specified requirements, change material and retest.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that survey bench marks and intended elevations for the Work are as indicated.

B. Identify required lines, levels, contours, and datum locations.

C. See Section 31 22 00 for additional requirements.

D. Verify subdrainage, dampproofing, or waterproofing installation has been inspected.

E. Verify structural ability of unsupported walls to support imposed loads by the fill.

F. Verify areas to be filled are not compromised with surface or ground water.

3.02 PREPARATION

A. Scarify and proof roll subgrade surface to a depth of 6 inches to identify soft spots.

B. Cut out soft areas of subgrade not capable of compaction in place. Backfill with general fill.

C. Compact subgrade to density equal to or greater than requirements for subsequent fill material.

D. Until ready to fill, maintain excavations and prevent loose soil from falling into excavation.

3.03 FILLING

A. Fill to contours and elevations indicated using unfrozen materials.

B. Employ a placement method that does not disturb or damage other work.

C. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet, frozen or spongy subgrade surfaces.

D. Maintain optimum moisture content of fill materials to attain required compaction density.

E. Granular Fill: Place and compact materials in equal continuous layers not exceeding 6 inches compacted depth.

F. Soil Fill: Place and compact material in equal continuous layers not exceeding 8 inches compacted depth.

G. Slope grade away from building minimum 2 inches in 10 feet, unless noted otherwise. Make gradual grade changes. Blend slope into level areas.

H. Correct areas that are over-excavated.

1. Load-bearing foundation surfaces: Use structural fill, flush to required elevation, compacted to 95 percent of maximum dry density.

2. Other areas: Use general fill, flush to required elevation, compacted to minimum 97 percent of maximum dry density.

I. Compaction Density Unless Otherwise Specified or Indicated:

1. Under paving, slabs-on-grade and similar construction: 95 percent of maximum dry density.

2. At other locations: 95 percent of maximum dry density.

J. Reshape and re-compact fills subjected to vehicular traffic.

K. Maintain temporary means and methods, as required, to remove all water while fill is being placed as required, or until directed by the Architect. Remove and replace soils deemed unsuitable by classification and which are excessively moist due to lack of dewatering or surface water control.

3.04 **FILL AT SPECIFIC LOCATIONS**

A. Use general fill unless otherwise specified or indicated per Soils Engineer recommendation in Geo-Tech Report and/or drawings.

3.05 **TOLERANCES**

A. Top Surface of General Filling: Plus or minus 1 inch from required elevations.

B. Top Surface of Filling Under Paved Areas: Plus or minus 1 inch from required elevations.

3.06 **FIELD QUALITY CONTROL**

A. See Section 01 40 00 - Quality Requirements, for general requirements for field inspection and testing.

B. Soil Fill Materials:

1. Evaluate results in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D698 ("standard Proctor"), ASTM D1557 ("modified Proctor") or AASHTO T 180.

2. If tests indicate work does not meet specified requirements, remove work, replace and retest.

3. Frequency of Tests: 1 per every 2,000 SF of area.

3.07 **CLEANING**

A. See Section 01 74 19 - Construction Waste Management and Disposal, for additional requirements.

B. Leave unused materials in a neat, compact stockpile.

C. Leave borrow areas in a clean and neat condition. Grade to prevent standing surface water.

END OF SECTION

SECTION 31 37 00
RIPRAP

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Riprap .

1.02 RELATED REQUIREMENTS

A. Section 31 23 23 - Fill: Aggregate requirements.

1.03 QUALITY ASSURANCE

A. Perform Work in accordance with City of Pueblo.

B. Maintain one copy of each document on site.

PART 2 PRODUCTS

2.01 MATERIALS

A. Riprap: Provide in accordance with City of Pueblo.

B. Aggregate: Granular fill as specified in Section 31 23 23.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not place riprap bags over frozen or spongy subgrade surfaces.

3.02 PLACEMENT

A. Place geotextile fabric over substrate, lap edges and ends.

B. Place riprap at culvert pipe ends, embankment slopes, [_____] and as indicated.

C. Installed Thickness: 5 inch average.

END OF SECTION

SECTION 32 11 23
AGGREGATE BASE COURSES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Aggregate base course.

B. Paving aggregates.

1.02 RELATED REQUIREMENTS

A. Section 31 22 00 - Grading: Preparation of site for base course.

B. Section 31 23 16.13 - Trenching: Compacted fill over utility trenches under base course.

C. Section 31 23 23 - Fill: Topsoil fill at areas adjacent to aggregate base course.

D. Section 31 23 23 - Fill: Compacted fill under base course.

E. Section 32 12 16 - Asphalt Paving: Finish and binder asphalt courses.

F. Section 32 13 13 - Concrete Paving: Finish concrete surface course.

G. Section 32 14 13 - Precast Concrete Unit Paving.

H. Section 32 17 13 - Parking Bumpers: Concrete bumpers.

1.03 REFERENCE STANDARDS

A. AASHTO T 180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18 in.) Drop 2018.

B. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)) 2012, with Editorial Revision (2015).

C. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN m/m3)) 2012, with Editorial Revision (2015).

D. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System) 2011.

E. ASTM D6938 - Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth) 2017.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Materials Sources: Submit name of imported materials source.

C. Aggregate Composition Test Reports: Results of laboratory tests on proposed and actual materials used.

D. Compaction Density Test Reports.

1.05 DELIVERY, STORAGE, AND HANDLING

A. When necessary, store materials on site in advance of need.

B. When aggregate materials need to be stored on site, locate where specified by Owner.

C. Aggregate Storage, General:

1. Separate differing materials with dividers or stockpile separately to prevent intermixing.

2. Prevent contamination.

3. Protect stockpiles from erosion and deterioration of materials.

PART 2 PRODUCTS

2.01 MATERIALS

A. Coarse , Blended, Medium, and Fine Aggregate: Coarse, blended, medium, and fine aggregate, conforming to City of Pueblo Public Works Department standard and Soils Engineer recommendation in Geo-Tech Report.

B. Herbicide: [_____] ; [_____] manufactured by [_____].

2.02 SOURCE QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for general requirements for testing and analysis of aggregate materials.

B. Where aggregate materials are specified using ASTM D2487 classification, test and analyze samples for compliance before delivery to site.

C. If tests indicate materials do not meet specified requirements, change material and retest.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that survey bench marks and intended elevations for the work are as indicated.

B. Verify substrate has been inspected, gradients and elevations are correct, and is dry.

3.02 PREPARATION

A. Correct irregularities in substrate gradient and elevation by scarifying, reshaping, and re-compacting.

B. Do not place aggregate on soft, muddy, or frozen surfaces.

3.03 INSTALLATION

A. Spread aggregate over prepared substrate as per City of Pueblo standards.

B. Place aggregate in maximum 4 inch layers and roller compact to specified density.

C. Level and contour surfaces to elevations and gradients indicated.

D. Add small quantities of fine aggregate to coarse aggregate as appropriate to assist compaction.

E. Add water to assist compaction. If excess water is apparent, remove aggregate and aerate to reduce moisture content.

F. Use mechanical tamping equipment in areas inaccessible to compaction equipment.

G. Apply herbicide to finished surface.

3.04 TOLERANCES

A. Flatness: Maximum variation of 1/4 inch measured with 10 foot straight edge.

B. Scheduled Compacted Thickness: Within 1/4 inch.

C. Variation From Design Elevation: Within 1/2 inch.

3.05 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for general requirements for field inspection and testing.

B. Compaction density testing will be performed on compacted aggregate base course in accordance with ASTM D1556, ASTM D2167 or ASTM D6938.

C. Results will be evaluated in relation to compaction curve determined by testing uncompacted material in accordance with AASHTO T 180, ASTM D698 ("standard Proctor") or ASTM D1557 ("modified Proctor").

D. If tests indicate work does not meet specified requirements, remove work, replace and retest.

E. Frequency of Tests: 1 per 2,000 SF.

F. Proof roll compacted aggregate at surfaces that will be under slabs-on-grade.

3.06 **CLEANING**

A. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.

END OF SECTION

SECTION 32 12 16
ASPHALT PAVING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Aggregate base course.

B. Single course bituminous concrete paving.

1.02 RELATED REQUIREMENTS

A. Section 09 91 13 - Exterior Painting: Pavement markings.

B. Section 31 22 00 - Grading: Preparation of site for paving and base.

C. Section 31 23 23 - Fill: Compacted subgrade for paving.

D. Section 32 11 23 - Aggregate Base Courses: Aggregate base course.

E. Section 32 13 13 - Concrete Paving: Concrete substrate.

F. Section 32 13 13 - Concrete Paving: Concrete curbs.

G. Section 32 14 13 - Precast Concrete Unit Paving.

H. Section 32 17 13 - Parking Bumpers: Concrete bumpers.

I. Section 32 17 23.13 - Painted Pavement Markings: Concrete bumpers.

1.03 REFERENCE STANDARDS

A. AI MS-2 - Asphalt Mix Design Methods 2015.

B. ASTM D946 - Standard Specification for Penetration-Graded Asphalt Cement for Use in Pavement Construction 2009a.

1.04 QUALITY ASSURANCE

A. Perform Work in accordance with City of Pueblo.

B. Mixing Plant: Conform to City of Pueblo.

C. Obtain materials from same source throughout.

1.05 FIELD CONDITIONS

A. Do not place asphalt when ambient air or base surface temperature is less than 40 degrees F, or surface is wet or frozen.

B. Place bitumen mixture when temperature is not more than 15 F degrees below bitumen supplier's bill of lading and not more than maximum specified temperature.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

A. Conform to applicable code for paving work on public property.

2.02 MATERIALS

A. Asphalt Cement: ASTM D946.

B. Aggregate for Base Course: In accordance with Municipality of Pueblo Public Work's standards.

2.03 ASPHALT PAVING MIXES AND MIX DESIGN

A. Use dry material to avoid foaming. Mix uniformly.

B. Base Course: Municipality of Pueblo Public Work's standards.

2.04 SOURCE QUALITY CONTROL

A. Test mix design and samples in accordance with AI MS-2.

PART 3 EXECUTION

3.01 **EXAMINATION**

A. Verify that compacted subgrade is dry and ready to support paving and imposed loads.

B. Verify gradients and elevations of base are correct.

3.02 **BASE COURSE**

A. Place and compact base course.

3.03 **PREPARATION - PRIMER**

A. Apply primer in accordance with manufacturer's instructions.

B. Apply primer on aggregate base or subbase at uniform rate of 1/3 gal/sq yd.

C. Use clean sand to blot excess primer.

3.04 **PREPARATION - TACK COAT**

A. Apply tack coat in accordance with manufacturer's instructions.

B. Apply tack coat on asphalt or concrete surfaces over subgrade surface at uniform rate of 1/3 gal/sq yd.

C. Coat surfaces of manhole and catch basin frames with oil to prevent bond with asphalt pavement. Do not tack coat these surfaces.

3.05 **PLACING ASPHALT PAVEMENT - SINGLE COURSE**

A. Install Work in accordance with State of [_____] Highways standards.

B. Place asphalt within 24 hours of applying primer or tack coat.

C. Compact pavement by rolling to specified density. Do not displace or extrude pavement from position. Hand compact in areas inaccessible to rolling equipment.

D. Perform rolling with consecutive passes to achieve even and smooth finish without roller marks.

3.06 **TOLERANCES**

A. Flatness: Maximum variation of 1/4 inch measured with 10 foot straight edge.

B. Compacted Thickness: Within 1/4 inch of specified or indicated thickness.

C. Variation from True Elevation: Within 1/2 inch.

3.07 **FIELD QUALITY CONTROL**

A. See Section 01 40 00 - Quality Requirements, for general requirements for quality control.

B. Provide field inspection and testing. Take samples and perform tests in accordance with AI MS-2.

3.08 **PROTECTION**

A. Immediately after placement, protect pavement from mechanical injury until surface temperature is less than 140 degrees F.

END OF SECTION

SECTION 32 13 13
CONCRETE PAVING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Concrete sidewalks, stair steps, integral curbs, gutters, median barriers, parking areas and roads.

1.02 RELATED REQUIREMENTS

A. Section 03 10 00 - Concrete Forming and Accessories.

B. Section 03 20 00 - Concrete Reinforcing.

C. Section 03 30 00 - Cast-in-Place Concrete.

D. Section 03 35 33 - Stamped Concrete Finishing: Additional requirements for patterned surfaces.

E. Section 07 92 00 - Joint Sealants: Sealing joints.

F. Section 09 91 13 - Exterior Painting: Pavement markings.

G. Section 31 22 00 - Grading: Preparation of site for paving and base and preparation of subsoil at pavement perimeter for planting.

H. Section 31 23 23 - Fill: Compacted subbase for paving.

I. Section 32 11 23 - Aggregate Base Courses

J. Section 32 12 16 - Asphalt Paving: Asphalt wearing course.

K. Section 32 14 13 - Precast Concrete Unit Paving.

L. Section 32 17 13 - Parking Bumpers: Precast concrete parking bumpers.

M. Section 32 17 26 - Tactile Warning Surfacing: Plastic tactile and detectable warning tiles for pedestrian walking surfaces.

1.03 REFERENCE STANDARDS

A. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete 1991 (Reapproved 2009).

B. ACI 301 - Specifications for Structural Concrete 2016.

C. ACI 305R - Guide to Hot Weather Concreting 2010.

D. ACI 306R - Guide to Cold Weather Concreting 2016.

E. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement 2018.

F. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens 2018.

G. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete 2018.

H. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method 2016.

I. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete 2011.

J. ASTM C685/C685M - Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing 2014.

K. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types) 2018.

L. ASTM D1752 - Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction 2018.

1.04 **SUBMITTALS**

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on joint filler, admixtures and curing compound.

C. Design Data: Indicate pavement thickness, designed concrete strength, reinforcement, and typical details.

PART 2 PRODUCTS

2.01 **PAVING ASSEMBLIES**

A. Comply with applicable requirements of ACI 301.

B. Design paving for parking and residential streets.

C. Concrete Sidewalks and Median Barrier: 4,000 psi 28 day concrete, 4 inches thick, buff color Portland cement, exposed aggregate finish unless otherwise indicated on drawings.

D. Parking Area Pavement: 4,000 psi 28 day concrete, 5 inches thick, 6 by 6 - W2.9 by W2.9 mesh reinforcement, wood float finish, unless otherwise indicated on drawings.

2.02 **FORM MATERIALS**

A. Form Materials: As specified in Section 03 10 00, conform to ACI 301.

B. Joint Filler: Preformed; non-extruding bituminous type (ASTM D1751) or sponge rubber or cork (ASTM D1752).

1. Thickness: 1/2 inch.

2.03 **REINFORCEMENT**

A. Reinforcing Steel and Welded Wire Reinforcement: Types specified in Section 03 20 00.

B. Dowels: ASTM A615/A615M, Grade 40 - 40,000 psi yield strength; deformed billet steel bars; unfinished finish or as otherwise noted on drawings.

2.04 **CONCRETE MATERIALS**

A. Concrete Materials: As specified in Section 03 30 00.

B. Fiber Reinforcement: Synthetic fibers shown to have long-term resistance to deterioration when in contact with alkalis and moisture; 1/2 inch length.

2.05 **ACCESSORIES**

A. Curing Compound: ASTM C309, Type 1, Class A.

B. Liquid Surface Sealer.

C. Surface Retarder:

1. Color: As selected by Architect from manufacturer's standard range.

D. Slab Isolation Joint Filler: 1/2 inch thick, height equal to slab thickness, with removable top section that will form 1/2 inch deep sealant pocket after removal.

1. Material: ASTM D1751, cellulose fiber.

E. Tactile Warning Surfaces: See Section 32 17 26.

2.06 **CONCRETE MIX DESIGN**

A. Proportioning Normal Weight Concrete: Comply with ACI 211.1 recommendations.

B. Concrete Strength: Establish required average strength for each type of concrete on the basis of field experience or trial mixtures, as specified in ACI 301.

1. For trial mixtures method, employ independent testing agency acceptable to Architect for preparing and reporting proposed mix designs.

C. Admixtures: Add acceptable admixtures as recommended in ACI 211.1 and at rates recommended by manufacturer.

D. Fiber Reinforcement: Add to mix at rate of 1.5 pounds per cubic yard, or as recommended by manufacturer for specific project conditions.

E. Concrete Properties:

1. Compressive strength, when tested in accordance with ASTM C39/C39M at 28 days; [_____] psi.

2. Fly Ash Content: Maximum 15 percent of cementitious materials by weight.

3. Calcined Pozzolan Content: Maximum 10 percent of cementitious materials by weight.

4. Silica Fume Content: Maximum 5 percent of cementitious materials by weight.

5. Cement Content: Minimum [___] lb per cubic yard.

6. Water-Cement Ratio: Maximum 40 percent by weight.

7. Total Air Content: 4 percent, determined in accordance with ASTM C173/C173M.

8. Maximum Slump: 3 inches.

9. Maximum Aggregate Size: [__] inch.

2.07 **MIXING**

A. On Project Site: Mix in drum type batch mixer, complying with ASTM C685/C685M. Mix each batch not less than 1-1/2 minutes and not more than 5 minutes.

B. Transit Mixers: Comply with ASTM C94/C94M.

PART 3 EXECUTION

3.01 **EXAMINATION**

A. Verify compacted subgrade is acceptable and ready to support paving and imposed loads.

B. Verify gradients and elevations of base are correct.

3.02 **SUBBASE**

A. See Section 32 11 23 for construction of base course for work of this Section.

3.03 **PREPARATION**

A. Moisten base to minimize absorption of water from fresh concrete.

B. Coat surfaces of manhole frames with oil to prevent bond with concrete pavement.

C. Notify Architect minimum 24 hours prior to commencement of concreting operations.

3.04 **FORMING**

A. Place and secure forms to correct location, dimension, profile, and gradient.

B. Assemble formwork to permit easy stripping and dismantling without damaging concrete.

C. Place joint filler vertical in position, in straight lines. Secure to formwork during concrete placement.

3.05 **REINFORCEMENT**

A. Place reinforcement at midheight of slabs-on-grade.

B. Interrupt reinforcement at contraction joints.

C. Place dowels to achieve pavement and curb alignment as detailed.

D. Provide doweled joints [____] inch on center at transverse joints.

3.06 **COLD AND HOT WEATHER CONCRETING**

A. Follow recommendations of ACI 305R when concreting during hot weather.

B. Follow recommendations of ACI 306R when concreting during cold weather.

C. Do not place concrete when base surface temperature is less than 40 degrees F, or surface is wet or frozen.

3.07 **PLACING CONCRETE**

A. Place concrete in accordance with City of Pueblo of Public Works standards.

B. Do not place concrete when base surface is wet.

C. Ensure reinforcement, inserts, embedded parts, formed joints are not disturbed during concrete placement.

D. Place concrete continuously over the full width of the panel and between predetermined construction joints. Do not break or interrupt successive pours such that cold joints occur.

E. Place concrete to pattern indicated.

F. Apply surface retarder to all exposed surfaces in accordance with manufacturer's instructions.

3.08 **JOINTS**

A. Align curb, gutter, and sidewalk joints.

B. Place 3/8 inch wide expansion joints at 20 foot intervals and to separate paving from vertical surfaces and other components and in pattern indicated.

1. Form joints with joint filler extending from bottom of pavement to within 1/2 inch of finished surface.

2. Secure to resist movement by wet concrete.

C. Provide scored joints.

1. At intervals per drawings.

2. Between sidewalks and curbs.

3. Between curbs and pavement.

D. Provide keyed joints as indicated.

E. Saw cut contraction joints 3/16 inch wide at an optimum time after finishing. Cut 1/3 into depth of slab.

3.09 **FINISHING**

A. Area Paving: Light broom, texture perpendicular to pavement direction.

B. Sidewalk Paving: Light broom, texture perpendicular to direction of travel with troweled and radiused edge 1/4 inch radius.

C. Median Barrier: Light broom, texture perpendicular to direction of travel with troweled and radiused edge 1/4 inch radius.

D. Curbs and Gutters: Light broom, texture parallel to pavement direction.

E. Inclined Vehicular Ramps: Broomed perpendicular to slope.

F. Place sealer on exposed concrete surfaces immediately after finishing. Apply in accordance with manufacturer's instructions.

3.10 TOLERANCES

A. Maximum Variation of Surface Flatness: 1/4 inch in 10 ft.

B. Maximum Variation From True Position: 1/4 inch.

3.11 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests, as specified in Section 01 40 00 - Quality Requirements.

1. Provide free access to concrete operations at project site and cooperate with appointed firm.

2. Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of concrete operations.

3. Tests of concrete and concrete materials may be performed at any time to ensure conformance with specified requirements.

B. Compressive Strength Tests: ASTM C39/C39M; for each test, mold and cure three concrete test cylinders. Obtain test samples for every 100 cu yd or less of each class of concrete placed.

1. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.

2. Perform one slump test for each set of test cylinders taken.

C. Maintain records of placed concrete items. Record date, location of pour, quantity, air temperature, and test samples taken.

3.12 PROTECTION

A. Immediately after placement, protect pavement from premature drying, excessive hot or cold temperatures, and mechanical injury.

B. Do not permit pedestrian traffic over pavement until 75 percent design strength of concrete has been achieved.

END OF SECTION

SECTION 32 14 14
PERMEABLE ARTICULATING CONCRETE BLOCK MAT

PART 1 GENERAL

1.01 SCOPE OF WORK

A. The contractor shall furnish all labor, materials, equipment, and incidentals required and perform all operations in connection with the installation of the permeable articulating concrete block/mats (P-ACB/M) in accordance with the fines, grades, design and dimensions shown on the contract drawings and as specified herein.

1.02 SUBMITTAL

A. The contractor shall submit to the engineer all manufacturer's performance research results and calculations in support of the permeable articulating concrete block/mat (P-ACBM) system and geotextile proposed for use.

B. The contractor shall furnish manufacturer's certificates of compliance for the permeable articulating concrete blocks/mats, revetment cable, and any revetment cable fittings and connectors to the engineer prior to the start of mat fabrication.

C. The contractor shall furnish to the engineer all manufacturer's specifications, literature, and layout drawings for the fabrication of the mats (if applicable) prior to assembly of the P-ACB/M.

1.03 PRE-CONSTRUCTION MEETING

A. Approximately two weeks prior to the start of the installation, a pre-construction meeting shall occur with the representative(s) from the design team, the general contractor, the excavation contractor, the installation contractor and the manufacturer's representative.

PART 2 PRODUCTS

2.01 GENERAL

A. Permeable articulating concrete block/mats shall be pre-manufactured of individual concrete blocks with specific storm water runoff capacities. Blocks may be hand placed, mechanically installed, or fabricated into mats by the use of revetment cables. The mats shall arrive at the jobsite assembled according to lengths and widths as specified on the shop drawings.

B. Individual blocks in the P-ACB/M shall be staggered, beveled, and interlocked for enhanced stability. The blocks/mats shall be constructed of closed cell blocks with an arched storage chamber for additional storm water runoff as shown on the contract drawings. Parallel strands of cable shall extend through two (2) ducts in each block in a manner which provides for longitudinal binding of the blocks within the mats. Each row of blocks shall be laterally offset by one-half block width from the adjacent row so that any given block is interlocked and cabled to four other blocks (two in the row above and two in the row below). Six adjacent blocks shall also surround each block.

C. Each block shall incorporate interlocking surfaces that prevent lateral displacement of the blocks within the mats when they are lifted by the longitudinal revetment cables. The interlocking surfaces must not protrude beyond the perimeter of the blocks to such an extent that they reduce the flexibility or articulating capability of the articulating concrete mats or become damaged or broken when the mats are lifted during shipment or placement. Once the mats are in place, the interlocking surfaces shall prevent the lateral displacement of the blocks even if the cables should become damaged or removed. The mats must be able to flex a minimum of 10 degrees between any given row and column of blocks in the uplift direction.

D. The cables shall be inserted into the mats in such a manner to form lifting loops at one end of the mat with the corresponding cable ends spliced together to for a lifting loop at the other end of the mat with sleeves approved by the engineer.

E. Infiltration Performance: The P-ACB/M will only be accepted when accompanied by documented third party infiltration performance characteristics based on ASTM documented third party infiltration performance characteristics based on ASTM C1701/C1701M-09. The infiltration rate shall be no less than 2,000 inches per hour on an outdoor working surface, with typical base material utilized for the test.

F. Structural Performance: The design of the P-ACB/M shall be capable of supporting AASHTO H-25 and HS-25 Truck Loading. The blocks should be analyzed as unreinforced concrete arches supporting a uniform truck tire load with impact per AASHTO standards. As with all vehicular traffic paving systems, the subgrade soil, geosynthetic and base preparation for the P-ACB/M must be properly designed and prepared. This is critical to the performance of the system.

2.02 CELLULAR CONCRETE BLOCKS

A. Materials

1. Cementitious Materials – Materials shall conform to the following applicable ASTM specifications:
   a. Portland Cements – Specification C 150, for Portland Cement.
   b. Blended Cements – Specification C 595, for Blended Hydraulic Cements.
   c. Hydrated Lime Types – Specification C 207, for Hydrated Lime Types.
   d. Pozzolans – Specification C 618, for Fly Ash and Raw or Calcinated Natural Pozzolans for use in Portland Cement Concrete.
2. Aggregates shall conform to the following ASTM specifications, except that grading requirements shall not necessarily apply:
   a. Normal Weight – Specification C 33, for Concrete Aggregates.

B. Physical Requirements

1. At the time of delivery to the work site, the units shall conform to the physical requirements prescribed below:

TABLE 1: PHYSICAL CHARACTERISTICS

ITEM	DESCRIPTION	VALUES
Dimensions	Length x Width x Height	12" x 12" x 5.65" (+/-1/8")
Compressive strength	ASTM D-6684/C-140	4,000 psi minimum
Block weight		Arched Block: 45-50 lbs/sf
Loading capabilities	Traffic rating	AASHTO HS-25
Joint filler between blocks	Material used	None required
Percent open space		Surface: 7% Storage: 20%
Water Absorption (%)Density (lbs/cf)	ASTM D-6684/C-140	9.1% Avg. of Three, 11.7% Individual 130 avg. of Three, 125 Individual
Storage capacity	Above aggregate within arch	0.0833 CF/Block
Post-installation, verified surface infiltration rate	ASTM C1701/C 701M-09	Minimum 2,000 inches/hour/sf

C. Visual Inspection

1. All units shall be sound and free of defects that would interfere with the proper placing of the unit or impair the strength or permanence of the construction. Surface cracks incidental to the usual methods of manufacture, or surface shipping resulting from customary methods of handling in shipment. and delivery, shall not be deemed grounds for rejection.

D. Sampling and Testing

1. The purchaser or his authorized representative shall be accorded proper access to the manufacturer to inspect and sample the permeable articulating concrete blocks at the place of manufacture from lots ready for delivery.

E. Expense of Tests

1. Additional testing, other than that provided by the manufacturer, shall be borne by the purchaser.

F. Manufacturer

1. The permeable articulating concrete block/mat shall be PaveDrain® or preapproved equal, as noted in Division 1.

2.03 **REVETMENT CABLE AND FITTINGS (WHEN APPLICABLE)**

A. General. Cable & Fittings are used only with Matted Installations. If blocks are not cabled into mats and placed by hand/machine, this section does not apply.

B. Polyester Revetment Cable and fittings. Revetment cable shall be constructed of high tenacity, low elongating, continuous filament polyester fibers. Cable shall consist of a core construction comprised of parallel fibers contained within an outer jacket or cover. The weight of the parallel core shall be between 65% to 70% of the total weight of the cable. The revetment cable shall have the following physical characteristics listed below.

NOMINAL CABLE DIAM -	**CIRCUM**	**APPROX.AVE.STRENGTH LBS.**	**WEIGHT/MIN.LBS.**	**100FT.MAX LBS.**
1/4"	20 mm	3,700	2.47	2.74
5/16"	27 mm	7,000	3.99	4.42

NOTE: POLYESTER CABLE SHALL BE DETERMINED BY THE SUPPLIER, BASED ON THE SIZE OF THE MATS TO BE PLACED.

C. Elongation requirements specified below are based upon stabilized new, dry, cable. Stabilization refers to a process in which the cable is cycled fifty (50) times between a load corresponding to 200D2 and a load equal to 10%, 20%, or 30% of the cables approximate average breaking strength. Relevant elongation values are as shown in the table below. The tolerance on the values is +-5%.

	% BREAKING STRENGTH10%		
	20%	**30%**	
Permanent Elongation (while working)	0.7	1.8	2.6
Elastic Elongation	0.6	1.4	2.2
Total Stretch	1.3	3.2	4.8

D. The revetment cable shall exhibit good to excellent resistance to most concentrated acids, alkalis, and solvents. Cable shall be impervious to rot, mildew and degradation.

E. The materials used in the construction of the cable shall not be affected by continuous immersion in storm water runoff.

F. Selection of cable and fittings shall be made in a manner that insures a safe design factor for mats being lifted from both ends, thereby forming a catenary. Consideration shall be

taken for the bending of the cables around hooks or pins during lifting. Revetment cable splicing fittings shall be selected so that the resultant splice shall provide a minimum of 60% of the minimum rated cable strength. Fittings such as sleeves and stops shall be aluminum unless otherwise shown on the contract drawings.

2.04 **SIZE OF PERMEABLE ARTICULATING CONCRETE BLOCK/MATS**

A. Unless otherwise specified in the layout drawings, the P-ACB/M shall be a standard size of 7.14' x 17.4' (124 sf).

PART 3 FOUNDATION PREPARATION AND MAT INSTALLATION

3.01 **FOUNDATION AND PREPARATION**

A. General. Areas on which permeable articulating concrete block/mats are to be placed shall be constructed to the lines and grades shown on the contract drawings and to the tolerances specified in the contract documents, and approved by the engineer.

B. Subgrade. Unless required on engineering drawings, compaction of subgrade should be avoided or minimized in order to encourage infiltration of storm water.

C. Geotextile Separator or Geogrid Stabilization. Install monofilament or multi filament geotextile (such as a Mirafi RS3801, equivalent, or other materials as shown on engineered drawings). The geotextile should be used on the bottom and sides of the installation to prevent contamination of clean base stone. A geogrid is also appropriate for base stabilization, but is not recommended on the sides of the aggregate base.

D. Stone Base. If more than 6” of base stone is required, only the top 4-6” shall be AASHTO #57 Stone (3/4" - 1" Clean, angular, with no fines, LA Abrasion <45) which is used as a leveling course directly beneath the blocks. Additional stone depth should consist of either AASHTO#2 or #3 stone, or as shown in drawings. The first leveling course of AASHTO #57 Stone shall be placed in a 2" lift and then rolled into the underlying AASHTO #2 or #3 stone. The final 2-4" lift shall be compacted with a plate compactor in both the perpendicular and parallel directions in the area of coverage.

E. Grading & Compaction. The aggregate bedding layer shall be graded to a smooth plane surface to ensure intimate contact is achieved between the legs of the permeable articulating concrete block/mats and the aggregate bedding layer.

F. All base stone (AASHTO #2 or #3) shall be compacted in 6-8” lifts with roller.

G. Recommended Geogrid Separator. Install BX-1100 (or equal) geogrid separator directly on top of prepared leveling course.

H. Inspection. Immediately prior to placing the P-ACB/M mats the prepared area shall be inspected by the engineer, the Owner's representative, and or by the manufacturer's representative. No blocks/mats shall be placed thereon until that area has been approved by one of these parties.

3.02 **PLACEMENT OF PERMEABLE ARTICULATING CONCRETE BLOCKS/MATS**

A. General. Permeable articulating concrete block/mats, shall be constructed within the specified lines and grades shown on the contract drawings.

B. Placement. The P-ACB/M shall be placed on the geogrid separator or on the aggregate bedding layer so as to produce a smooth plane surface. No individual block within the plane of placed articulating concrete mats shall protrude more than one quarter of an inch or as otherwise specified by the engineer.

C. If installed in mats the P-ACB/M shall be attached to a spreader bar or other conventional device to aid in the lifting and placing of the mats in their proper position by the use of a large, tracked excavator or other appropriate equipment. The equipment used should be

adequate capacity to place the mats without bumping, dragging, or otherwise damaging the aggregate bedding layer. The mats shall be "zippered" together forming a seamless mat to mat connection.

D. Consultation. The manufacturer’s representative shall provide design and construction advice during the design and installation phases of the project.

E. Finishing. The joints between the P-ACB/M do not require backfilling with smaller aggregates or sand in order to function properly. The joints are means to be left open. This includes following maintenance of the P-ACB/M.

F. Post Installation Certification. Upon completion of the P-ACB/M installation, the surface infiltration rate of the pavement shall be verified by ASTM C1701M-09 to confirm the required infiltration rate of the pavement (per Section 2.1, Table1). If the system fails to perform as required in section Table 1 of this spec, it shall be removed and replaced at the suppliers' cost.

END OF SECTION

SECTION 32 17 13
PARKING BUMPERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Precast concrete parking bumpers and anchorage.

1.02 REFERENCE STANDARDS

A. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement 2018.

B. ASTM C150/C150M - Standard Specification for Portland Cement 2018.

C. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete 2010a (Reapproved 2016).

D. ASTM C330/C330M - Standard Specification for Lightweight Aggregates for Structural Concrete 2017a.

1.03 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide unit configuration, dimensions.

PART 2 PRODUCTS

2.01 MATERIALS

A. Parking Bumpers: Precast concrete, conforming to the following:

1. Cement: ASTM C150/C150M, Portland Type I - Normal; white color.
2. Concrete Materials: ASTM C330/C330M aggregate, water, and sand.
3. Reinforcing Steel: ASTM A615/A615M, deformed steel bars; unfinished, strength and size commensurate with precast unit design.
4. Air Entrainment Admixture: ASTM C260/C260M.
5. Concrete Mix: Minimum 5,000 psi compressive strength after 28 days, air entrained to 5 to 7 percent.
6. Use rigid molds, constructed to maintain precast units uniform in shape, size and finish. Maintain consistent quality during manufacture.
7. Embed reinforcing steel, and drill or sleeve for two dowels.
8. Cure units to develop concrete quality, and to minimize appearance blemishes such as non-uniformity, staining, or surface cracking.
9. Minor patching in plant is acceptable, providing appearance of units is not impaired.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install units without damage to shape or finish. Replace or repair damaged units.

B. Install units in alignment with adjacent work.

C. Fasten units in place with 2 dowels per unit.

END OF SECTION

SECTION 32 17 23.13
PAINTED PAVEMENT MARKINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Parking lot markings, including parking bays, crosswalks, arrows, handicapped symbols and curb markings.

B. Roadway lane markings and crosswalk markings.

C. "No Parking" curb painting.

1.02 RELATED REQUIREMENTS

A. Section 32 12 16 - Asphalt Paving.

B. Section 32 13 13 - Concrete Paving.

C. Section 32 17 26 - Tactile Warning Surfacing: Plastic tactile and detectable warning tiles for pedestrian walking surfaces.

1.03 REFERENCE STANDARDS

A. FS TT-B-1325 - Beads (Glass Spheres); Retro-Reflective 2007d (Validated 2017).

B. MPI (APL) - Master Painters Institute Approved Products List; Master Painters and Decorators Association Current Edition.

C. FHWA MUTCD - Manual on Uniform Traffic Control Devices for Streets and Highways; U.S. Department of Transportation, Federal Highway Administration Current Edition.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used, including:

1. Preparation instructions and recommendations.
2. Storage and handling requirements and recommendations.
3. Installation methods.

C. Certificates: Submit for each batch of paint and glass beads stating compliance with specified requirements.

D. Maintenance Materials: Furnish the following for Owner 's use in maintenance of project.

1. See Section 01 60 00 - Product Requirements, for additional provisions.
2. Extra Paint: 2 containers, 1 gallon size, of each type and color.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver paint in containers of at least 5 gallons accompanied by batch certificate.

B. Deliver glass beads in containers suitable for handling and strong enough to prevent loss during shipment accompanied by batch certificate.

C. Store products in manufacturer's unopened packaging until ready for installation.

D. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.06 FIELD CONDITIONS

A. Do not install products under environmental conditions outside manufacturer's absolute limits.

PART 2 PRODUCTS

2.01 **MATERIALS**

A. Line and Zone Marking Paint: MPI (APL) No. 97 Latex Traffic Marking Paint; color(s) as indicated.

1. Roadway Markings: As required by authorities having jurisdiction.
2. Parking Lots: White.
3. Handicapped Symbols: Blue.

B. Reflective Glass Beads: FS TT-B-1325, Type I (low index of refraction), Gradation A (coarse, drop-on) ; with silicone or other suitable waterproofing coating to ensure free flow.

C. Temporary Marking Tape: Preformed, reflective, pressure sensitive adhesive tape in color(s) required; Contractor is responsible for selection of material of sufficient durability as to perform satisfactorily during period for which its use is required.

D. Tactile Warning Surfaces: See Section 32 17 26.

PART 3 EXECUTION

3.01 **EXAMINATION**

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 **PREPARATION**

A. Allow new pavement surfaces to cure for a period of not less than 14 days before application of marking materials.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Clean surfaces thoroughly prior to installation.

1. Remove dust, dirt, and other granular surface deposits by sweeping, blowing with compressed air, rinsing with water, or a combination of these methods.
2. Completely remove rubber deposits, existing paint markings, and other coatings adhering to the pavement, by scraping, wire brushing, sandblasting, mechanical abrasion, or approved chemicals.

D. Where oil or grease are present, scrub affected areas with several applications of trisodium phosphate solution or other approved detergent or degreaser, and rinse thoroughly after each application; after cleaning, seal oil-soaked areas with cut shellac to prevent bleeding through the new paint.

E. Establish survey control points to determine locations and dimensions of markings; provide templates to control paint application by type and color at necessary intervals.

F. Temporary Pavement Markings: When required or directed by Architect , apply temporary markings of the color(s), width(s) and length(s) as indicated or directed.

1. After temporary marking has served its purpose, remove temporary marking by carefully controlled sandblasting, approved grinding equipment, or other approved method so that surface to which the marking was applied will not be damaged.
2. At Contractor 's option, temporary marking tape may used in lieu of temporary painted marking; remove unsatisfactory tape and replace with painted markings at no additional cost to Owner .

3.03 **INSTALLATION**

A. Begin pavement marking as soon as practicable after surface has been cleaned and dried.

B. Do not apply paint if temperature of surface to be painted or the atmosphere is less than 50 degrees F or more than 95 degrees F.

C. Apply in accordance with manufacturer's instructions using an experienced technician that is thoroughly familiar with equipment, materials, and marking layouts.

D. Comply with FHWA MUTCD manual (http://mutcd.fhwa.dot.gov) for details not shown.

E. Apply markings in locations determined by measurement from survey control points; preserve control points until after markings have been accepted.

F. Apply uniformly painted markings of color(s), lengths, and widths as indicated on drawings true, sharp edges and ends.

1. Apply paint in one coat only.
2. Wet Film Thickness: 0.015 inch, minimum.
3. Width Tolerance: Plus or minus 1/8 inch.

G. Roadway Traffic Lanes: Use suitable mobile mechanical equipment that provides constant agitation of paint and travels at controlled speeds.

1. Conduct operations in such a manner that necessary traffic can move without hindrance.
2. Place warning signs at the beginning of the wet line, and at points well in advance of the marking equipment for alerting approaching traffic from both directions. Place small flags or other similarly effective small objects near freshly applied markings at frequent intervals to reduce crossing by traffic.
3. If paint does not dry within expected time, discontinue paint operations until cause of slow drying is determined and corrected.
4. Skip Markings: Synchronize one or more paint "guns" to automatically begin and cut off paint flow; make length of intervals as indicated.
5. Use hand application by pneumatic spray for application of paint in areas where a mobile paint applicator cannot be used.
6. Distribute glass beads uniformly on the paint lines within ten seconds without any waste, applied at rate of 6 pounds per gallon of paint; if the marking equipment does not have a glass bead dispenser, use a separate piece of equipment adjusted and synchronized with the paint applicator; remove and replace markings having faulty distribution of beads.

H. Parking Lots: Apply parking space lines, entrance and exit arrows, painted curbs, and other markings indicated on drawings.

1. Mark the International Handicapped Symbol at indicated parking spaces.
2. Hand application by pneumatic spray is acceptable.

I. Symbols: Use a suitable template that will provide a pavement marking with true, sharp edges and ends, of the design and size indicated.

3.04 **DRYING, PROTECTION, AND REPLACEMENT**

A. Protect newly painted markings so that paint is not picked up by tires, smeared, or tracked.

B. Provide barricades, warning signs, and flags as necessary to prevent traffic crossing newly painted markings.

C. Allow paint to dry at least the minimum time specified by the applicable paint standard and not less than that recommended by the manufacturer.

D. Remove and replace markings that are applied at less than minimum material rates; deviate from true alignment; exceed length and width tolerances; or show light spots, smears, or other deficiencies or irregularities.

E. Remove markings in manner to avoid damage to the surface to which the marking was applied, using carefully controlled sand blasting, approved grinding equipment, or other approved method.

F. Replace removed markings at no additional cost to Owner .

END OF SECTION

SECTION 32 17 26
TACTILE WARNING SURFACING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Plastic tactile and detectable warning tiles for pedestrian walking surfaces.

1.02 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Concrete for sidewalks and platforms.

B. Section 32 13 13 - Concrete Paving: Concrete sidewalks.

C. Section 32 17 23.13 - Painted Pavement Markings: Crosswalk and curb markings.

1.03 REFERENCE STANDARDS

A. 49 CFR 37 - Transportation Services for Individuals with Disabilities (ADA) current edition.

B. AASHTO LRFD - Bridge Design Specifications 2017.

C. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design 2010.

D. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar 2015.

E. ASTM B117 - Standard Practice for Operating Salt Spray (Fog) Apparatus 2018.

F. ASTM C501 - Standard Test Method for Relative Resistance to Wear of Unglazed Ceramic Tile by the Taber Abraser 1984 (Reapproved 2015).

G. ASTM C903 - Standard Practice for Preparing Refractory Specimens by Cold Gunning 2015, with Editorial Revision (2016).

H. ASTM D2047 - Standard Test Method for Static Coefficient of Friction of Polish-Coated Flooring Surfaces as Measured by the James Machine 2011.

I. ASTM D543 - Standard Practices for Evaluating the Resistance of Plastics to Chemical Reagents 2014.

J. ASTM D570 - Standard Test Method for Water Absorption of Plastics 1998 (Reapproved 2010).

K. ASTM D638 - Standard Test Method for Tensile Properties of Plastics 2014.

L. ASTM D695 - Standard Test Method for Compressive Properties of Rigid Plastics 2015.

M. ASTM D790 - Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials 2016.

N. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2018b.

O. ASTM G155 - Standard Practice for Operating Xenon Arc Light Apparatus for Exposure of Nonmetallic Materials 2013.

P. ATBCB PROWAG - Proposed Accessibility Guidelines for Pedestrian Facilities in the Public Right-of-Way 2011.

1.04 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit manufacturer's product data, standard details, details specific to this project; written installation and maintenance instructions.

C. Shop Drawings: Submit plan and detail drawings. Indicate:

1. Locations on project site. Demonstrate compliance with referenced accessibility standards.
2. Sizes and layout.
3. Pattern spacing and orientation.
4. Attachment and fastener details, if applicable

D. Warranty: Submit manufacturer warranty; complete forms in Owner's name and register with manufacturer.

1.05 **DELIVERY, STORAGE, AND HANDLING**

A. Deliver to project site in manufacturer's protective wrapping and in manufacturer's unopened packaging.

B. Store covered and elevated above grade and in manufacturer's unopened packaging until ready for installation. Maintain at ambient temperature between 40 and 90 degrees F.

1.06 **WARRANTY**

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Plastic Tiles: Provide manufacturer's standard five year warranty against manufacturing defects, breakage or deformation.

PART 2 PRODUCTS

2.01 **TACTILE AND DETECTABLE WARNING DEVICES**

A. Plastic Tactile and Detectable Warning Tiles: ADA Standards compliant, glass fiber and carbon fiber reinforced, exterior grade, matte finish polyester sheet with truncated dome pattern, solid color throughout, internal reinforcing of sheet and of truncated domes, integral radius cut lines on back face of tile; with factory applied removable protective sheeting.

1. Material Properties:
    a. Water Absorption: 0.20 percent, maximum, when tested in accordance with ASTM D570.
    b. Slip Resistance: 0.50 minimum dry static coefficient of friction, when tested in accordance with ASTM D2047.
    c. Compressive Strength: 25,000 pounds per square inch, minimum, when tested in accordance with ASTM D695.
    d. Tensile Strength: 10,000 pounds per square inch, minimum, when tested in accordance with ASTM D638.
    e. Flexural Strength: 25,000 pounds per square inch minimum, when tested in accordance with ASTM D790.
    f. Chemical Stain Resistance: No reaction to 1 percent hydrochloric acid, motor oil, calcium chloride, gum, soap solution, bleach, or antifreeze, when tested in accordance with ASTM D543.
    g. Abrasion Resistance: 300, minimum, when tested in accordance with ASTM C501.
    h. Flame Spread Index: 25, maximum, when tested in accordance with ASTM E84.
    i. Accelerated Weathering: Delta-E of less than 5.0 at 2,000 hours exposure, when tested in accordance with ASTM G155.
    j. Adhesion: No delamination of tile prior to board failure in a temperature range of 20 to 180 degrees F, when tested in accordance with ASTM C903.

k. Loading: No damage when tested according to AASHTO LRFD test method HS20.

l. Salt and Spray Performance: No deterioration or other defect after 200 hours of exposure, when tested in accordance with ASTM B117.

2. Installation Method: Cast in place.

3. Shape: As indicated on drawings.

4. Pattern: In-line pattern of truncated domes complying with ADA Standards.

5. Color: As selected by Architect from manufacturer's standard range.

2.02 **ACCESSORIES**

A. Fasteners: ASTM A666, Type 304 stainless steel

1. Type: Countersunk, color matched composite sleeve anchors

2. Size: 1/4 inch diameter and 1-1/2 inches long.

B. Adhesive: Type recommended and approved by surfacing tile manufacturer.

C. Sealant: Elastomeric sealant of color to match adjacent surfaces; approved by surfacing tile manufacturer.

PART 3 EXECUTION

3.01 **EXAMINATION**

A. When installation location is near site boundary or property line, verify required location using property survey.

B. Verify that work area is ready to receive work:

1. If existing conditions are not as required to properly complete the work of this section, notify Architect.

2. Do not proceed with installation until deficiencies in existing conditions have been corrected.

C. Verify that dimensions, tolerances, and attachment methods for work in this section are properly coordinated with other work on site.

3.02 **INSTALLATION, GENERAL**

A. Install in accordance with manufacturer's written instructions.

1. Do not install damaged, warped, bowed, dented, abraded, or otherwise defective units.

2. Do not install when ambient or substrate temperature has been below 40 degrees F during the preceding 8 daylight hours.

B. Field Adjustment:

1. Locate relative to curb line in compliance with ATBCB PROWAG, Sections 304 and 305.

2. Orient so dome pattern is aligned with the direction of ramp.

3. Align truncated dome pattern between adjacent units.

C. Install units fully seated to substrate, square to straight edges and flat to required slope.

3.03 **INSTALLATION, CAST IN PLACE PLASTIC TILES**

A. Concrete:

1. See Section 03 30 00.

2. Slump: 4 to 7 percent.

B. When installing multiple adjacent units, leave a 3/16 inch gap between units to allow for expansion.

C. Tamp and vibrate units as recommended by manufacturer.

D. Place and position weights on units while concrete cures as recommended by manufacturer. Ensure no voids or air pockets exist between top surface of concrete and underside of units.

3.04 **INSTALLATION, SURFACE APPLIED PLASTIC TILES**

A. Cure concrete surfaces for a minimum of 4 days before installing units.

B. Verify substrate is clean and dry; free of voids, projections and loose material. Remove dust, oil, grease, curing compounds, sealers and other substances that may interfere with adhesive bond or sealant adhesion.

C. Mechanically roughen surface as required to remove contaminants and prepare surface for adhesive and sealant application.

D. When installing multiple adjacent units, leave a 1/8 inch gap between tiles to allow for expansion.

E. Drill fastener holes straight, true and to depth recommended by manufacturer.

F. Apply adhesive to back of unit as recommended by manufacturer.

G. Mechanically fasten to substrate. Avoid striking or damaging the unit itself during installation.

H. Apply sealant to edges in cove profile.

3.05 **CLEANING PLASTIC UNITS**

A. Remove protective plastic sheeting within 24 hours of installation.

B. Remove excess sealant or adhesive from joints and edges.

C. Clean four days prior to date of scheduled inspection.

3.06 **PROTECTION**

A. Protect installed units from traffic, subsequent construction operations or other imposed loads until concrete is fully cured.

B. Touch-up, repair or replace damaged products prior to Date of Substantial Completion.

END OF SECTION

SECTION 32 31 15
FENCES, GATES, AND OPERATORS

PART 1 GENERAL

1.01 SUMMARY

A. Section includes Linear Low Density Polyethylene Plastic (LLDPE) fences and swing gates.

B. Related Sections:

1. Section 03300 – Cast-in-Place Concrete (concrete for post footings)

2. Section 02205 – Earthwork (for filling and grading work)

1.02 PERFORMANCE REQUIREMENTS

A. Structural Performance: Fence and gate framework shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.

B. Minimum and Maximum Spacing:

C. Panel height of 6’ will withstand wind speeds of 110 mph.

D. Panel width: 6 feet and 8’ as shown on the drawings.

1.03 REFERENCES

A. American Society for Testing and Materials (ASTM):

B. ASTM E 90, Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.

1.04 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and pre-consumer recycled content. Include statement indicating cost for each product having recycled content. “Laboratory Test Reports for Credit IEQ 4” Subparagraph below applied to LEED for Schools.

C. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work. First paragraph below assumes manufacturer’s standard-size.

D. Samples: For each polymer-coated product and for each color and texture specified, in 6-inch (150 mm) lengths for components and on full-sized units for accessories according to Section 01300 Submittals.

1.05 INFORMATIONAL SUBMITTALS

A. Product Certificates.

B. Product Test Reports.

C. Sample of Special Warranty.

1.06 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.07 WARRANTY

A. Special Warranty: Manufacturer’s standard form agrees to repair or replace components of the fences and gates that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to: materials beyond normal weathering.

B. Warranty Period: Five (5) years from the date of Substantial Completion.

PART 2 PRODUCTS

2.01 PRODUCTS

2.02 MANUFACTURER

A. SimTek Fence.

B. Approved equal according to Section 01320 Substitutions.

2.03 PANELS

A. General: Provide Linear Low Density Polyethylene Plastic (LLDPE) containing UV-12 Inhibitors.

B. Panel Width: Six (6) Feet (1829 mm), Eight (8) Feet (2438 mm) or as indicated on the drawings.

1. Color: Faux Stone (as selected by Architect from manufacturer's full range).

C. Single Panel Height: Four (4) or Six (6) Feet (1829 mm), as indicated on drawings.

1. Color: Faux Stone (as selected by Architect from manufacturer's full range).

2.04 FENCE FRAMING - POSTS

A. Line Post: Impact resistant, rotational molded, made with linear low density polyethylene plastic (LLDPE), shell containing UV inhibitors and with a rigid recycled polyethylene foam core.

1. Internal eleven (11) gauge (.114) galvanized Z-Beam (2 legs x 3.56 web) reinforcement steel, 144" long.

2. Posts shall be 5' x 5' – "H" section, 144" long with two 2" x 2" channels on opposite sides to receive panels. Approximate weight is 56 lbs.

B. Corner Post: Impact resistant, rotational molded, made with linear low density polyethylene plastic (LLDPE), shell containing UV inhibitors and with a rigid recycled polyethylene foam core.

1. Internal eleven (11) gauge (.065) galvanized box-tube 2" x 2" reinforcement steel, 144" long.

2. Posts shall be 5' x 5' – "L" section, 144" long with two 1" x 2" channels on adjacent sides to receive panels. Approximate weight is 56 lbs.

C. End Post: Impact resistant, rotational molded, made with linear low density polyethylene plastic (LLDPE), shell containing UV inhibitors and with a rigid recycled polyethylene foam core.

1. Internal eleven (11) gauge (.065) galvanized box-tube 2" x 3" reinforcement steel, 144" long.

2. Posts shall be 5' x 5' – "C" section, 144" long with two 2" x 2" channels on one side to receive panels. Approximate weight is 56 lbs.

D. Gate Post: Impact resistant, rotational molded, made with linear low density polyethylene plastic (LLDPE), shell containing UV inhibitors and with a rigid recycled polyethylene foam core.

1. Internal eleven (11) gauge (.125) galvanized box-tube 2" x 3" with two each 1/8" x 2" flat stock reinforcement steel, 144" long.

2. Posts shall be 5' x 5' – "C" section, 144" long with two 2" x 2" channels on one side to receive panels. Approximate weight is 82 lbs.

3. Color: Faux Stone (as selected by Architect from manufacturer's full range – match fence panel.)

2.05 **GATE**

A. Sizes: 72" High x 48" Wide (1829 mm High x 1219 mm Wide.

B. Color: Faux Stone (as selected by Architect from manufacturer's full range – match fence panel.)

C. Hardware:

1. Spring Loaded Hinge: Stainless Steel; Black
2. Heavy Duty Latch: Stainless Steel; Black
3. Heavy Duty Striker Rod: Stainless Steel; Black
4. Drop Rod: Stainless Steel; Black

2.06 **ACCESSORIES**

A. Post Caps: Impact resistant, rotational molded, made with linear low density polyethylene plastic (LLDPE), shell containing UV inhibitors.

1. Single:
   a. Dimension - 6.5 inches x 6.5 inches (165 x 165 mm)
   b. Approximate weight: 0.4 lbs. (181 g)
2. Double Inline:
   a. Dimension – 11.5 inches x 6.5 inches (292 x 165 mm)
   b. Approximate weight: 0.7 lbs. (318 g)
3. Double 45 Degree:
   a. Approximate weight: 0.7 lbs. (318 g)

B. Filler Panel - Impact resistant, rotational molded, made with linear low density polyethylene plastic (LLDPE), shell containing UV inhibitors.

C. Cover Skirt - Impact resistant, rotational molded, made with linear low density polyethylene plastic (LLDPE), shell containing UV inhibitors.

1. Color: Faux Stone (as selected by Architect from manufacturer's full range – match fence panel.)

D. Cast-in-Place Anchors in Concrete: Either threaded type or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A 47/A 47M malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F 2329.

E. Material for Exterior Locations and Where Stainless Steel in Indicated: Alloy Group 1 (A1) stainless-steel bolts, ASTM F 593 (ASTM F 738M) and nuts, ASTM F 594 (ASTM F 836M).

PART 3 EXECUTION

3.01 **EXAMINATION AND PREPARATION**

A. Verify that survey in first paragraph below is specified in Division 01 Section "Execution" or is otherwise available. Consider using sleeves to leave voids in new concrete substrates.

1. Examine areas and conditions, with Installer present, for compliance with requirements for a verified survey of property lines and legal boundaries, site clearing, earthwork, pavement work, and other conditions affecting performance of the Work.

2. Do not begin installation before final grading is completed unless otherwise permitted by Architect.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

C. Stake locations of fence lines, gates, and posts. Do not exceed intervals of 500 feet (152.5 m) or line of sight between stakes. Indicate locations of utilities, lawn sprinkler system, underground structures, benchmarks, and property monuments.

D. Post Excavation: Drill or hand-excavate holes for posts to diameters and spacings indicated, in firm, undisturbed soil.

3.02 **INSTALLATION**

A. Post Setting: Set posts in concrete at indicated spacing into firm, undisturbed soil, with mechanical anchors, at indicated spacing, into firm, undisturbed soil.

1. Verify that posts are set plumb, aligned, and at correct height and spacing, and hold in position during setting with concrete or mechanical devices.

2. Install brackets for panel installation before setting posts.

B. Concrete Fill: Place concrete around posts to dimensions indicated and vibrate or tamp for consolidation. Protect above ground portion of posts from concrete splatter.

1. Exposed Concrete: Extend two (2) inches (50 mm) above grade; shape and smooth to shed water.

C. Retaining Wall and Flat Concrete Installation:

1. Concrete Mounting Brackets are manufactured with a heavy steel plate with vertical members attached to concrete with anchors and bolts to the post.

2. Post shall be cut to required height and to accommodate changes in elevation. (Cut bottom of post to retain factory finished post top.)

3. The Panels will set directly on the concrete surface and shall not require panel support brackets.

D. Line Posts: Space line posts uniformly as per Manufacturer’s recommendations.

3.03 **PANEL INSTALLATION**

A. Single Height Panel:

1. Panels are universal with no front or back and no top or bottom.

2. Verify that brackets have been installed correctly. Adjust as required.

3. Install panels and secure to posts according to manufacturer’s written instructions.

a. Never attach both edges of any panel to posts to allow for expansion and contraction.

B. Cutting Panels:

1. Remove steel stiffeners from panels. Determine the exact width between post channels. Mark and cut stiffeners to that width with a metal cutting blade.

2. Mark and cut the panel to the stiffener width, minus ½” to allow for thermal expansion and contraction of the panel. Make certain panels are cut accurately with edges parallel.

3. If a cut panel is used with an end or corner post, use the factory edge for attachment to the post.

END OF SECTION

SECTION 33 00 10
SITE UTILITIES

PART 1 GENERAL

1.01 DESCRIPTION

A. Scope: includes all layout, trenching, piping, backfill, and compaction for the systems following. Work shall extend from a point approximately 5'-0" outside the building exterior wall to the point of connection or termination indicated on the drawings or specified herein.

B. Systems: include storm drain, sanitary sewer, fire lines, natural gas lines, domestic water lines, and perforated perimeter drains.

1.02 REGULATIONS, REFERENCES, AND STANDARDS

A. Applicable sections and referenced sections of the following standards, latest edition in effect on date of Invitation for Bids, shall form a part of these specifications.

1. American Society for Testing and Materials (ASTM)

PART 2 PRODUCTS

2.01 MATERIALS

A. USE PIPE MATERIALS REQUIRED BY APPLICABLE CODES AND ORDINANCES, AND AS INDICATED ON THE DRAWING.

1. PVC: Schedule 40
2. PVC: SDR 35, ASTM D3035
3. Copper: Type K soft
4. Black steel pipe
5. PVC: Class 200 psi

PART 3 EXECUTION

3.01 LAYOUT

A. Locate: existing utility lines. Stake out, establish, and maintain grades and elevation as required. Check and verify accuracy.

3.02 EXCAVATION, TRENCHING, AND BACKFILL

A. Comply: with requirements of Earthwork Section; provide compaction tests.

B. Keep: excavation and trenching free of water. Grade adjacent surface area to prevent surface water from entering. Provide pumping if required.

3.03 INSTALLATION OF PIPE

A. Lay pipe: true to established lines and grades with bells or groove end upgrade.

B. Lay pipe: on properly prepared foundation bed providing support for full length of pipe.

C. Remove: all dirt and foreign matter from pipe as work progresses.

D. During work stoppage periods: provide plugs or covers for open ends of pipe to prevent foreign matter from entering.

E. Test pipe: for leaks prior to backfilling.

3.04 COMPLETION

A. Backfill: and compact trenching per requirements of Section 31 00 00; provide compaction tests.

B. Repair: any cuts made in asphalt paving, concrete walks, etc., in accordance with the requirements of the applicable sections of the specifications.

END OF SECTION

SECTION 33 41 00
SUBDRAINAGE

PART 2 PRODUCTS

END OF SECTION