

# PROJECT MANUAL

## Point Breeze Scattered Site Rehabs Philadelphia, PA

1159 S. Cleveland Street  
1628 Manton Street  
1633 S. Taylor Street  
1637 S. 24<sup>th</sup> Street  
1734 S. 24<sup>th</sup> Street  
2325 Watkins Street

07-28-14



**CICADA**  
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## **DIVISION 01 – GENERAL REQUIREMENTS**

### ***SECTION 01 10 00- GENERAL REQUIREMENTS***

#### A. Permits

1. The contractor shall secure and pay for the building permit. The contractor, and/or his subcontractors, shall secure and pay for all other permits and governmental fees, licenses, and inspections necessary for proper execution and completion of the work.
  - a. The developer may secure the necessary permits as directed by OHCD/PHDC/PRA.

#### B. Codes and Regulations

1. The contractor and his subcontractors to comply with all laws, ordinances, rules, regulations, and orders of any public authority having jurisdiction on the performance of the work.
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.

#### C. Taxes

1. The contractor shall pay sales, consumer, use and similar taxes for the work or portions thereof provided by the contractor which are legally enacted when bids are received or negotiations concluded.

#### D. Labor and Material

1. Unless otherwise 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.
2. The contractor shall enforce strict discipline 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. Substitutions: Product names, if and where noted, are given as a standard for type and quality.
  - a. Contractor or developer may propose substitution for any named product by submitting sufficient information (catalog cuts, technical data, performance data, samples, etc.) to prove that the proposed substitute is of equal or greater quality and will perform as well as or better than the named product to OHCD/PHDC/PRA. Substitutes are not to be installed unless approved in writing by OHCD/PHDC/PRA

#### E. Warranty

1. The contractor warrants that materials and equipment furnished under the Contract will be of good quality and new unless otherwise required or permitted, 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.

- a. The contractor's warranty excludes remedy for damage or defect caused by abuse, modifications not executed by the contractor, improper or insufficient maintenance, improper operation, or normal wear and tear under normal usage.

F. Shop Drawings, Product Data, and Samples

1. 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 Inspector and/or Architect. Such work shall be in accordance with approved submittals.
2. Shop Drawings showing all essential construction, finishes, materials, field dimensions, views and other details shall be provided for approval as required by the Specifications and/or drawings.
  - a. Contractor to submit four (4) copies of each material; one for OHCD/PHDC/PRA, one for the Inspector, one for the Architect, and one to be returned to the contractor.
2. Samples and Product Data to establish standards of acceptable quality shall be submitted to OHCD/PHDC/PRA.
  - a. Contractor to submit four (4) copies of each material; one for OHCD/PHDC/PRA, one for the Inspector, one for the Architect, and one to be returned to the contractor.

G. Review of Contract Documents and Field Conditions

1. The contractor to carefully study and compare the Contract Documents with each other and with information furnished by OHCD/PHDC/PRA and shall report any errors, inconsistencies, or omissions discovered to the Architect, developer, and OHCD/PHDC/PRA.
2. The contractor to take field measurements and verify field conditions and to compare such field measurements and information with the Contract Documents before commencing activities. Immediately report any errors, inconsistencies, or omissions discovered to the Architect, developer, and OHCD/PHDC/PRA.

H. Use of Site

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

I. Cutting and Patching

1. The contractor is responsible for cutting, fitting or patching required to complete the work or to make its parts fit together properly.

J. Cleaning Up

1. The contractor to keep the premises and surrounding area free from accumulation of waste materials or rubbish caused by construction operations.

- a. The contractor to provide daily clean up of the site.
2. At completion of the work the contractor to remove from and about the Project waste materials, rubbish, the contractor's tools, construction equipment, machinery, and surplus materials.

K. Indemnification

1. Upon completion of the Project, and prior to final payment, the contractor to provide a complete waiver of liens, including a waiver of liens from each subcontractor and material supplier, stating that each has received payment for all labor and materials relating to the Project and disclaiming any right to file a lien against the property.

L. Insurance

1. Certificates of Insurance, on a form acceptable to OHCD/PHDC/PRA shall be submitted, prior to the start of the work, to OHCD/PHDC/PRA.
  - a. Submit one copy to the Architect and developer.

M. Execution of the Work

1. The contractor to install and maintain dust barriers, temporary covers and temporary doors as required to maintain security, safety, weather tightness, and cleanliness.
2. The contractor to provide secure temporary supports as required and maintain same until permanent supports are fully in place.
3. At Project completion, the contractor to provide a "Clean" building and site, vacuum carpet and mop hard surface floors, wipe down walls, ceilings, and fixtures. Remove all stains and paints from glass, flooring, plastic laminate, metal, and similar finishes. The interior of the building is to be dust free, ready for the Lead Risk Assessors to perform their final assessment.

**END OF SECTION**



**SECTION 01 20 00 - PROJECT SUMMARY**

A. Project Description

1. Project Name and Location:

Name: Point Breeze Scattered Site Rehabs  
Owner: Philadelphia Redevelopment Authority  
Locations: 1159 S. Cleveland Street (Market-rate unit)  
1628 Manton Street (Market-rate unit)  
1633 S. Taylor Street  
1637 S. 24<sup>th</sup> Street  
1734 S. 24<sup>th</sup> Street  
2325 Watkins Street  
Architect: CICADA Architecture/Planning, Inc.

2. Project Summary: The project consists of the complete renovation of (6) two-story single-family homes in the Point Breeze neighborhood of Philadelphia.
3. Projected Date of Occupancy: Spring 2015
4. Scope of Work: Unless otherwise specifically noted, the Contractor shall provide and pay for all labor, materials, equipment, tools, construction equipment and machinery, transportation, and other facilities and services necessary for the proper execution and completion of the Work.
5. Bid Submission Documents: The following documents must be provided by the General Contractor as part of the bid submission:
- a. Bid Form with completed Redevelopment Authority of Philadelphia Construction Cost Estimate form attached
  - b. Non-Collusion Affidavit
  - c. Bid Bond
  - d. Contractor's Qualification Statement
  - e. Timeline for Construction Activity Subcontracting: The GC/bidder must specify anticipated dates for advertising bids or soliciting services, selecting subcontractors, forwarding executed contracts, and submitting monthly summary reports.
  - f. Contractor's Certificate of Compliance: The GC/bidder must sign and return a certification (form attached) indicating their commitment to making good faith efforts to utilize disadvantaged and/or local low-income residents and businesses in the project.
  - g. Contractor's Workforce Needs/Manpower Utilization: The GC/Bidder must indicate the anticipated number of employment and training positions to be filled during the course of the project.
  - h. Contractor's Affirmative Action Plan for Business Utilization: The GC/Bidder must specify the anticipated number and dollar amounts of subcontracts to be let during the course of the project.
  - i. Bid Solicitation and Commitment: The GC/Bidder must list all contractors solicited for each bid opportunity and indicate the dollar amount of contracts committed, if any.
  - j. Certification of Training, Employment, and Contracting Opportunities for Business and

Lower Income Persons: The GC/bidder must sign and return the attached certification.

6. Special Requirements:
  - a. Prior or Concurrent Work by Owner or Others: None.
  - b. Existing Site Conditions and Restrictions: None.
  - c. Contractor's Use of Premises and Adjacent Facilities: Contractor shall have full access to the sites.
  - d. Owner-Furnished and Owner-Installed Items: None.

B. Contract Forms

1. Owner Contractor Agreement: AIA Document A101-1997, Stipulated Sum Edition.
2. Bid Bond: AIA Document A310-1970.
3. Non-Collusion Affidavit of Bidder: See Specification Section 00 08 00.
4. Material and Payment Bond: AIA Document 312-1984, Performance Bond and Labor and Material Payment Bond: for 100% of the contract amount.
5. General Conditions of the Contract for Construction: AIA Document A201-1997 (copy attached).
6. Waiver of Liens: See Specification Section 00 08 10.
7. Contractor's Affidavit of Release of Liens: AIA Document G706A-1994.
8. Contractor's Application and Certificate for Payment: AIA Document G702-1992.
9. Economic Opportunity Plan:
  - a. Contractor's Certification of Compliance
  - b. Contractor's Workforce Needs/Manpower Utilization
  - c. Contractor's Affirmative Action Plan for Business Utilization
  - d. Bid Solicitation and Commitment
  - e. Certification of Training, Employment, and Contracting Opportunities for Business and Lower Income Persons
10. Contractor's Request for Information: Contractor's standard form.
11. Change Order: AIA Document G701-2000.
12. Supplementary General Conditions:
  - a. Preconstruction requirements:
  - b. The Contractor shall examine the site and verify all dimensions and conditions before start of construction. Any discrepancies shall be reported immediately to the Architect.

C. Testing



1. Testing Agency: Independent testing agency engaged and paid for by Owner.

D. Coordination

1. Coordination: Coordination of site work, utilities, and building construction.
2. Schedule: Bar-chart type project schedule indicating the estimated time duration and sequence requirements for each major activity or trade identified on the PRA Construction Cost Estimate form. An updated schedule is to be submitted by the Contractor with each Application and Certificate for Payment.

E. Field Engineering

1. Underground Utilities: Verification and location of underground utilities, facilities, and equipment.

F. Project Meetings

1. Pre-Construction Conference: Attendance by Owner, Architect, Engineers, Contractor and Owner's Representative, if applicable.
2. Progress Meetings: Biweekly; attendance by Owner, Architect, Engineers, Contractor and Owner's Representative, if applicable. Contractor is responsible for tracking and reviewing the status of outstanding Requests for Information (RFI's). Architect is responsible for production and distribution of meeting minutes.

G. Submittals

1. Project Submittals: Reproducible plus three copies of shop drawings, three copies for product data and warranties, two representative units for samples. The PRA
2. will require their Energy Consultant to review and approve submittals for windows and mechanical systems before installation proceeds.
3. Record Documents: Record drawings, record specifications and maintenance manuals.
4. Substitutions and "Or Equal": Product names are given as a standard of type and quality. The Architect and Owner will approve other products that, in their opinion, are of equal quality and performance. For any proposed substitution, the Contractor shall provide sufficient catalog sheets, technical information, and/or samples to the Architect for approval. Use of substitutions is subject to such approval; substitutions shall not be installed until approval is granted.

H. Quality Control

1. Codes and Regulations: The Contractor and his subcontractors shall comply with all laws, ordinances, rules, regulations, and orders of any public authority bearing on the performance of the Work.
2. Standards: Quality of materials and workmanship shall generally be in accordance with the best standards and practices of the trades involved.
3. Any discrepancy in the Drawings or Specifications shall be brought to the attention of the Architect.

I. Temporary Facilities

1. Temporary Utility Service: All new temporary utility services including temporary heating systems

during cold weather.

2. Temporary Facilities: Temporary construction, support facilities, and security measures. One of the properties will be designated as the Contractor's field office; the Contractor is responsible for supplying drinking water, sanitary facilities, a telephone/fax line, plan table and meeting facilities.
3. Security, Safety, and Cleanliness: The Contractor shall install and maintain dust barriers, temporary covers and temporary doors as required to maintain security, safety and cleanliness. The Contractor shall provide daily cleanup of construction areas.

J. Contract Closeout

1. Waiver of Liens: Upon completion of the project, and prior to final payment, the contractor shall provide a complete release of all liens with all subcontractors and suppliers, stating that each has received payment for all labor and materials related to the project and disclaiming any right to file a lien against the property.
2. At job completion, the Contractor shall provide a "broom clean" work area and shall, in addition, remove and clean all stains and paints from glass, flooring, laminate, metal, and similar finishes.
3. Extra Materials: General Contractor is to provide each property with a minimum of one (1) gallon of each paint used and 10% of the floor area of each floor finish and base used.
4. At Substantial Completion, have the final property survey recorded by or with local governing authorities as the official "property survey".
5. At Substantial Completion, reduction of retainage from 10% to 5% will be approved provided that the Contractor submits, at a minimum, the following closing documents:
  - a. Certificate of Occupancy and/or all Permits signed off by Philadelphia L&I.
  - b. Electrical Certificate from the Underwriter.
  - c. Plumbing Certificate from L&I.
  - d. Roof Warranty/Guarantee must be provided by the General Contractor (not the roofing subcontractor).
  - e. Complete set of As-built Drawings (incorporating field changes) for all trades.
  - f. Copies of the Change Order Log, Shop Drawing/Submittal Log, all sketches and Product Data.
  - g. Final Construction Schedule.
  - h. All Engineering Reports, if applicable.
  - i. All Manufacturer's Certifications.
  - j. All Guarantees and/or Warranties.
  - k. All Testing and Balancing approvals (including Blower Door Test results).
  - l. Operation and Maintenance data/manuals.
  - m. Subcontractor's and Material Suppliers final "Release of Liens."

**END OF SECTION**

**DIVISION 1- GENERAL REQUIREMENTS**

***SECTION 01 21 00- BASIS OF DESIGN***

A. Product/Finish Schedule:

<p>04 MASONRY Unit Masonry Assemblies - 04 20 00</p>	<p>Brick Type: Where required, new brick is to match existing, unless drawings indicate that wall is to be covered with stucco. Submit sample(s) of brick for approval.</p> <p>Provide reinforced precast concrete lintels for window and door openings where indicated for stucco finished masonry walls.</p>
<p>04 MASONRY Cast Stone - 04 30 00</p>	<p>Provide Reinforced Cast Stone Lintels for door and window openings, where indicated for exposed brick walls. Provide cast stone sills for window openings where indicated for exposed brick walls and for stucco faced masonry walls. Submit samples for approval from Continental Cast Stone or approved equal.</p>
<p>05 METALS Decorative Metals - 05 70 00</p>	<p>Steel handrail for new painted steel railings to be Julius Blum #4428, or approved equal.</p>
<p>06 WOODS, PLASTICS &amp; COMPOSITE Finish Carpentry – 06 20 00</p>	<p>Wood rail for railing at bottom of stairs to second floor and for wall-mounted railing to be oak railing in natural clear finish with railing profile as indicated on detail D1/A4.1</p> <p>Exterior trim to be painted fiber-cement trim or painted Azek Cellular PVC.</p>
<p>07 THERMAL &amp; MOISTURE PROTECTION Drainage Plane – 07 28 00</p>	<p>Provide layer of Benjamin Obdyke "Home Slicker" drainage mat, vented at top and bottom, over Water Resistive Barrier (WRB) beneath all installations of fiber cement siding and trim.</p>
<p>07 THERMAL &amp; MOISTURE PROTECTION Siding – 07 46 00</p>	<p>Fiber Cement Siding: Smooth Lap Siding, without wood grain, width 7.25" for 6" exposure.</p> <p>Fiber Cement Trim: Boards Smooth, ¾" thick by 3 ½" wide for corner boards and for trim between bottom of siding and exposed soffit.</p> <p>Soffit and Porch Ceilings: For soffits of overhanging bays and for porch ceiling provided Fiber-cement, beaded porch panels</p>
<p>07 THERMAL &amp; MOISTURE PROTECTION Modified Bituminous Roofing – 07 52 00</p>	<p>Roof Warranty: minimum 5 year installation warranty to be provided for all roofing, in addition to manufacturers' warranties.</p>

<p>07 THERMAL &amp; MOISTURE PROTECTION</p> <p>Roofing Accessories or Plumbing</p>	<p>Provide cast iron combination downspout boot with area drain.</p>
<p>08 OPENINGS</p> <p>Doors and Frames - 08 11 00</p>	<p>Interior Door Profile: Masonite Two panel, smooth finish (wood grain texture not permitted).</p> <p>Exterior Door Profile: Fiberglass smooth finish (wood grain texture not permitted) with two panel square top, no glazing.</p>
<p>08 OPENINGS</p> <p>Storm Doors and Windows – 08 20 00</p>	<p>Combination Storm door: Self-Storing Storm Door, White finish</p>
<p>08 OPENINGS</p> <p>Windows - 08 50 00</p>	<p>Double Hung windows, or casement windows where indicated on drawings with matching brick moulding and jambs and head and extended subsill.</p> <p>Window Color: White</p>
<p>08 OPENINGS</p> <p>Security Screens and Doors – 08 56 00</p>	<p>Security Storm Door: Divided Lite security storm door, White finish.</p>
<p>08 OPENINGS</p> <p>Door Hardware - 08 71 00</p>	<p>Door Hardware: Lever Set: Passage function &amp; Privacy lock for bathrooms and bedrooms; Satin nickel finish.</p> <p>Door Hardware: Entrance Handleset: Entrance Lock with profiled exterior handleset and interior lever set; satin nickel finish.</p> <p>Provide hinges, stops, thresholds and weatherstripping as indicated in specifications. Standard finish for hinges and stops to be satin nickel finish. Threshold to have satin nickel or satin stainless steel finish.</p>
<p>09 FINISHES</p> <p>Portland Cement Plastering - 09 24 00</p>	<p>Three-coat stucco over metal lath.</p> <p>Stucco Finish: Medium Sand Float</p> <p>Stucco Color: As selected by Owner from manufacturer's standard colors</p>
<p>09 FINISHES</p> <p>Tiling - 09 30 00</p>	<p>Kitchen Backsplash tile: White, 3"x6" subway tile, full height with accent tiles where indicated on drawings.</p> <p>Kitchen Floor Tile: 12" x12" nominal Porcelain Floor Tiles, with matching bullnose wall base tile, to be selected.</p> <p>Powder Room Floor Tile: Porcelain Floor Tiles, to be selected.</p> <p>Bathroom Tile: Porcelain Floor Tiles, with matching bullnose base tile, except for bathrooms scheduled to receive wainscot wall tile, to be selected.</p>

Bathroom Wall Tile (where indicated in interior elevations)

Wainscot Tile: White, 3"x6" subway tile, with bullnose edge tile at top, with row of Accent Glass Mosaic tiles, to be selected.

Tub Surround: White 6"x6" tiles with 3"x6" bullnose tope edge tile and with accent glass mosaic tile to be selected.

Grout: to be selected

Thresholds: Marble to be selected

Provide recessed shelf in shower where indicated in the interior elevations.

Setting Methods:

Floors: Latex Thin-set, TCA F144-14

Walls: Latex Thin-set, TCA W244-14

Shower and Bath Surrounds: Latex Thin-Set with waterproof membrane; TCA B412-14

09 FINISHES

Wood Flooring - 09 64 00

Wood Flooring: Nominal 3 1/4" Oak plank flooring, finish to be selected

09 FINISHES

Carpeting – 09 60 00

Carpet: To be selected

09 FINISHES

Painting and Coating  
- 09 64 00

Interior Ceiling Paint: Flat White

Interior Trim Paint: Gloss White

Interior Wall Paint: Eggshell, color(s) to be selected

Interior Basement walls: 2 coats UGL Drylok Latex Base Masonry Waterproofer

Exterior Trim

Door: Semi-gloss, color to be selected

Cornice Trim: Semi-gloss, color to be selected

10 SPECIALTIES

Toilet and Bath Accessories –  
10 28 00

Medicine Cabinet: 24"W x 30"H recessed mounted with satin nickel or satin stainless steel finish.

Alternative is 24"w x 30" h frameless recessed mounted cabinet with beveled edge mirror.

Powder room Medicine Cabinet: Recessed Cabinet to fit in 16" stud space and to be 24" high, satin nickel or satin stainless steel finish frame.

Bath Accessories: Satin nickel Finish, Provide the following as indicated on the drawings:

Towel Bars

Towel Rings

Robe Hooks

	Toilet Paper Holder
	Curved Shower Rod
	No soap dish or tooth brush holder at sink
10 SPECIALTIES	Mail Box: Locking, wall-mounted, brushed stainless steel finish
Mailboxes – 10 28 00	House Numbers: 5" cast brass, satin nickel finish
11 EQUIPMENT	Stainless Steel Finished Appliances (Market-Rate Units):
Residential Appliances – 11 31 00	Refrigerator: 18 Cu. Ft., Stainless Steel finish; Top-mount Freezer w/Ice maker; Energy Star
	Dishwasher: 24" built-in, Energy Star; stainless steel finish
	Range: 5-burner 30" gas range, self-cleaning, gas, stainless steel finish
	Microwave/Range Hood: 30" over range microwave/hood; stainless steel finish
	Silver-Mist Finish Appliances
	Refrigerator: 18 Cu. Ft.; Top-mount Freezer w/Ice maker; Energy Star, Silver Mist Finish
	Dishwasher: 24" built-in, Energy Star; Silver Mist finish
	Range: 30" freestanding, self-cleaning, gas, Silver Mist finish
	Microwave/Range Hood: 30" over range microwave/hood; Silver Mist finish
	Garbage Disposal: Insinkerator Badger 5, 1/2 HP
12 FURNISHINGS	Window Treatments: 1" Premium Vinyl horizontal blinds, to be provided/installed at all windows.
Window Treatments - 12 20 00	For Market-rate units upgrade to 2" Premium Faux Wood Blinds
12 FURNISHINGS	Kitchen & Vanity Casework: Full overlay with Shaker doors and slab drawer fronts, all-plywood construction. Finish: To be selected.
Residential Casework – 12 35 30	Kitchen & Vanity Pulls: Stainless steel bar pulls with 3" center-to-center mounting.
	Kitchen Countertops: Plastic laminate to be selected. For market-rate units upgrade to granite counters, to be selected
22 PLUMBING	Also provide downspout boot with area drain.
Plumbing and Drainage – 22 00 00	

<p>22 PLUMBING Domestic Water Heaters – 22 36 00</p>	<p>Hot Water Heater: Bradford-White PDX4-40S6FBN; 40 gal.; Natural Gas, Power Direct Vent High EF Energy Saver Gas Water Heater, Energy Star Qualified, or approved equal.</p>
<p>22 PLUMBING Plumbing Fixtures - 22 40 00</p>	<p>Water Closet: Toto Eco Drake EL 1.28 gpf, White.</p> <p>Bathtub: 60” Cast Iron White, white 3-piece fiberglass surround where indicated on drawings.</p> <p>Tub/Shower Trim: Delta T17430; stainless finish.</p> <p>Vanity Sink: Cultural marble vanity top with integral oval bowl.</p> <p>Vanity Faucet: Delta 520-MPU-DST; stainless finish.</p> <p>Drop-in Kitchen Sink: Moen 2200 Series G221943, 7 ¾” depth.</p> <p>Kitchen Faucet: Delta 4353-DST stainless finish</p> <p>Washer Box: Oatey Quadtro, single lever ball valve</p> <p>Laundry Sink: Florestone Model 20FM Utility Sink, 20”x24”. Provide with Chicago faucet and hole punching to accommodate faucet</p>
<p>23 HVAC Exhaust System - 23 35 00</p>	<p>Exhaust fans:</p> <p>Bathrooms: Panasonic Whisper Green Lite, ENERGY STAR certified combination recessed exhaust fan with compact fluorescent light. Size to suit conditions.</p> <p>Powder Room: Panasonic Whisper Green, ENERGY STAR certified recessed exhaust fan. Size to suit conditions.</p>
<p>23 HVAC Gas Vents – 23 51 23</p>	<p>Furnace: Condensing Unit, direct vent using plastic pipe in accordance with specifications</p> <p>Hot Water Heater: Power direct vent with 2" or 3" PVC</p>
<p>23 HVAC Central Heating System Requirements – 23 52 22</p>	<p>HVAC to be air system. Provide supply in basement to temper space.</p>
<p>23 HVAC Furnaces – 23 54 00</p>	<p>High-Efficiency, gas fired condensing furnace, ENERGY STAR certified and direct-vent with exterior fresh-air intakes.</p> <p>Thermostat: Programmable</p>
<p>26 ELECTRICAL Electrical - 26 00 00</p>	<p>Recessed Light Fixture: Halo H471CAT 5” Insulated</p> <p>Ceiling Fan: Hampton Bay Windward IV 52”, Brushed nickel</p> <p>Ceiling Surface-mounted lights: AFX Capri Flush Mount CFF Series 12" diameter (2) Compact Fluorescent lamps, satin nickel finish, CFF-12-2-18W-GU- 27-SN</p> <p>Under-cabinet Light Fixture: Progress Hide-a-Lite3, P7021 (20, 22, or</p>
<p>Point Breeze Scattered Site Rehabs Philadelphia Redevelopment Authority</p>	<p>DIVISION 1 – BASIS OF DESIGN 10 21 00 - 5</p>

23), fixture w/ built-in switch, direct wire, white finish. Coordinate length with wall cabinet layout.

Vanity Light Fixture: Progress P7114-60EB with (2) F17T8 lamps

Exterior Light Fixture at Front: Eglo Ascoli Model #90121A, Up and Down light cylinder, stainless steel finish, with (2) compact fluorescent lamps.

Exterior Light Fixture at Rear: Progress Lighting P5881-30WB, white finish, with 1 GU-24 18w lamp.

Exterior Porch Light: Progress P5616-16 satin aluminum w/ white glass globe, supply with compact fluorescent lamp

Basement Light Fixture: T8 wrap-around fluorescent

31 EARTHWORK  
Termite Control – 31 31 16

Provide termite control treatment at each residence.

32 EXTERIOR  
IMPROVEMENTS  
Paving – 32 00 00

Provide asphalt paving repair as required by news work to make all utility connections to street.

32 EXTERIOR  
IMPROVEMENTS  
Landscaping – 32 92 00

All Landscaping beds in rear yards to receive sod.

**END OF SECTION**



## DIVISION 01 – GENERAL REQUIREMENTS

### ***SECTION 01 77 00- CLOSEOUT PROCEDURES***

#### A. Summary

1. Section includes, but is not limited to, the following:
  - a. Inspection procedures.
  - b. Warranties.
  - c. Final cleaning.

#### B. Substantial Completion

1. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. Certificate of Substantial Completion will not be issued until all of these items are complete:
  - a. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
  - b. Advise OHCD/PHDC/PRA of pending insurance changeover requirements.
  - c. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
  - d. Obtain and submit releases permitting OHCD/PHDC/PRA unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
  - e. Prepare and submit Project Record Documents, operation and maintenance manuals, Final Completion construction photographs, damage or settlement surveys, property surveys, and similar final record information.
  - f. Deliver tools, spare parts, extra materials, and similar items to location designated by OHDC/PHDC/PRA. Label with manufacturer's name and model number where applicable.
  - g. Make final changeover of permanent locks and deliver keys to ODDC/PHDC/PRA. Advise OHDC/PHDC/PRA personnel of changeover in security provisions.
    - 1) Remove all temporary locks installed by Contractor, sub-contractors, or other contractor related personnel.
  - h. Complete startup testing of systems.
  - i. Submit test/adjust/balance records.
  - j. Required submittals to regulatory agencies.
  - k. Terminate and remove temporary facilities from Project site, along with mockups, excess materials, construction tools, and similar elements.
  - l. Advise OHDC/PHDC/PRA of changeover in heat and other utilities.
  - m. Submit changeover information related to occupancy, use, operation, and maintenance.
  - n. Complete final cleaning requirements, including touchup painting.
  - o. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
2. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Architect or Developer and Inspector will either proceed with inspection or notify Contractor of unfulfilled requirements. OHDC/PHDC/PRA will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's

list or additional items identified by Architect or developer, that must be completed or corrected before certificate will be issued.

- a. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
  - 1) The Architect or developer will perform one re-inspection when requested and only when assured that the Work has been substantially completed.
- b. Results of completed inspection will form the basis of requirements for Final Completion.

#### C. Final Completion

1. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:
  - a. Submit a final Application for Payment according to provisions in the Contract.
  - b. Submit certified copy of Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect or developer. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
  - c. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
  - d. Submit Hazardous Material final inspection report.
  - e. Instruct OHDC/PHDC/PRA personnel in operation, adjustment, and maintenance of products, equipment, and systems.
2. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Architect or developer and Inspector will either proceed with inspection or notify Contractor of unfulfilled requirements. OHCD/PHDC/PRA will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
  - a. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
    - 1) The Architect or his consultants will perform one re-inspection when requested and only when assured that the remaining corrective Work has been completed.

#### D. List of Incomplete Items (Punch List)

1. Preparation: Submit three copies of list. Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.
  - a. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor.

- b. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
- c. Include the following information at the top of each page:
  - 1) Project name.
  - 2) Date.
  - 3) Name of Architect or developer.
  - 4) Name of Contractor.
  - 5) Page number.

E. Warranties

1. Submittal Time: Submit written warranties on request of Architect or developer for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.
2. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.
  - a. Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11 - inch paper.
  - b. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
  - c. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
3. Provide additional copies of each warranty to include in operation and maintenance manuals.

F. Materials

1. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

G. Final Cleaning

1. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
2. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition acceptable for testing by hazardous material risk assessor. Comply with manufacturer's written instructions.

- a. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:
  - 1) Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
  - 2) Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
  - 3) Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
  - 4) Remove tools, construction equipment, machinery, and surplus material from Project site.
  - 5) Remove snow and ice to provide safe access to building.
  - 6) Clean exposed exterior and interior hard-surfaced finishes to a dirt/dust-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
  - 7) Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
  - 8) Sweep and mop concrete floors in unoccupied spaces.
  - 9) Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
  - 10) Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
  - 11) Remove labels that are not permanent.
  - 12) Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
    - a) Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.
  - 13) Wipe surfaces of mechanical and electrical equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
  - 14) Replace parts subject to unusual operating conditions.
  - 15) Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.

- 16) Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
  - 17) Clean ducts, blowers, and coils if units were operated without filters during construction.
  - 18) Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
  - 19) Leave Project clean and ready for risk assessment and occupancy.
3. Pest Control: Engage an experienced, licensed exterminator to make a final inspection and rid Project of rodents, insects, and other pests. Prepare a report.
  4. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

**END OF SECTION**



## **DIVISION 01 – GENERAL REQUIREMENTS**

### ***SECTION 01 81 20- SUSTAINABLE DESIGN REQUIREMENTS***

#### A. Summary

1. The OHCD/PHDC/PRA has determined that all projects will follow a best practices approach of environmentally responsible design and construction. This Section outlines this approach. Attention will be given to: materials and products, energy and resource efficiency, durability, and indoor environmental quality both during construction and for future homeowners. These requirements are in addition to minimum efficiencies, methods, and other aspects specified in other divisions of this specification manual.
  - a. ENERGY STAR Certification: If the project will meet ENERGY STAR for New Homes certification, also refer to Part G of this Section.
  - b. LEED Certification: If the project is pursuing LEED for Homes Certification, also refer to Part H of this Section.
  
2. Section Includes:
  - a. General requirements and procedures for the following:
    - 1) Indoor Water Use.
    - 2) Heating and Cooling Distribution System.
    - 3) Space Heating and Cooling Equipment.
    - 4) Water Heating.
    - 5) Lighting.
    - 6) Appliances.
    - 7) Residential Refrigerant Management.
    - 8) Environmentally Preferable Products.
    - 9) Waste Management.
    - 10) Indoor Air Quality During Construction.

#### B. Definitions

1. Absorptive Materials: Materials which can absorb moisture and air-borne particulates leading to mold growth or other damage. Materials include but are not limited to: carpet, gypsum wallboard, and wood flooring, trim, and doors.
2. Environmentally Preferable Products: Products which contain no formaldehydes, contain no added urea-formaldehyde, and meet VOC content levels listed in other parts of this Section.
3. Green Guard: The Green Guard Environmental Institute certifies products and materials for low chemical emissions.
4. IAQ: Indoor Air Quality.
5. Urea-formaldehyde: Thermosetting resin or plastic made from urea and formaldehyde, heated in the presence of a mild base such as ammonia. Urea-formaldehyde may have short- or long-term health effects.
6. VOC: Volatile Organic Compound. Gases which are emitted from certain solids or liquids which may contain VOC's and may have short- or long-term health effects.

C. Administrative Requirements

1. Respond to questions and requests from the OHCD/PHDC/PRA.
2. Track the total amount of waste generated on the project and amount diverted from landfill. Report monthly waste totals and amount diverted totals to OHCD/PHDC/PRA with each Application for Payment. Separate diverted totals into categories listed in other parts of this Section.
3. Maintain minimum IAQ standards during construction as required by other Articles of this Section.
4. Provide Manual J calculations in accordance with most current version of the ACCA Manual J Residential Load Calculation Manual prior to purchase and/or installation of new heating or cooling equipment, unless written authorization is received from OHCD/PHDC/PRA to exclude the calculations.

D. Systems and Products

1. Systems and Products, General: Provide systems, materials and products meeting the following requirements.
2. Indoor Water Use: Comply with Division 224000 Plumbing Fixtures.
3. Heating and Cooling Distribution System: Comply with 230000 HVAC Air Distribution.



4. Space Heating and Cooling Equipment: Comply with Division 23 Sections specific to system or systems being installed.
5. Water Heating. Comply with Section 223600 Domestic Water Heaters.
6. Lighting. Comply with Section 260000 Electrical.
7. Appliances. Comply with Section 113100 Residential Appliances.
8. Residential Refrigerant Management. Comply with Section 238126 Split System Air Conditioners.
9. Environmentally Preferable Materials:
  - a. Formaldehyde Free: Select insulation products which contain no formaldehyde or are Green Guard certified.
  - b. No Added Urea-Formaldehyde: To the fullest extent possible, select engineered wood products which contain no added urea-formaldehydes in resins.
    - 1) If products containing urea-formaldehyde resins need to be used either due to inability to obtain product or cost issues, obtain written permission from OHCD/PHDC/PRA prior to purchase and installation. Clearly explain why material containing added urea-formaldehyde resin must be used in request to OHCD/PHDC/PRA. If permission is granted, follow requirements for handling and installing outlined in other Sections of the OHCD/PHDC/PRA Small Building Specifications.
  - c. Flooring: Select flooring products with the following attributes:
    - 1) Carpet and carpet pad complying with the Carpet & Rug Institute Green Label and Green Label Plus program unless approved in writing by OHCD/PHDC/PRA to install non-complying carpet and carpet pad.
  - d. Interior Paints & Finishes: Paints and coatings with low to no VOC's, complying with the following VOC content limits:
    - 1) Architectural paints and coatings applied to interior walls and ceilings must not exceed the VOC content limits established in Green Seal Standard CS11, Paints, the most current addition, available at this link:  
[http://www.greenseal.org/Portals/0/Documents/Standards/GS-11%20Stn20Dev/paints GS 11.pdf](http://www.greenseal.org/Portals/0/Documents/Standards/GS-11%20Stn20Dev/paints%20GS%2011.pdf)
    - 2) Anti-corrosive and anti-rust paints applied to interior ferrous metal substrates must not exceed the VOC content limit of 250 *g/L*.

- 3) Clear wood finishes, floor coatings, stains, primers, sealers, and shellacs applied to interior elements must not exceed the current VOC content limits established in South Coast Air Quality Management District (SCAQMD) Rule #1113, Architectural Coatings, available at the following link: <http://www.agmd.gov/rules/reg/reg11/r1113.pdf>.
- e. Adhesives and Sealants: Adhesives and sealants with low to no VOC's, complying with current VOC content limits as outlined in the South Coast Air Quality Management District (SCAQMD) Rule #1168 available at the following link: <http://www.agmd.gov/rules/reg/reg11/r1168.pdf>.

E. Waste Management

1. Performance Requirements: The OHCD/PHDC/PRA has determined that projects shall divert as much non-hazardous construction and demolition waste as possible from landfills. Amount will be measured as a percentage of the total and percent totals will be measured by weight in tons.
2. Waste Management Plan: The Contractor will develop a waste management plan. This plan will be submitted to OHCD/PHDC/PRA for review prior to starting construction. The plan will identify anticipated types of waste and a plan for diverting waste from landfills, including names of organizations and facilities which will accept the diverted waste. The following waste to be diverted will be indentified at minimum, (as applicable to each project):
  - a. Recycling Waste: Recycle paper and beverage containers used by on-site workers.
    - 1) Packaging:
      - a) Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
      - b) Polystyrene Packaging: Separate and bag materials.
      - c) Pallets: As much as possible, require deliveries using pa/lets to remove pa/lets from Project site. For pa/lets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
      - d) Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.
    - 2) Site-Clearing Wastes: Chip brush, branches, and trees off site.
    - 3) Concrete and Masonry: Place unusable excess/waste in designated area/container. Remove reinforcement and other metals from concrete and sort with other metals.
    - 4) Wood Materials: Place unusable excess/waste in designated area/container.
    - 5) Metals: Place unusable excess/waste in designated area/container.

- 6) Gypsum Board: Stack large clean pieces on wood pallets or in container and store in a dry location. Remove edge trim and sort with other metals.
- 7) Metal Suspension System: Separate metal members including trim, and other metals from acoustical panels and tile and place with other metals.

F. Indoor Air Quality During Construction

1. General: The OHCD/PHDC/PRA has determined that all projects will institute minimum IAQ standards during construction. Standards are as follows:
  - a. Smoking is prohibited inside buildings during construction and within 10 feet of any window and door openings.
  - b. Storage Area: The Contractor must designate a secure and clean area to store all absorptive materials and products.
    - 1) Designate and review this area with OHCD/PHDC/PRA prior to taking delivery of and starting to store absorptive materials.
    - 2) Keep the designated area dry, clean, and orderly; prevent contamination of products from moisture and construction debris/dirt. Cover products with tarps that are weighted down.
    - 3) Monitor the storage areas for contamination; correct problems and implement preventative measures.
  - c. Protection:
    - 1) Do not install dry materials until wet materials have been installed and allowed to dry to greatest extent practical.
    - 2) Immediately remove products exhibiting stains, mold, mildew, or other evidence of water or moisture damage from site.
    - 3) Protect fabricated ductwork stored on site, wrapped and protected from dust and debris. Elevate ductwork off of floor level.
    - 4) Completely seal exposed duct ends and exposed return air and supply air grilles with plastic film and tape, or other suitable material, until after final cleaning of unit.

G. Energy Star for New Homes Certification

1. General: This part of the Section applies only to projects pursuing ENERGY STAR for New Homes Certification, as directed by the OHCD/PHDC/PRA. This Part is in addition to all requirements in preceding parts of this Section.
2. References
  - a. ENERGY STAR National Program Requirements:

- 1) Information on current program requirements is available here:  
[www.energystar.gov/index.cfm?c=bldrs\\_lenders\\_raters.homes\\_guidelns](http://www.energystar.gov/index.cfm?c=bldrs_lenders_raters.homes_guidelns).

### 3. Administrative Requirements

- a. HERS Rater will inform the designers of ENERGY STAR requirements.
- b. HERS Rater will provide energy modeling of proposed construction to demonstrate that construction meets or exceeds ENERGY STAR for New Homes standards
- c. HERS Rater will perform inspections and tests to confirm performance in accordance with ENERGY STAR National Program Requirements.
- d. Contractor will respond to questions and requests from the OHCD/PHDC/PRA, and HERS Rater.

### H. LEED for Homes Certification

1. General: This part of the Section applies only to projects pursuing LEED for Homes Certification, as directed or approved by the PHCD/OHDC/PRA. This Part is in addition to all requirements in preceding parts of this Section References
  - a. LEED for Homes Reference Guide, current edition per USGBC and GBCI.
  - b. LEED for Homes Providers: Providers do not need to be in the state where the project is located. Refer to the USGBC website for a full listing of LEED for Homes Providers: [http://www.usgbc.org/DisplayPage.aspx?CMS\\_PageID=1\\_554](http://www.usgbc.org/DisplayPage.aspx?CMS_PageID=1_554)

### 2. Definitions

- a. In supplement and/or addition to definitions listed in Part B of this Section, the following:
  - 1) Environmentally Preferable Products: Products which contain recycled content, and are extracted, processed and manufactured locally, i.e.: within 500 miles of the home and that generally have a lesser or reduced effect on human health and the environment when compared with competing products or services that serve the same purpose. This comparison may consider raw materials acquisition, product, manufacturing, packaging, distribution, reuse, operation, maintenance, or disposal of the product or service.
  - 2) Green Rater: Individuals who work with the LEED for Homes Provider overseeing all verification services on a project.
  - 3) LEED for Homes Provider: Providers are responsible for working with eligible LEED for Homes projects, Green Raters, and verifying that homes are built to meet the requirements of the LEED for Homes Rating System.
  - 4) MERV: Minimum efficiency reporting value, a standard for mechanical air filters.
  - 5) USGBC: Unites States Green Building Council, a non-profit organization dedicated to promoting sustainable design and developers of the LEED for Homes Rating System.

3. Administrative Requirements

- a. In supplement and/or addition to requirements outlined in Part C of this Section:
  - 1) With approval to proceed with LEED certification by OHCD/PHDS/PRA, a qualified architect with LEED Accreditation shall be engaged.
  - 2) The developer and architect shall select a LEED for Homes Provider to monitor the project and perform inspections as required under LEED practices. A LEED for Homes Provider is required on LEED for Homes projects.
  - 3) Respond to questions and requests from the OHCD/PHDC/PRA, Architect, LEED for Homes Provider and Green Rater.
  - 4) Submit information to document compliance with LEED as directed by the Architect, LEED for Homes Provider and Green Rater.

4. Environmentally Preferable Materials

- a. Recycled Content: To the fullest extent possible, select products and materials which contain recycled content as defined in Part C of this Section. Materials containing recycled content include but are not limited to the following:
  - 1) Concrete
  - 2) Flooring products (carpet, vinyl, linoleum)
  - 3) Doors
  - 4) Roofing
  - 5) Drywall
- b. Extracted, Processed and Manufactured Locally: To the fullest extent possible, select products and materials which have raw materials which were extracted and processed within 500 miles of project site and which were manufactured within 500 miles of project site. Local materials are generally -but not limited to, the following:
  - 1) Concrete
  - 2) Flooring products (carpet, vinyl, linoleum)
  - 3) Doors
  - 4) Roofing
  - 5) Drywall

5. Waste Management

- a. In supplement to Part E of this Section, the following

- 1) Performance Requirements: Divert as much non-hazardous construction and demolition waste at minimum from landfills. Amount will be measured by weight in tons.

**END OF SECTION**

**DIVISION 07 – THERMAL & MOISTURE PROTECTION*****SECTION 07 - QUALITY STANDARDS & CONSTRUCTION PROCEDURES***

- A. Quality Standards: Conform to the following standard material/product attributes and installation and workmanship requirements for all Sections within this Division.
1. References:
    - a. Builder’s Guide to Mixed-Humid Climates, Joseph Lstiburek, Ph.D., PE, Building Science Corporation, c. 2005; Chapter 2 “Rain, Drainage Planes and Flashings,” Chapter 4” Insulations, Sheathings and Vapor Retarders,” and Chapter 7 “Foundation Design.”
    - b. National Roofing Contractors Association (NRCA), “NRCA Roofing and Waterproofing Manual,” most current edition.
    - c. Sheet Metal and Air Conditioning Contractors’ National Association, Inc. (SMACNA), “Architectural Sheet Metal Manual.”
    - d. Revere Copper Products, Inc., “Copper and Common Sense.”
  2. General: Products in this Division shall meet all fire safety requirements of OSHA and the City of Philadelphia and minimum ASTM standards required by code and as stated in other Division 07 Sections.
  3. Thermal Boundary: Ensure an uninterrupted boundary of thermal insulation enclosing the conditioned area (defined as mechanically heated and cooled) of the building. Basement walls and crawl space walls require insulation.
  4. Crawl Spaces: Provide minimum 6 mil polyethylene vapor barriers at all dirt crawlspaces. Lap minimum one foot up vertical wall surface.
  5. Low VOC Products: Provide adhesives and sealants meeting current VOC content limits. Refer to Section 01 81 20 “Sustainable Design Requirements” for additional direction and information.
  6. Insulation: Select insulations which contain no formaldehyde or are GreenGuard certified. Refer to Section 01 81 20 “Sustainable Design Requirements” for additional direction and information.
  7. Insulation Levels: Provide insulation levels at all exterior wall, roof, and floor assemblies, as well as under new slabs-on-grade and on new foundation walls which meet or exceed the minimum R-values required by Energy Star levels unless written permission is received to do otherwise. Note that Energy Star levels are sometimes higher than what is required by local code requirements.
  8. Air Gap in Exterior Wall Cladding Design: Provide a minimum 3/8 inch wide gap between front side of sheathing and backside of exterior wall surface cladding with furring strips to ensure an adequate drainage pathway and ability for air to circulate and aid in drying of materials.
  9. Exterior Finishes:

- a. Bowed Siding:
  - 1) Replace wood and fiber cement siding which bows greater than 1/2 inch in 60 inches.
  - 2) Remove and reinstall or fully replace aluminum or vinyl siding with waves exceeding 1/2 inch in 8 feet.
- b. Visible Gaps and Edges: Provide a bead of caulk in gaps in wood and fiber cement siding wider than 1/8 inch. Paint caulk to match adjacent siding.
- c. Parallel Courses of Lap Siding: Remove and re-install lap siding which is not parallel to the upper or lower course.
- d. Nail Stains: Remove stains exceeding 1/2 inch around nail heads which are visible from 2 feet. Use method as approved by OHCD/PHDC/PRA.
- e. Loose Siding and Trim: Reinstall or secure loose aluminum or vinyl trim per manufacturer's written instructions.

B. Construction Procedures: Conform to the following standard construction procedures. Procedures apply to all Sections within this Division.

- 1. Capillary Break - New Concrete Footings: Provide a capillary break across the top of new concrete footing by troweling-on coating of asphaltic emulsion dampproofing before laying or placing the foundation wall.
- 2. Grade existing and newly placed soils to drain away from foundations, to prevent water infiltration issues and damage to foundations.
- 3. Insulation - Storage: Store insulation delivered to site on an elevated platform in manufacturer's original wrapping. Platform may be 2x lumber strips with plywood, OSB or other similar surface. Protect insulation from weather. If manufacturer's original wrapping becomes damaged or torn, cover insulation with a waterproof covering.
- 4. Insulation Installation: Installation shall be as follows:
  - a. Batt Insulation: Install insulation tight-fitting between studs and full-depth of stud so there are no gaps or voids. Fluff and align insulation with outside edge of stud. Staple vapor retarder facing to adjacent studs.
  - b. Foamed-in Place Insulations: Spray to required depth as indicated on Drawing. When installing in stud bays, scrape any loose spray insulation debris from stud flanges prior to installing drywall.
  - c. Loose Fill Blown-in Insulations: Follow manufacturer's written instructions for installation and ensure insulation is adequately packed into cavity; avoid voids. Blow-in to required depth specified on Drawings.
- 5. Roofing Installation: Install all roofing systems in accordance with manufacturers written instructions.
  - a. Asphalt Shingles: Install shingles to be horizontally aligned. Remove and reinstall existing shingles which are not horizontally aligned to be horizontally aligned.



6. Roof Deck Conditions: All roof decks to receive new roofing will be firm, clean, smooth and dry and structurally sound, able to support live and dead load requirements of the roofing system and rigid enough to support construction traffic.
7. Roof Edge: Provide metal drip edge flashing when installing asphalt shingles.
8. Asphalt Shingles and Roof Slope: Do not install asphalt shingles on roofs with a slope less than 3-1/2 in 12.
9. Roof Ventilation: Comply with current building code requirement for net free vent area of all roofs.
10. House-wrap Prohibitions: Synthetic-type house-wrap membranes are prohibited over oriented strand board (OSB).

**END OF DOCUMENT**



**DIVISION 07 – THERMAL & MOISTURE PROTECTION**

***SECTION 07 11 00- DAMPPROOFING***

A. Summary

1. Section Includes:

- a. Cold-Applied, Emulsified-Asphalt Dampproofing,
- b. Drainage, Foundation.

2. Sustainable Design: Comply with Division 01 Section “Sustainable Design Requirements.

B. Products

1. Cold-Applied, Emulsified-Asphalt Dampproofing:

- a. Trowel Coats: ASTM D 1227, Type II, Class 1.
- b. Fibered Brush and Spray Coats: ASTM D 1227, Type II, Class 1.
- c. Brush and Spray Coats: ASTM D 1227, Type III, Class 1.
- d. VOC Content: 30 g/L or less.

2. Emulsified-Asphalt Primer: ASTM D 1227, Type III, Class 1, except diluted with water as recommended in writing by manufacturer.

3. Asphalt-Coated Glass Fabric: ASTM D 1668, Type I.

4. Protection Course: ASTM D 6506, 1/8 inch thick, semi-rigid sheets of fiberglass or mineral-reinforced-asphaltic core, pressure laminated between two asphalt-saturated fibrous liners.

C. Installation

1. Comply with manufacturer’s written instructions for substrate preparation, dampproofing application, cure time between coats, and drying time before backfilling unless more stringent requirements are indicated.

- a. Apply dampproofing to provide continuous plane of protection.
- b. Apply additional coats if recommended in writing by manufacturer or to achieve a smooth surface and uninterrupted coverage.

2. Where dampproofing footings and foundation walls, apply from finished-grade line to top of footing; extend over top of footing and down a minimum of 6 inches over outside face of footing.

- a. Extend dampproofing 12 inches onto intersecting walls and footings, but do not extend onto surfaces exposed to view when Project is completed.
  - b. Install flashings and corner protection stripping at internal and external corners, changes in plane, construction joints, cracks, and where shown as “reinforced,” by embedding an 8-inch- wide strip of asphalt-coated glass fabric in a heavy coat of dampproofing. Dampproofing coat for embedding fabric is in addition to other coats required.
3. Where dampproofing interior face of above-grade, exterior concrete or masonry single wythe walls, continue dampproofing through intersecting walls by dampproofing walls before constructing intersecting walls.
4. Applying Cold-Applied, Emulsified-Asphalt Dampproofing:
- a. Concrete Foundations and Parged Masonry Foundation Walls: Apply two brush or spray coats at not less than 1.5 gal./100 sq. ft. for first coat and 1 gal./100 sq. ft. for second coat, one fibered brush or spray coat at not less than 3 gal./100 sq. ft. or one trowel coat at not less than 4 gal./100 sq. ft.
  - b. Unparged Masonry Foundation Walls: Apply primer and two brush or spray coats at not less than 1.5 gal./100 sq. ft. for first coat and 1 gal./100 sq. ft. for second coat, primer and one fibered brush or spray coat at not less than 3 gal./100 sq. ft. or primer and one trowel coat at not less than 5 gal./100 sq. ft.
  - c. Concrete Backup for Brick Veneer Assemblies, Stone Veneer Assemblies, and Dimension Stone Cladding: Apply one brush or spray coat at not less than 1 gal./100 sq. ft.
  - d. Masonry Backup for Brick Veneer Assemblies, Stone Veneer Assemblies and Dimension Stone Cladding: Apply primer and one brush or spray coat at not less than 1 gal./100 sq. ft.
  - e. Interior Face of Exterior Concrete Walls: Where above grade and indicated to be furred and finished, apply one brush or spray coat at not less than 1 gal./100 sq. ft.
  - f. Interior Face of Single-Wythe Exterior Masonry Walls: Where above grade and indicated to be furred and finished, apply primer and one brush or spray coat at not less than 1 gal./100 sq. ft.
  - g. Where indicated, install protection course over completed-and-cured dampproofing. Comply with dampproofing material and protection course manufacturers’ written instructions for attaching protection course.
  - h. Backfill with care to prevent damage to protection course or dampproofing.
  - i. Where existing foundation walls are exposed, parge and apply dampproofing as specified for new construction.
5. Foundation Drainage (new construction):
- a. Install new foundation drainage system where indicated as specified in Section 07 13 00 - Sheet Waterproofing.

**END OF SECTION**

**DIVISION 07 – THERMAL & MOISTURE PROTECTION**

***SECTION 07 13 00- SHEET WATERPROOFING***

A. Summary

1. Section Includes:

- a. Rubberized asphalt sheet waterproofing.
- b. Molded-sheet drainage panels.
- c. Drainage, Foundation.

2. Sustainable Design:

- a. Comply with Division 01 Section “Sustainable Design Requirements.”

B. Quality Assurance

- 1. Manufacturer Qualifications: Minimum of 20 years experience in the production of self-adhesive sheet membrane waterproofing.
- 2. Installer Qualifications: A firm that is approved or licensed by waterproofing manufacturer for installation of waterproofing required and has a minimum of 3 years experience in work of this type.
- 3. Source Limitations: Obtain primary waterproofing materials and protection course and molded-sheet drainage panels from single source from single manufacturer.

C. Delivery, Storage and Handling

- 1. Deliver products to site in original manufacturer’s containers with seals unbroken.
- 2. Store materials in a weather-protected environment clear of ground and dry, and within the temperature range required by manufacturer.
  - a. Store materials in their original containers and protected from direct sunlight.
    - 1) Discard, and legally dispose of damaged material.
  - b. Protect mastic and adhesive from moisture and potential sources of ignition.
  - c. Store drainage composite flat and off the ground. Provide cover on top and all sides.
  - d. Protect surface conditioner from freezing.

D. Field Conditions

1. Environmental Limitations: Proceed with installation only when ambient and substrate temperatures are within the range recommended by waterproofing manufacturer.
  - a. Do not apply waterproofing in snow, rain, fog or mist, or when such weather conditions are imminent during application and curing period.

E. Warranty

1. Special Manufacturer's Material Warranty: Manufacturer's standard form in which manufacturer agrees to provide replacement material for material that does not comply with requirements or that fails to remain watertight within warranty period.
  - a. Warranty shall be transferable to homeowner.
  - b. Warranty does not include failure of waterproofing due to failure of substrate prepared and treated according to requirements or formation of new joints and cracks in substrate that exceed 1/16 inch in width.
2. Special Installer's Warranty: Installer's standard form, signed by installer, covering Work of this Section, for a warranty period of five years.
  - a. Warranty includes removing and reinstalling protection board, drainage panels, and removing and replacing backfill, topsoil, concrete walks (if any) and any other improvement made following installation of waterproofing.

F. Products

1. Sheet Membrane Waterproofing System: Self-adhesive, cold-applied composite sheet consisting of a 0.056 inch thick rubberized asphalt layer and a 0.004 inch layer of cross-laminated, high density polyethylene film specially formulated for use with water-based surface conditioner. Provide rubberized asphalt membrane covered with a release sheet which is removed during installation. No special adhesive or heat shall be required to form laps. Provide sheet waterproofing that meets or exceeds the following:
  - a. Thickness: 0.060 inches, nominal, when tested in accordance with ASTM D 3767, Method A.
  - b. Flexibility, 180 degree bend over 1 inch mandrel at 32 degrees F.: Unaffected, when tested in accordance with ASTM D 1970.
  - c. Tensile Strength, Membrane Die C: 325 lbs/Sq. Inch minimum, when tested in accordance with ASTM D 412 Modified.
  - d. Tensile Strength, Film: 5,000 lbs/Sq. Inch minimum, when tested in accordance with ASTM D 882 Modified.
  - e. Elongation, Ultimate Failure of Rubberized Asphalt: 300 percent minimum, when tested in accordance with ASTM D 412 Modified.
  - f. Crack Cycling at -25 Degrees F, 100 Cycles: Unaffected, when tested in accordance with ASTM C 836.
  - g. Lap Adhesion at Minimum Application Temperature: 5 lbs/inch, when tested in accordance with ASTM D 1876 Modified.
  - h. Peel Strength: 9 lbs/inch, when tested in accordance with ASTM D 903 Modified.

- i. Puncture Resistance, Membrane: 50 lbs minimum, when tested in accordance with ASTM E 154.
  - j. Resistance to Hydrostatic Head: 231 Feet of water, when tested in accordance with ASTM D 5385.
  - k. Permeance: 0.05 perms maximum, when tested in accordance with ASTM E 96, Section 12 - Water Method.
  - l. Water Absorption: 0.1 percent maximum, when tested in accordance with ASTM D 570.
2. Molded-Sheet Drainage Panels: Non-woven-geotextile-faced, molded-sheet drainage panel for vertical surfaces.
    - a. Drainage sheet shall be designed to promote positive drainage while serving as a protection course.
  3. Miscellaneous Materials: Surface conditioner, mastic, liquid membrane, tape and accessories specified or acceptable to sheet membrane waterproofing manufacturer.

G. Execution

1. Examination:
  - a. Examine substrates, areas, and conditions, with installer present, for compliance with requirements and other conditions affecting performance.
    - 1) Verify that concrete has cured and aged for minimum time period recommended by waterproofing manufacturer.
      - a) Fill form tie rod holes with concrete and finish flush with surrounding surface.
      - b) Repair bug holes over 1/2 inch long and 1/4 inch deep, finish flush with surrounding surface.
      - c) Remove scaling to sound, unaffected concrete and repair exposed area.
      - d) Grind irregular construction joints to suitable flush surface.
    - 2) Masonry Substrates: Apply waterproofing over concrete block and brick with smooth trowel-cut mortar joints or parge coat.
    - 3) Related Materials: treat joints and install flashing as recommended by waterproofing manufacturer.
2. Waterproofing Application:
  - a. Install in accordance with manufacturer's written instructions, including but not limited to:

- 1) Apply surface conditioner at rate recommended by manufacturer. Recoat areas not waterproofed if contaminated by dust. Mask and protect adjoining exposed finish surfaces to protect those surfaces from excessive application of surface conditioner.
- 2) Delay application of membrane until surface conditioner is completely dry.
- 3) Seal daily terminations with troweled bead of mastic.
- 4) Apply molded-sheet drainage panel in accordance with manufacturer's written instructions.

3. Curing and Protection:

- a. Remove any masking materials after installation. Clean any stains on materials which will be exposed in the completed work.
- b. Protect completed membrane waterproofing from subsequent construction activities as recommended by manufacturer.

4. Foundation Drainage (new construction):

- a. Install perforated perimeter drain on outer side of footing and below the level of floor slab where indicated.
- b. Surround the perforated drain with coarse gravel (no fines).
  - 1) Install filter fabric on top of gravel.
  - 2) Pipe to drainage system.
  - 3) Above footing, face the below-ground portion of the basement wall with draining rigid glass fiber insulation (or drainage membrane with filter fabric), installed in accordance with manufacturer's written instructions.

**END OF SECTION**



## DIVISION 07 – THERMAL & MOISTURE PROTECTION

### ***SECTION 07 20 00- THERMAL INSULATION***

#### A. Summary

##### 1. Section includes;

- a. Batt insulation in exterior wall, roof, and floor construction.
- b. Cellulose Loose-Fill insulation in exterior wall, roof, and floor construction.
- c. Fiberglass Loose-Fill insulation in exterior wall, roof, and floor construction.
- d. Board insulation in exterior walls.
- e. Spray Foam insulation in exterior wall, roof, and floor construction.
- f. Exterior insulation and finish systems (EIFS).

##### 2. Sustainable Design: Comply with Division 01 Section “Sustainable Design Requirements.”

#### B. References

1. Builder’s Guide to Mixed and Humid Climates, Joseph Lstiburek, Ph.D., PE, Building Science Corporation, c. 2005
2. EEBA (Energy and Environmental Building Alliance) standard air sealing and framing details, attached for reference.

#### C. System Description

1. Definition of thermal boundary: Uninterrupted thermal insulating barrier enclosing entire heated space of building. Basements and connected crawlspaces are defined to be within the thermal envelope. Other crawlspaces may be excluded from the thermal envelope only when approved in writing by OHCD/PHDC/PRA, and only when the air, moisture, pressure, and thermal control layers are aligned continuously applied at the floor plane, and where no mechanical systems or freeze vulnerable systems remain in the crawlspaces designated outside the envelope.

#### D. Delivery, Storage and Handling

1. Storage and handling: All insulation shall be delivered to the site in manufacturer’s original container, clearly marked and identified with brand, applicable standards, type and R-value. Protect materials from weather.
  - a. Spray foam insulation to be stored in dry locations with adequate ventilation, protected from freezing rain, direct sunlight, and at temperatures between 55 and 80 degrees F.

E. Field Conditions

1. Do not install adhesives when temperature or weather conditions are detrimental to successful installation.
  - a. Do not apply spray foam insulation when substrate temperatures are less than 40 degrees F.

F. Sequencing

1. Sequence work to ensure fire-stopping, vapor retarder, and air barrier materials are in place before beginning installation of insulation.
2. When possible, a blower door test should be used as a diagnostic tool to identify and seal air leaks prior to insulation installation. See Section 07 96 00 - Air-Sealing, and Section 07 97 00 - Blower Door Air Leakage Testing.

G. Products

1. Cellulose Loose-Fill Insulation: Shall conform to CPSCI6 CFR, Parts 1209 and 1404.
  - a. Loose fill cellulose: R-3.2 per inch.
  - b. Dense-packed cellulose: Density not less than 3.5 and not more than 5 lb/cubic foot installed.
2. Fiberglass Loose Fill Insulation: ASTM C 764, Type I, Formaldehyde-free blow-in loose-fill fiber glass insulation.
3. Batt Insulation:
  - a. Batt Insulation (Type I): ASTM C665, Type I, preformed glass fiber batt type, un-faced.
  - b. Batt Insulation (Type II): ASTM C665, Type II, Class C preformed glass fiber batt type, Kraft paper faced one side.
  - c. Thermal Resistance:
    - 1) R-13, 3-1/2 inch thick high-density batt, Type II.
    - 2) R-19, 6 inch thick batt, Type II.
    - 3) R-38 10 inch thick batt, Type I.
  - d. Batt Size: Friction fit of sizes to suit stud spacing.
4. Board Insulation:

- a. Board Insulation: ASTM C587, Type IV extruded polystyrene labeled by an approved agency, conforming to the following:
    - 1) Thermal Resistance: R of 5.0 per inch of thickness, minimum at 75 degrees F, ASTM C518.
    - 2) Compressive Strength: Minimum 25 psi, ASTM D1621.
    - 3) Water Absorption: Maximum 0.1 percent by volume, ASTM C272.
    - 4) Edges: Square.
    - 5) Flame/Smoke Properties: 25/450 maximum in accordance with ASTM E84.
  - b. Foil-faced glass fiber board: ASTM C 612, Type IA, Class A, Category 1; Foil faced fiber-glass board insulation, thickness required to meet R-value requirements.
    - 1) Nominal density of 3 lb/cu. ft., thermal resistivity of 4.3 degrees F x h x sq. ft./BTU x in. at 75 degrees F.
  - c. Other types of board insulation may be substituted. Submit data for approval in accordance with Section 01 10 00 - General Requirements.
5. Spray Foam Insulation: HFC-blown type, medium-density, MDI-based polyurethane rigid closed cell foam, with an in-place core density of 1.9 to 2.2 pcf; meeting, or exceeding, the following:
- a. Core Density: 1.9 to 2.4 pcf when tested in accordance with ASTM D 1622.
  - b. Thermal Resistance (aged): 5.8 less than or equal to 2-1/2 inches; 6.4 when greater than 2-1/2 inches when tested in accordance with ASTM C 518 at 75 degrees F.
  - c. Thermal Resistance (Initial): 6.4 when tested in accordance with ASTM C 518 at 75 degrees F.
  - d. Closed cell Content: 88-95 percent when tested in accordance with ASTM D 2842.
  - e. Compressive Strength: Greater than 25 psi when tested in accordance with ASTM D 1621.
  - f. Tensile Strength: 23 psi when tested in accordance with ASTM D 1623.
  - g. Water Absorption: Less than 2 percent by volume when tested in accordance with ASTM D 2842.
  - h. Water Vapor Transmission: 1.3 perm/inch when tested in accordance with ASTM E 96.
  - i. Air Permeability: 0.013 when tested in accordance with ASTM E 283 at 1 inch thickness.

- j. Fungi Resistance: Pass, with no growth when tested in accordance with ASTM C 1338.
    - k. Fire Performance: Flame Spread and Smoke: Less than 25 and 450 respectively when tested in accordance with ASTM E 84.
  - 6. Exterior Insulation and Finish Systems: Complete system including expanded- or extruded-polystyrene board insulation, mechanical fasteners, reinforcing mesh, synthetic stucco, and aperture details, all provided or certified for use by the same EIFS manufacturer. System shall be designed with a drainage plane behind the foam insulation. EIFS dependent on a perfect face seal for moisture exclusion shall not be used.
  - 7. Staples: Galvanized or bronze flattened 1/2 inch shank wire staples.
  - 8. Support wire: 12 gauge galvanized soft-annealed, mild steel wire.
  - 9. Prefabricated batt hangers.
  - 10. Vapor barrier: Polyethylene film 6 mil thick, minimum. Other types may be substituted in accordance with Section 01 10 00 - General Requirements.
  - 11. Vapor barrier tape.
  - 12. Adhesive: As recommended by insulation manufacturer.
    - a. Shall not damage insulation or vapor barrier.
- H. Execution
- 1. Insulate entire thermal boundary as specified.
  - 2. Verify that substrate, adjacent materials, and insulation materials are dry and ready to receive insulation and adhesive.
  - 3. Spray Foam Insulation to be installed in accordance with manufacturer's written instructions, must be installed in accordance with all code requirements, and must be installed by a qualified applicator.
    - a. Apply insulation by spray method, to uniform monolithic density without voids.
    - b. Apply to minimum cured thickness to achieve R-values specified below.
  - 4. Special requirement for exterior insulation and finish system: The system shall be a water-managed system, with a drainable plane, weeps, flashing and integral opening flashing, installed by certified EIFS applicators trained by its manufacturer. Flashing, sealing and termination details shall be pre-approved by the Inspector and prime contractor. Joints shall be sealed with silicon or other low-modulus sealant.

- a. Provide manufacturer's 15 year warranty against leaks.
5. Special requirement for steel framing: De-rating due to thermal short. Insulation installed between metal framing (that portion of insulation with thickness equal to framing member depth) shall be de-rated by 50%. Where insulation method is not prescribed below, provide additional insulation outside (on the cold side of) the framing to achieve required minimum total thermal resistance.
  6. Special requirements for pipes and ductwork:
    - a. General: Building insulation shall be installed such that all wet piping and ductwork remain within the building thermal envelope.
    - b. Walls and chases: Install minimum R-13 of insulation uncompressed on cold side of heating pipes and ducts. Two-inch rigid glass fiber board, fit tight at studs and butt joints, may be substituted for R-1 3 glass fiber where mechanicals leave insufficient clearance for full thickness batts. Insulate remainder of cavity to either side of mechanicals.
  7. Walls:
    - a. General:
      - 1) Insulation requirement: Achieve effective minimum R-value with batt insulation, loose-fill insulation, or spray foam insulation as required by building code or to meet Energy Star standards, whichever provides the greater R-value, unless stipulated otherwise.
      - 2) Exterior frame walls: Insulate full depth of stud cavity.
      - 3) Studded-out exterior masonry walls:
        - a) Glass fiber batt: R-13 minimum if nominal 2 x 4 studs are used, R-19 if nominal 2 x 6 studs are used and whenever steel studs are used (see Metal stud walls below).
      - 4) Fitting batts: Cut batts 1 inch longer than stud cavity. Staple top to underside of fire-stop or top plate and press-fit between studs with stapling tabs left folded. Install wrinkle free and flush with stud face to minimize convection within stud cavity. Cut batts 1/2-inch wider than non-standard width stud bays to provide snug fit. (For walls studded out with metal studs, see "Metal stud walls" below.)
        - a) Install without gaps or voids. Fluff insulation to full thickness for specified R-value before installation. Do not compress insulation.

- b) Fit insulation tight in spaces and tight to exterior side of mechanical and electrical services within the plane of insulation.
  - c) Install with factory applied vapor retarder membrane facing warm side of building spaces. Lap ends and side flanges of membrane over framing members.
  - d) Tape in place.
  - e) Tape seal butt ends, lapped flanges, and tears or cuts in membrane.
  - f) Cut and fluff around electrical wiring, piping, etc., to eliminate compression. Tape cuts.
- 5) Exterior corners fully insulated: Provide continuous insulation at outside corners and where partition walls abut outside walls.
- 6) Exterior walls between floors: When new ceilings, other than on the top-floor, are erected below the joists, insulate exterior walls to R-13 between the new ceiling and floor sheathing above.
- b. Metal stud walls:
- 1) Comply with all other minimum insulation requirements.
  - 2) Glass fiber batt: Width shall equal full center to center spacing of studs.
  - 3) Loose-fill and Spray Foam Insulations: Install to full depth of wall cavity without voids behind studs or inside stud channels. Flanges of studs and runners shall be scraped free of insulation prior to installation of drywall.
  - 4) New frame walls: Insulate stud bays to full depth. Use R-13 batts with insulating exterior sheathing (polyisocyanurate or XPS), R-5 minimum.
  - 5) Studded-out exterior masonry walls:
    - a) Glass fiber batt: Use R-19 batts the full width of the center-to-center stud spacing, slit to fit around the stud C-section so that approximately 40% of the batt thickness is in the space between the masonry and studs. The edges of adjacent batts shall meet in this space.
    - b) Loose-fill and Spray Foam Insulations: Install without voids to full depth of wall cavity.

c. Basement and crawlspace:

- 1) Basement walls (new construction): In dwellings where the floor-to-ceiling height is 6 feet or more, insulate to R-10 minimum; R-13 if insulating within wood studs at exterior walls
  - a) Interior: in unfinished spaces, install a foil-faced glass fiber board, approved for exposed use, over the full height of the exterior (non-party) wall. In finished space, use any approved non-hygroscopic insulating material.
  - b) Exterior: Where insulation is placed on the exterior of the basement wall without foundation drainage, use 2 -inch extruded polystyrene extending from the top of the footing to the top of the foundation wall. Where insulation is part of an exterior foundation drainage system, comply with manufacturer's specifications. In either case, provide rigid fiberglass protective membrane over entire insulation board and appropriate termite barrier detail.
- 2) Basement walls (existing construction): Insulate finished basement exterior walls with any approved non-hygroscopic insulating material.
- 3) Basement-under-porch partition: Construct partition, with hinged door, to separate excavated areas under porches or sidewalks from the main basement space. Insulate partition wall with R-13 foil-faced glass fiber board.
  - a) In lieu of constructing partition to separate main portion of basement from area beneath porch; insulate exterior walls to R-13 and ceiling below porch to R-38.
- 4) Crawlspace perimeter: Insulate wall of crawlspaces under heated living areas with foil-faced glass fiber board, R-10 minimum. Completely air seal exterior crawlspace perimeter prior to insulating. Embed board 1-foot into crawlspace soil. On walls perpendicular to joists, wedge top tight against joist. On walls parallel to joists, affix with adhesive approved for use with glass fiber.
- 5) Slab-on-grade (new construction only): a floating-slab design should be used unless structural considerations dictate an anchored slab.
  - a) Floating slab: Separate the edge of the floor slab from the perimeter wall with continuous 2-in, extruded polystyrene insulation, which then continues 2 ft. downward or 2 ft. inward horizontally. Insulation thickness at slab edge may be reduced to as little as 0.75 in. where necessary to avoid a gap between slab and wall-base trim.

- b) Anchored slab: When the slab cannot be thermally isolated from the perimeter wall, insulate outside surface of perimeter wall to R-10 minimum.

8. Floors between heated/air conditioned and unheated/non-air conditioned spaces:

- a. Insulation requirement: Use batt insulation, blow in loose-fill insulation to full depth of floor cavity, or blow in spray foam insulation to meet minimum R-value requirements of building code or Energy Star standards, whichever provides the greater R-value.
- b. Overhangs: Insulate portion directly above exterior wall to full depth of floor cavity.
- c. Bay over existing porch: Install insulation against all exterior surfaces including retrofit air barrier, ends of joist bays and sides of outboard joists.
- d. Support open batt: Where exterior sheathing or finish is not installed immediately below floor batt, support batt with approved wire or hangers spaced 10 inches on center. Attach wire to joist with staple or "J" nail.

9. Ceiling/Roofs:

- a. Insulation requirement: Achieve R-38 with glass fiber batt, blow-in loose-fill or spray foam insulation. Batt insulation should be un-faced if necessary to conform to ceiling finish where lower part of batt is compressed by width of stud.
- b. Chimneys and vents: Maintain combustible materials at least 2 inches from hot surfaces, or as required by code.
- c. Wood-framed ceilings:
  - 1) Batt Insulation: Install batts, width equal to center-to-center joist spacing, compressed at the bottom to fit between joists, without gaps in space above joists.
  - 2) Loose-Fill or Spray Foam Insulations: Blow-in loose-fill insulation to required depth.
- d. Metal-framed ceilings: top flanges shall be covered with a continuous layer of loose-fill or spray foam insulation or batt insulation. That portion of insulation installed between metal framing members shall be derated by 50%.
  - 1) Batt insulation shall be applied in two perpendicular layers. The lower layer shall be Kraft-faced, inserted between members and be the same width as C-C joist spacing, and have same thickness as members (exception: insulation shall be permitted to be 1/2 in. thinner than joist web). The upper layer shall be a minimum 23 in. wide R-30 un-faced batt insulation laid cross-wise over joists. Top layer shall be laid flat without gaps between courses. All gaps between perimeter of framing and masonry walls,



including party walls, shall be sealed with rigid board or spray-foam insulation in compliance with Section 07 96 00 - Air Sealing.

- a) Suspended grid ceiling systems to be insulated with one layer of Kraft-faced 23-inch wide glass fiber batts, installed without gaps and a second layer of un-faced batt insulation, perpendicular to first layer. Total R-38.
- 2) Loose-fill or Spray Foam Insulations: Blow-in insulation to required depth to achieve R-38 value.
- e. Low clearance: Where low rafters cause glass fiber batt to be compressed vertically, insulate between rafters as necessary to achieve R-38. Install batts in two layers or blow-in loose-fill or spray foam insulation.

**END OF SECTION**



**DIVISION 07 – THERMAL & MOISTURE PROTECTION**

***SECTION 07 28 00 - DRAINAGE PLANE***

A. Summary

1. Section Includes:

- a. Building Paper.
- b. Synthetic Membrane.
- c. Foil-Faced Polyisocyanurate Sheathing.

2. Sustainable Design: Comply with Division 01 Section “Sustainable Design Requirements.”

3. Drainage Plane:

- a. A continuous drainage plane is required at all frame construction behind the exterior cladding.

B. References

- 1. Builder’s Guide to Mixed and Humid Climates, Joseph Lstiburek, Ph.D., PE, Building Science Corporation, c. 2005
- 2. EEBA (Energy and Environmental Building Alliance) standard air sealing and framing details, attached for reference.

C. Delivery, Storage and Handling

- 1. Deliver products to site in manufacturer’s original containers with seals unbroken.
- 2. Store materials in a weather-protected environment clear of ground and dry, and within the temperature range required by manufacturer.
  - a. Store foil-faced polyisocyanurate sheathing flat, on pallets, and covered as per manufacturer’s written instructions.
- 3. Protect materials from damage and from deterioration from sunlight, moisture, soiling, and other sources. Comply with manufacturer’s written instructions for handling, storing, and protecting during installation.

D. Products

1. Flexible systems:

- a. Building Paper: No 15 asphalt felt complying with ASTM D226, Type I.
- b. Synthetic Membrane, Vapor-permeable Spun-bonded polyolefin, non-woven, non-perforated, weather barrier with the following minimum performance characteristics:
  - 1) Air Penetration: Less than 0.004 cfm/sf at 1.57 psf, when tested in accordance with ASTM E2178. Type I per ASTM E1677.
  - 2) Water Vapor Transmission: 56 perms, when tested in accordance with ASTM E96-05, Method A.
  - 3) Water Penetration resistance: 250 cm when tested in accordance with AATCC Test Method 127.
  - 4) Basis Weight: 1.8 oz/CY, when tested in accordance with TAPPI Test Method T 140. DRAINAGE PLANE
  - 5) Air Resistance: 1200 seconds, when tested in accordance with TAPPI Test Method T-460.
  - 6) Tensile Strength: 30/30 lbs/in., when tested in accordance with ASTM D882.
  - 7) Tear Resistance: 8/6 lbs, when tested in accordance with ASTM
  - 8) Surface Burning Characteristics: Class A, when tested in accordance with ASTM E84, Flame Spread: 15, Smoke Developed: 15.

2. Rigid systems:

- a. Foil Faced Polyisocyanurate Sheathing: Non-structural, closed-cell polyisocyanurate foam core bonded on each side to a foil facer, minimum 1/2 inch thick. Produce foam with a non-HCFC blowing agent.

3. Sealing Tapes:

- a. For use on synthetic membrane: As approved by membrane manufacturer.
- b. For use on foil: As approved by insulation or sheathing manufacturer.

4. Adhesive membrane strip: Self-adhering membrane.

5. Fasteners:

- a. Type and size as recommended by manufacturer for type of construction.

E. Installation

1. Location: Fasten drainage layer to exterior surface of sheathing.
2. Compatibility:
  - a. Synthetic membranes are prohibited:
    - 1) Unless there is an air gap between the membrane and the inside face of exterior cladding.
    - 2) Over oriented strand board (OSB).
  - b. Synthetic membranes may be used behind stucco or wood siding only if an air space is provided behind the stucco or wood siding by furring strips or channels.
3. Installation of flexible drainage layers:
  - a. Install horizontally in accordance with manufacturer's written instructions.
  - b. Lap horizontal joints shingle fashion to drain water to exterior.
    - 1) Lap upper layer over lower layer minimum of 2 inches for felts and 6 inches for Synthetic membrane.
    - 2) Synthetic membrane only: Tape joints to exclude air.
  - c. End Laps: Lap ends a minimum of 6 inches.
    - 1) Synthetic membrane only: Tape end lap joints to exclude air.
  - d. Lower termination: To drain water to the exterior, provide aluminum flashing at bottom of drainage layer where it terminates above a projection (such as a roof or a step in the plane of the wall). Lap material over flashing to drain water to exterior.
  - e. Openings: Wrap drainage material around all penetrations and openings for full depth of framing. Provide head flashing above all penetrations and openings. Lap material and flashing to drain water to exterior.
4. Installation of foil-faced polyisocyanurate sheathing:
  - a. Install in accordance with manufacturer's written instructions.
  - b. Joints: Tape all joints with approved foil tape.
  - c. Lower termination: To drain water to the exterior, provide aluminum flashing at bottom of drainage layer where it terminates above a projection. Tape flashing to exterior surface with approved adhesive membrane strip.
  - d. Openings: Cover sill framing with adhesive membrane strip and lap over rigid drainage material. Provide head flashing above all penetrations and openings. Tape flashing to exterior surface with approved adhesive membrane strip.

**END OF SECTION**

## **DIVISION 07 – THERMAL & MOISTURE PROTECTION**

### ***SECTION 07 46 00- SIDING***

#### A. Summary

##### 1. Section Includes:

a. Fiber-cement Siding.

2. Sustainable Design: Comply with Division 01 Section “Sustainable Design Requirements.”

#### B. Submittals

1. Samples: For siding, submit manufacturer’s standard color samples for selection.

#### C. Quality Assurance

1. Labeling: Provide fiber-cement siding that is tested and labeled according to ASTM C 1186 by a qualified testing agency acceptable to authorities having jurisdiction.

2. Source Limitations: Obtain each type, color, texture, and pattern of siding, including related accessories, from single source from single manufacturer.

#### D. Delivery, Storage and Handling

1. Deliver products to site in manufacturer’s original packaging.

2. Store products in original packaging, on flat surface under cover, stacked no more than 12 boxes high.

#### E. Products

1. Fiber-Cement Siding: ASTM C 1186, Type A, Grade II, fiber-cement board, noncombustible when tested according to ASTM E 136; with a flame-spread index of 25 or less when tested according to ASTM E 84.

a. Horizontal Pattern: Exposure as indicated by Architect or as selected by developer in plain style.

b. Texture: As indicated by Architect or as selected by developer.

c. Factory Priming: Manufacturer’s standard acrylic primer.

d. Factory Finish Coating: Manufacturer’s standard top coats.

- 1) Colors: As indicated by Architect or as selected by developer from manufacturer's standard full range of industry colors.

2. Soffit Materials:

a. Fiber-Cement Soffit Panels, Same manufacturer as Fiber-cement siding:

- 1) 12 inch wide panels.
- 2) Thickness: 1/4 inch.
- 3) Weight: 1.8 lbs per sq, ft,
- 4) Provide ventilating units
- 5) Finish: Same as siding.

b. Plywood, exterior grade with exterior glue, 1/2 inch thick.

3. Accessories:

a. Siding Accessories: Provide starter strips, edge trim, outside and inside corner caps, and other items as recommended by siding manufacturer for building configuration.

- 1) Provide accessories made from same material as adjacent siding unless otherwise indicated.
- 2) Finish: To match siding.

b. Aluminum Accessories: Where aluminum accessories are indicated, provide accessories complying with AAMA 1402.

- 1) Texture: Smooth.
- 2) Nominal Thickness: 0,024 inch.
- 3) Finish: Manufacturer's standard primer and baked-on acrylic or polyester top coat, to match siding.

c. Flashing: Provide aluminum flashing complying with Section 07 62 00 "Sheet Metal Flashing and Trim" at window and door heads and where indicated, or if not indicated as required for a complete weather tight installation.



- 1) Finish for Aluminum Flashing: Siliconized polyester coating, same color as siding.
  - a) For fiber-cement siding, provide flashing with manufacturer's factory-prime coating.

d. Fasteners:

- 1) For fastening to wood, use stainless steel, type 304, siding nails, with shank rings, of sufficient length to penetrate a minimum of 1-1/4 inch into studs.
- 2) For fastening to metal, use ribbed bugle-head screws of sufficient length to penetrate a minimum of 1/4 inch, or three screw-threads, into substrate.
- 3) For fastening fiber cement, use hot-dip galvanized or stainless-steel fasteners.

F. Execution

1. Examination:

- a. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of siding and related accessories.
- b. Proceed with installation only after unsatisfactory conditions have been corrected.

2. Installation:

- a. Comply with siding manufacturer's, or appropriate wood association's, written installation instructions applicable to products and applications indicated unless more stringent requirements apply.
  - 1) Do not install damaged components.
  - 2) Center nails in elongated nailing slots without binding siding to allow for thermal movement.
- b. Install fiber-cement siding and related accessories.
  - 1) Install fasteners no more than 24 inches on center.
- c. Install joint sealants as specified in Section 07 92 00 "Joint Sealants" and to produce weather tight installation.

- d. Match architectural configuration and detail of substrate to be covered, unless directed otherwise by Inspector.

3. Adjusting and Cleaning:

- a. Remove damaged, improperly installed, or otherwise defective materials and replace with new materials complying with specified requirements.
  - 1) Clean finished surfaces according to manufacturer's written instructions and maintain in a clean condition during construction.

**END OF SECTION**

**DIVISION 07 – THERMAL & MOISTURE PROTECTION**

***SECTION 07 52 00- MODIFIED BITUMINOUS ROOFING***

A. Summary

1. Section Includes:

- a. SBS-modified bituminous membrane roofing.
- b. Substrate Board (Thermal Barrier).
- c. Roof Insulation.
- d. Cover Board.
- e. Roofing Accessories integrally related to roofing system installation.

2. Sustainable Design: Comply with Division 01 Section “Sustainable Design Requirements.”

B. Quality Assurance

1. Membrane manufacturer: A company specializing in modified bitumen membranes with more than 10 years of experience and has FMG approval for roofing systems identical to that used for this Project.
2. Installer: A company specializing in modified bitumen roofing installation, with more than 5 years of experience and is approved, authorized, certified, or licensed by roofing system manufacturer to install manufacturer’s products and that is eligible to receive manufacturer’s warranty.
3. Fire-Test-Response Characteristics: Provide roofing materials with fire-test-response characteristics as determined by testing identical products per test method below by UL, FMG, or another testing agency acceptable to authorities having jurisdiction. Materials shall be identified with markings of testing agency.
  - a. Exterior Fire-Test Exposure: Class C; ASTM E 108.
  - b. Fire-Resistance Ratings: ASTM E 119.

C. Delivery, Storage and Handling-

1. Deliver products to site in original manufacturer’s containers with seals unbroken.
2. Store materials in a weather-protected environment clear of ground and dry, and within the temperature range required by manufacturer.
  - a. Store liquid materials in their original containers and protected from direct sunlight.

- 1) Discard, and legally dispose of, liquid material that cannot be applied within its stated shelf life.
3. Protect roof insulation materials from damage and from deterioration from sunlight, moisture, soiling, and other sources. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.
4. Handle and store roofing materials and place equipment to avoid permanent deflection of deck.
  - a. Do not store materials on finished roof membrane areas.

D. Field Conditions

1. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

E. Warranty

1. Provide a 12 year manufacturer's No Dollar Limit (NDL) Systems Warranty for roof. Warranty shall be transferrable to homeowner.
  - a. The manufacturer shall warrant to the Homeowner, that for a total period of 12 years from the date of Substantial Completion, the manufacturer at its expense will repair or cause to be repaired the Roofing System described in this Warranty to return the roofing system to a watertight condition.
  - b. During this Warranty period term, the manufacturer shall take appropriate action to repair leaks which occur through the Roofing System attributable to ordinary wear and tear of the Roofing System or which may be required because of workmanship deficiencies in its application.
  - c. In the event of a leak in the Roofing System, the Homeowner shall notify the manufacturer and that a leak occurred. Manufacturer shall take appropriate action to return the roofing system to a watertight condition at no cost to the homeowner or the PHDC/PRA.
  - d. If a leak occurs that is not the responsibility of the manufacturer, the manufacturer shall advise the Homeowner to make the repairs at the Homeowner's cost.
  - e. Upon completion of the repair the manufacturer's warranty shall remain in effect for the remainder of the term of the warranty. Failure of the Homeowner or the PHDC/PRA to make these repairs may void warranty.
  - f. In the event that an emergency condition exists, requiring immediate repair to avoid substantial damage to the building and its contents, the Homeowner may make temporary repairs. Manufacturer shall reimburse Homeowner for the temporary repair work.

- g. The warranty does not obligate manufacturer to repair the Roofing System for leaks resulting from (a) natural disasters, (b) misuse, abuse, materials supplied or manufactured by others, exposure to damaging substances such as oil or solvents, or unauthorized alterations of the Roofing System (c) failure of substrate, or (d) improper drainage. Manufacturer is not responsible for damage resulting from water entry from portion of the building structure not a part of the Roofing System.
- h. No one is authorized to change, alter or modify the provisions of the warranty other than the manufacturer as acceptable to the PHDC/PRA.

1) The roof system guarantee shall include:

- a) Roof membrane and membrane flashing, including base sheets, temporary membrane, and vapor retarder and walkway products.
- b) Fasteners and fastening systems.
- c) Insulation, including cover board, thermal barrier, crickets and saddles.
- d) Prefabricated Roof Edge
- e) Peak gust wind speed up to 72 m.p.h.
- f) All materials specified and installed as part of this specification section.

- 2. This warranty shall be in addition to and not a limitation of the other rights the PHDC/PRA may have against the contractor under the Contract Documents.

F. Products

- 1. Provide a compatible assembly of products that are recommended by manufacturers to be fully compatible with substrates, flashings, and related materials.
- 2. SBS-Modified Asphalt-Sheet Materials:
  - a. Roofing Membrane Sheet, (Base Ply): ASTM D 6163, Grade S, Type I or II, glass- fiber-reinforced or ASTM D 6162, Grade S, Type I or II, composite polyester- and glass-fiber-reinforced, SBS-modified asphalt sheet.
  - b. Roofing Membrane Cap Sheet: ASTM D 6163, Grade G, Type I or II, glass-fiber-reinforced or ASTM D 6162, Grade G, Type I or II, composite polyester- and glassfiber-reinforced, SBS-modified asphalt sheet; granular surfaced, and as follows:

1) Granule Color: White.

3. Base Flashing Sheet Materials:

- a. Backer Sheet: ASTM D 6163, Grade 5, Type I or II, glass-fiber-reinforced or ASTM D 6162, Grade S, Type I or II, composite polyester- and glass-fiber-reinforced, SBS-modified asphalt sheet.
- b. Flashing Sheet: ASTM D 6163, Grade G, Type I or II, glass-fiber-reinforced or ASTM D 6162, Grade G, Type I or II, composite polyester- and glass-fiber-reinforced, SBS-modified asphalt sheet; granular surfaced, and as follows:

1) Granule Color: White or Gray to match roofing membrane cap sheet.

4. Auxiliary Roofing Membrane Materials:

- a. Auxiliary materials recommended by or approved by the roofing system manufacturer and compatible with roofing membrane.
- b. Fasteners: Corrosion-resistant factory-coated steel fasteners and metal plates, designed for fastening roofing membrane components to substrate, meeting required pullout strength, and acceptable to roofing system manufacturer.

5. Miscellaneous Accessories:

- a. Vents: “Mushroom” design, passive ventilator, 12 or 16 inches diameter. Do not use turbine vents.
- b. Stacks or pipes penetrating the roof shall be flashed with aluminum collars with rubber gaskets.
- c. Other accessories as recommended by roofing system manufacturer.

6. Substrate Boards (If required by roofing system manufacturer):

- a. ASTM C 1177/C1177M, glass-mat, water-resistant gypsum substrate, Type X, 1/2 inch thick.
- b. Fasteners: Corrosion-resistant factory-coated steel fasteners and metal plates, designed for fastening substrate board to wood roof deck. Size fasteners to fully penetrate deck.

7. Roof Insulation (If required by building design or roofing system manufacturer):

- a. General: Provide preformed roof insulation boards approved by the roofing system manufacturer that comply with requirements and referenced standards, selected from manufacturer’s standard sizes and of thicknesses indicated.

- b. Polyisocyanurate Board Insulation: ASTM C 1289, Type II, felt or glass-fiber mat facer on both major surfaces.
- c. Tapered Insulation: Provide factory-tapered insulation boards fabricated to slope of 1/4 inch per 12 inches (1: 48), where indicated or as directed by the Inspector.
- d. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.

8. Insulation Accessories (If insulation is required):

- a. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatible with membrane roofing.
- b. Fasteners: Corrosion-resistant factory-coated steel fasteners and metal or plastic plates, designed for fastening roof insulation to substrate, and acceptable to roofing system manufacturer. Fasteners for wood decks shall be sized to fully penetrate the deck.
- c. Cold Fluid-Applied Adhesive: Manufacturer's standard cold fluid-applied adhesive formulated to adhere roof insulation to substrate.
- d. Insulation Cant Strips: ASTM C 728, perlite insulation board.
- e. Cover Board: ASTM C 1177/C 11 77M, glass-mat, water-resistant gypsum substrate, with special surface coating, 1/2 inch thick.
- f. Substrate Joint Tape: 6-or 8-inch- wide, coated, glass-fiber joint tape.

G. Execution

1. Examination:

- a. Verify the roof openings and penetrating elements through the roof are solidly set and all nailing and cant strips are in place. Verify that the deck is solid and secured.
- b. Do not apply roofing to damp, frozen, or dirty surfaces, or to surfaces unacceptable to the manufacturer, installer, or PHDC/PRA. Beginning installation means acceptance of the substrate by the contractor.

2. Fire Safety:

- a. The contractor shall meet all the fire safety requirements of OSHA, the City of Philadelphia, and the manufacturer of the roofing materials.
- b. During application, the contractor shall require that a designated person on each crew be assigned to conduct a fire watch. This individual shall be trained in the use of fire extinguishing equipment and shall have a phone for calling the fire department in the event of a fire. He/she shall watch for smoldering materials or fires on all areas of the roof, try to extinguish them when the fire is within the limits of the fire extinguishing equipment available, and sound the alarm.

- c. After application, a fire watch shall be continued on a daily basis after torch welding applications are completed. The job foreman or other designated person shall carefully walk the entire area of application at the end of the work day, checking for smoldering material. A fire watch shall be maintained during breaks in the work day and for two hours after the last torch is shut off for the day.

3. Surface Preparation:

- a. Fully prepare the surface for each component of the roofing system. Remove all existing roofing and flashing materials unless otherwise directed. Remove all materials from the roof by means of an approved chute to a truck or dumpster. Provide legal disposal. Patch all holes and gaps in the roof sheathing. Maintain the watertight integrity of the roof at all times.
- b. Prevent materials from entering or clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof drain plugs when no work is taking place or when rain is forecast.

4. Substrate Board Installation:

- a. Install substrate boards with long joints in continuous straight lines, perpendicular to roof slopes with end joints staggered between rows. Tightly butt substrate boards together.

5. Insulation Installation:

- a. Comply with roofing system manufacturer's written instructions for installing roof insulation.
- b. Insulation Cant Strips: Install and secure preformed 45-degree insulation cant strips at junctures of roofing membrane system with vertical surfaces or angle changes greater than 45 degrees.
- c. Install tapered insulation under area of roofing to conform to slopes indicated.
- d. Install insulation with long joints of insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch with insulation.
- e. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.
- f. Install one or more layers of insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 2 inches or greater, install 2 or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches in each direction.
- g. Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water.
- h. Install tapered edge strips at perimeter edges of roof that do not terminate at vertical surfaces.



- i. Mechanically Fastened Insulation: Install each layer of insulation and secure first to deck using mechanical fasteners specifically designed and sized for fastening, specified board-type roof insulation to deck type.
  - 1) Fasten insulation according to Code requirements for specified Windstorm Resistance Classification.
  - 2) Install subsequent layers of insulation in a cold fluid-applied adhesive.
- j. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Stagger joints from joints in insulation below a minimum of 6 inches in each direction. Loosely butt cover boards together and adhere to prepared substrate. Tape joints if required by roofing system manufacturer.
  - 1) Where membrane flashing is applied to parapets, provide primed cover board as sheathing.

6. Roofing Membrane Installation, General:

- a. Install roofing membrane system according to roofing system manufacturer's written instructions.
- b. Coordinate installing roofing system so insulation and other components not permanently exposed are not subject to precipitation or left uncovered at the end of the day or when rain is forecast.
  - 1) Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system.
  - 2) Remove and discard temporary seals before beginning work on adjoining roofing.

7. Base sheet Installation (If required):

- a. Install a coated glass fiber base sheet over the roof deck according to manufacturer's instructions.
- b. Mechanically fasten base sheet to roof deck in accordance with applicable building code.

8. SBS-Modified Bituminous Membrane Installation:

- a. Install modified bitumen membrane sheet and cap sheet according to roofing manufacturer's written instructions, starting at low point of roof.

- b. Laps: Accurately align roofing membrane sheets, without stretching, and maintain uniform side and end laps. Stagger end laps. Completely bond and seal laps, leaving no voids.

- 1) Repair tears and voids in laps and lapped seams not completely sealed.

- c. Install roofing membrane sheets so side and end laps shed water.

9. Flashing and Stripping Installation:

- a. Install base flashing over cant strips and other sloping and vertical surfaces, at roof edges, and at penetrations through roof, and secure to substrates according to roofing system manufacturer's written instructions and as follows:

- 1) Prime substrates with asphalt primer if required by roofing system manufacturer.

- 2) Backer Sheet application: Adhere backer sheet to substrate, if required by roofing system manufacturer.

- 3) Flashing Sheet Application: Adhere flashing sheet to substrate as required by roofing system manufacturer.

- b. Extend base flashing up walls or parapets a minimum of 8 inches above roofing membrane and 4 inches onto field of roofing membrane.

- c. Mechanically fasten top of base flashing securely at terminations and perimeter of roofing.

- 1) Seal top termination of base flashing.

- d. Install roofing membrane cap-sheet stripping where metal flanges and edgings are set on membrane roofing according to roofing system manufacturer's written instructions.

10. Vents: Comply with building code requirement for ventilation of each roof area. Install vents in accordance with vent and roofing system manufacturers' written instructions.

11. Protection of roofing: Upon completion of roofing, including associated work, take appropriate measures for surveillance and protection of roofing during remainder of construction period.

**END OF SECTION**

**DIVISION 07 – THERMAL & MOISTURE PROTECTION**

***SECTION 07 62 00- SHEET METAL FLASHING AND TRIM***

A. Summary

1. Section Includes:

- a. Flashings and counter-flashings.
- b. Gutters and Downspouts.

2. Sustainable Design: Comply with Division 01 Section “Sustainable Design Requirements.”

B. Quality Assurance

1. The work of this section shall conform to standards and guidelines for work of this type contained in:

- a. SMACNA: Architectural Sheet Metal Manual.
- b. Revere Copper and Brass Inc.: Copper and Common Sense.
- c. NRCA: Roofing and Waterproofing Manual.

C. Delivery, Storage and Handling

- 1. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.
- 2. Prevent contact with materials which may cause discoloration or staining.

D. Warranty

1. Finish Warranty: Include coverage for aluminum finishes degradation including color fading.

- a. Painted Finish: Provide a 20 year manufacturer’s warranty.

E. Products

1. Metal Flashing Materials:

- a. Galvanized Sheet Metal: ASTM A526 commercial quality mm. 28 gauge.

- b. Prefinished aluminum sheet: ASTM 8209/B209M: 3003 alloy, H14 temper; minimum 0.020 inch thick, smooth surface, fluoropolymer finish for locations exposed to view.
  - c. Aluminum Sheet: ASTM B209/B209M; 3003 alloy, H14 temper; minimum 0.032 inch thick; mill finish for locations not exposed to view.
  - d. Concealed flashings may be galvanized or aluminum. Forming of exposed flashings shall be neatly done to consistent, tight fitting and self-lapping configuration. All flashings at roof edge, vents, curbs and other roof protrusions shall be preformed to appropriate shapes; vent and similar flashings shall be cap and counter flashed.
  - e. Flashings shall be asphalt coated if in contact with dissimilar metal or masonry.
2. Masonry Through-wall flashing: See Section 04 20 00 - Unit Masonry.
3. Window and Door flashing - Integral with unit or 0.032 inch thick aluminum.
4. Gutters and Downspouts:
- a. Gutters: Provide one of the following as directed by Architect:
    - 1) 5 inch style K (ogee) aluminum.027 inch thick, prefinished, with all necessary brackets, outlet boxes, end caps, gutter guards, joining sections, mitered section, hangers, and straps necessary for a completely finished job.
    - 2) 4 inch half-round smooth aluminum, 0.027 inches thick, prefinished, with all necessary brackets, outlet boxes, end caps, gutter guards, joining sections, mitered section, hangers, and straps necessary for a completely finished job.
  - b. Downspouts: Provide one of the following as directed by Architect:
    - 1) 3 inch x 4 inch corrugated aluminum, 0.027 inch thick, prefinished, with all necessary elbows and fasteners.
    - 2) 3 or 4 inch round corrugated aluminum, 0.027 inch thick, prefinished with all necessary elbows and fasteners..
    - 3) Downspouts to be one piece from gutter or scupper outlet to grade or boot.
  - c. Provide removable leaf strainer at neck of downspout.

5. Parapet Scuppers (Eave Box): Fabricate scuppers from prefinished aluminum sheet of required dimensions with closure flange trim to exterior, 4 inch wide wall flanges to interior, and base extending 4 inches beyond cant into field of roof.
  6. Accessories:
    - a. Fasteners: Stainless steel, Type recommended by roofing manufacturer.
    - b. Underlayment: ASTM D226; Type I, No. 15 un-perforated asphalt felt.
    - c. Slip Sheet: Rosin sized building paper.
    - d. Bituminous Coating: ASTM D 1187; Cold-applied asphalt emulsion.
    - e. Sealant: Sealant as specified in Section 07 90 00.
    - f. Asphalt Roofing Cement: ASTM D4586, asbestos free, of consistency required for application.
- F. Fabrication
1. Form sections true to shape, accurate in size, square, and free from distortion or defects.
  2. Fabricate cleats of same material as sheet metal, interlocking with sheet.
  3. Form pieces in longest possible lengths.
  4. Hem exposed edges on underside  $1/2$  inch; miter and seam corners.
  5. Form material with flat lock seams, except where otherwise indicated. At moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.
  6. Form expansion joints with slip joints using 12 inch wide backup plate in accordance with SMACNA Architectural Manual. Form backup plate to profile matching face.
  7. Fabricate corners from one piece with minimum 18 inch long legs; seam for rigidity, seal with sealant.
  8. Fabricate vertical faces with bottom edge formed outward  $1/4$  inch and hemmed to form drip.
  9. Fabricate flashings to allow toe to extend 2 inches over roofing. Return and brake edges.
  10. Seal metal joints.
- G. Factory Finishing

1. Fluoropolymer Finish: 2 coat Kynar 500 or Hylar 5000 system, thermally cured, conforming to AAMA 2605; color as selected from manufacturer's full range.

H. Execution

1. Paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mils.
2. Install flashing where required to provide weatherproof enclosure in accordance with conventional and specified standards and in accordance with manufacturer's written instructions.
3. At roof penetrations, install preformed type of cap and counter flashing in accordance with manufacturer's written recommendation.
4. Parapet Scuppers: Install where indicated, or as directed by Inspector, through parapet. Continuously support scupper, set to correct elevation, and seal flanges to interior face, over cants, and under roofing membrane.
5. Downspouts shall be mechanically fastened to walls at no smaller interval than 8 ft. vertically and no less than one fastener per piece. Secure downspouts to gutters or scuppers with stainless steel screws. Cement downspouts at boot fitting.
6. Repair flashing and sheet metal work at neighboring structures when damaged either in demolition or in the performance of the new work with materials matching the quality and type of the existing damaged elements.
7. Repair of sheet metal work at cornices and bays of existing structure: Repair shall match quality, material, type, workmanship and configuration of the existing sheet metal.
8. Secure flashings in place using concealed fasteners. Use exposed fasteners only where permitted.
9. Apply plastic cement compound between metal flashings and felt flashings.
10. Fit flashings tight in place. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.
11. Seal metal joints watertight.

**END OF SECTION**

**DIVISION 07 – THERMAL & MOISTURE PROTECTION**

***SECTION 07 92 00- SEALANTS***

A. Summary

1. Section Includes:

- a. Sealants and joint backing.
- b. Fire-stopping for through penetrations of fire or smoke assemblies.

2. Sustainable Design: Comply with Division 01 Section “Sustainable Design Requirements.”

B. References

- 1. ASTM C 510- Standard Test Method for Staining and Color Change of Single- or Multi-component Joint Sealants.
- 2. ASTM C 794 - Standard Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants.
- 3. ASTM C 834 - Standard Specification for Latex Sealants.
- 4. ASTM C 920 - Standard Specification for Elastomeric Joint Sealants.
- 5. ASTM C 1087 - Standard Test Method for Determining Compatibility of Liquid-Applied Sealants with Accessories Used in Structural Glazing Systems.
- 6. ASTM C 1193 - Standard Guide for Use of Joint Sealants.
- 7. ASTM C 1247- Standard Test Method for Durability of Sealants Exposed to Continuous Immersion in Liquids.
- 8. ASTM C 1248 - Standard Test Method for Staining of Porous Substrate by Joint Sealants.
- 9. ASTM E 84 - Test Method for Surface Burning Characteristics of Building Materials.
- 10. ASTM E 119 - Method for Fire Tests of Building Construction and Materials.
- 11. ASTM E 814 - Test Method of Fire Tests of Through Penetration Firestops.
- 12. ASTM E 1966 - Standard Test Method for Fire-Resistive Joint Systems.
- 13. Underwriters Laboratories, Inc.:

- a. UL 1479- Fire Tests of through-Penetration Firestops.
- b. UL 2079 - Tests for Fire Resistance of Building Joint Systems.
- c. UL - Fire Resistance Directory.

C. Quality Assurance

1. Laboratory Pre-Construction Testing: Test exterior sealants, joint accessories, and joint substrates in accordance with the following, before starting sealant installation:
  - a. Obtain samples of joint substrate products specified in other sections.
  - b. Adhesion: ASTM C 794; determine surface preparation and required primer.
  - c. Compatibility: ASTM C 1087; determine materials forming joints and adjacent materials do not adversely affect sealant materials and do not affect sealant color.
  - d. Staining: ASTM C 510, or ASTM C 1248; determine sealants will not stain joint substrates.
  - e. Pre-construction testing is not required when sealant manufacturer can furnish data acceptable to Inspector based on previous testing for materials matching those of the Work.
2. Field Pre-Construction Testing: Test each exterior sealant and joint substrate in accordance with the following, before starting sealant installation:
  - a. Install sealants in field samples using joint preparation methods determined by laboratory pre-construction testing.
  - b. Install field-test joints in inconspicuous locations as approved by Inspector.
  - c. Test Method: Manufacturer's standard field adhesion test to verify joint preparation and primer required to obtain optimum adhesion of sealants to joint substrate.
  - d. When test indicates sealant adhesion failure, modify joint preparation, primer, or both and retest until joint passes sealant adhesion test.

D. Qualifications

1. Manufacturer: Company specializing in manufacturing products specified with minimum three years documented experience.



E. Field Conditions

1. Maintain temperature and humidity recommended by sealant manufacturer during and after installation.
2. Conform to applicable code for fire resistance ratings and surface burning characteristics.

F. Products

1. Silicone Exterior Joints: ASTM C 920, Type S, Grade NS, Class 25; NT, M, G, A and 0: single component, neutral or moisture curing, non-staining, non-bleeding, color as selected:
  - a. Applications: Use for exterior non-traffic bearing joints, including EIFS Joints.
    - 1) Control and soft joints in masonry.
    - 2) Joints between concrete or stone and other materials.
    - 3) Joints between metal frames and other materials.
    - 4) Other exterior non-traffic bearing joints for which no other sealant is indicated.
    - 5) Sealant at vinyl siding to meet vinyl siding manufacturer's requirements.
2. Polyurethane Traffic Joints: ASTM C 920, Type M, Grade P, Class 25; self-leveling, two component, chemical curing, non-staining, non-bleeding, capable of continuous water immersion, color as selected:
  - a. Applications:
    - 1) Joints in concrete floors and paving.
    - 2) Other traffic bearing joints for which no other sealant is indicated.
3. Acrylic Interior Joints: ASTM C 834; single component, non-staining, non-bleeding, non-sagging; color as selected:
  - a. Applications: Use for interior joints, except where sanitary sealant is required.
    - 1) Interior wall and ceiling joints.
    - 2) Interior joints between door and window frames and wall surfaces.

- 3) Other interior joints for which no other type of sealant is indicated.
  - 4) Sealants and Sealant Primers: Maximum volatile organic compound content in accordance with SCAQMD Rule 1168.
4. Silicone Interior Sanitary Joints: ASTM C 920; single component, solvent or neutral curing, non-sagging, non-staining, fungus resistant, non-bleeding; color as selected:
- a. Applications: Use for kitchens, bathrooms, and other wet areas.
    - 1) Joints between plumbing fixtures and floor or wall surfaces.
    - 2) Joints between kitchen and bath countertops and wall surfaces.
    - 3) Joints between toilet accessories and adjacent surfaces.
    - 4) Sealants and Sealant Primers: Maximum volatile organic compound content in accordance with SCAQMD Rule 1168.
5. Miscellaneous Sealants for interior use:
- a. Foam sealant at air barrier penetrations: Non-expanding one-part polyurethane foam.
  - b. Sealant for air-sealing, interior trim (already-painted or wall-papered surfaces): Clear siliconized acrylic rated by the manufacturer to last 25 years or more.
6. Firestop Materials: Fill Void, and Cavity Materials: One or more of the following types, as appropriate for particular construction conditions:
- a. Silicone sealant material, except on finished surfaces to be painted.
    - 1) Sealants and Sealant Primers: Maximum volatile organic compound content in accordance with SCAQMD Rule 1168.
  - b. Caulk type material.
  - c. Putty type material.
  - d. Composite sheet type material, 1/4 inch nominal thickness, foil-faced.
  - e. Wrap strip type material, 1/4 inch nominal thickness, intumescent elastomeric.
  - f. Mortar as specified in Section 04 20 00 - Unit Masonry where permitted by applicable building code.
  - g. Packing Materials:
    - 1) Ceramic fiber blanket, 4 lb/cu ft density.

- 2) Ceramic fiber insulation, minimum 1 inch thick, 8 lb/cu ft minimum density.
- 3) Mineral wool batt insulation, 6.0 lb/cu ft minimum density.
- h. Forming Materials: As required by tested design for particular construction conditions.

7. Accessories:

- a. Primer: Non-staining type, recommended by sealant manufacturer to suit application.
  - 1) Sealants and Sealant Primers: Maximum volatile organic compound content in accordance with SCAQMD Rule 1168.
- b. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.
- c. Joint Backing: Round foam rod compatible with sealant; oversized 30 to 50 percent larger than joint width; recommended by sealant manufacturer to suit application.
- d. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

G. Execution

1. Preparation:

- a. Verify substrate surfaces and joint openings are ready to receive sealant work.
- b. Verify joint backing and release tapes are compatible with sealant.
- c. Remove loose materials and foreign matter which might impair adhesion of sealant.
- d. Clean and prime joints.
- e. Perform preparation in accordance with ASTM C 1193.
- f. Protect elements surrounding joints from damage or disfiguration.

2. Installation:

- a. Perform installation in accordance with ASTM C 1193.
- b. 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.
- c. Install bond breaker where joint backing is not used.

- d. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.
- e. Apply sealant within manufacturer's recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
- f. Tool joints concave.
- g. Remove excess material immediately.
- h. Clean adjacent soiled surfaces.
- i. Protect sealants until cured.

3. Installing Firestop Materials:

- a. Install material at openings requiring firestop material in accordance with firestop manufacturer's written instructions, and in accordance with UL Fire resistive Design requirements.

**END OF SECTION**

## **DIVISION 07 – THERMAL & MOISTURE PROTECTION**

### ***SECTION 07 96 00- AIR-SEALING***

#### A. Summary

##### 1. Section Includes:

###### a. Requirements for Air-Sealing Building.

- 1) Products and methods required for Air-Sealing are specified in other Sections.

##### 2. Sustainable Design: Comply with Division 01 Section “Sustainable Design Requirements.”

#### B. References:

1. EEBA (Energy and Environmental Building Alliance) standard air sealing and framing details, attached for reference.

##### 2. Definitions:

- a. Air barrier: Building elements which prevent the migration of air between zones.
- b. Zone: An air space, within which air movement is permissible or desirable, but which is intentionally separated from other spaces. (See C.3 for examples.)
- c. Outer air seal: Exterior air barrier, including shell and air sealing measures, intended to prevent infiltration of outside air into framing cavities and spaces within the thermal boundary.
- d. Inner air seal: Interior air barrier, including interior building finish and air sealing measures, intended to prevent transfer of air between building interior and framing cavities.
- e. Intermediate air seal: Measures performed to subfloor, framing voids, shafts, chases, and penetrations to isolate, or impede air flow between, zones as required.
- f. Top floor ceiling air barrier: Continuous air barrier, terminating at exterior sheathing or masonry, intended to prevent the transfer of air between roof cavity and all zones below, including building interior and framing cavities.
- g. Thermal boundary: See Section 07 20 00 - Thermal Insulation.
- h. Unconditioned space: Space enclosed by building shell but outside thermal boundary.
- i. Conditioned space: All space within thermal boundary.
- j. Sealing measure: Sealant, rigid or spray-applied blocking, or a combination of blocking and sealant as appropriate.

C. Products

1. Rigid Wood Blocking: See Section 06 1000- Rough Carpentry; for product requirements.
  - a. Lumber.
  - b. Plywood.
2. Rigid Insulation: See Section 07 20 00 - Thermal Insulation; for product requirements.
  - a. Foam insulating board: polyisocyanurate, extruded polystyrene, plain and foil faced.
3. Spray-applied or Blow-in Insulation: See Section 07 20 00 - Thermal Insulation; for product requirements.
  - a. Expanding foam insulation.
  - b. Spray polyurethane foam
  - c. Blown-in Insulation.
    - 1) Blown-in cellulose insulation air-seals when applied at levels of 3.5lbs per cubic foot or greater.
    - 2) Blown-in fiberglass insulation does not air-seal.
4. Sealants: See Section 07 92 00 - Joint Sealants; for product requirements.
5. Gaskets: Silicone, EPDM, or neoprene bulb: See Section 08 71 00 - Door Hardware; for product requirements.
6. Fire-resistive materials:
  - a. Sealant: Firestop sealant. See Section 07 92 00 - Joint Sealants; for product requirements.
  - b. Sheet metal:.032 inch pre-finished aluminum; See Section 07 62 00 - Sheet Metal Flashing and Trim; for product requirements.
  - c. Concrete board: nominal 1/2-inch thick. See Section 09 30 00 - Tiling; for product requirements.

D. Execution

1. Firestops - Provisions of this section do not supersede firestopping or smoke barrier requirements of applicable building code.

- a. All holes through firestopping components to be sealed with firestop sealant.
2. Blower door test - Sealing measures shall be judged adequate when structure passes all portions of blower door test. Note that there are minimum and maximum allowable airflows. See Section 07 97 00 - Blower Door Air Leakage Testing.
3. Zones requiring separation by air sealing (note that firestop requirements may apply to air-sealing materials):
  - a. Finished interior, basement, and ductwork.
  - b. Framing voids and chases.
  - c. Attic or roof cavity and the outdoors to which it is vented.
  - d. Framing cavities in projecting construction (bays).
  - e. Any part of basement or crawlspace specifically defined as outside the thermal boundary.
4. Outer air seal:
  - a. Basement and crawlspace:
    - 1) Exterior walls: seal unintentional wall openings of basements and crawlspaces within thermal boundary.
    - 2) Space outside thermal boundary: Seal all openings between conditioned and unconditioned spaces.
    - 3) Basement-under-porch partition: Weather-strip partition door.
  - b. Roof cavities and attics:
    - 1) Unconditioned Spaces: For cavities outside thermal boundary, do not seal to outside unless otherwise required.
    - 2) Conditioned Spaces: For cavities enclosed within thermal boundary (i.e. unvented with roof deck and exterior walls insulated), seal to outside.
  - c. Exterior walls (not covered in a. or b. above):
    - 1) Masonry and sheathing: Seal all cracks, gaps and unintentional openings.
    - 2) Fenestration: Frames and sills shall be sealed to rough openings.

- 3) Bay over porch: Seal underside of bay framing to separate bay from porch roof space.

5. Intermediate air seal (framing):

- a. Floors and ceilings: Seal cavities of perimeter stud walls and partitions at each ceiling level.
  - 1) Note: failure to provide firestop or top plate at ceiling level may increase cost of air sealing.
- b. Bays and projections:
  - 1) Cantilevered joists - Block and seal joist bays where projecting through exterior wall.
  - 2) Roof cavity: Seal opening into bay roof at exterior wall.
- c. Bathtub at exterior wall: Seal exterior wall cavity from space under tub.
- d. Subflooring: Seal subfloor to exterior sheathing or masonry at each floor level.
- e. Chases: Seal all openings into attics, roof cavities, basements and crawl-spaces.
- f. Framing penetrations:
  - 1) Piping subject to movement - All seals around soil stack, stack vent, and domestic water piping shall employ resilient materials. Rigid foam shall not be used.
  - 2) Hot pipes and ducts - Seals around all hot water, hydronic, or steam piping, and uninsulated warm-air ducts shall employ resilient materials rated for the service temperature.
- g. Chimneys and vents: Use approved noncombustible materials within 2 inches of chimney, B-vent, or flue carrying combustion products, or follow appliance manufacturer's directions.
- h. Electrical devices: Seal cable knockouts from back of box unless box is provided with device and cover designed to prevent infiltration.
- i. Abandoned flues, conduits and chases: Remove or seal to prevent air movement between zones.

6. Inner air seal:

- a. Seal drywall to framing:



- 1) Floor/ceiling - Seal interior finish to wall framing at ceiling level to prevent air transfer between vented roof cavity or room above and wall cavities below.
  - a) Ceiling method: Caulk edges of ceiling finish to all top plates, runners, and firestops prior to installing wall finish. For ceilings finished prior to framing walls, caulk to exterior masonry.
  - b) Wall method: Install approved drywall gasket, caulk, or panel adhesive to top plates, runners, and firestops before installing interior finish.
    - (1) For Projects pursuing Energy Star certification panel adhesive is not to be used for this purpose; use method and materials approved by Energy Star standards to achieve inner air seal.
- b. Openings for mechanical or electrical components: In top-floor ceilings and all exterior walls, seal penetrations of interior finish for electrical devices, pipes, register boots, etc.
- c. Prioritizing inner air sealing measures: Where necessary to comply with whole house infiltration (blower door) test limits, install sealant to interior finish in the following order of priority:
  - 1) All bathrooms.
  - 2) Exterior walls on top floor.

**END OF SECTION**



**DIVISION 07 – THERMAL 7 MOISTURE PROTECTION**

***SECTION 07 97 00- BLOWER DOOR AIR LEAKAGE TESTING***

A. Summary

1. Section includes:

- a. Whole-house air infiltration test.
- b. Top-floor ceiling air barrier test.
- c. Duct system exterior leakage test.

2. Sustainable Design: Comply with Division 01 Section “Sustainable Design Requirements.”

B. References:

1. ASHRAE 62-2
2. ASH RAE 62-89

C. Applicability

1. Perform specified tests on rehabilitation and new construction projects, with a gross floor area of 3500 square feet or less between firewalls.

D. Related Requirements

1. Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.

E. Submittals

1. Test results shall be submitted to OHCD/PHDC/PRA.

F. Quality Assurance

1. Certification: Operator performing tests to be certified by the Building Performance Institute (BPI), or Energy Star, unless otherwise approved in writing by OHCD/PHDC/PRA.

2. Definitions:

- a. Pascal: Unit of pressure. One inch water column = 249 Pascals (Pa).
- b. cfm50: Cubic feet per minute at a pressure difference of 50 Pa.

G. Equipment

1. Blower door kit: Variable speed fan rated 4000 cfm at 50 Pa mm., expanding frame, calibrated flow sensor.
2. Micromanometer: Digital pressure gauge accurate to 0.5 Pa.
3. Pressure pan: Shallow box, one face open and gasketed, with pressure tap for testing registers.

H. Execution

1. Whole-House Infiltration (Blower Door) Test:

- a. Multi-family with separate outside entryways: Where no one entryway gives access to all units, treat each portion of the building served by its own entryway as a separate building.

b. Procedure:

- 1) Set up: Erect blower door in common entry, place exterior windows and doors in winter position, open basement (if conditioned) and apartment doors to common area, fill traps with water or seal, close basement vents. (See “Measuring Air Tightness with a Blower Door” and “#2 Air Sealing” in the OHCD/ PHDC/ PRA “Resource Efficient Rehabilitation Implementation Guide,” and separate guideline “Testing Roof cavity Pressure to Verify Integrity of Top-Ceiling Air Barrier.”)
- 2) Measurement: Depressurize building to 50 Pa, read cfm50 air flow. If fan cannot reach 50 Pa, calculate  $cfm = cfm * (50/pressure)^{0.65}$ , or use “can’t reach 50” table.

c. Allowable limits:

- 1) New Construction/ Gut rehab: Calculate allowable limits per BPI procedures.

- a) Calculation Method: Multiply building volume X.0058 (.35 Air Changes per 60 minutes) X N-Factor

(1) N-Factor for Philadelphia:

- 1 story: 18.5
- 1.5 story: 16.5
- 2 story: 15
- 2.5 story: 14
- 3 story: 13.3

- b) Calculation achieved in point A is maximum allowable air flow. Readings 70% or less of this amount require mechanical ventilation for safety and air quality.

- (1) Mechanical ventilation shall not require homeowner action (such as a summer/winter switch exhaust fan), unless approved in writing by OHCD/PH DC/PRA.

- 2) Moderate Rehabilitation, Row homes: flow shall not exceed 2.5 cfm per square foot of finished space, Notify Inspector if flow is less than 1800 cfm, 1 cfm per square foot, or 900 cfm per unit, whichever is larger.
  - 3) Moderate Rehabilitation, Single house or free-standing building - flow shall not exceed 2.5 cfm per square foot. Notify Inspector if flow is less than 1400 cfm, 0.75 cfm per square foot, or 700 cfm per unit, whichever is larger.

- d. Correcting failure: If maximum flow limit is exceeded, continue air sealing according to requirements of Section 07 96 00.
- e. If minimum air flow (70 percent of BAS) is not reached, mechanical ventilation must be introduced. Operation of mechanical ventilation system must be automatic and is not to require any operation by the homeowner.

- 2. Unconditioned Space Air Barrier Test: Conduct test on all spaces outside thermal and air barrier.

- a. Top-Floor Ceiling Air Barrier Test: Conduct test on all roof cavities outside thermal boundary.

- 1) Procedure: Depressurize building to 50 Pa. Measure pressures between roof cavity, building interior, and outside. Sum of pressures from interior to roof cavity, and from roof cavity to outside shall be within 1 Pascal of pressure from, inside to outside.
    - 2) Allowable limit: Cavity pressure with respect to outside shall be less than 10% of house pressure (5 Pa with building at 50 Pa).
    - 3) Correcting failure: If cavity pressure limit is exceeded, identify and install sealant in openings in interior finish responsible for passage of air from building interior to attic or roof cavity.

- b. Unconditioned space (Basement, Crawlspace, Garage) Test

- 1) Procedure: Depressurize building to 50 Pa. Measure pressures between roof cavity, building interior, and outside. Sum of pressures from interior to roof cavity, and from roof cavity to outside shall be within 1 Pascal of pressure from inside to outside.
  - 2) Allowable limit: Cavity pressure with respect to outside shall be less than 10% of house pressure (5 Pa with building at 50 Pa).
  - 3) Correcting failure: If cavity pressure limit is exceeded, identify and install sealant in openings in interior finish responsible for passage of air from building interior to attic or roof cavity.
3. Duct System Exterior Leakage Test: (See Section 23 05 93 - Testing, Adjusting and Balancing for HVAC, for additional information.
- a. Procedure: Depressurize house to 50 Pa with basement and furnace room doors open. Place pressure pan over each register individually and measure pressure with micromanometer.
  - b. Allowable limit: Register pressure shall not exceed 1.5 Pa.
  - c. Correcting failure: if register pressure limit is exceeded, repair duct leakage. Restore any damaged interior finish to original condition.

**END OF SECTION**