CITY OF PHILADELPHIA

OFFICE OF HOUSING AND COMMUNITY DEVELOPMENT
PHILADELPHIA HOUSING DEVELOPMENT CORP.
REDEVELOPMENT AUTHORITY

SPECIFICATIONS

FOR CONSTRUCTION AND REHABILITATION OF SINGLE FAMILY HOUSES AND
SMALL MULTI- FAMILY PROPERTIES
2-4 UNITS, 3 STORIES OR LESS

MAY 2011

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END OF SECTION

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/RDA.

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/RD. Substitutes are not to be installed unless approved in writing by OHCD/PHDC/RDA

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/RDA, one for the Inspector, one for the Architect, and one to be returned to the contractor.
3. Samples and Product Data to establish standards of acceptable quality shall be submitted to OHCD/PHDC/RDA.
   a. Contractor to submit four (4) copies of each material; one for OHCD/PHDC/RDA, 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/RDA and shall report any errors, inconsistencies, or omissions discovered to the Architect, developer, and OHCD/PHDC/RDA.
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/RDA.

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/RDA shall be submitted, prior to the start of the work, to OHCD/PHDC/RDA.
   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 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/RDA 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/RDA 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/RDA. Label with manufacturer's name and model number where applicable.
   g. Make final changeover of permanent locks and deliver keys to ODDC/PHDC/RDA. Advise OHDC/PHDC/RDA 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/RDA 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/RDA 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/RDA 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/RDA 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

SECTION 01 81 20 - SUSTAINABLE DESIGN REQUIREMENTS

A. SUMMARY

1. The OHCD/PHDC/RDA 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/RDA.
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/RDA 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/RDA 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/RDA prior to purchase and installation. Clearly explain why material containing added urea-formaldehyde resin must be used in request to OHCD/PHDC/RDA. If permission is granted, follow requirements for handling and installing outlined in other Sections of the OHCD/PHDC/RDA 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/RDA 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:
   a) Architectural paints and coatings applied to interior walls and ceilings must not exceed the VOC content limits established in Green Seal Standard GS-11, Paints, the most current addition, available at this link: http://www.greenseal.org/Portals/0/Documents/Standards/GS-11%20Stn%20Dev/paints_GS_11.pdf.
   b) Anti-corrosive and anti-rust paints applied to interior ferrous metal substrates must not exceed the VOC content limit of 250 g/L.
   c) 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.aqmd.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.aqmd.gov/rules/reg/reg11/r1168.pdf.

E. WASTE MANAGEMENT

1. Performance Requirements: The OHCD/PHDC/RDA has determined that projects shall divert as muchnon-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/RDA 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 pallets to remove pallets from Project site. For pallets 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/RDA 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/RDA 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/RDA. 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: 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/RDA, 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/RDA. 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?CMSPageID=1554
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/RDA, 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/RDA, 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 02 EXISTING CONDITIONS

DIVISION 02 EXISTING CONDITIONS
QUALITY STANDARDS AND 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. Ensure that safety measures in accordance with local building code and as described in other Sections of this Division are in place implemented during all demolition activities. Protect adjacent properties from damage.

   1. Conduct a pre-demolition conference at the site with the OHCD/PHCD/RDA prior to commencing demolition activities unless directed by OHCD/PHDC/RDA to do otherwise.

   2. If hazardous materials are encountered, notify the OHCD/PHDC/RDA immediately.

   3. OHCD/PHDC/RDA encourages either on-site or off-site sorting and recycling of demolition debris and material or, engaging an architectural salvage company to reduce labor, waste and overall demolition cost. Any monetary gain for such actions is the property of the Contractor. Legally remove and dispose of non-recyclable waste to an EPA approved landfill.

      a. In cases where Contractor does not hire a waste removal service, submit landfill tickets and certifications to OHCD/PHDC/RDA.

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

   1. Ensure that all utilities are shut off and capped before commencing any demolition activities.

   2. Do not close or obstruct streets, sidewalks or other occupied or used facilities without obtaining permission from authorities having jurisdiction.

   3. Where directed by the OHCD/PHDC/RDA or the Philadelphia Historic Commission, carefully remove and salvage items for reuse and reinstallation or for delivery to the OHCD/PHDC/RDA prior to commencing demolition activities. Protect and store items designated for reuse and reinstallation in a secure location as directed by the OHCD/PHDC/RDA until time of reinstallation.

   4. Protect adjacent properties, structures, landscaping, and vehicles as necessary to prevent damage, dust, and contamination. Provide pollution control measures specified in other Sections of this Division.

   5. Where demolition activities expose any portion of an adjacent building or buildings, protect the building(s) from weather and water infiltration.

END OF DOCUMENT

SECTION 02 26 10 - HAZARDOUS MATERIAL ASSESSMENT AND REMEDIATION

A. SUMMARY

1. Section Includes:
   a. Identification and Removal of the following:
      1) Asbestos containing materials.
      2) Lead based Paint.
      3) Mold.
2. Field Conditions:
   a. It is anticipated that the following hazardous materials may be present in the existing facility:
      1) Asbestos containing materials.
      2) Lead based paint products.
      3) Mold.
      4) No report of the presence of Asbestos containing materials, lead based paint, or mold exists.
         a) Contractor is responsible for identifying asbestos and/or asbestos containing materials. Contractor to prepare report of asbestos and/or asbestos containing materials and submit report to OHCD/PHDC/RDA.
            (1) Insulation, including pipe wrap and duct, not easily identifiable as fiberglass, and the observation of 9 inch square floor tile, will require assessment for asbestos.
         b) Prior to the start of Work, have an independent laboratory perform, a Risk Assessment to determine the presence of lead based paint. Risk Assessment report to be submitted to the RDA.
            (1) Risk Assessment must be performed by a Risk Assessor certified by the Commonwealth of Pennsylvania. Include a copy of the certification with the Risk Assessment report.
         c) In lieu of preparing a risk assessment, Contractor may proceed with Work as if all paint is lead based.
            (1) Contractor to retain the services of an abatement contractor who is certified by the Commonwealth of Pennsylvania to perform lead abatement and operate as if all surfaces are painted with lead based paint. All applicable lead-safe procedures to be followed after abatement work is complete. Copies of all licenses and/or certificates shall be submitted to OHCD/PHDC/RDA prior to the start of remediation work.
         d) Lead paint abatement must be performed prior to beginning any other work within the structure.
      5) If materials suspected of containing asbestos are encountered, do not disturb; immediately notify developer and OHCD/PHDC/RDA.
         a) Once the presence of asbestos containing material is confirmed, the developer will make the necessary arrangements for its removal, or direct the Contractor how to proceed.

(1) Only licensed and/or certified firms and/or individuals are permitted to remove asbestos containing materials. Prior to the start of remediation work copies of all licenses and/or certificates shall be submitted to OHCD/PHDC/RDA.

(2) Once removal of asbestos containing materials commences, all work is to be in strict compliance with all regulations and requirements of the authorities having jurisdiction, including requirements for disposal.

(a) Asbestos remediation firm to submit verification that disposal has been made in an approved asbestos disposal site.

(3) Once remediation work is started no person is permitted in the space without proper attire and must be de-contaminated in accordance with regulations upon leaving the area containing asbestos.

6) If materials suspected of containing mold are encountered, do not disturb; immediately notify developer and OHCD/PHDC/RDA.

a) Contractor to take all recommended and necessary precautions issued by authorities having jurisdiction, and remove the mold-containing, and any adjacent wet, material completely, in accordance with the recommendations of the US EPA and all other authorities having jurisdiction.

(1) Contractor may retain a mold remediation specialist to perform investigation and remediation work as approved OHCD/PHDC/RDA.

b) Prior to commencing with new work, the source of the water or moisture infiltration is to be corrected.

B. SUBMITTALS

1. One copy of all licenses and certificates of certification attesting to licensing or certification by the Commonwealth of Pennsylvania, and other Authorities Having Jurisdiction requiring licensing or certification, of firms and individuals performing work for the following:
   a. Asbestos assessment and remediation.
   b. Lead Based Paint assessment and remediation.
   c. Mold assessment and remediation.
2. One copy of lead abatement plans and wipe test results.
3. One copy of assessment reports for the following:
   a. Asbestos.
   b. Lead Based Paint.
   c. Mold.
4. Submit copies of licenses to Inspector prior to commencing assessment work.
5. Submit copies of assessment reports to Inspector upon completion of assessment work and prior to start of remediation work.

C. QUALITY ASSURANCE

1. Lead Based Paint Abatement - Contractor Requirements:

1) The developer and contractor to retain the services of a Lead Based Paint (LBP) abatement contractor. The LBP Abatement Contractor must provide a detailed Abatement Plan indicating the method of abatement being utilized for all items:
   a) Indicate types of removal (RENCAP, REM, etc). This plan must be approved by OHCD/PHDC/RDA before work may begin. The plan must indicate that the LBP Abatement Contractor will follow all procedures established by the EPA, Health Department, and other authorities having jurisdiction, as well as the information necessary to confirm #2 below.
   b) Once remediation work is started no person is permitted in the space without proper attire and must be de-contaminated in accordance with regulations upon leaving the area containing lead based paint.
2) The LBP Abatement Contractor must be a state certified abatement contractor, and personnel assigned to remove lead based paint, must be lead safe trained and certified, and meet all requirements of authorities having jurisdiction. The LBP Abatement Contractor and each employee are required to submit a copy of their EPA Certificate prior to the start of work.
3) After the abatement work is complete, the LBP Abatement Contractor shall issue an abatement report indicating compliance with the abatement plan. Any deviation from the plan shall be noted and explained. This report shall be issued to the developer, general contractor, and OHDC/PHDC/RDA. No further work may begin until this report is issued.
4) At the completion of the project, the LBP Abatement Contractor is to perform a “wipe test” or lead based paint clearance.
5) The Contractor shall provide the homeowner with a copy of the EPA’s pamphlet “Renovate Right - Important Lead Hazard Information for Families, Child Care Providers, and Schools” prior to the start of any renovation work. The Contractor shall have the homeowner sign a pre-renovation disclosure form confirming receipt of the pamphlet.
6) The Contractor shall at all times employ lead safe practices as identified in the rules of the Authority having Jurisdiction.
7) One copy of the lead risk assessment, abatement plans, abatement reports, and wipe tests to be provided to the homeowner, or in the event of housing rehabbed for homeownership, is to be included in the deed documents to be transferred to new owners in perpetuity.

2. Mold Removal - Contractor Requirements:
   1) The Contractor shall provide the Owner with a copy of the EPA’s pamphlet “A Brief Guide to Mold, Moisture and Your Home” EPA 402-K-02-003, English language; and EPA 402-K-02-008, Spanish language, prior to starting any renovation work.

D. EXECUTION

1. Removal of materials containing hazardous substances is to be completed in compliance with all rules, regulations, and recommendations of the Authorities Having Jurisdiction.

a. The contractor shall obtain additional information from the following Agencies/Authorities and other Authorities Having Jurisdiction, including, but not limited to. The City of Philadelphia, and the Pennsylvania Department of Health:
   1) HUD: http://www.hud.gov/offices/lead/library/enforcement/LSHR_Sub_J.pdf
      a) This document establishes and defines the various levels of rehabilitation and is the policy that all federally funded programs follow,
   2) HUD: http://www.epa.gov/lead/pubs/epahudrrmodel.htm
      a) This document provides documentation regarding the EPA RRP (Renovation, Repair, and Painting) requirements.
b. The contractor shall notify each department of all authorities having jurisdiction of the presence of asbestos, lead based paint, and/or mold.

E. PROTECTION

1. Protect facility from damage from weather and other causes during remediation work.

END OF SECTION

SECTION 02 41 00 - DEMOLITION

A. SUMMARY

1. Section Includes:
   a. Demolition and removal of selected portions of existing building.
   b. Demolition and removal of selected site elements.
   c. Salvage of existing items to be reused or recycled.
2. Sustainable Design: Comply with Division 01 Section “Sustainable Design Requirements.

B. DEFINITIONS

1. Remove: Detach items from existing construction and legally dispose of them off-site, unless noted to be removed and salvaged or removed and reinstalled.
2. Remove and Salvage: Detach items from existing construction and deliver, ready for reuse, as directed by OHCD/PHDC/RDA.
3. Remove and Reinstall: Detach item from existing construction, prepare them for reuse, and reinstall them where indicated.
4. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

C. MATERIALS OWNERSHIP

1. Items of interest or value to OHCD/PHDC/RDA that may be encountered during selective demolition remain the property of OHCD/PHDC/RDA. Carefully remove and salvage each item or object in a manner to prevent damage and deliver as directed by OHCD/PHDC/RDA.

D. QUALITY ASSURANCE

1. Refrigerant Recovery Technician Qualifications: Certified by an EPA-approved certification program.
2. Regulatory Requirements:
   a. Comply with governing EPA notification regulations before beginning selective demolition.
   b. Perform demolition in accordance with all local codes and regulations with strict regard to safety, protection of this and adjacent property, pollution, pest control, and encroachment of streets and walks.
      1) The contractor is to secure all required permits from the appropriate government agencies.
      2) The contractor to provide required notification to and secure required permission from the Philadelphia Streets Department and Police Department prior to erecting barricades and restricting traffic when required.
   c. Comply with hauling and disposal regulations of authorities having jurisdiction.

d. Standards: Comply with ANSI A10.6 and NFPA 241.

e. Safety: The contractor is solely responsible for the implementation and enforcement of safe working conditions and methods of operation.

1) Contractor to provide all notifications, precautions, and warnings; and erect all barriers, barricades, and devices necessary for protection of the general public, his workers, and Inspectors having rightful access to the project site.

2) When demolition operations require work in, or the use of, exterior areas, yards, sidewalks and streets the contractor to erect suitable barriers, barricades, fences, warning signs or lights as necessary, particularly at excavations to provide protection to the general public.

E. FIELD CONDITIONS

1. Conditions existing at time of inspection for bidding purpose will be maintained as far as practical. Variations within structure may occur due to removal and salvage operations prior to start of selective demolition. Claims for additional costs due to such variations will not be considered.

2. Notify Inspector of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

3. Hazardous Materials: See Section 02 26 10.

4. Sale or storage of removed items or materials on-site is not permitted.

5. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

a. Notify occupants, in writing, of occupied spaces 48 hours prior to scheduled shut-off of utilities which serve occupied spaces. One copy of notice shall be submitted to OHCD/PHDC/RDA.

1) Notice to include approximate time utility will be shut-off and expected length of shut-off.

F. EXECUTION

1. Examination:

a. Verify that utilities required to be removed have been disconnected and capped.

b. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.

c. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the extent of conflict. Promptly submit a written report to Inspector.

d. Engage a professional engineer, if necessary, to survey condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective demolition operations.

e. Record existing conditions of adjacent structures by digital photographs or video.

2. Utility Services and Mechanical/Electrical Systems: Maintain services/systems indicated to remain and protect them from damage during selective demolition operations.
   a. Locate, identify, disconnect, and seal or cap off services/systems serving areas to be selectively demolished.
   b. If services/systems are required to be removed, relocated, or abandoned, before proceeding with selective demolition provide temporary services/systems that bypass area being demolished and that maintain continuity of services/systems to other parts of the building.
   c. Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing.
      1) Where entire wall is to be removed, existing services/systems to be removed with removal of wall.
      2) Systems indicated to be relocated, or to remain in place with or without modification, are not to be removed as work of this Section.
      3) Ducts, pipes, or other devices which pass entirely through areas of selective demolition, and which are not indicated to be removed or to remain, to be removed only after review by Inspector.
3. Preparation:
   a. Verify that property is unoccupied and no longer being used.
      1) Prior to start of demolition operations confirm by field coordination with Inspector that the address is correct and that the property is the correct location of the Contract Work.
      2) Review the scope of the selective demolition work during field inspection with the Inspector.
   b. Site Access and Temporary Controls: Conduct selective demolition and debris-removal to ensure minimum interference with streets, sidewalks, and other adjacent occupied facilities.
   c. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings.
   d. Temporary Shoring: Provide and maintain temporary shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
4. Protection of Existing Facilities and Features that Remain:
   a. Protect existing trees in the affected area with appropriate barriers and guard panels.
   b. Protect adjacent buildings, sidewalks, and other improvements from damage.
      1) The repair, or replacement, of damage to adjacent properties is the responsibility of the contractor. All damage is to be repaired, or replaced, with materials matching the existing construction and by methods that will produce construction that matches the damaged elements.
   c. Provide temporary weather protection, as necessary, of any newly exposed elements of adjacent properties, to prevent weather damage until new construction is complete.

d. When roof construction is removed, provide temporary weather protection, as required, to prevent weather damage to remainder of property.

5. Pollution Control:
   a. Sprinkle debris with water and provide temporary enclosures as required to limit dust to lowest possible level.
      1) Do not allow water to accumulate or cause flooding, runoff, or icing.
   b. Provide enclosed chutes from upper windows, or openings, to enclosed trucks or dumpsters.
      1) In lieu of enclosed chutes and trucks/dumpsters, provide continuous water spray to contain dust (especially from plaster debris).
   c. Remove all debris from street, sidewalk surfaces, and adjoining property at end of each day's work.
   d. Burning of debris is not permitted.

6. Selective demolition:
   a. Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the work within limitations of governing regulations and as follows:
      1) Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor before disturbing supporting members on the next lower level.
      2) Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
         a) Remove lath without loosening studs.
         b) Remove finish flooring without loosening subflooring.
         c) Remove window frames without loosening masonry sills and jambs.
         d) Remove door and window frames from deteriorated or unsound masonry openings with care. Brace existing masonry to prevent further damage to masonry and masonry lintels.
         e) Remove all existing unused joists, studs, framing, nails, hooks, wire, and other extraneous items. Provide a clean, substrate for new construction.
      3) Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
      4) Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain fire watch and portable fire-suppression devices during flame-cutting operations.
      5) Maintain adequate ventilation when using cutting torches.
      6) Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.

7) Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
8) Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
9) Dispose of demolished items and materials promptly.

b. Selectively demolish exterior facade, structures, and components designated to be removed, including below-grade footings, foundations, utilities, and site improvements to depth necessary to avoid conflict with new construction or sitework.
   1) Backfill basement and below grade openings with clean fill where required. Fill material to be free of organic matter, rocks, brick, and other debris larger than 3 inches in any direction.
      a) Install fill in 12 inch lifts, compacting each layer with mechanical tampers.
         (1) Fill 12 inches or less may be hand tamped.

7. Removed and Salvaged Items:
   a. Clean salvaged items.
   b. Pack or crate items after cleaning. Identify contents on containers.
   c. Store items in a secure area until delivery to OHCD/PHDC/RDA.
   d. Protect items from damage during transport and storage.
8. Removed and Reinstalled Items:
   a. Clean and repair items to functional condition adequate for intended use. Paint equipment to match new equipment.
   b. Pack or crate items after cleaning and repairing. Identify contents on containers.
   c. Protect items from damage during transport and storage.
   d. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for intended use.
9. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Inspector, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

G. CLEANING

1. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to conditions existing before selective demolition operations began.

END OF SECTION

DIVISION 03 CONCRETE

DIVISION 03 CONCRETE
QUALITY STANDARDS AND 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. Reference:
   a. American Concrete Institute (ACI); published standards, most current versions.
   b. Builder's Guide to Mixed-Humid Climates, Joseph Lstiburek, Ph.D., PE, Building Science Corporation, c. 2005; Chapter 7 "Foundation Design."
2. All concrete mixes shall conform to ASTM C94 "Standard Specification for Ready Mixed Concrete."
3. Portland Cement Alternative: Alternatives to Portland cement such as fly ash are permitted for use in footings and foundations, provided that additives are certified by the mixing company to meet minimum strength, bearing capacity, and other requirements as indicated in other sections of this specification. Do not use in slabs-on-grade and other flat work.
4. Perimeter Insulation at Slabs-on-Grade: Install slab perimeter (edge) insulation in accordance with current building and energy codes.
5. Install vapor retarder in mil thickness specified in other Sections of this Division unless directed otherwise by the Architect.
6. Basement slabs shall be 4 inches thick minimum. Crawl space slabs shall be 2 inches thick minimum. Slabs-on-grade to be minimum 4 inches thick unless otherwise specified by the architectural or engineering Drawings.

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

1. Install under slab vapor retarders in accordance with manufacturer's written instructions. Do not puncture. Seal all through penetrations and seams.
2. Do not place any concrete for foundation work until inspection is conducted by the building inspector and written approval to proceed is given.
3. Finish concrete work as specified in other Sections of this Division.
4. Existing Concrete Work:
   a. If an existing concrete slab exhibits cracks greater than 3/16 inch in width or 3/16 inch in vertical displacement, repair using a durable and suitable concrete repair material. Feather out and slope repair material at vertical displacement locations for smooth transition.
   b. If an existing concrete slab has a slope exceeding 3/8 inch in 32 inches, or exhibits pits and depressions, repair using a suitable and durable concrete repair material.
   c. If an addition will be built to an existing dwelling and foundations are found to be out of level 1/2 inch or more over 20 feet, contact the OHCD/PHCD/RDA to determine whether or not corrective measures need to be taken or if the existing foundation unevenness will have little to no impact on the new addition.

   d. Repair cracks in an existing concrete footing that are greater than 1/4 inch.

5. New Concrete Work:
   a. Foundations to be out of level no more than 1/2 inch in 20 feet.
   b. Cracks in footings and foundation walls greater than 1/4 inch must be repaired.
   c. New concrete slabs-on-grade may not be out of level more than 1/4 inch in 10 feet unless so designed for drainage.
   d. Cracks in slabs-on-grade 1/8 inch and greater are considered excessive and must be repaired.
   e. Pitting and spalling is not acceptable. Concrete work evidencing either must be repaired or replaced.

END OF DOCUMENT

SECTION 03 30 00 - CAST-IN-PLACE CONCRETE

A. SUMMARY

1. Section includes:
   a. Cast-in-Place Concrete.
2. Sustainable Design: Comply with Division 01 Section “Sustainable Design Requirements.

B. QUALITY ASSURANCE:

1. ACI Publications: Comply with the most recent version of the following, unless more stringent requirements are indicated:
   a. ACI 301 "Specification for Structural Concrete."
   b. ACI 117 “Specifications for Tolerances for Concrete Construction and Materials.”
   c. ACI 260 “Standard Specification for Air-Entraining Admixtures for Concrete.”
   d. ACI 305R "Hot Weather Concreting."
   e. ACI 306.1 "Standard Specification for Cold Weather Concreting."
   f. ACI 308.1 “Standard Specification for Curing Concrete.”
   g. ACI SP 66 "ACI Detailing Manual."
   h. ACI 318 "Building Code Requirements for Reinforced Concrete."
   i. ACI 347 "Guide to Formwork for Concrete."
   j. ASTM C 494 “Standard Specification for Chemical Admixtures for Concrete.”
2. Foundations, slab, footing design, and formwork to comply with relevant sections of Building Guide to Mixed Humid Climates, standards noted in ACI Publications, or building codes adopted by authorities having jurisdiction, whichever is more stringent.

C. DELIVERY, STORAGE, AND HANDLING

1. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.

D. PRODUCTS

1. Form-Facing Materials:
   a. Smooth-Formed Finished Concrete: Provide Plywood, metal, or other approved panel materials that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
      1) Particle board may be used if face is sealed to provide smooth form surface.
      2) Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impart subsequent treatments of concrete surfaces.
      3) Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete and to prevent spalling of concrete upon removal.

a) Furnish units that will leave no corrodible metal closer than 1 inch to the surface of exposed concrete.
b) Furnish ties that, when removed, will leave holes no larger than 1 inch in diameter in concrete surface.

2. Steel Reinforcement:
   a. Reinforcing Bars: ASTM A615, grade 60, deformed.
   b. Plain-Steel Wire: ASTM A82, as drawn.
   c. Plain-Steel Welded Wire Fabric: ASTM A185, fabricated from as-drawn steel wire into flat sheets. Rolls not acceptable.
3. Reinforcement Accessories:
   a. Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" of greater compressive strength than concrete, and as follows:
      1) For slabs-on-grade, use supports with sand plates or horizontal runners where base material will not support chair legs.
      2) For footings, use concrete masonry units made of stone concrete with compressive strength equal to 4,000 psi at 28 days.
4. Concrete Materials:
   a. Portland Cement: ASTM C150, Type I/II
      1) Fly Ash: ASTM C 628, Class C or F.
5. Normal-Weight Aggregate: ASTM C 33, uniformly graded, and as follows:
   a. Class: Severe weathering region, but not less than 3S.
   b. Maximum size of course aggregates: Not more than one-fifth of narrowest dimension between sides of forms, one-third of the depth of slabs, nor three-fourths of minimum clear spacing between reinforcing bars.
6. Water - clean, potable and complying with ASTM C 94.
7. Admixtures:
   a. Use admixtures only with written RDA approval unless otherwise indicated in sealed engineer's documents. Contractor to make every effort to coordinate schedule so admixtures are not required.
   b. Use only admixtures certified by manufacturer to be compatible with other admixtures and cementitious materials and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use admixtures containing calcium chloride.
   c. Air-Entraining Admixture: ASTM C 260.
   d. Water-Reducing Admixture: ASTM C 494, Type A.
   e. Water-Reducing and Accelerating Admixture: ASTM C 494, Type E.
   f. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.

8. Synthetic Fiber: Fibrillated or monofilament polypropylene fibers engineered and designed for use in concrete, complying with ASTM C 1116, Type III, 3/4 to 1-1/2 inches long.
9. Vapor Retarder: Plastic Vapor Retarder: ASTM E 1745, Class A not less than 10 mils thick. Furnish manufacturer's accessories including bonding asphalt, pointing mastics, and self-adhering joint tape and pipe boots.

E. CONCRETE MIXES:

1. All concrete shall be 3000 psi minimum compressive strength at 28 days.
2. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than Portland cement in concrete as follows:
   a. Fly Ash: 25 percent.
3. Air Content: Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content as indicated within a tolerance of plus 1 or minus 1.5 percent, unless otherwise indicated.
   a. Do not air entrain concrete to trowel-finished interior floor slabs.
   b. Do not allow entrapped air content to exceed 3 percent.
4. Limit water-soluble, chloride-ion content in hardened concrete to 0.10 percent by weight of cement.
5. Synthetic Fiber: Uniformly disperse in concrete mix at manufacturer's recommended rate, but not less than 1.5 lb/cu. Yd.
6. Admixtures: Use admixtures according to manufacturer's written instructions, and only with RDA written approval.

F. FABRICATING REINFORCEMENT

1. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

G. CONCRETE MIXING

1. Ready-Mixed Concrete: Measure, batch mix, and deliver concrete according to ASTM C 94 and ASTM C 1116, and furnish batch ticket information.
   a. When air temperature is between 85 and 90 degrees F., reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 degrees F., reduce mixing and delivery time to 60 minutes.
   b. Provide delivery ticket for each batch discharged and used in the work, indicating project identification name and number, date, mix type, mix time, quantity, and amount of water introduced and location placed in project.

H. EXECUTION:

1. Formwork:
   a. Design, erect, shore, brace, and maintain formwork, According to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until concrete structure can support such loads.

b. Construct formwork so concrete members and structure are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
c. Limit concrete surface irregularities to 1/8 inch as designated by ACI 347R for Class A smooth-formed finished surfaces.
d. Construct forms tight enough to prevent loss of concrete mortar.
e. Clean forms and bracing before placing concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
f. Coat contact surfaces with form-release agent, according to manufacturer's written instructions, before placing reinforcement.
g. Earth Forms: Earth cuts may be used as forms for footings only.
    1) If earth forms are used, the dimensions of the concrete member are to be increased by 2 inches (1 inch each face) to meet the requirements of ACI 318 for minimum concrete cover over reinforcing.

2. Vapor Retarders:
    a. Place, protect, and repair vapor-retarder sheets according to manufacturer's written instructions, and the following:
        1) Extend vapor retarder to extremities of areas to be protected from vapor transmission. Lap joints minimum of 12 inches. Secure in place with tape, adhesives or other anchorage system as required to permanently retain vapor retarder. Lap over footings and seal to foundation wall.
        2) Seal all penetrations with cloth or aluminized tape.
        3) Repair any tears or punctures immediately before placing concrete. Cover damaged area with another layer of vapor retarder overlapping damaged area by 6 inches all around and sealing 4 sides with tape.

3. Steel Reinforcement:
    a. Comply with CRSI's "Manual of Standard Practice" for placing reinforcing.
        1) Do not cut or puncture vapor retarder. Repair damage as noted above.
        2) Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials.
        3) Accurately position, support, and secure reinforcement against displacement.
            a) Do not tack weld crossing reinforcing bars.
            b) Bend bars, cold, unless otherwise approved. Do not field bend bars partially embedded in concrete.
    b. Install welded wire fabric in longest practical lengths on bar supports spaced to minimize sagging.
        1) Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction.
        2) Lace overlaps with wire.
    c. One core test per truckload shall be submitted after 28-day curing cycle (location of test(s) to be determined by Project Inspector).

4. Concrete Placement:

a. Verify that excavations, formwork, reinforcement, and embedded items are completed, that no ice or water are present, and required inspections have been performed.
b. Perform slump test(s) as directed by the Inspector, Architect, or engineer.
   1) Do not add water to concrete during delivery, at Project site, or during placement. Adjust slump for workability as directed by Architect or engineer.
c. Prepare one core test cylinder per truckload. Cure cylinder in a protected area on site as directed by inspector.
d. Convey concrete from mixer to final position by method which will prevent separation of material. Deposit in continuous operation until panel or section is complete.
   1) If a section cannot be placed continuously, provide construction joint(s).
e. Deposit concrete in forms in horizontal layers no deeper than 24 inches and in a manner to avoid inclined construction joints. Place each layer while preceding layer is still plastic, to avoid cold joints.
   1) Consolidate placed concrete with mechanical vibrating equipment, using equipment and procedures recommended by ACI 309R.
   2) Do not use vibrators to transport concrete inside forms.

5. Basement and Crawlspace Floors:
   a. Basement floor slabs shall be 4 inches thick minimum. Crawl space slabs shall be 2 inches thick minimum.
   b. Install continuous vapor retarded under concrete in basements, crawl spaces, and interior slabs-on-grade, as specified above.
   c. Deposit and consolidate concrete for floors and slabs in a continuous operation, until placement of a panel or section is complete.
      1) Consolidate concrete during placement so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
      2) Screed slab surfaces with a straight edge and strike off to correct elevations.
      3) Slope surfaces uniformly to drains where required.
      4) Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, free of humps or hollows, before excess moisture or bleedwater appears on surface. Do not further disturb slab surfaces before starting finish operations.
   d. Finish new basement slabs with smooth steel-troweled finish, free of trowel marks and uniform in texture and appearance.
      1) Provide tooled crack joints to control maximum 400 sq. ft. of unrelieved area. Crack joints shall be straight and evenly spaced.
      2) In addition to crack joints specified above, provide control joints through the short dimension of the floor at all offsets and changes in floor configuration; provide isolation joints around support post footings.

Comment Made: Does this belong in this section, or in the QC section? It belongs in this section.

      3) Floors to be level within 1/4 inch in 10 feet.

   e. Finish new crawlspace slabs with Float finish. Cut down high spots and fill low spots. Repeat float passes until surface is left with a uniform, smooth, granular finish.

6. Steps:
   a. Steps shall be of size shown in plan, with minimum 8-inch thick back and cheek walls and minimum 8 inch throat dimension. Construct on footings 24 inches deep (minimum) or use monolithic pour extending at least 24 inches below grade.
   b. Bullnose all step nosings and provide sloped vertical riser.
   c. Apply a broom finish to concrete landings and treads.
   d. Comply with building code stair requirements.

7. Footings:
   a. Install footings to a minimum of 36 inches below finish grades, and a minimum of 12 inches into undisturbed earth. Footings to be a minimum of 12 inches deep by 24 inches wide unless otherwise indicated.
      1) Configura-tion of footings adjacent to an existing footing to be designed by an engineer.
   b. Formwork shall be used where trench will not retain firm shape or is subject to cave-in or collapse.
   c. Inspect footing bottoms, clean and remove any water prior to pour. Do not place concrete on wet or frozen soil.

8. Porches:
   a. Where porches are contiguous with existing neighboring wood framed porch floors, the Contractor shall provide a suitable joint detail at the dividing property line and shall repair all damage to the neighboring porch floor including piers, pilasters and replacement of railing.
   b. New concrete porch floors shall be formed and braced from below, and shall rest on masonry walls on all sides or on approved lintel. Top surface shall slope 1/8-inch per foot toward direction of proper drainage.
   c. Concrete slabs shall be a minimum of 4 inches thick with #4 reinforcing rods at 12-inch spacing each way. Steel rods shall be wire tied at intersections and supported on chair carriers to lift reinforcement off form.
   d. Concrete porch floors shall have smooth steel trowel finish and shall be cured by wet methods or by the use of a curing compound.
   e. All openings below new porch slab shall have steel or precast concrete lintels.
   f. All new porch slabs shall have a bullnosed 3-inch overhang along front and exposed side edges.

9. Sidewalks:
   a. See Section 32 13 13 - Portland Cement Concrete Paving.

10. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

a. When air temperature has fallen to or is expected to fall below 40 deg F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F and not more than 80 deg F at point of placement.
b. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
c. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators.
d. Use only a non-corrosive, non-chloride accelerator. Calcium chloride or thiocyanates admixtures are NOT permitted.

11. Hot-Weather Placement: Place concrete according to recommendations in ACI 305R and as follows, when hot-weather conditions exist:
    a. Cool ingredients before mixing to maintain concrete temperature below 90 degrees F. at time of placement. Chilled mixing water or chopped ice may be used to control temperature providing water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
    b. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
    c. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.
    d. Use water-reducing retarding admixture (Type D) when required by high temperatures, low humidity or other adverse placing conditions.

I. CONCRETE PROTECTION AND CURING

1. Protect freshly poured concrete from premature drying and excessive cold or hot temperatures.
2. Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, and other surfaces.
3. Cure concrete according to ACI 308.1.

END OF SECTION

DIVISION 04 MASONRY

DIVISION 04 MASONRY
QUALITY STANDARDS AND 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. The Brick Industry Association (BIA) Technical Notes, available at www.gobrick.com.
   b. National Concrete Masonry Association (NCMA) Tek Manual and Technical Details, available at www.ncma.org.
2. General: Masonry units must meet minimum ASTM standards required by code and as stated in other Division 04 Sections.
3. Spalling Masonry: Replace or repair masonry units evidencing spalling.
   a. Replacement: Where masonry is existing, match new masonry to adjacent masonry as closely as possible.
   b. Repair: Repair masonry using mortars and cements approved by OHCD/PHDC/RDA.
4. Mortar: Mortar mixture shall meet specifications described in other Sections in this Division. For mortar used for repointing, comply with the Philadelphia Historical Commission mix designs when required.
5. Mortar Bridging: Do not allow mortar to bridge between back face of masonry unit to front face of sheathing or other back-up material in veneer construction.
6. Mortar Droppings and Debris - Cavity Walls: Keep cavities free of mortar droppings and other debris. Cavities with excessive droppings and debris will be tested for proper water drainage. If cavity is found to not drain properly, contractor will correct the cavity and wall at contractor's expense, including demolishing work and re-starting wall construction if issue is deemed to be severe enough to warrant this action.
7. Flashing: Project and terminate veneer and through-wall flashing minimum 1/4 inch from face of masonry and form drip edge. When flexible flashings are used, create drip edge with non-corrosive metal.
8. Weepholes: Place maximum 24 inches apart.
9. Salvaged Masonry: Use of salvaged masonry is permitted provided that any remaining mortar is properly removed prior to placing, to ensure proper bond.
10. Repointing: Rake out joint minimum 2 to 2-1/2 times the width of the joint. Remove loose mortar and additional mortar as necessary to provide an adequate bonding surface for new mortar.
11. Cracking: Repair cracks in composite or veneer masonry walls which are visible from 2 feet away or which are larger than 1/4 inch in width. Repair by tuck pointing or patching.

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

1. Protection of Stored Masonry during Construction: Protect masonry materials and metal reinforcement from wetting by rain, snow or ground water and from soilage during storage and construction. Do not place units which have been exposed to wetting or soilage. Do not use metal reinforcing or ties with loose rust, ice, or other coatings which will reduce or destroy bond.
2. Environmental Conditions - Cold Weather: Do not place masonry units when air temperature is below 40 degrees F. If work must be done to meet schedule in temperature below 40 degrees F, do not do so unless approved in writing by OHCD/PHDC/RDA. In addition, preferred method of installation for cold weather installation following Brick Industry Association Standards for installation in temperatures below 40 degrees F shall be submitted to OHCD/PHDC/RDA for approval.
3. Environmental Conditions - Hot Weather: Protect masonry from direct exposure to wind and sun when ambient air temperature is above 99 degrees F. If unable to provide adequate protection, do not lay masonry when ambient air temperature is above 99 degrees F.
4. Workmanship: All work will be installed plumb, and aligned and level. Work out of plumb, alignment or level greater than 1/4 inch in 10 feet shall be removed and re-installed.
5. New to Existing Construction: Key new masonry into existing masonry walls a minimum half unit length every third course.
6. Toothing: Toothing is not permitted.
7. Protection of Work: Cover the top of newly laid walls with a non-staining, strong waterproof covering. Ballast covering to prevent wind or other kind of uplift when site is unoccupied.
8. Mortar Stains: Clean mortar fins and smears prior to tooling joints. Clean mortar stains with an approved cleaner. Proposed cleaner shall be submitted to OHCD/PHDC/RDA or the Philadelphia Historical Commission for review and approval prior to starting work.
9. Cleaning Existing Masonry: Remove graffiti, deteriorated paint coatings and other unsightly surface blemishes. Proposed removal method shall be submitted to OHCD/PHDC/RDA for approval prior to starting work. Removal methods may include water washing, solvent cleaning and steam cleaning. Pressures in power water washing shall not damage masonry or mortar.
10. Masonry Steps: Where existing stone steps exist and are undamaged, raise and reset to be level and true and to not exceed riser height maximum per code. Provide new concrete foundation in cases where existing foundation is not structurally sound or does not exist.

END OF DOCUMENT

SECTION 04 10 00 - MAINTENANCE OF MASONRY

A. SUMMARY

1. Section Includes:
   a. Repairs to brick masonry. Required repairs include, but are not limited to. The following:
      1) Re-pointing of brick joints as required by the Inspector.
      2) Replacement of damaged bricks with salvaged brick from demolition.
   b. Repairs to brownstone, sandstone, or other decorative stone facings or trim.
   c. Patching simulated masonry or other cementitious facings.
   d. Masonry cleaning.
2. Sustainable Design: Comply with Division 01 Section “Sustainable Design Requirements.”

B. REFERENCES

1. The following guidelines apply to re-pointing, cleaning or repair of masonry on historic buildings:
   a. "Preservation Briefs: 1. The Cleaning and Waterproof Coating of Masonry Buildings," U.S. Department of the Interior, National Technical Information Service 1975
   b. "Preservation Briefs: 2. Repointing Mortar Joints in Historic Brick Buildings," U.S. Department of the Interior, National Technical Information Service 1980
   c. “The Brownstone Guide: Maintenance & Repair Facts for Historic Property Owners,” The New York Landmarks Conservancy, 2003.
   d. “Technical Tips: Composite Patching of Brownstone - A Step-by-Step Overview,” New York Landmarks Conservancy, 2003.
   e. “Technical Tips: Removing Graffiti,” New York Landmarks Conservancy, 1995.

C. DELIVERY, STORAGE, AND HANDLING

1. Deliver all materials in manufacturer’s original packaging with brand and product identification clearly visible.
2. Handle, store and protect materials in a manner to prevent deterioration or intrusion of foreign matter.
   a. Protect mortar and grout materials from deterioration by moisture or temperature.
   b. Do not use material that has deteriorated or has been mixed with foreign matter.
   c. Do not use cement or lime based materials that have been stored for more than 6 months.

D. FIELD CONDITIONS

1. Work of this Section is to be completed when the air and surface temperatures are at least 40 degrees F. and rising or less than 90 degrees F. and falling.

2. No masonry pointing or patching is to be completed while there is visible frost, snow, or ice present on masonry surfaces.
3. Protect existing adjacent materials and property of others during work.

E. EXECUTION

1. Before any masonry restoration and cleaning work is started, the contractor is to review the scope of work in the field with the Inspector to determine exactly what is to be completed and to get approval of the methods and materials to be used in the work.
2. Re-pointing - In all walls requiring re-pointing of over fifty percent or more of the total surface area, the entire wall shall be re-pointed. Rake out all joints, remove all loose mortar and additional mortar as necessary to provide adequate purchase surface for new mortar, and re-point to uniform surface and condition using round point tool or a tool shaped as required to provide pointed joints to match existing joint style.
3. Restoration of existing brownstone, sandstone and other decorative stone facings and trims:
   a. Restore small areas of spalling, broken and missing stonework with mortar or stucco patching materials colored to match existing stonework. Restore and tool to match line, color, and detail of existing stonework. Provide and install non-staining anchors and metal lath as required. See Division 09 Sections “Portland Cement Plastering.”
   b. Restore other stonework by covering with stucco to match color and approximate detail and configuration of existing stonework.
4. Patching Simulated Masonry and Other Cementitious Facings:
   a. Restore with stucco or mortar mix matching color of existing facing material. See Division 09 Sections “Portland Cement Plastering.”
5. Cleaning Existing Masonry:
   a. Remove graffiti, deteriorated paint coatings, and other unsightly surface blemishes from existing faces of walls as required.
   b. Removal methods may include water washing, solvent cleaning, and steam cleaning; in all cases, the method to be employed is to be reviewed with the Inspector for prior approval. Sandblasting shall not be used. Pressures in power water washing shall not exceed 500 lb./square inch.
      1) The Historical Commission can provide information on appropriate cleaning products.
   c. Solvent cleaner shall be used in strict accordance with the manufacturer's written instructions.
   d. All masonry cleaning operations shall be scheduled and accomplished prior to other finishing work such as trim painting, flashing and sheet metal or siding work and painting.

END OF SECTION

SECTION 04 20 00 - UNIT MASONRY ASSEMBLIES

A. SUMMARY

1. Section Includes:
   a. Face Brick.
   b. Building (common) Brick.
   c. Salvaged Brick
   d. Concrete Masonry Units (CMUs).
   e. Concrete Brick.
   f. Mortar.
   g. Grout.
   h. Masonry Joint Reinforcement.
   i. Ties and Anchors.
   j. Embedded Flashing.
   k. Miscellaneous masonry accessories.
2. Sustainable Design: Comply with Division 01 Section “Sustainable Design Requirements.

B. QUALITY ASSURANCE

1. Perform Work in accordance with ACI 530 Building Code Requirements for Masonry Structures and ACI 530.1 Specifications for Masonry Structures.

C. DELIVERY, STORAGE, AND HANDLING

1. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.
2. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
3. Deliver preblended, dry mortar mix in moisture-resistant containers designed for lifting and emptying into dispensing silo. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in a metal dispensing silo with weatherproof cover.
4. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

D. ENVIRONMENTAL REQUIREMENTS

1. Cold Weather Requirements: In accordance with ACI 530.1 when ambient temperature or temperature of masonry is less than 40 degrees F.
   a. Do not use frozen materials or materials mixed with or coated by ice or frost.
   b. Do not build on frozen substrates.

c. Do not place masonry units or mix mortar when temperature is 32 degrees F or lower and will remain below freezing for 24 hours.

2. Hot Weather Requirements: In accordance with ACI 530.1 when ambient temperature is greater than 100 degrees F or ambient temperature is greater than 90 degrees F with wind velocity greater than 8 mph.

E. FIELD CONDITIONS

1. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each days work. Cover partially completed masonry when construction is not in progress.
   a. Protect exposed external corners subject to damage.
2. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least 3 days after building masonry walls or columns,
3. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
   a. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
   b. Protect sills, ledges, and projections from mortar droppings.
   c. Protect surfaces of window and door frames, as well as similar products with painted or integral finishes, from mortar droppings.
   d. Turn scaffold boards near the wall on edge at end of each day to prevent rain from splashing mortar and dirt onto completed masonry.

F. PRODUCTS

1. Face Brick: ASTM C216, Type FBX, Grade SW, standard size; color as selected
   a. Special sizes, shades and colors to provide conformity with neighboring characteristics may be required.
2. Back-up Brick: ASTM C62, Grade MW, standard size Building brick may be used for back-up to face brick and at other interior wythes in repaired or new masonry walls.
3. Used Salvaged Brick: cleaned, salvaged face brick from existing structures may be used for patching and repairs if of same type, size and color as existing brick in wall to be patched.
   a. Cleaned, salvaged brick may be used for small areas of masonry wall repair where the face is to be concealed by new work and finishes at interior locations in any structure.
4. Hollow Load Bearing Concrete Masonry Units: ASTM C90, light weight, 8 inch by 16 inch nominal dimensions. This unit shall be used only at above grade locations.
5. Solid Load Bearing Concrete Masonry Units: ASTM C90, light weight, 12 inch by 16 inch nominal dimensions, 75% solid. This unit shall be used at founda-tion wall and other below grade locations.

6. Concrete Brick Units: ASTM C55, light weight, standard size, solid - for soaps, make-up and bearing pads.
7. Mortar - ASTM C270, Type S; Property specification. Unless otherwise required by Historical Commission.
   a. Portland Cement: ASTM C150, Type I or Type II, except Type III may be used for cold-weather construction.
   b. Hydrated Lime: ASTM C207, Type S
   c. Aggregate: ASTM C144.
      1) For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
      2) For joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.
      3) White-Mortar Aggregates: Natural white sand or crushed white stone.
      4) Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.
   d. Water: Clean and potable.
   e. Admixtures: Admixtures shall not be used, except for Cold-Weather Admixture.
   f. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494/C494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.
   g. Mortar Mixing:
      1) Thoroughly mix mortar ingredients in accordance with ASTM C270 in quantities needed for immediate use.
      2) Achieve uniformly damp sand immediately before the mixing process.
      3) Add mortar color. Provide uniformity of mix and coloration.
      4) Re-temper only within two hours of mixing.
8. Grout Mixes:
   a. Grout: 2,000psi strength at 28 days; 8-11 inches slump; mixed in accordance with ASTM C476.
      1) Course Grout: For grouting spaces with minimum 4 inch dimension in every direction.
      2) Fine Grout: For grout in other spaces.
   b. Grout Mixing:
      1) Transit Mixed Grout: Mix grout in accordance with ASTM C94, modified to use ingredients complying with ASTRM C476.
      2) Site Mixed Grout: Mix grout ingredients in quantities needed for immediate use in accordance with ASTM C476.
9. Masonry Joint Reinforcement: welded wire ladder or truss type, single wire, W2.8 or 0.188-inch diameter side rods and W1.7 or 0.148-inch diameter cross rods, Hot-dip galvanized carbon steel, width to suit wall thickness.

a. Masonry Joint Reinforcement for Single-Wythe Masonry: Either ladder or truss type with single pair of side rods.
b. Masonry Joint Reinforcement for Multi-wythe Masonry: Ladder type with 1 side rod at each face shell of hollow masonry units more than 4 inches in width, plus 1 side rod at each wythe of masonry 4 inches or less in width.
    1) If masonry joints do not align in face and back-up withes use adjustable (two-piece) type, ladder or truss design, with 1 side rod at each face shell of backing wythe and with separate ties that extend into facing wythe. Ties to have two hooks that engage eyes or slots in reinforcement and resist movement perpendicular to wall. Ties to extend at least halfway through facing wythe but with at least 5/8 inch cover on outside face.

10. Metal Ties and Anchors: Provide ties and anchors complying with the following:
    a. Hot-Dip Galvanized, Carbon-Steel Wire: Unless otherwise indicated size wire ties to extend at least halfway through veneer with at least 5/8-inch cover on outside face. Outer ends of wires are bent 90 degrees and extend 2 inches parallel to face of veneer,
    b. Corrugated Metal Ties: Metal strips not less than 7/8 inch wide made from steel sheet, galvanized after fabrication.
11. Flashings:
    a. Metal Flashings: Provide one of the following as directed by Inspector:
        1) 5-oz copper sheet bonded between two layers of fiberglass.
        2) Copper: ASTM B370, soft temper 20 oz/sq ft thick; natural finish.
        3) Stainless Steel: ASTM A240/240M, Type 304, soft temper, 24 gauge thick; smooth finish.
        4) Flexible Flashing: Composite sheet 40 mils thick; 38 mils thick self adhesive rubberized asphalt bonded to 2 mils thick high density polyethylene film.
            a) Provide surface conditioner, Primer, and termination mastic as recommended by manufacturer.
12. Accessories:
    a. Weeps: Preformed plastic tubes, cotton wick filled. Double cotton wick and insert through plastic tube with one loose end extending 18 inches beyond tube.
        1) Plastic tube length to be equal to face brick thickness.
    b. Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade within wall cavity.
        1) Provide one of the following configurations:
            a) Strips, full depth of cavity and 10 inches wide, with dovetail shaped notches 7 inches deep that prevent mesh from being clogged by mortar droppings.
            b) Strips, not less than 1-1/2 inches thick and 10 inches wide, with dimpled surface designed to catch mortar droppings and prevent weep holes from being clogged with mortar.

c. Cleaning Agents: Proprietary masonry cleaning agent as recommended by masonry unit manufacturer, and not harmful to masonry work or adjacent materials.
   1) For old masonry, consult Historical Commission.

G. EXECUTION

1. Examination:
   a. Verify that field conditions are acceptable and are ready to receive work.
   b. Verify items provided by other sections of work are properly sized and located.
   c. Verify that built-in items are in proper location, and ready for roughing into masonry work.
2. Preparation:
   a. Direct and coordinate placement of metal anchors supplied to other sections.
   b. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent support.
3. New Masonry Walls:
   a. Establish lines, levels, and coursing indicated. Protect from displacement.
   b. Anchor new walls to floor joists perpendicular to wall at every fourth joist with 18 gauge galvanized 1 inch metal twisted strap. Anchor new walls parallel to joists at mid-span or at no less than 8 ft. intervals using 1/8 inch by 1 inch wide galvanized steel strap of sufficient length to engage a minimum of 3 adjacent wood joists. Install at bottom of joists and bend strap for solid anchorage into masonry wall construction.
   c. Cut masonry units with motor-driven saw designed to cut masonry with clean, sharp, unchipped edges. Cut units as required to provide continuous pattern to fit adjoining work neatly. Use full units without cutting wherever possible.
   d. Wet brick having absorption rates greater than 0.025 oz. per square inch per minute so that rate of absorption when laid does not exceed this rate. Do not wet concrete masonry units or use such units if wet.
   e. Lay up walls plumb and true with courses level, accurately spaced and coordinated with other work neatly. Joints to be 3/8 inch unless otherwise shown. Lay masonry in running bond pattern unless otherwise indicated.
   f. As the work progresses, build in items specified under this and other sections of the specifications. Fill in solidly with masonry around built-in items. Fill space between frames and masonry solidly with mortar. (Do not fill in around basement joists: see *Parging - masonry around basement joists*, below.) Where built-in items and anchors are to be embedded in cores of hollow concrete masonry units, place a layer of metal lath in the joint below and rod mortar or grout into core.
   g. Lay brick and other solid masonry units with completely filled bed and head joint; butter ends with sufficient mortar to fill head joints and shove into place. Do not slush head joints. Keep cavity clean and free of mortar droppings. Do not furrow bed joints. Rock closures into place. Do not pound corner or jambs to fit stretcher units after setting in place.

h. Lay hollow concrete masonry units with full mortar coverage on horizontal and vertical face shells; also bed webs in mortar where adjacent to cells or cavities to be reinforced or to be filled with concrete or grout.

i. If units are displaced after mortar has stiffened, remove, clean joints and units of mortar and relay with fresh mortar. When joining fresh masonry to set or partially set mason-ry: remove loose masonry and mortar; clean and lightly wet exposed surface of set ma-sonry prior to laying fresh masonry. If necessary to stop off a horizontal run of masonry, rack back in each course. Toothing is not permitted.

j. Key new masonry into existing walls a minimum half unit length every third course vertically.

k. Bond new masonry walls using continuous wire joint reinforcement spaced not more than 16 inches vertically. In addition, provide joint reinforcement at bottom (first) joints in 2 courses at 8 inches vertically, and at bed joints 8 inches above head and 8 inches below sill at all masonry openings, extending 24 inches beyond opening on both sides at both joints.

l. At small area wall patching such as at closure of existing windows, corrugated metal ties shall be used at 2 sq. ft. intervals to provide bond.

m. Provide concealed flashings in masonry work as indicated on drawings or as required; at the minimum provide flashings at sills and heads of new openings and at sills and heads of replaced windows or doors. Prepare masonry surfaces smooth and free from projections which might puncture flashing. Place through-wall flashing on bed of mortar and cover with mortar. Seal flashing penetrations with mastic before covering with mortar. Terminate flashing 1/2 inch from face of wall, unless otherwise shown. Extend flashing beyond edge of lintels and sills (if any) at least 4 inches and turn up edge on sides to form pan to direct moisture to exterior. Provide weep holes in the head joints of the first course of masonry immediately above con-cealed flashings. Space 24 inches on center, unless otherwise shown. Place and leave sash cord wick in head joint. Keep weep holes and areas above flashing free of mortar droppings.

   1) Install cavity drainage material in accordance with manufacturer’s written instructions and as directed by Inspector.

n. Retain sealant joints around outside perimeter of exterior door, window frames and other wall openings.

o. Tool all joints in exposed surfaces including exterior of CMU foundation walls, when thumb print hard using round jointing tool to produce a well dressed concave joint. All other joints including walls to be stuccoed shall be cut flush.

p. Parging - back parge all face brick as the work progresses. Parge interior and exterior surfaces of all new foundation walls. See Division 07 for dampproofing coatings.

q. Protection of work - Protect sills, ledger and off-sets from mortar droppings, remove droppings from new work. Cover tops of walls with non-staining waterproof coverings when work is not in progress. At cavity walls, if any, place wood strips with attached wire pulls on metal ties (joint reinforcement) and clean wood strip prior to placing succeeding rows of metal ties or joint reinforcement.

r. Clean exposed face brick masonry surfaces with proprietary cleaner, brushed, flushed and thoroughly rinsed, intended for cleaning masonry. Use cleaner as recommended by the face brick manufacturer or supplier and in accordance with manufacturer's instructions.
   1) Use non-metallic tools in cleaning operations.
   2) Replace defective mortar, Match adjacent work.
   3) Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 degrees F and above and will remain so until masonry has dried, but not less than 7 days after completing cleaning.

4. Parging basement/foundation walls:
   a. Dampen masonry walls prior to parging.
   b. New walls - Parge interior and exterior surfaces of all new foundation walls. Parging shall be a mix of one part Portland cement to 3 parts sand. Rough casting on interior face of new foundation walls to be installed in 2 coats to minimum 1/2 inch thickness, carried up between joists and smoothly finished to sand texture with wood float.
      1) Scarify each parging coat to ensure full bond to subsequent coat.
   c. Existing walls - Remove loose mortar, mortar dust, loose parging, whitewash and cementitious coatings, and all other loose materials to expose sound portions of walls. Plug and point all obvious cracks and sources of seepage and water infiltration (see Division 07, Dampproofing). Patch and point to replace failed and removed mortar to bring surface out to generally smooth plane, then parge to meet existing wall surfaces. Apply 2 coats parging. Allow 24 hours curing time between successive coats in bringing the wall surface out to the required plane. All rough-casted walls are to have sponge float finish.
      1) Scarify each parging coat to ensure full bond to subsequent coat.
   d. Steel trowel surface smooth and flat with a maximum surface variation of 1/8 inch per foot.
   e. Strike top of parging at 45 degrees.
5. Masonry around basement joists - To permit drying, joist ends should not be mortared in. Leave 1/2-inch gap between parging and surface of joist, unless directed otherwise by Inspector.
   a. Assure that joist pocket is completely air sealed to upper floors and the exterior.

END OF SECTION

SECTION 04 40 00 - STONE ASSEMBLIES

A. SUMMARY

1. Section Includes:
   a. Stone Steps.
   b. Stone Lintels.
   c. Stone Sills.
2. Sustainable Design: Comply with Division 01 Section “Sustainable Design Requirements.”

B. QUALITY ASSURANCE

1. Obtain each variety of stone, regardless of finish, from a single quarry.
2. Obtain mortar materials for each cementitious component from a single manufacturer
3. Obtain each aggregate from one source or producer.

C. DELIVERY, STORAGE, AND HANDLING

1. Store and handle stone and related materials to prevent deterioration or damage due to moisture, temperature changes, contaminants, breaking, chipping, and other causes.
   a. Lift stone with wide-belt slings; do not use wire rope, or ropes that might cause staining.
   b. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
   c. Store aggregates in locations where grading and other required characteristics can be maintained and where contamination can be avoided.

D. FIELD CONDITIONS

1. Protect stone during erection:
   a. Cover partially completed structures when work is not in progress.
      1) Extend cover a minimum of 24 inches down sides and hold securely in place.
      2) Prevent staining of stone from mortar, grout, sealants, and other sources.
         a) If staining occurs, immediately remove such material without damaging stone.
      3) Protect sills, ledges, and projections from mortar and sealant droppings.
2. Do not use frozen materials, or materials mixed or coated with ice or frost.
   a. Remove and replace stone damaged by frost or freezing conditions.

E. PRODUCTS

1. Stone:
   a. Provide stone to match existing materials, unless otherwise directed by Inspector.
2. Mortar Materials:

a. Portland Cement: ASTM C 150, Type I, except Type III may be used for cold-weather. Provide natural color or white cement as required to produce mortar color required.
b. Hydrated Lime: ASTM C 207.
c. Portland Cement-Lime Mix: Packaged blend of Portland cement complying with ASTM C 150, Type I or III, and hydrated lime complying with ASTM C 207.
d. Aggregate: ASTM C 144, except for joints narrower than 1//4 inch and pointing mortar, use aggregate graded with 100 percent passing No. 16 sieve.
   1) Colored Aggregates: Natural-colored sand or ground marble, granite, or other durable stone; of color necessary to produce required mortar color.
e. Water: Potable and clean.

3. Anchors and Fasteners:
   a. Provide anchors and fasteners as required to support loads imposed without exceeding allowable design stresses.
      1) Fabricate anchors from stainless steel, ASTM A 666, Type 304.
      2) Fabricate dowels and pins from stainless steel, ASTM A 276, Type 304.
4. Stone Accessories:
   a. Setting Shims: Resilient plastic or vulcanized neoprene, Type A Shore durometer hardness of 50 to 70, nonstaining to stone, of thickness needed to prevent point loading of stone on anchors and of depths to suit anchors without intruding into required depths of pointing materials.
   b. Setting Buttons: Resilient plastic buttons, nonstaining to stone, sized to suit joint thicknesses and bed depths of stone units without intruding into required depths of pointing materials.

F. STONE FABRICATION

1. Fabricate stone units in sizes and shapes required.
2. Control depth of stone and back check to maintain minimum clearance between back of stone and surfaces of backup walls, and other work behind stones.
3. Dress joints (bed and vertical) straight and at right angle to face.
4. Cut stone to produce uniform joints 3/8 inch wide.
5. Cut and drill sinkages and holes in stone for anchors, fasteners, supports, and lifting devices as needed to set stone securely in place.
6. Finish exposed faces and edges of stone to comply with requirements indicated, if not indicated as directed by the Inspector, or to match existing stone.

G. EXECUTION

1. Raise and reset existing stone steps as required.
   a. Exercise care during removal to prevent damage to existing stone.
   b. Provide new concrete foundation for steps as directed by Inspector.

2. Repair spalls in existing stonework as required using matching stone materials, and appropriate mortars and cements.
   a. If repair work calls for cementing, use special cement commercially prepared and sold for that use.
   b. If repair calls for build-up of missing parts by mortar patching, provide aggregate in mortar to produce matching color of patching materials to stone.
   c. Use stainless steel anchors and non-staining bonding agent in patching spalled or broken stonework.
3. Provide new stone steps, lintels, sills and other pieces and assemblies as required using stone of type, color and configuration shown on drawings or specified. Install using conventional mortars, materials and methods appropriate to the piece and its position in the structure.
4. Before setting stone clean surfaces that are dirty or stained by removing soil, stains, and foreign materials. Thoroughly scrub with fiber brushes, using mild cleaning compounds that contain no caustic or harsh materials or abrasives, follow by rinsing with clear water.
5. Set stone to comply with requirements indicated, or as directed by Inspector. Install anchors, supports, fasteners, and other attachment devices necessary to secure stone in place. Shim and adjust anchors, supports, and accessories to set stone accurately in place with uniform joint widths indicated and with edges and faces aligned according to established relationships and required tolerances.
6. Install concealed flashing at lintels, ledges, and similar obstructions to downward flow of water. Divert water to building exterior.
7. Keep cavities between back of stone and backup wall open where unfilled space is indicated, or as directed by Inspector; do not fill with mortar or grout.
   a. Place weeps in joints where moisture may accumulate. Space 24 inches on center maximum.
8. Set stone in full bed of mortar with head joints filled, unless otherwise directed by Inspector.
   a. Use setting buttons of adequate size, in sufficient quantity, and of thickness required to maintain uniform joint width and to prevent mortar from extruding.
      1) Hold buttons back from face of stone a distance at least equal to width of joint, but not less than depth of pointing materials.
   b. Do not set heavy units or projecting units until mortar in courses below have hardened enough to resist being squeezed out of joint.
   c. Support and brace projecting stones until wall above is in place and mortar has set.
   d. Provide compressible filler in ends of dowel holes to prevent end bearing of dowels and anchor tabs on stone. Fill remainder of anchor holes with mortar.
   e. Point stone joints by placing mortar in layers not more than 3/8 inch. Compact each layer and allow to become thumbprint hard before applying next layer.
   f. Tool joints with a round jointer 1/8 inch larger than width of joint.

END OF SECTION

DIVISION 05 METALS

DIVISION 05 METALS
QUALITY STANDARDS AND 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. Reference - Framing: U.S. Department of Housing and Urban Development (HUD), “Prescriptive Method for Residential Cold-Formed Metal Framing,” c. 1997.
2. Welding: Qualify welding procedures and each welder in accordance with the American Welding Society (AWS) D1.3, “Structural Welding Code - Sheet Steel.”
3. Metal Fabrications: In accordance with AISC Manual of Steel Construction.
4. Finish - Metal Framing: Provide metal framing members which are galvanized (zinc-coated), minimum G60.
5. Splicing: Splicing of studs is not permitted. Erect load-bearing metal studs in one piece, full length.
6. Wall Tolerances: A maximum 1/4 inch variance from true and plumb is allowed.
7. Insulation of Framed Walls: New exterior walls and openings are encouraged to be laid out so that adequate stud bay space is available to receive insulation. A minimum stud bay size of six inches is required. Studs at corners and partition intersections shall be installed to permit continuous insulation, except where permitted otherwise by Program Administration.
8. Lintels: Minimum flange thickness of steel lintels shall be 5/16 inch.

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

1. Delivery and Storage: Store and handle all metal products in a manner to prevent damage, deterioration and formation of rust. Keep materials in a dry area.
2. Workmanship: Install work plumb, square and true to line, properly and tightly cut, fitted and securely fastened. Correctly position top and bottom runner tracks.
3. Thermal Isolation of Metal Studs:
   a. Hold metal stud framing minimum 1 inch off of exterior walls to prevent the back side of metal stud flange from touching the colder exterior wall. Party walls are considered exterior walls.
   b. Terminate top floor partitions to underside of ceiling. Corner studs are permitted to enter the roof cavity to provide lateral support for wall when necessary.
4. Do not attach metal studs and runner track which are installed in the ceiling cavity directly to any metal framing member to which interior finish is fastened. If attachment is unavoidable, provide a thermal break of minimum 2x lumber.
5. Air Sealing:
   a. Where metal stud walls are constructed against exterior masonry walls and are to be air-sealed, brace top runners and corner studs to prevent lateral movement from air sealing measures.

RDA COMMENT "all partitions should be air sealed to eliminate as much air flow as possible, incl. stack/chimney effect" I DO NOT FEEL THIS ADD'L COMMENT IS NECESSARY. I THINK YOU LET THE AIR SEALING SECTION DEFINE IT FURTHER.

b. Air-seal all top floor partitions, exterior walls, furring spaces and chases at underside of ceiling and at subfloor.

END OF DOCUMENT

SECTION 05 40 00 - COLD FORMED METAL FRAMING

A. SUMMARY

1. Section Includes:
   a. Load bearing formed steel stud exterior wall and interior framing, formed steel slotted channel, and framing and bridging.
2. Sustainable Design: Comply with Division 01 Section “Sustainable Design Requirements.

B. REFERENCES

1. American Iron and Steel Institute:
   a. AISC General - Standard for Cold-Formed Steel Framing - General Provisions.
   b. AISI Header - Standard for Cold-Formed Steel Framing - Header Design.
   c. AISI NAS - North American Specification for Design of Cold-Formed Steel Structural Members.
   d. AISI PM - Standard for Cold-Formed Steel Framing - Prescriptive Method for One and Two Family Dwellings.
   e. AISI SG-973 - Cold-Formed Steel Design Manual.
2. ASTM International:
   a. ASTM A 1003/1003M - Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members.
   b. ASTM C955 - Standard Specification for Load-Bearing (Transverse and Axial) Steel Studs, Runners, (Tracks), and Bracing or Bridging for Screw Application of Gypsum Panel Products and Metal Plaster Bases.
   c. ASTM C 1513 - Standard Specification for Steel Tapping Screws for Cold-Formed Framing Connections.
3. American Welding Society:
   a. AWS D1.1 - Structural Welding Code - Steel.
   b. AWS D1.3 - Structural Welding Code - Sheet Steel.
4. National Association of Architectural Metal Manufacturers:
   a. NAAMM ML/SFA 540 - Lightweight Steel Framing Systems Manual.
5. Steel Stud Manufacturers Association:
   a. SSMA - Product Technical Information.

C. PERFORMANCE REQUIREMENTS

1. Structural Performance: Provide cold-formed metal framing capable of withstanding design loads within limits and under conditions indicated.
   a. Design Loads: As indicated on drawings or as required by building codes adopted by authorities having jurisdiction.
   b. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:

1) Exterior non-load bearing wall framing: Horizontal deflection as follows:
   a) At masonry veneer: 1/600 of wall height.
   b) At other materials: 1/360 of wall height.

c. Design framing systems to provide for movement of framing members without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 degrees F.

d. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as follows:
   1) Upward and downward movement of 3/4 inch.

2. Design exterior non-load-bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing material.

D. QUALITY ASSURANCE

1. Welding: Qualify welding procedures and each welder in accordance with American Welding Society (AWS) D1.3, "Structural Welding Code - Sheet Steel."

2. Framing Members Installed as Part of Fire-Resistance Rated Assemblies: Provide framing members approved by governing authorities.

3. Calculate structural properties of framing members in accordance with AISI SG-973 Cold-Formed Steel Design Manual.

4. Furnish framing materials in accordance with SSMA - Product Technical Information.

5. Perform Work in accordance with the following:
   a. Framing: AISI General and AISI NAS.
   b. Headers: AISI Header.
   c. Trusses: AISI Truss.
   d. Wall Studs: AISI WSD.
   e. Lateral Design: AISI Lateral.
   f. Residential Framing: AISI PM.

E. DELIVERY, STORAGE, AND HANDLING

1. Deliver, store, and handle products in a manner to prevent damage and deterioration, including rust.

2. Store materials above the ground in a dry area, in manufacturer's original packaging. Keep labels showing product type, name, and grade intact.

F. PRODUCTS

1. Cold formed metal framing:
   a. Cold-Formed Metal Framing: ASTM C 955.

2. Framing Components:

a. Steel Sheet: ASTM A1003/A1003M; Structural Grade, Type H, metallic coated:
   1) Framing Grade: As required by performance requirements.
   2) Track Grade: ST33H.
   3) Coating: G60.
b. Studs: Steel sheet, formed to channel shape, punched web, minimum 0.0451 inch (18 gauge) thick, 1.625 inch face, and 3.5 inch depth, unless otherwise indicated or required to meet performance requirements.
c. Joists: Steel sheet, formed to channel shape, solid web, in thickness and size as required to meet performance requirements.
d. Track: Steel sheet, formed to channel shape; same width as studs, tight fit; 0.0451 inch (18 gauge) thick, solid web.
   1) Provide deep-leg track where required or as directed by Inspector.

3. Accessories:
   a. Fabricate from minimum 16 gage steel sheet of the type and finish used for framing members. Provide manufacturer's standard configuration for the following items:
      1) V-bridging.
      2) Cold-rolled channels, 1/2 inch depth.
      3) Vertical slide track.
      4) Clip angles.
      5) Flat strapping.
      6) Vertical slide clips.
      7) Plates and Gussets
4. Fasteners:
      1) Fasteners: ASTM C1513; self-tapping, corrosion resistant screws.
      2) Anchorage devices: Hot-dip galvanized steel or stainless steel. Acceptable types include power-actuated fasteners, drilled expansion bolts, and power-driven anchor screws.
   b. Touch-up Paint: FS TT-P-645, zinc-molybdate alkyd.
   c. Welding: In conformance with AWS D1.1 and AWS D1.3.
5. Fabrication:
   a. Fabricate assemblies of formed sections of sizes and profiles required.
   b. Fit, reinforce, and brace framing members to suit design requirements.
   c. Fit and assemble in largest practical sections for delivery to site, ready for installation.

G. EXECUTION

1. Examination:
   a. Verify that project conditions and substrates are appropriate to installation of cold formed metal framing systems.

b. Verify that inserts, clips, and similar attachment devices installed as work of other sections are located and installed properly.
c. Verify that rough-in utilities are in proper location.

2. Installation, general:
   a. Comply with requirements of ASTM C 1007 except where exceeded by other requirements.
   b. Install framing accessories such as web stiffeners, diagonal bracing, and bridging as indicated or required.
   c. Masonry Relieving Angles: Obtain steel angles (specified elsewhere) and install in proper position.
   d. Fastening: Join components by welding or by using screws or bolts, as recommended by framing component manufacturer for members to be joined. Clean welds, removing spatter and slag, and apply one coat of touch-up paint. Wire tying of framing elements is prohibited.
3. Erection of Studs:
   a. Correctly position runner tracks at base and top of studs. Attach runner tracks to structure in accordance with manufacturer's recommendations for substrate and fastener type used. Use fasteners at all track terminations and corners.
   b. Place studs at spacing indicated on drawings.
   c. Corners and partition intersections of perimeter walls shall be so framed as to permit continuous insulation. There should be no uninsulated cavities.
   d. Double stud at wall openings, door jambs, and window jambs.
   e. Install intermediate studs above and below openings to align with wall stud spacing.
   f. Erect load-bearing studs one piece, full length. Splicing of studs is not permitted. Brace and reinforce to develop full strength.
   g. Where metal stud walls are constructed inside exterior masonry, top runners and corner studs that are to receive air sealing or spray foam insulation shall be braced sufficiently to prevent lateral movement from damaging air-sealing or spray foam insulation measures.
   h. All top floor partitions, exterior walls, furring spaces and chases shall be sealed at ceiling level according to the provisions of Division 07 to prevent air movement between wall cavities and roof cavity.
4. Tolerances - 1/4 inch maximum variance from True Position.
5. Thermal isolation of metal framing:
   a. Metal framing members shall not form a continuous thermal conduction path between interior finish and either exterior surfaces of the building or cold air spaces.
      1) Party walls to adjacent unoccupied buildings shall be considered as exterior walls for the purposes of this section.
   b. To permit compliance with insulation requirements of Division 07, maintain a 5-inch minimum clearance from interior stud flange to exterior masonry walls.
   c. Top floor metal stud walls must terminate at ceiling level.
      1) Exception: Corner studs may enter roof cavity to provide lateral support for wall.

d. Metal studs and runners installed in the roof cavity must not be attached directly to any metal framing member to which the interior finish is fastened. Any such attachment must include a thermal break of 2x (minimum) lumber.

6. Erection of Joists:
   a. Install framing components.
   b. Make provisions for erection stresses. Install temporary bracing to maintain alignment, until permanent bracing and attachments are installed.
   c. Place joists at 16 inches on center; not more than 2 inches from abutting walls. Connect joists to supports using fastener method.
   d. Set floor and ceiling joists parallel and level, with lateral bracing and bridging.
   e. Locate joist end bearing directly over load bearing studs or install load distributing member to top of stud track.
   f. Install web stiffeners at reaction points.
   g. Touch-up damaged metallic coated surfaces with primer to match shop coating.

END OF SECTION

SECTION 05 50 00 - METAL FABRICATIONS

A. SUMMARY

1. Section Includes:
   a. Lintels.
   b. Pipe Columns.
   c. Anchor Bolts.
2. Sustainable Design: Comply with Division 01 Section “Sustainable Design Requirements.”

B. QUALITY ASSURANCE

1. All fabrications shall be in accordance with AISC Manual of Steel Construction, and AISC Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings.
2. All Welding shall be in accordance with AWS D1.1 Structural Welding Code.

C. PRODUCTS

1. Structural W-Shapes: ASTM A992/A992M.
2. Rolled angle lintels, beams, plates and other structural shapes: ASTM A36/A36M
3. Pipe columns: ASTM A53, Grade B Schedule 40.
4. Anchors, fasteners, nuts, bolts: ASTM A307, Grade A, galvanized to ASTM A153/A153M for galvanized components.
5. Welding Materials: AWS D1.1; type required for materials being welded.
6. Shop Primer: SSPC 15, Type 1, red oxide.
7. Touch-up Primer: To match shop primer.
   a. Flat and Non-Flat Paints: Maximum VOC content in accordance with GS-1.
8. Touch-up Primer for Galvanized Surfaces: SSPC 20, Type I Inorganic.
   a. Anti-Corrosive Paints: Maximum VOC content in accordance with GC-03.
9. Grout - non-shrink commercial pre-packaged mix.
10. Lintels:
    a. Steel angles, 3-1/2 by 3-1/2 by 5/16 inches for openings up to 5 feet wide.
       1) Length to allow 8 inches minimum bearing on both sides of opening,
          a) Exterior Locations: Galvanized.
          b) Interior Locations: Prime paint, one coat.
       2) For openings larger than 5 feet wide consult Inspector.
11. Pipe Columns:
    a. Minimum ASTM A 53, Grade B Schedule 40, 4 inch diameter by length as required to fit span tightly.

1) Provide 8 inch long (minimum) by width of beam bearing plate continuously welded to each end.
2) Punch bearing plate for 3/8 inch diameter anchor bolts at each end.
3) Finish with one coat of prime paint.

12. Anchor Bolts:
    a. 3/4 inch bolt, standard J-hook, with nut and washer; unfinished.
13. Factory Applied Finishes - Steel:
    a. Prepare surfaces to be primed in accordance with SSPC SP 2 or SP 3.
    b. Do not prime surfaces in direct contact with concrete or where field welding is required.
    c. Prime paint items with one coat except where galvanizing is specified.
14. Galvanizing: ASTM A123/A123M; hot-dip galvanize after fabrication.

D. EXECUTION

1. Coordination with Other Work:
    a. At proper times, furnish and set in place miscellaneous metal items and accessories such as sleeves, anchors, inserts which are to be built into other work, or furnish such items to others for installation together with any necessary diagrams and templates.
    b. Cut, fit, drill and tap miscellaneous metal as required for installation or attachment of work.
    c. Drill and cut other work as necessary for installation of miscellaneous metal. Exercise care not to damage or mar adjacent finishes.
2. Fabrication:
    a. Work shall be accurately fabricated in accordance with approved details. Edges shall be straight and true; angles, sharp; and surfaces smooth, free of scratches, pits and other blemishes. Curves where required shall be smoothly formed to required profiles without waves and buckles. Shearing and punching shall leave clean, true edges and surfaces.
    b. All work shall be neat and smooth and made strong, stiff and rigid. Joints shall be strong and secure. Exposed joints shall be accurate and close fitting.
    c. Fastenings shall be concealed where possible. Exposed welds shall be ground smooth. Exposed bolts, and screws shall be countersunk. Provide lock washers for all bolts.
3. Installation:
    a. Install work properly positioned, solid, secure, with verticals plumb, horizontal level, and free of damage and imperfections.
    b. Unless otherwise specified, anchors, fasteners and accessories for exterior use shall be non-ferrous or galvanized metal fully compatible with metal used.
        1) For interior use fasteners of same metal as item being fastened.

c. Use expansion bolts and anchors for attaching miscellaneous metals to concrete and solid masonry and toggle bolts for attaching to hollow masonry.

4. Rough Hardware: Provide all brackets, supports, sleeves, bearing plates, tie rods, anchor bolts, inserts and similar items not specified elsewhere.
5. Lintels: Steel angle lintels shall be employed at openings in face brick walls. Where steel angle lintels are used for face brick, the back-up or interior lintel shall be steel angle or precast concrete masonry lintels.
6. Perform field welding in accordance with AWS D1.1.
7. Obtain approval prior to site cutting or making adjustments not scheduled.
8. After erection, touch-up welds, abrasions, and damaged finishes with prime paint or galvanizing repair paint to match shop finishes.

END OF SECTION

SECTION 05 70 00 - DECORATIVE METAL

A. SUMMARY

1. Section Includes:
   a. Steel and Iron Ornamental Railings.
2. Sustainable Design:
   a. Comply with Division 01 Section “Sustainable Design Requirements.”

B. PERFORMANCE REQUIREMENTS

1. In engineering railings to withstand loads indicated, determine allowable design working stresses or railing materials based on the following:
   a. Steel: 72 percent of minimum yield strength.
2. Structural Performance:
   a. Handrails and Top Rails of Guards:
      1) Uniform load of 50lbf/ft. applied in any direction.
      2) Concentrated load of 200 lbf applied in any direction.
      3) Uniform and concentrated loads need not be assumed to act concurrently.
   b. Infill of Guards:
      1) Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft.
      2) Infill load and other loads need not be assumed to act concurrently.
3. Thermal Movements: Provide exterior railings that allow for thermal movements resulting from a maximum change (range) of 120 degrees F., ambient; 180 degrees F. material surfaces; in ambient temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
4. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

C. QUALITY ASSURANCE

1. Source Limitations: Obtain railings and guards through one source from a single manufacturer.
   a. Provide product data displaying proposed design appearance to Inspector for approval prior to start of fabrication.
2. Welding: Qualify procedures and personnel according to AWS D1.1, Structural Welding Code-Steel.

D. FIELD CONDITIONS

1. Field Measurements: Verify actual locations of walls and other construction contiguous with railings by field measurements before fabrication.

E. SCHEDULING

1. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not satisfy structural performance requirements.

F. PRODUCTS

1. Metals, General:
   a. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.
   b. Brackets, Flanges, and Anchors: Same metal and finish as supporting rails, unless otherwise directed by Inspector.
2. Steel and Iron:
   a. Tubing: ASTM A 500 (cold formed).
   b. Bars: Hot-rolled, carbon steel complying with ASTM A 29/A 29M, Grade 1010.
   c. Plates, Shapes, and Bars: ASTM A 36/A 36M.
3. Fasteners:
   a. Uncoated Steel Components: Plated-steel fasteners complying with ASTM B 633, Class Fe/Zn 25 for electrodeposited zinc coating where concealed; Type 304 stainless-steel fasteners where exposed.
   b. Dissimilar Metals: Type 304 stainless-steel fasteners.
   c. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to construction and capable of withstanding design loads.
   d. Provide concealed fasteners for interconnecting railing components and for attaching railings to other work, unless otherwise indicated or approved by Inspector or exposed fasteners are unavoidable.
      1) Provide Phillips flat-head machine screws for exposed fasteners, unless otherwise indicated or approved by Inspector.
   e. Anchors: Provide torque-controlled expansion anchors, fabricated from corrosion-resistant materials with capability to sustain, without failure, a load equal to six times the load imposed when installed in masonry and equal to four times the load imposed when installed in concrete.
4. Welding Rods and Bare Electrodes: To suit metal to be welded and performed in accordance with AWS stan-dards.
5. Shop and Finish Paint: Primer and 2 finish coats, to comply with Division 09 Section - Painting, factory applied, rust inhibitive paint.
   a. Finish color: Black unless otherwise indicated.
6. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.
7. Nonshrink, Nonmetallic Grout:
   a. Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107.

b. Provide grout recommended by manufacturer for interior and exterior applications.

G. FABRICATION

1. Railings to be fabricated of standard shaped parts with standard roll formed top rail, minimum 1/2 inch x 1/2 inch balusters or spindles, minimum 1 inch x 3/8 inch bottom rail, minimum 1 inch x 1 inch starting posts, newel posts and column posts, and minimum 1/4 inch base plates where required with minimum 2 holes for anchorage at running supports and 4 holes for anchorage at starting posts and columns. Balusters at stair railings shall be vertical and spaced at 4 inch maximum, face to face.
   a. Provide lambs tongue, rounded corners or turn down at top rail at free ends for safety.
2. Assemble railings in shop to greatest extent possible to minimize field splicing and assembly. Use connections that maintain structural value of joined pieces.
3. Cut, drill, and punch metals cleanly and accurately. Remove burrs and grind and ease edges to a radius of 1/32 inch, unless otherwise directed. Remove sharp or rough areas on exposed surfaces.
4. Form work true to line and level with accurate angles and surfaces.
5. Fabricate connections exposed to the weather to exclude water. Provide weep holes as necessary.
6. Cut, reinforce, drill, and tap as required to receive finish hardware, screws, and similar items.
7. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at Fittings.
   a. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   b. Obtain fusion without undercut or overlap.
   c. Remove flux immediately.
   d. Finish exposed edges smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.
8. Anchor railings by imbedding posts into concrete or masonry work, or by inserting into predrilled holes in masonry with non-shrink, non-staining grout.
   a. Provide inserts and other anchoring devices for connecting railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings.
   b. For railing posts set in concrete, provide steel sleeves not less than 6 inches long with outside dimensions not less than 1/2 inch greater than outside dimension of post, with steel plate forming bottom closure.
   c. Where embedment is not possible, anchor plates to masonry and concrete surfaces with stainless steel or galvanized expansion bolts. Expansion bolts shall not be permitted closer than 3 inches to any edge of concrete or masonry materials. Anchor to wood members using square head lag screws of appropriate size and length. All

railings and posts shall be mounted firmly and securely and shall provide sufficient strength to withstand loads indicated..

9. Handrails shall be continuous through a run.
   a. If splicing is necessary, splice connection to be welded, with weld ground smooth so that the joint is not percepti-ble by sight or touch.
10. Finish paint shall be a high-gloss enamel and field touch-up shall be provided where required to restore final finish.
11. Security grilles: Mount grilles using lugs welded to frame - 2 per side. Mount lugs by lagging to wood frame (beyond grille - interior side) or by embedment in masonry opening. Grille shall be fabricated of iron strips and bars, welded construction, or 12 gauge wire fabric, 1-1/2 inch diamond mesh, engaged in 1 inch x 1/2-inch channel frame. Grilles shall be shop primed and finish coated with 2 coats of black paint. All grilles are to be hinged, and operable with interior-mounted latch which permits unobstructed egress.

H. EXECUTION

1. Examination: Examine conditions where work of this Section is to be attached and notify Inspector of conditions which are detrimental to the proper installation of the Work.
2. Installation:
   a. Fit exposed connections together to form tight, hairline joints.
   b. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.
      1) Do not weld, cut, or abrade surfaces that have been coated or finished after fabrication and are intended for field connection by mechanical or other means without further cutting or fitting.
      2) Set posts plumb within a tolerance of 1/16 inch in 3 feet.
      3) Align rails so variances from level for horizontal members and variations from parallel with rake of steps for sloping members do not exceed 1/4 inch in 12 feet.
   c. Adjust railings before anchoring to ensure matching alignment at abutting joints.
   d. Fastening to in-place construction: Use anchorage devices and fasteners necessary for securing railings and for properly transferring loads to in-place construction.
   e. Welded Connections: Use fully welded joints for permanently connecting railing components.
   f. Anchoring Posts:
      1) Use steel pipe sleeves preset and anchored into concrete.
      2) After inserting posts into sleeves, fill annular space between post and sleeve with nonshrink, nonmetallic grout.
         a) Mix grout according to manufacturer’s written instructions.
      3) For non-preinstalled pipe sleeves core-drill holes not less than 5 inches deep and 3/4 inch larger than OD of post for installing posts in concrete. Clean holes of loose material, insert posts, and fill annular space as specified above.

4) Leave anchorage joint exposed, wipe off excess grout; leaving 1/8 inch build-up, sloped away from post, at all exterior locations.
5) Attach handrails to walls with wall brackets. Provide brackets with 1-1/2 inch clearance from inside face of handrail to finished wall surface.
6) Locate brackets at spacing required to support structural loads.
7) Secure wall brackets to building as follows:
   a) For concrete and solid masonry: Use drilled-in expansion shields and hanger or lag bolts.
   b) For steel-framed gypsum board partitions: Fasten brackets with toggle bolts installed through flanges of steel framing or through concealed steel reinforcement.
   c) For wood-framed gypsum board partitions: Fasten brackets with lag bolts installed into wood studs or wood blocking.

g. Cleaning:
   1) Clean rails by wiping with a damp cloth and then wiping dry.
   2) Touchup Painting: Immediately after erection and cleaning, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting. Comply with SSPC-PA 1 for touching up shop-painted surfaces.

h. Protection:
   1) Protect finishes of railings from damage during remainder of construction period with protective coverings. Remove coverings at direction of Inspector.
   2) Restore finishes damaged during installation and construction period so no evidence remains of correction work.

END OF SECTION

DIVISION 06	WOOD, PLASTICS, AND COMPOSITES

DIVISION 06 WOOD, PLASTICS, AND COMPOSITES
QUALITY STANDARDS AND 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. Reference: Builder's Guide to Mixed-Humid Climates, Joseph Lstiburek, Ph.D., PE, Building Science Corporation, c. 2005; Chapter 3 "Air Barriers," and Chapter 11 "Framing."

2. Air Barrier: When an Architect is contracted, a Drawing or Drawings showing a continuous, un-interrupted exterior air barrier is required and shall be applicable on Projects where a wall or ceiling has been opened and is rebuilt or where a new floor, wall and roof will be constructed.

3. Urea-Formaldehyde: Install engineered and composite wood products used on the interior of the building, defined as within the weather barrier/waterproofing layer, which contain no added urea-formaldehyde resins. On non-LEED for Homes projects where engineered wood products containing no added urea-formaldehyde resins are cost prohibitive or other, install products containing added urea-formaldehyde only when approved in writing by OHCD/PHDC?RDA.

   a. If products containing added urea-formaldehyde resins are used, they shall be encapsulated by sealants meeting VOC levels defined in other Divisions of the OHCD/PHCD/RDA Small Building Specifications.

4. Insulation of Framed Walls: New exterior walls and openings are encouraged to be laid out so that adequate stud bay space is available to receive insulation, and large un-insulatable areas or areas of solid framing are avoided. A minimum stud bay size of six inches is required. Studs at corners and partition intersections shall be installed to permit continuous insulation, except where directed by OHCD/PHDC/RDA to do otherwise. Refer to the Reference Builder's Guide to Mixed-Humid Climates, Figure 11.3 "Corner Framing and Top Plate Splice" and Figure 11.4 "Interior Wall at Exterior Wall" for additional guidance.

5. Stack Framing: The use of stack framing is encouraged. When used, sealed Drawings by a Professional Engineer or Licensed Architect are required.

6. Existing Floor System: If existing floor systems are being reused and springiness, bounce, and shaking are present, structural member sizes must be checked for compliance with local building codes. If members are found to be undersized, members meeting local building codes must be installed.

7. Uneven and Level Floors: In buildings which are gut rehabilitations, floors must not have more than a 1/4 inch ridge or depression over any 60-inch measurement. Floors must not slope more than 1/2 inch in 15 feet.

8. Yankee'd joists (joists in which a notch in the joist bears in a hole in a header, beam, of on a ledger attached to a beam) are not permitted. All joists must be supported by joist hangers unless resting on a beam.

9. Roof Slope: Flat roofs must have minimum slopes complying with local building codes.

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

1. Air Sealing: Air sealing of framing for exterior walls and roof must be conducted per Section 07 96 00 “Air Sealing.”
2. Corner Framing: Framed corners to permit continuous insulation where possible, as illustrated in the Reference Builder’s Guide to Mixed-Humid Climates, Figure 11.3 “Corner Framing and Top Plate Splice.”
3. Headers: Frame headers as “open insulated double headers,” as illustrated in the Reference Builder’s Guide to Mixed-Humid Climates, Figure 11.5 “Insulated Headers.”.
4. Openings in Non-Load Bearing Exterior Frame Walls: In order to allow for maximum insulation at exterior walls, openings less than 4’-0” in non load-bearing exterior walls do not require a header, unless otherwise directed by the Structural Engineer or Licensed Architect.
5. Workmanship: Install work plumb, straight and true, properly and tightly cut, fitted and nailed or anchored with solid backing.
6. Correction of Misalignments and Defects at Existing Construction: All new work shall correct misalignments and defects of existing substrates, walls, floors and ceilings.
7. Security During Construction: Protect work under construction daily from rain and snow and theft and vandalism. Board up window and door openings with minimum 1/2 inch plywood, bolted to 2 by 4 boards laid across the opening.

END OF DOCUMENT

SECTION 06 10 00 - ROUGH CARPENTRY

A. SUMMARY:

1. Section Includes:
   a. Framing lumber.
   b. Framing with engineered wood products.
   c. Sheathing.
   d. Roof curbs and cants.
   e. Blocking.
   f. Furring and Grounds.
   g. Electrical panel back boards.
   h. Wood preservative treatment.
2. Related Sections:
   a. Section 07 96 00 - Air Sealing
3. Sustainable Design: Comply with Division 01 Section “Sustainable Design Requirements.

B. QUALITY ASSURANCE

a. Lumber Grading Agency: Certified by ALSC.
b. Wood Structural Panels: DOC PS 1 or DOC PS 2.
c. Structural Composite Lumber Structural Capacities: Determine in accordance with ASTM D5456.
d. Wood Structural Panel Grading Agency: Certified by EWA - The Engineered Wood Association.
e. Grade Marks: Identify each piece of lumber and each sheet of plywood with official mark of grading agency.

C. DELIVERY, STORAGE, AND HANDLING

a. Immediately upon delivery to job site, place materials in area protected from weather.
b. Store materials a minimum of 6 inches above ground on framework or blocking and cover with protective waterproof covering providing for adequate air circulation or ventilation.
c. Do not store seasoned materials in wet or damp portions of building.
d. Protect sheet materials from corners breaking and damaging surfaces, while unloading.

D. FRAMING

1. Framing Lumber:
   a. Surfacing: Surface four sides (S4S), unless specified otherwise.
   b. Moisture Content: Kiln-dried to maximum 19 percent.
   c. Light framing:
      1) General Framing: Standard and Better or Stud Grade.

2) Plates, Blocking, Bracing, and Nailers: Utility Grade.
3) Bracing, Blocking, Bulk Headings, and General Utility Purposes: Economy grade.
4) Studs Loadbearing & Non-Loadbearing: Stud or Standard Grade.

d. Studs:
1) Loadbearing and Non-Loadbearing: Stud or Standard Grade.
2) Typical partition framing shall be of 2 x 3 lumber. Fire-rated partitions shall be framed with 2 x 4 lumber.

e. Structural light framing, nom. 2 inches to 4 inches thick and 4 inches wide
1) Allowable extreme fiber stress in bending: 1250 psi
2) Modulus of elasticity (E): 1,300,000.
3) Species: Hem-Fir

f. Structural joists and planks, nom. 2 inches to 4 inches thick, 6 inches and wider:
1) Allowable extreme stress in bending: 1250 psi
2) Modulus of elasticity (E): 1,400,000
3) Species: Hem-Fir

2. Engineered Wood Products:

a. Provide engineered wood products acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that show compliance with building code in effect for Project.
1) Provide engineered wood products with allowable design stresses, as published by manufacturer, that meet or exceed those indicated.
2) Engineered wood products shall contain no urea formaldehyde.

b. Laminated-Veneer Lumber: Structural composite lumber made from wood veneers with grain primarily parallel to members lengths, evaluated and monitored according to ASTM D 5456 and manufactured with an exterior-type adhesive complying with ASTM D 2559.
1) Extreme Fiber Stress in Bending, Edgewise: 2900 psi for 12 inch nominal depth members.
2) Modulus of Elasticity, Edgewise: 1,800,000 psi.

c. Parallel-Strand Lumber: Structural composite lumber made from wood strand elements with grain primarily parallel to members lengths, evaluated and monitored according to ASTM D 5456 and manufactured with an exterior-type adhesive complying with ASTM D2559.
1) Extreme Fiber Stress in Bending, Edgewise: 2900 psi for 12 inch nominal depth members.
2) Modulus of Elasticity, Edgewise: 2,200,000 psi.

d. Wood I-Joists: Prefabricated units, I-shaped in cross section, made with a solid or structural composite lumber flanges and wood-based structural panel webs, let into and bonded to flanges. Provide units complying with material requirements of and with structural capacities established and monitored according to ASTM D5055.
1) Web Material: Plywood, complying with DOC PS 1, Exterior grade.

2) Structural Properties: Provide units with depths and design values not less than those indicated.
3) Rim Boards: Product designed to be used as a load-bearing member and to brace wood I-joists at bearing ends, complying with research/evaluation reports for I-joists.
   a) Manufacturer: Same as manufacturer of I-joists.
   b) Material: Product made from any combination of solid lumber, wood strands, and veneer.
   c) Thickness: 1-1/8 inch.

E. SHEATHING:
1. Plywood:
   a. Roof sheathing: Nominal 5/8 inch.
      1) Grade: Exterior, Structural I.
   b. Wall sheathing: Nominal 1/2 inch.
      1) Grade: Exterior, Structural I.
   c. Subflooring: 3/4 inch, tongue and groove.
      1) Grade: Exterior, Structural I single floor panels or sheathing.
2. Glass Mat Gypsum Wall Sheathing - ASTM C1177/1177M, nominal size 4 ft. x 8 ft., 1/2 inch thick.
3. Oriented-Strand-Board: Provide material produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, “FSC Principles and Criteria for Forest Stewardship.”
   a. Roof sheathing: Nominal 5/8 inch.
      1) Grade: Exposure 1, Structural I sheathing.
   b. Wall sheathing: Nominal 1/2 inch.
      1) Grade: Exposure 1, Structural I sheathing.
   c. Subflooring: Nominal 3/4 inch.
      1) Grade: Exposure 1, Structural I sheathing.

F. ACCESSORIES:
1. Construction Adhesive: Suitable for adhering subfloor to joists and underlayment to subfloor.
2. Building Paper: Asphalt-saturated felt: ASTM D226, Type 1, No. 15 unperforated.
3. Building Paper: Plain untreated cellulose building paper.
4. Sill-Sealer Gaskets: 1/4 inch thick by width of sill plate, closed cell polyethylene foam from continuous rolls.
5. Termite Shield: Galvanized steel sheet, minimum 18 gauge.
6. Preservation Treated Wood Products:

a. Preservative Treatment by Pressure Process: AWPA U1, Commodity Specification A-Sawn Products or F-Wood Composites using water-borne ammoniacal copper quat (ACQ) preservative.
b. Shop pressure treat lumber materials indicated on Drawings, or as required by Authority having Jurisdiction, and lumber used for the following applications:
   1) Exterior locations.
   2) Wood in direct contact with concrete or masonry.
   3) Wood within 12 inches of grade.
c. Kiln dry wood after treatment to maximum moisture content specified herein.

7. Rough Hardware:
   a. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below, with capability to sustain a load equal to 6 times the load imposed when installed in masonry and 4 times the load imposed when installed in concrete:
      1) Carbon-steel components, zinc plated to comply with ASTM B 663, Class Fe/Zn 5.
      2) Stainless steel with bolts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2.
   b. Lag screws and bolts: ASME B18.2.1 9 (ASME B18.2.3.8M)
   c. Toggle bolts: FS FF-B-588
   d. Wood screws: ASME B18.6.1
   e. Nails and staples: ASTM F1667
   f. Power Driven Fasteners: NES NER-272
   g. Metal nailing discs:
      1) Flat caps, minimum 1 inch diameter;
      2) Minimum 30 gauge sheet metal,
      3) Formed to prevent dishing,
      4) Bell or cup shapes not acceptable.
   h. Miscellaneous Metal Items: (Joist hangers, Joist ties, Rafter tie-Downs, Hold-downs, Floor-to-Floor ties, Strap Anchors, etc.): various types providing adequate structural support - MINIMUM 18 gauge zinc coated steel.
   i. Plyclips: Extruded 6063-T6 aluminum alloy.
   j. Where carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in areas of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A153M.
      1) Where rough carpentry is ACQ pressure-treated, provide stainless-steel fasteners or fasteners approved for use with ACQ pressure-treated lumber.

G. EXAMINATION:

1. Conditions of Surfaces: Verify that surfaces to receive rough carpentry materials are prepared to exact grades and dimensions and are ready to receive rough carpentry materials.

H. PREPARATION:

1. Coordinate placement of blocking, curbing, and framing items with partition and roof construction.

I. INSTALLATION:

1. Workmanship:
   a. Rough carpentry to be installed plumb, straight and true, properly and tightly cut, fitted and nailed or anchored.
   b. Assembled work to be rechecked and made plumb, level, straight and true after installation.
   c. New work to correct misalignments and defects of existing substrates, walls, floor and ceilings.
   d. Lumber with defects which would prevent proper nailing or attachment and which would impede the proper alignment and fit of finish surfaces to be rejected. Reject improperly cut, fit and nailed lumber as well as lumber with excessive knots, warp, wane, mildew, checks and bow.
   e. Fasten framing in accordance with applicable codes.
2. Installation: New Framing:
   a. Erect wood framing and sheathing members in accordance with applicable code. Place members level and plumb. Place horizontal members crown side up.
   b. Curb all roof openings except where curbs are provided. Construct curb members of single pieces per side. Form corners by alternating lapping side members.
   c. Sills: Set level to 1/16 inch in 6 ft., in mortar bed. Secure to foundation with 1/2 inch O.D. x 16 inch anchor bolts embedded in the structure and spaced a maximum of 8 ft. o.c. and within 1 ft. of the ends of each piece of sill. Provide a minimum of two anchor bolts per section of sill.
      1) Place sill gasket directly on cementitious foundations. Puncture gasket clean and fit tight to protruding anchor bolts.
   d. Posts or columns: Provide two surfaces on posts at right angles to each other for installation of interior finish materials. Built-up posts to be arranged and nailed together to accommodate type of construction.
      1) Erect posts straight and plumb brace with tack boards at top plate and sill.
   e. Stud Framing: Unless otherwise directed by a drawing bearing the Seal and Signature of a licensed engineer (PE) or a Registered Architect (RA) provide the following:
      1) Studs spacing: 16 inches on center.
      2) Provide studs in continuous lengths without splices.
      3) Heating or return duct are not to be run on an exterior wall unless approved in writing by OHCD/PHDC/RDA.
         a) Where a heating or return duct is on an exterior wall, provide a chase studded out to sufficient depth to allow for continuous, un-compressed insulation of R-15 minimum on the cold side of the duct in walls and R-38 minimum on the cold side of the duct in attics.

4) Provide single bottom plate and double top plates for load bearing partitions, nominal 2 inches thick by width of studs.
    a) Overlap double top plate minimum of 6 inches at corners and intersections.
    b) Face nail upper top plate to lower top plate.
5) Provide single bottom plates and single top plates for non-loadbearing partitions, nominal 2 inches thick by width of studs.
6) Nail bottom plate to wood construction.
7) Studs at corners and partition intersections of perimeter walls to be installed as to permit continuous insulation. Gypsum board may be attached to a single stud with drywall clips, or to a 1x4 support nailed to the back of the stud.

f. Headers:
1) Headers in bearing walls to be comprised of continuous 2 x lumber, width as required by building code, same width as studs, with no joints.
2) For headers installed in interior partitions, install 1/2-inch plywood plate between header members and spike assembly together. Plywood plate to be full length of header but may be in several pieces.
3) For headers installed in exterior partitions, fill void space between lumber with insulation.
4) Lap headers at intersections with bearing partitions or tie with metal straps.

g. Blocking - Locate blocking to facilitate installation of finishing materials, fixtures, specialty items, and trim.
1) Provide 2 x 8 backing at lavatories and shower grab bars.
2) Provide 2 x 4 backing at shower curtain rod and other such accessory items.
3) Provide 2 x 6 backing at top and bottom of wall mounted cabinets.

h. Furring: Install horizontally or vertically, as directed by the Inspector, space maximum 16 inches on center, not more than 4 inches from floor and ceiling lines.

i. Joist Framing:
1) Install with crown edge up.
2) Support ends of each member a minimum 1-1/2 inches of bearing on wood, and 3 inches on masonry.
    a) Joists supported on masonry walls to have fire cuts. Shim joists fully with sound masonry materials of flat configuration set solidly in the wall. Place capillary break of nonferrous metal between masonry and first floor joists.
3) Lap members framing from opposite sides of beams, girders, or partitions a minimum of 4 inches or tie opposing members together by toe nailing or metal connectors.
4) Provide and install joist hangers as required to avoid unnecessary or unacceptable ceiling drops and headroom clearance problems.
5) Bored holes: Maximum 1/3 depth of member, 2 inches minimum distance to top or bottom of joists. No bored holes to be closer to bearing point that 1/4 of the span.

6) Bridging - Install rows of bridging at 8 ft. intervals, or at midspan for spans less than 16 ft.
   a) Install 1 x 3 wood cross bridging, manufactured metal straps, or solid wood blocking. Nail bottom end of all cross bridging after sheathing is installed.

j. Rafters: Notch to fit exterior wall plates and toenail to plates.
   1) Provide double rafters at openings in roof framing to support headers and trimmers. Support with metal hangers.
   2) At valleys, bevel ends of rafters for bearing against valley rafters.
   3) At hips, bevel ends of rafters for bearing against hip rafters.

k. Beams and Girders:
   1) Install with crown edge up.
   2) Provide bearing at ends of each member: Minimum 4 inch.
   3) Built-up wood beams or girders to be bolted together with 2 rows of 3/8 inch diameter bolts spaced maximum of 2 feet on center, locating 1 row 1-1/2 inches from top edge and the other 1-1/2 inches from bottom edge of member.

l. Ceiling Framing:
   1) In spaces where the short dimension is less than 6 feet, install 2 x 3 framing members at 16 inches on center, with 3 inch side vertical.
   2) In spaces where short dimension is over 6 feet, install 2 x 4 framing members with 4 inch side vertical.
   3) Where spans exceed 8 feet, install intermediate 2 x 4 stringers at maximum 8 foot spacing, laid flat perpendicular to and across top of 2 x 4 spanning members and nailed to each member. Stringers to be full length of ceiling. In addition, install 2 x 4 vertical struts at every other ceiling joist, nail to ceiling joist, stringer, and to framing member above ceiling. Ensure a rigid framework to hang ceiling.

m. Firestopping: Provide firestops as necessary to comply with all provisions of the applicable building code and Philadelphia Fire Code.

n. Provisions for Air-Sealing:
   1) Section 07 96 00 sets forth the requirement for a continuous air barrier at the thermal boundary of the house. Air-sealing requirements affect certain framing details. Construct all framing in such a way that the air-sealing requirements can be met. For example:
      a) When a lowered ceiling is built on the top floor, any new partition walls on the top floor to be built with their top plates below the ceiling framing.
      b) If the ceiling is at different heights on either side of a partition wall, the wall is to be framed to provide an air barrier between the stud pockets of the wall and the space above the lower ceiling.

o. Framing for mechanical work:
   1) Frame members for passage of pipes and ducts to avoid cutting structural members.
   2) Do not cut, notch, or bore framing members for passage of pipes or conduits without approval of Building Code Enforcement Officer.
   3) Reinforce framing members where damaged by cutting.

p. Roof Sheathing:
   1) Plywood Sheathing: Install sheathing with face grain perpendicular to supports. Allow 1/16-inch space between end joints and 1/8-inch space at edge joints to permit expansion of panels. Support edge joints by use of ply-clips.
   2) Nail 6 inches on center along panel edges and 12 inches o.c. at intermediate supports.

q. Wall Sheathing
   1) Plywood Sheathing: Allow 1/16-inch space at end joints and 1/8-inch space at edge joints to permit expansion of panels.
      a) Double spacing in wet or humid conditions.
      b) Nail 6 inches on center along panel edges and 12 inches o.c. at intermediate supports with 6d common nails.
   2) Gypsum Sheathing:
      a) Apply gypsum sheathing with long dimension horizontal.
      b) Abut ends at center of supports.
      c) Stagger end joints.
      d) Attach with 1-3/4 inch, 11d, 7/16 inch diameter. flathead galvanized, roofing nails, 6 inches on center on all supports.

r. Subflooring:
   1) Install with face grain perpendicular to supports. Allow 1/16-inch space at end joint and 1/8 inch at edge joints.
   2) Glue to floor joists.
   3) Nail to floor joists 6 inches on center along panel edges and 10 inches on center at intermediate supports with 8d common nails.

s. Subflooring - Repairs to existing Board Subflooring:
   1) Use boards or plywood as required, to match existing thickness, to provide a uniform and continuous surface, in plane with existing subfloor suitable for hardwood floor installation.
   2) Replace subflooring at all cracked boards and where necessary to eliminate gaps between boards exceeding 1/4-inch wide.

t. Telephone and Electrical Panel Back Boards: Install plywood back boards where required. Size back boards by 12 inches beyond the size of the electrical panel or telephone equipment.

3. Framing with Engineered Wood Products: Install engineered wood products to comply with manufacturer's written instructions.

END OF SECTION

SECTION 06 20 00 - FINISH CARPENTRY

A. SUMMARY

1. Section Includes:
   a. Exterior Finish Carpentry:
      1) Standing and running trim, including door frames.
      2) Stairs, handrails, and balustrades.
      3) Decking.
   b. Interior Finish Carpentry:
      1) Standing and running trim, including door frames.
      2) Stairs, handrails, and balustrades.
      3) Shelving.
      4) Clothes rods.
2. Sustainable Design: Comply with Division 01 Section “Sustainable Design Requirements.

B. QUALITY ASSURANCE

1. Lumber to be in conformance with DOC PS 20 and the appropriate following grading rules:
   a. NeLMA: Northeastern Lumber Manufacturer's Association, “Standard Grading Rules for Northeastern Lumber.”
   b. NHLA: National Hardwood Lumber Association, “Rules for the Measurement and Inspection of Hardwood & Cypress.”
   c. NLGA: National Lumber Grades Authority, “Standard Grading Rules for Canadian Lumber.”
   d. SPIB: The Southern Pine Inspection Bureau, “Standard Grading Rules for Southern Pine Lumber.”
   e. WCLIB: West Coast Lumber Inspection Bureau, Standard No. 17, “Grading Rules for West Coast Lumber.”
   f. WWPA: Western Wood Products Association, “Western Lumber Grading Rules.”
   g. APA: The Engineered Wood Association, “APA/EWA PS 1 = Voluntary Product Standard for and Industrial Plywood.”
   h. MDF: ANSI A208.2, Grade 130, made with binder containing no urea-formaldehyde resin.
   i. Particleboard: ANSI A208.1, grade M-2, made with binder containing no urea-formaldehyde resin.
   j. Grade Marks: Identify all lumber and plywood by official grade mark - on finish trim pieces, grade marking to be on backs or ends.

C. DELIVERY, STORAGE, AND HANDLING

1. Immediately upon delivery to job site, place materials in areas protected from weather, moisture, debris or damage.

2. Store trim and plywood panels flat, covered and raised off the ground or floor.
3. If interior finish carpentry materials must be stored in other than installation areas, maintain storage space environmental conditions must be the same as conditions specified for installation areas.

D. ENVIRONMENTAL REQUIREMENTS

1. Do not deliver or install interior finish carpentry materials until building is enclosed and weatherproof, wet work in space is complete and nominally dry, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during and after installation.
2. Do not install finish carpentry materials that are wet, moisture damaged, or mold damaged.

E. EXISTING CONDITIONS

1. Verify field measurements prior to fabrication.

F. PRODUCTS

1. Exterior Standing and Running Trim (Opaque Finish):
   a. Softwood lumber and plywood:
      1) Profile: On existing buildings: To match existing.
      2) Profile: New Construction: As indicated by Architect.
      3) Species and Grade: Any species, Finish or 1 Common; NeLMA, NLGA, WCLIB, or WWPA.
      4) Maximum Moisture Content: 15 percent, with at least 85 percent of shipment at 12 percent or less.
      5) Finger Joining: Allowed if made with wet-use adhesive complying with ASTM D 5572.
      6) Face Surface: Surfaced (smooth).
2. Exterior MDO Trim: Exterior Grade B-B, MDO plywood.
3. Exterior Stairs and Railings:
   a. All exterior stair and railing components to be preservative treated by pressure process.
      1) Preservative Treatment by Pressure Process: AWPA U1; Use Category UC3b.
         a) Kiln dry lumber after treatment to a maximum moisture content of 19 percent.
         b) Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
         c) Do not use material that is warped or does not comply with requirements for untreated material.
         d) Do not use chemical formulations that contain colorants or that bleed through or otherwise adversely affect finishes.

e) Mark lumber on end or back of each piece with treatment-quality mark of an approved American Lumber Standard Committee's Board of Review inspection agency.

b. Treads: 1-1/4 inch thick, kiln-dried, stepping with half-round or rounded edge nosing.
   1) Species and Grade: Douglas fir, C & Better VG (Vertical Grain) stepping; Hem-fir, C & Better VG Stepping; NGLA, WCLIB, or WWPA; Southern Pine, B & B stepping; SPIB.

c. Risers: 3/4 inch thick, kiln-dried finish boards.
   1) Species and Grade: Douglas fir, C & Better or Superior finish; Hem-fir, C & Better or Superior finish; NLGA, WCLIB, or WWPA; Southern Pine, B & B; SPIB.

d. Railings: Clear, kiln-dried, solid yellow poplar, Douglas fir, or Southern pine.
   1) Profile: As indicated by Architect, to match existing, or as selected by developer.

e. Balusters: Made from 1-1/16 inch square, clear, kiln-dried, solid, yellow poplar, Douglas fir, or Southern pine.
   1) Profile: As indicated by Architect, to match existing, or as selected by developer.

f. Newel Posts: Clear, kiln-dried, yellow poplar, Douglas fir, or Southern pine.
   1) Profile: As indicated by Architect, to match existing, or as selected by developer.

4. Exterior Decking: Softwood lumber, preservative treated by method indicated above.
   a. Profile: Deck boards to be minimum 5/4 inch by nominal 6 inch deck boards, unless otherwise indicated.
      1) Stair treads to be minimum 2 x 12 boards.
      2) Risers to be minimum 1 x 8 boards, trimmed to fit, nose of tread to extend 1 inch beyond face of riser.
      3) Stairs to have minimum 3 stringers.
   b. Elevated Decks (More than 8 inches above finish grade at any point);
      1) Provide and install railing system consisting of nominal 2 x 6 top rail, 4 x 4 posts, and 2 x 2 vertical pickets spaced maximum 4 inches clear between pickets.
      2) Provide and install stair system consisting of handrail, newel posts, intermediate posts, and pickets.
         a) Pickets to be installed on deck side of top and bottom rails
      3) Design all stairs, hand rails, and balusters under direct supervision of licensed professional to the following criteria:
         a) Uniform Live Load: 100psf with deflection of stringer or landing framing not to exceed 1/360 of span.
         b) Concentrated Load: 300pounds at any location on treads and landings.
         c) Maximum Deflection: 1/360 of span for stringers, treads, and landings.
         d) Top Rail Concentrated Load: 200 pounds applied at any point in any direction.
         e) Top Rail Uniform Load: 50 pounds applied to one square foot area
         f) Baluster Concentrated Load: 50 pounds applied to one square foot area.
         g) Wall Handrail Concentrated Load: 75 pounds.

h) Apply loads non-simultaneously to produce maximum stresses.

5. Interior Standing and Running Trim (Opaque Finish):
   a. Species and Grade: Eastern white, Idaho white, lodgepole, ponderosa, radiate, or sugar pine; Finish or 1 Common (Colonial): NeLMA, NLGA, or WWPA.
   b. Profile, Existing Buildings: To match existing.
   c. Profile, New Construction: As indicated by Architect.
   d. Maximum Moisture Content: 15 percent with at least 85 percent of shipment at 12 percent or less.
   e. Finger Joining: Allowed.
   f. Face Surface: Surfaced (smooth).
   g. Optional Material: Primed MDF of same actual dimensions as lumber may be used in lieu of lumber.
6. Interior Moldings (Opaque Finish):
   a. Profile, Existing Buildings: Provide base, shoe-mold, casing, mull-casing, stop, and chair-rails in locations and patterns to match existing.
   b. Profile, New Construction: Provide base, shoe-mold, casing, mull-casing, stop, and chair-rails in locations and patterns as indicated by Architect.
   c. Softwood moldings: WMMPA WM 4, P grade.
      1) Species: Same as for Standing and Running Trim.
      2) Maximum Moisture Content: 15 percent with at least 85 percent of shipment at 12 percent or less.
      3) Finger Joining: Allowed.
      4) Face Surface: Surfaced (smooth).
      5) Optional Material: Primed MDF.
   d. Hardwood Moldings: WMMPA HWM 2, P grade.
      1) Species: Aspen, basswood, cottonwood, soft maple, or yellow poplar.
      2) Maximum Moisture Content: 9 percent.
      3) Finger Joining: Allowed.
      4) Face Surface: Surfaced (smooth).
      5) Optional Material: Primed MDF.
7. Interior Wood Components: Existing with transparent or stained finish:
   a. For Projects where existing finish wood components with transparent or stained finish is encountered AND is to be modified, repaired, or replaced, provide materials and finishes to match existing species, grain, texture, and color, unless otherwise directed by Architect or Inspector.
8. Shelving and Clothes Rods:
   a. Exposed Shelving and Utility Shelving: (Opaque Finish):
      1) Made from one of the following:
         a) Particleboard with radiused and filled front edge.
         b) MDF with radiused front edge.

c) MDO softwood plywood with solid-wood edge,
d) Wood boards as specified above for Standing and Running Trim.
e) Wire rack shelving, coated. Provide appropriate fastening devices manufactured by manufacturer of shelving.

b. Shelf Cleats: 3/4 inch by 3-1/2 inch boards where clothes rods are indicated or 3/4 inch by 1-1/2 inch boards where clothes rods are not indicated as specified above for Shelving.
c. Shelf Brackets with Rod Support: BHMA A156.16, B04051; prime-painted formed steel.
d. Shelf Brackets without Rod Support: BHMA A156.16, B04041; prime-painted formed steel.
e. Standards for Adjustable Shelf Brackets: BHMA A156.9, B04102; powder-coat-finished for opaque finished shelving.
f. Adjustable Shelf Brackets: BHMA A156.9, B04112; same finish as shelf standards.
g. Standards for Adjustable Shelf Supports: BHMA A156.9, B04071; powder-coat-finished for opaque finished shelving.
h. Adjustable Shelf Supports: BHMA A156.9, B04081 or B04091; same finish as shelf supports.
i. Clothes Rods: 1-5/16 inch diameter, chrome-plated-steel telescoping tubes with end brackets for mounting on shelf cleats.

9. Stairs and Railings:
   a. Unfinished or Carpeted Treads: 1 inch kiln-dried Douglas fir, C & Better VG (Vertical Grain) stepping; NLGA, WCLIB, or WWPA; Hem-fir, C & Better VG (Vertical Grain) stepping; NLGA, WCLIB, or WWPA; or Southern pine, B & B stepping; SPIB with half-round or rounded edge nosing.
   b. Unfinished or Carpeted Risers: 3/4 inch kiln-dried Douglas fir, C & Better; NLGA, WCLIB, or WWPA; Hem-fir, C & Better; NLGA, WCLIB, or WWPA; or Southern pine, B & B; SPIB.
   c. Interior Railings: Clear, kiln-dried, solid or laminated railing in pattern and species as indicated or as selected by the Inspector.
   d. Balusters: Clear, kiln-dried, turned balusters of pattern and size indicated or as selected by the Inspector.
   e. Newel Posts: Clear, kiln-dried, turned newel posts of pattern and size indicated or as selected by the Inspector.
10. Plywood used in finish carpentry shall have a sanded paint grade face veneer, and shall be exterior grade at exterior or wet locations.
11. Fasteners:
   a. Fasteners for Exterior Finish Carpentry: Provide stainless steel or galvanized nails or screws as required for preservative treated lumber or galvanized nails or screws for non-preservative treated lumber, in sufficient length to penetrate not less than 1-1/2 inches into wood substrate.

b. Fasteners for Interior Finish Carpentry: Nails, screws, and other anchoring devices of type, size, material, and finish required for application indicated to provide secure attachment, concealed where possible.

c. Glue: Aliphatic-resin, polyurethane, or resorcinol wood glue recommended by manufacturer for general carpentry use.

1) Wood glue shall have a VOC content of 30 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

12. Fabrication:

a. Back out or kerf backs of standing and running trim wider than 5 inches, except members with ends exposed in finished work.

b. Ease edges of lumber less than 1 inch in nominal thickness to 1/16 inch radius and edges of lumber of 1 inch or more in nominal thickness to 1/8 inch radius.

G. EXECUTION

1. Standing and Running Trim Installation:

a. Install with minimum number of joints practical, using full-length pieces from maximum lengths of lumber available. Do not use pieces less than 24 inches long, except where necessary. Stagger joints in adjacent and related standing and running trim. Miter at outside and inside corners, cope at returns and interior angles to produce tight-fitting joints with full-surface contact throughout length of joint. Use scarf joints for end-to-end joints. Plane backs of casings to provide uniform thickness across joints where necessary for alignment.

b. Install trim after gypsum-board joint finishing operations are completed.

c. Install without splitting; drill pilot holes before fastening where necessary to prevent splitting. Fasten to prevent movement or warping. Countersink fastener heads on exposed carpentry work and fill holes.

d. Leave work free of tool marks.

2. Selected design shall be used uniformly throughout the structure. Base trim shall be nominal 4 inch. Door and window trim shall be nominal 3 inch. Shoe moldings at hard surface floor materials shall be 3/4 inch quarter round. Provide stools and aprons at windows.

3. Gypsum-board openings without doors are not required to be cased.

a. All openings with swinging, sliding, or bi-folding doors are required to be cased.

4. Install 1/2-inch plywood access panels with frame and trim at tubs, crawl spaces, and attic spaces, secured with screws.

5. Install milled round white pine handrail at basement stairs with 4 x 4 starting post. Support rails at mid-span, attaching support rails to stringer with 1/4 inch lag or through-bolt.

6. Closet shelving - Closet shelving shall be minimum 1 x 12 boards. Clothes closets shall have 1 shelf and 1 clothes rod. Linen closets shall have a minimum of 5 shelves at 12-inch vertical spacing. Shelving longer than 5 ft. span shall be supported at midspan with

suitable finished bracket or other support. Closet shelves require continuous cleat at back and sides. Linen-closet shelves shall be the full depth of the closet.

a. Install shelf cleats to framing or blocking with finish nails or trim screws, set below face and filled.

7. Install shelf brackets according to manufacturer's written instructions, spaced not more than 32 inches on center. Fasten to framing members or blocking.

8. Install standards for adjustable shelf supports according to manufacturer's written instructions. Fasten to framing members or blocking. Space fasteners not more than 12 inches on center.

9. Install standards for adjustable shelf brackets according to manufacturer's written instructions, spaced not more than 36 inches on center and within 6 inches of end of shelves. Fasten to framing members or blocking.

10. Cut shelves to neatly fit openings with only enough gap to allow shelves to be removed and reinstalled. Install shelves fully seated on cleats, brackets, or supports.
    a. Fasten shelves to cleats with finish nails or trim screws, set flush.
    b. Fasten shelves to brackets to comply with bracket manufacturer's written instructions.
    c. Install rod flanges as indicated. Fasten to cleats.

11. Stair and Railing Installation:
    a. Site-Built Stairs: All site-built stairs shall have no fewer than 3 stringers. At all stairs, anchor stringers to wall at mid-span. At basement stairs, install 4 x 4 P.T. vertical brace to floor at mid-span. All stringers shall be cut from 2 x 12's and reinforced with 2 x 4's when throat dimension is less than 4-1/2 inches.
        1) Treads and Risers at Interior Stairs: secure treads and risers by gluing and nailing to stringers.
        2) Closed Stringers: House treads and risers into wall stringers, glue, and wedge into place. Cope wall stringers to tightly fit over treads and risers.
        3) Balusters: Dovetail or mortise balusters into treads, glue, and nail in place. Let into railings and glue in place.
        4) Newel Posts: Secure newel posts to stringers and risers with countersunk-head wood screws and glue.
        5) Railings: Secure wall railings with metal brackets. Fasten freestanding railings to newel posts and to trim at walls with countersunk-head wood screws or rail bolts, and glue. Assemble railings at goosenecks, easements, and splices with rail bolts and glue.
    b. Shop-Built Stairs: Prefabricate using a housed 5/4 inch (min.) pine stringers, with wedged and glued treads and risers. Use 5/4 inch yellow pine treads and 3/4 inch risers.
        1) Install railings, newel posts, and balusters as specified above.

H. PROTECTION

1. Protect installed products from damage from weather and other causes during construction.
2. Remove and replace finish carpentry materials that are wet, moisture damaged, and mold damaged.

END OF SECTION

DIVISION 07	THERMAL AND MOISTURE PROTECTION

DIVISION 07 THERMAL AND MOISTURE PROTECTION
QUALITY STANDARDS AND 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 hardboard 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 hardboard 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/RDA.

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. Housewrap Prohibitions: Synthetic-type housewrap membranes are prohibited over oriented strand board (OSB).

END OF DOCUMENT

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

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

   a. 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.
      1) Warranty shall be transferable to homeowner.

2) 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.
3) Warranty Period: Five years.

b. Special Installer's Warranty: Installer's standard form, signed by installer, covering Work of this Section, for a warranty period of five years.
   1) 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 I 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 bugholes 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

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

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/RDA, 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

E. 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.

1. 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.

F. 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.

G. SEQUENCING

1. Sequence work to ensure firestopping, 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.

H. PRODUCTS

1. Cellulose Loose-Fill Insulation: Shall conform to CPSC16 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, unfaced.
   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.

I. 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-13 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 firestop 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 isulation 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. At-tach 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 unfaced 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 unfaced 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 unfaced 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

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

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 Spunbonded 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.

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 D1117.
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 mem-brane 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

SECTION 07 31 13 - ASPHALT SHINGLES

A. SUMMARY

1. Section Includes:
   a. Asphalt shingles.
   b. Underlayment.
2. Sustainable Design: Comply with Division 01 Section “Sustainable Design Requirements.”

B. SUBMITTALS

1. Colors: As selected by Architect, or to match existing.
   a. For Projects pursuing LEED certification, provide shingles with a minimum SRI of 29.

C. DELIVERY, STORAGE, AND HANDLING

1. Deliver materials to jobsite packaged with manufacturer’s labels intact and legible. Store materials on raised platforms and protect with coverings at outdoor locations. Do not stack bundles more than 3 ft. high.

D. WARRANTY

1. Special Warranty: Standard form in which manufacturer agrees to repair or replace asphalt shingles that fail in materials or workmanship within specified warranty period.
   a. Material Warranty Period: 25 years, prorated, with first 3 years nonprorated.
2. Special Warranty: Installer's standard or customized form, in which installer agrees to repair or replace components workmanship within specified warranty period.
   a. Warranty Period: 5 years.

E. PRODUCTS

1. Glass-Fiber-Reinforced Asphalt Shingles:
   a. Multitab-Strip Asphalt Shingles: ASTM D 3462, glass-fiber reinforced, mineral-granule surfaced, and self-sealing.
      1) Tab Arrangement: Three tabs, regularly spaced.
      2) Cutout Shape: Square.
      3) Butt Edge: Straight.
      4) Strip Size: Manufacturer’s standard, approximately 12 inches by 36 inches.
      5) Color and Blends: As selected by Inspector from manufacturer’s full range.
2. Hip and Ridge Shingles: Manufacturer’s standard units to match asphalt shingles.
3. Underlayment Materials:
   a. Felt: ASTM D 226, Type I, asphalt-saturated organic felts, nonperforated.

b. Self-Adhering Sheet Underlayment, Polyethylene Faced: ASTM D 1970, minimum 40-mil thick, slip-resistant, polyethylene-film-reinforced top surface laminated to SBS-modified asphalt adhesive, with release paper backing; cold applied.

4. Ridge Vents: Manufacturer's standard, rigid section high-density polypropylene or other UV-stabilized plastic ridge vent with non-woven geotextile filter strips and external deflector baffles; for use under ridge shingles.
   a. Minimum Net Free Area: 18 square inches per lineal foot.
   b. Width: Minimum 10 inches.
   c. Thickness: Minimum 1 inch.
5. Accessories:
   a. Roofing Nails: ASTM F 1667; aluminum, stainless-steel, or hot-dip galvanized-steel wire shingle nails, minimum 0.120 inch (10 gauge) diameter, barbed shank, sharp-pointed, with a minimum 3/8 inch diameter flat head, of sufficient length to penetrate 3/4 inch into solid wood decking or extend at least 1/8 inch through OSB or plywood sheathing.;
      1) Where nails are in contact with metal flashing, use nails made from same metal as flashing.
   b. Asphalt Roofing Cement: ASTM D 4586, Type II, asbestos free.
   c. Felt Underlayment Nails: Aluminum, stainless-steel, or hot-dip galvanized-steel wire with low-profile capped heads or disc caps, 1 inch minimum diameter.
6. Metal Flashing and Trim: Painted aluminum.
   a. Fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of the item.

F. INSTALLATION

1. Preparation:
   a. Prior to installation of new roofing materials all existing shingles and underlayment to be removed and any damaged or water stained sheathing to be removed and replaced.
      1) Assure that all nails or staples are removed.
2. Underlayment Installation:
   a. Comply with underlayment manufacturer's written installation instructions applicable to products and applications indicated, unless more stringent requirements apply.
   b. Single-Layer Felt Underlayment: Install on roof deck parallel with and starting at the eaves. Lap sides a minimum of 2 inches over underlying course. Lap ends a minimum of 4 inches. Stagger end laps between succeeding courses at least 72 inches. Fasten with felt underlayment nails.
      1) Install felt underlayment on roof deck not covered by self-adhering sheet underlayment. Lap sides of felt over self-adhering sheet underlayment not less than 3 inches in direction to shed water. Lap ends of felt not less than 6 inches over self-adhering sheet underlayment.

c. Self-Adhering Sheet Underlayment: Install, wrinkle free, on roof deck. Comply with low-temperature installation restrictions of underlayment manufacturer if applicable. Install at locations indicated below, lapped in direction to shed water. Lap sides a minimum of 3-1/2 inches. Lap ends minimum 6 inches staggered 24 inches between courses. Roll laps with roller. Cover underlayment within 7 days:
   1) All eaves, extending a minimum of 2 feet beyond inside face of exterior wall.
   2) Entire dormer roof surface.
   3) All valleys, extending a minimum of 24 inches on each side of valley.
   4) All ridges, extending a minimum of 12 inches on each side of ridge.
   5) Along each sloping roof edge, including sloping roof against a rising wall and roof edges over a wall. Extend underlayment a minimum of 24 inches beyond inside face of exterior wall.
   6) At any other location recommended by the manufacturer of the underlayment and the roof shingles.

3. Metal Flashing Installation: Install metal flashings and other sheet metal to comply with requirements in Section 07 62 00 “Sheet Metal Flashing and Trim.”
   a. Install metal flashings according to recommendations in ARMA’s “Residential Asphalt Roofing Manual” and asphalt shingle recommendations in NRCA’s “The NRCA Roofing and Waterproofing Manual.”

4. Asphalt Shingle Installation:
   a. Install asphalt shingles according to manufacturer’s written instructions, recommendations in ARMA’s “Residential Asphalt Roofing Manual,” and asphalt shingle recommendations in NRCA’s “The NRCA Roofing and Waterproofing Manual.”
      1) Do not install asphalt shingles on roofs with slope of less than 4: 12 unless approved in writing by OHCD/PHDC/RDA.
   b. Install starter strip along lowest roof edge, consisting of an asphalt shingle strip at least 7 inches wide with self-sealing strip face up at roof edge.
      1) Extend asphalt shingles 3/4 inch over fascia at eaves and rakes.
      2) Install starter strip along rake edge.
   c. Install first and remaining courses of asphalt shingles stair-stepping diagonally across roof deck with manufacturer’s recommended offset pattern at succeeding courses, maintaining uniform exposure.
   d. Fasten asphalt shingles strips with a minimum of four roofing nails located according to manufacturer’s written instructions.
      1) Where roof slope exceeds 20: 12, seal asphalt shingles with asphalt roofing cement spots after fastening with additional roofing nails.
      2) Where roof slope is less than 4: 12, seal asphalt shingles with asphalt roofing cement spots.
      3) When ambient temperature during installation is below 50 degrees F, seal asphalt shingles with asphalt roofing cement spots.

e. Open Valleys: Cut and fit asphalt shingles at open valleys, trimming upper concealed corners of shingle strips. Maintain uniform width of exposed open valley from highest point to lowest point.

f. Ridge Vents: Install continuous ridge vents over asphalt shingles according to manufacturer's written instructions. Fasten with roofing nails of sufficient length (or nails supplied by manufacturer with ridge vent) to penetrate sheathing.

   1) Fasten ridge cap asphalt shingles to cover ridge vent without obstructing airflow.

g. Dormer Sides: Install asphalt shingles to match roof surfaces.

5. Protection:

   a. Repair damage to neighboring roofs caused during demolition or new roofing work with materials of type and quality to match existing.

END OF SECTION

SECTION 07 46 00 - SIDING

A. SUMMARY

1. Section Includes:
   a. Aluminum Siding.
   b. Fiber-cement Siding.
   c. Vinyl Siding.
   d. Wood 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. Aluminum siding to meet or exceed FHA Minimum Property Standard 4900.1 for One and Two Family Dwellings or Standard 4910.1 for Multi-Family Dwellings..
2. 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.
3. Vinyl Siding Installer Qualifications: A qualified installer who employs a VSI-Certified Installer on Project.
4. Vinyl Siding Certification Program: Provide vinyl siding products that are listed in VSI’s list of certified products.
5. 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.
3. Wood Siding: Keep materials separated from other materials and identified with grade marks legible. Keep damaged material, marked as damaged, separate from non-damaged siding.

E. PRODUCTS

1. Aluminum Siding: Formed and coated aluminum siding complying with AAMA 1402, and the following:
   a. Horizontal Pattern: Exposure as indicated by Architect or as selected by developer in plain, single board style.
   b. Texture: Smooth.
   c. Nominal Thickness: 0.024 inch; aluminum alloy 3105-H27P.

1) Minimum Tensile Strength: 28,000 psi.
2) Minimum Yield Strength: 25,000 psi.

d. Insulation: Manufacturer's standard integral insulation panels.

e. Finish: Manufacturer's standard primer and baked-on acrylic top coating.

1) Colors: As indicated by Architect or as selected by developer from manufacturer's standard full range of industry colors.
2) All exposed accessories shall be prefinished to match siding.

2. 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.

3. Vinyl Siding: Integrally colored vinyl siding complying with ASTM D 3679 and ASTM D 4477.

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

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

c. Nominal Thickness: 0.044 inch.

d. Minimum Profile Depth (butt Thickness): 1/2 inch.

e. Nailing Hem: Double thickness.

f. Color: As indicated by Architect or as selected by developer from manufacturer's standard full range of industry colors.

1) All exposed accessories shall be prefinished to match siding.

4. Wood Siding - New Installations:

a. Wood Clapboard or Beveled Siding, of one of the following species:

1) Clear Cedar: Western Red Cedar graded to meet NLGA "Grading Standards," paragraph 201, and WCLIB "Grading Standards," paragraph 106.

a) Grade: A Clear and better.
b) Pattern: Plain Bevel.
c) Material: Solid wood.
d) Size: 6 inch; 4 inch exposed.
e) Moisture Content: Kiln-dried.
f) Finish: Factory primed.

2) Pine, or Spruce:

a) Grade: Clear, no knots and smooth appearance in exposed section of board.

b) Pattern: Plain Bevel. Vertical grain.
c) Material: Solid wood. (No finger joining).
d) Size: 6 inch; 4 inch exposed.
e) Moisture Content: Kiln and air drying to a maximum moisture content of 12 percent.
f) Finish: Factory primed.

5. Wood Siding - Existing Installations:
   a. Match existing wood species, Grade: A Clear and better, size and thickness, and pattern.
6. Soffit Materials:
   a. Aluminum Soffit Panels, Same manufacturer as Aluminum siding:
      1) 12 inch wide panels, 3/8 inch deep, with double 5-1/2 inch wide faces forming V-grooves at 6 inches on center
      2) Thickness: Nominal 0.019 inch; aluminum alloy 3105-H26P.
         a) Minimum Tensile Strength: 28,000 psi.
         b) Minimum Yield Strength: 25,000 psi.
      3) Interlocking edges and elongated nailing hems.
      4) Finish: Same as siding, color as indicated by Architect or as selected by developer.
      5) Provide ventilating type soffit material, minimum 15 square inches per lineal foot of net free air area.
   b. 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.
   c. Vinyl Soffit Panels, Same manufacturer as Vinyl Siding:
      1) Manufacturer’s standard design, featuring 4 inch wide fully vented panel strips, with post-formed lock design.
      2) Thickness: Nominal 0.040 inch.
      3) Panel Projection: 1/2 inch.
      4) Free Air Area: 5.9 Sq. In. per Sq. Ft.
   d. Plywood, exterior grade with exterior glue, 1/2 inch thick.
7. 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. Vinyl Accessories: Integrally colored vinyl accessories complying with ASTM D 3679 except for wind-load resistance.
   1) Texture: To match siding texture.
d. 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.
e. 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 aluminum, use aluminum fasteners. Where fasteners will be exposed to view, use prefinished aluminum fasteners in color to match item being fastened.
   4) For fastening fiber cement, use hot-dip galvanized or stainless-steel fasteners.
   5) For fastening vinyl, use aluminum or stainless-steel fasteners. Where fasteners will be exposed to view, use prefinished aluminum fasteners in color to match item being fastened.

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 aluminum siding and related accessories according to AAMA 1402.

1) Install fasteners no more than 24 inches on center.

c. Install fiber-cement siding and related accessories.

1) Install fasteners no more than 24 inches on center.

d. Install vinyl siding and related accessories according to ASTM D 4756.

1) Install fasteners no more than 16 inches on center.

e. Install joint sealants as specified in Section 07 92 00 “Joint Sealants” and to produce weather tight installation.

f. Where aluminum siding will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape or installing nonconductive spacers as required by manufacturer for this purpose.

g. 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.

b. Clean finished surfaces according to manufacturer’s written instructions and maintain in a clean condition during construction.

END OF SECTION

SECTION 07 51 00 - BUILT-UP BITUMINOUS ROOFING

A. SUMMARY

1. Section Includes:
   a. Built-up asphalt roofing.
   b. Roof coatings.
2. Sustainable Design: Comply with Division 01 Section “Sustainable Design Requirements.”

B. PERFORMANCE REQUIREMENTS

1. Roofing System Design: Provide built-up roofing system that is identical to systems that have been successfully tested by a qualified testing and inspection agency to resist uplift pressure calculated according to ASCE/SEI 7.
2. Solar Reflective Index: Not less than 78 when calculated according to ASTM E 1980 based on testing identical products by a qualified testing agency.
3. Energy Performance: Provide roofing system that is listed on the DOE’s ENERGY STAR “Roof Products Qualified Product List” for low-slope roof products.

C. REFERENCES

1. National Roofing Contractors Association: A Manual of Roofing Practice, latest edition.

D. QUALITY ASSURANCE

1. Source Limitations: Obtain components for built-up roofing from same manufacturer as built-up roofing or approved by built-up roofing manufacturer.

E. WARRANTY

1. Special Warranty: Manufacturer’s standard or customized form, without monetary limitation, in which manufacturer agrees to repair or replace components of built-up roofing that fail in materials or workmanship within specified warranty period.
   a. Warranty Period: 10 years.
2. Special Warranty: Installer's standard or customized form, in which installer agrees to repair or replace components workmanship within specified warranty period.
   a. Warranty Period: 2 years.

F. PRODUCTS

1. Base-Sheet Materials:
   a. Sheathing Paper: Red-rosin type, minimum 3 lb/100 Sq. Ft.
2. Base Sheet: ASTM D 4601, Type II, nonperforated, asphalt-impregnated and coated, glass-fiber sheet, dusted with fine mineral surfacing on both sides.
3. Ply Sheet: ASTM D 2178, Type IV, asphalt-impregnated, glass-fiber felt.

4. Backer Sheet: ASTM D 4601, Type II, asphalt-impregnated and coated, glass-fiber sheet, dusted with fine mineral surfacing on both sides.
5. Granule-Surfaced Flashing Sheet: ASTM D 6163, Grade G, Type I or II, glass-fiber-reinforced, SBS-modified asphalt sheet; granular surfaced; suitable for application method specified, and as follows:
   a. Granule Color: White.
6. Roofing Asphalt: ASTM D 312, Type III or IV as recommended by built-up roofing manufacturer for application.
7. Auxiliary Built-up Roofing Materials:
   a. Auxiliary materials recommended by roofing manufacturer for intended use and compatible with built-up roofing.
   b. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required by roofing manufacturer for application.
   c. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening built-up roofing components to substrate, tested by manufacturer for required pullout strength, and acceptable to roofing manufacturer.
   d. Cant Strips: ASTM C 728, perlite insulation board or ASTM C 208, Type II, Grade 1, cellulosic-fiber insulation board, as acceptable to roofing manufacturer.
8. Roof Coatings:
   a. White Elastomeric Roof Coating: Water-based acrylic latex coating meeting or exceeding the following:
      1) ASTM D 6083-97a, and ASTM D 6083-05.
      2) LEED requirements for Cool Roof Credit, compliant with reflectivity (ASTM E 903) and emissivity (ASTM E 408)
      3) Energy Star Rated.
      4) 10 year manufacturer's warranty.
   b. Aluminum Pigmented Asphalt Roof Coating, Fibrated: ASTM D 2824, Type III, containing no asbestos.

G. EXECUTION

1. General:
   a. Inspect roof deck, ensure roof deck is structurally sound to support live and dead load requirements of the roofing system and is able to support construction traffic.
   b. Decks shall be firm, clean, and smooth. Do not install roofing on wet, damp, ice covered, or frost covered surfaces.
   c. Minimum temperature for application of roofing is 35 degrees F, unless lower temperatures are permitted by manufacturer and approved by Inspector.
2. Built-up Roofing Installation:
   a. Install roofing membrane according to manufacturer's written instructions and applicable recommendations of ARMA/NRCA's "Quality Control Guidelines for the Application of Built-up Roofing."

b. Where roof slope exceeds 1/2 inch per 12 inches, install built-up roofing sheets parallel with slope.

c. Coordinate installation of roofing so other components of built-up roofing not permanently exposed are not subject to precipitation or left uncovered at the end of the workday or when rain is forecast.

d. Substrate-Joint Penetrations: Prevent roofing asphalt and adhesives from penetrating substrate joints, entering building, or damaging built-up roofing components or adjacent building construction.

e. Install and secure preformed 45-degree cant strips at junctures of built-up roofing and vertical surfaces or angle changes greater than 45 degrees.

f. Loosely lay one course of sheathing paper, lapping edges and ends a minimum of 2 inches and 6 inches respectively, as required by roofing manufacturer over wood decks.

g. Install lapped base sheet course, extending sheet over and terminating beyond cants. Mechanically fasten base sheet to substrate.

h. Install three ply sheets starting at low point of roofing. Align ply sheets without stretching. Single side laps of ply sheets uniformly to achieve required number of plies throughout thickness of roofing membrane. Shingle in direction to shed water. Extend ply sheets over and terminate beyond cants.

1) Embed each ply sheet in a solid mopping of hot roofing asphalt applied at rate required by roofing manufacturer, to form a uniform membrane without ply sheets touching.

3. 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 built-up roofing manufacturer's written instructions.

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

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

d. Install stripping, according to roofing manufacturer's written instructions, where metal flanges and edgings are set on built-up roofing.

4. Roof Coating Installation:

a. White Elastomeric Roof Coating:

1) Install in strict accordance with manufacturer's written instructions.

2) Allow new built-up roofing to cure for coating manufacturer's required minimum period before applying coating.

3) Clean surface as required according to coating manufacturer's written instructions.

4) Do not apply when air temperature is below coating manufacturer's required minimum or when surface temperature is above coating manufacturer's maximum.

b. Aluminum Pigmented Asphalt Roof Coating, Fibrated:

1) Install in strict accordance with manufacturer's written instructions.
2) Allow new built-up roofing to cure for coating manufacturer's required minimum period before applying coating.
3) Clean surface as required according to coating manufacturer's written instructions.
4) Do not apply when air temperature is below coating manufacturer's required minimum or when surface temperature is above coating manufacturer's maximum.

END OF SECTION

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

a. Provide a 12 year manufacturer's No Dollar Limit (NDL) Systems Warranty for roof. Warranty shall be transferrable to homeowner.

1) 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.

2) 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.

3) 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/RDA.

4) 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.

5) 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/RDA to make these repairs may void warranty.

6) 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.

7) 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.

8) No one is authorized to change, alter or modify the provisions of the warranty other than the manufacturer as acceptable to the PHDC/RDA.

b. The roof system guarantee shall include:

1) Roof membrane and membrane flashing, including base sheets, temporary membrane, and vapor retarder and walkway products.

2) Fasteners and fastening systems.

3) Insulation, including cover board, thermal barrier, crickets and saddles.

4) Prefabricated Roof Edge
5) Peak gust wind speed up to 72 m.p.h.
6) All materials specified and installed as part of this specification section.

c. This warranty shall be in addition to and not a limitation of the other rights the PHDC/RDA 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 glass-fiber-reinforced, SBS-modified asphalt sheet; granular surfaced, and as follows:
      1) Granule Color: White or Gray.
3. Base Flashing Sheet Materials:
   a. Backer Sheet: 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. 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 1177M, 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/RDA. 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' 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

SECTION 07 62 00 - SHEET METAL FLASHING AND TRIM

A. SUMMARY

1. Section Includes:
   a. Flashings and counterflashings.
   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 min. 28 gauge.
   b. Prefinished aluminum sheet: ASTM B209/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 Inspector
   1) 5 inch style K (ogee) aluminum.027 inch thick, prefinished, with all necessary brackets, outlet boxes, end caps, gutter guards, join-ing 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 Inspector
   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 unperforated 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

SECTION 07 72 00 - ROOF ACCESSORIES

A. SUMMARY

1. Section Includes:
   a. Roof Windows.
   b. Roof Hatches.
   c. Hatch Mounted Guards.
2. Sustainable Design: Comply with Division 01 Section “Sustainable Design Requirements.”
   a. New roof windows are required to meet or exceed ENERGY STAR guidelines based on the EPA performance standards for the North-Central Climate Zone.
3. Performance Requirements:
   a. Hatches to withstand 40 lbf/sf external live load and negative (uplift) design pressure of 20 lbf/sf or greater.
   b. Guardrail and attachments to resist forces as required by IBC and 29 CFR 1910.23. Apply loads non-simultaneously to produce maximum stresses.
      1) Guard Top Rail Concentrated Load: 200 pounds applied at any point in any direction.
      2) Guard Top Rail Uniform Load: 50 plf applied in any direction.
      3) Intermediate Rails Concentrated Load: 50 pounds applied to 1sf area.

B. PRODUCTS

1. Roof Windows:
   a. New Roof Windows:
      1) Maintenance free exterior cladding: Roll formed 0.65 inch thick aluminum, prefinished, and fabricated to fit exterior exposed surfaces.
      2) Weather Stripping: Manufacturer’s standard, factory applied neoprene weather stripping throughout entire frame and sash profiled to effect weather seal.
      3) Fittings: Manufacturer’s standard electro-galvanized, chromate passivated yellow fittings.
      4) Flashing: Manufacturer’s standard flashing system designed for use with roofing materials less than 3/4 inch thick and for slopes of 3: 12 (15 degrees) to 85 degrees.
      5) Glass and Glazing Materials:
         a) Manufacturer’s standard 1 inch thick dual sealed insulating glass unit with 9/16 inch air space. Stainless steel spacer with desiccant, primary seal polyisobutylene, secondary seal silicone. Provide Low-E coating on interior surface of exterior lite.
         b) Gasketing: Each I.G. unit dry glazed with chloroprene gasket, no sealants.
      6) Sash: Top hinged, spring assisted. Hinge pivots, allowing for easy cleaning of glass from inside room.
      7) Fabrication:

a) Fabricate frame components with minimum tolerances, enabling installation and movement of sash and dynamic movement of perimeter weather stripping.
b) Fabricate frames with manufacturer's standard method of interlocking corner seams, glued and nailed for hairline joints and weather tight fit.
c) Permit external drainage channels to migrate moisture to exterior. Provide internal drainage of glazing spaces to exterior through gasketing.
d) Factory glaze each unit.

8) Finishes:
a) Exterior surfaces: Exposed exterior wood surfaces to be covered with roll formed manufacturer's standard maintenance free aluminum cladding, with umber grey, Kynar 500 polyvinylidene fluoride resin finish.
b) All exposed interior wood surfaces to have factory applied clear varnish finish.

b. Existing single-glazed roof windows: add permanent glazing panel at ceiling level. If roof window is operable, then the interior glazing panel shall also be operable and shall form a tight seal when closed.

2. Roof Hatches:
a. Fabricate roof hatches with insulated double-wall lids and insulated single wall curb frame with integral deck mounting flange and lid frame counterflashing. Corner joints to be welded or mechanically fastened and sealed. Provide continuous weathertight perimeter gasket and galvanized hardware.
1) Type and Size: Single-leaf lid, 30 by 36 inches.
2) Curb and Lid Material: Galvanized steel sheet, 0.079 inches thick, Prime painted.
3) Insulation: High-density fiberboard.
4) Interior Lid Liner: Same material and finish as outer metal lid.
5) Exterior Curb Liner: Same material and finish as metal curb.
6) Curb Height: 12 inches minimum, unless otherwise indicated.
7) Hardware: Galvanized steel spring latch with turn handles, butt- or pintle-type hinges, and padlock hasp on inside.

3. Hatch Mounted Guard:
a. Manufacturer's standard system, include rails, clamps, fasteners, safety barrier at railing opening, and all accessories required for installation.
1) Manufacturer: Same manufacturer as hatch.
2) Height: 42 inches above finish roof deck.
3) Pipe or Tube: 1-1/2 inch diameter galvanized steel or fiberglass.
4) Self-Latching Gate.
5) Pipe Ends and Tops: Covered or plugged with weather-resistant material.
6) Provide weep holes to drain entrapped water from hollow sections.
7) Fabricate joints exposed to weather in a watertight manner.
8) Close exposed ends of railing members with prefabricated end fittings.

9) Fasteners: Stainless Steel.

C. EXECUTION

1. Verify rough roof openings are proper dimensions and proper orientation.
2. Mount roof accessories according to manufacturer's written instructions.
3. Anchor roof accessories securely in place and capable of resisting forces specified.
4. Install roof accessories to resist exposure to weather without failing, rattling, leaking, and fastener disengagement.
5. Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or other permanent separation as recommended by manufacturer.
6. Install roof accessories level, plumb, true to line and elevation, and without warping, jogs in alignment, excessive oil-canning, buckling, or tool marks.
7. Check roof accessories for proper operation. Adjust operating mechanism as required. Clean and lubricate joints and hardware as recommended by manufacturer.
8. Touch up factory primed surfaces as required with compatible primer ready for field painting
9. Repair of existing roof windows and roof hatches: Repair shall match quality material and workmanship of the original installation.

END OF SECTION

SECTION 07 92 00 - SEALANTS

A. SUMMARY

1. Section Includes:
   a. Sealants and joint backing.
   b. Firestopping 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 O: 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 wallpapered 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

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.”
3. 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.

B. PRODUCTS

1. Rigid Wood Blocking: See Section 06 10 00 - 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.

C. 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 crawl-spaces within thermal boundary.
      2) Space outside thermal boundary: Seal all openings between conditioned and unconditioned spaces.
      3) Basement-under-porch partition: Weatherstrip 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 inte-rior 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

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. ASHRAE 62-89

C. APPLICABILITY

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

E. RELATED REQUIREMENTS

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

F. SUBMITTALS

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

G. 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/RDA.
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.

H. EQUIPMENT

1. Blower door kit: Variable speed fan rated 4000 cfm at 50 Pa min., 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.

I. 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/ RDA "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_{50} = 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/PHDC/RDA.
      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

DIVISION 08 OPENINGS

DIVISION 08 OPENINGS
QUALITY STANDARDS AND 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. Architectural Woodwork Standards, Architectural Woodwork Institute (AWI), c. 2009; most current edition.
   b. BHMA Certified Products Directory, Builders Hardware Manufacturers Association, most current edition.
   c. SDI-108-04, “Recommended Selection and Usage Guide for Standard Steel Doors” and SDI-111-09, “Recommended Selection & Usage Guide Standard Steel Doors, Frames and Accessories,” both published by the Steel Door Institute (SDI).
   d. “Window Directory for Historic Buildings,” c. 1992, U.S. Department of the Interior, National Park Service, Preservation Assistance Division, Washington, DC.
2. General: Doors, windows and glazing shall meet fire ratings and ANSI and ASTM standards as listed in other Sections of this Division.
3. Door Hardware: Door hardware shall comply with BHMA Certified Products Directory.
4. Doors and Windows: Doors and windows shall be rated by the National Fenestration Rating Council’s (NFRC) NFRC Rating System. Do not remove NFRC rating System stickers affixed to doors and windows delivered to the site and installed until directed by OHCD/PHCD/RDA to do so.
5. Storm Windows: Exterior storm windows shall conform to AAMA 1002.10 - 1993 Voluntary Specification for Insulating Storm Products for Windows and Sliding Glass Doors. Where directed to by the Philadelphia Historical Commission in special situations, provide interior storm windows meeting requirements of the Philadelphia Historical Commission.
6. Security screens shall be custom manufactured to fit each window opening.
7. Windows shall have plastic or aluminum sash tracks and springs appropriately sized for weight of sash.

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

1. Installation and Repair - General: Install and repair all work to be level and plumb, securely fastened and having smooth operation.
2. Quality - General: Scratches visible in doors or glass beyond 12 inches are considered excessive and must be corrected or a new unit installed.
3. Field measure all existing openings to receive new windows or doors.
4. Existing Window and Door Frame Repair: Where required, repair existing door and window frames in accordance with Philadelphia Historical Commission Standards and other parts of this Section.

5. Existing Door Repair: Where required to salvage existing doors and hardware to fullest extent possible, repair as follows:
   a. General: Provide a smooth surface ready for new paint finish by removing existing deteriorated paint and other finishes, sanding surfaces and filling holes and dents with wood putty.
   b. Stops, Jambs and Trim: Repair using traditional epoxy where feasible, otherwise replace. At jambs at hinge locations, cut out and mortise-in new wood as necessary to restore sound mountings of hinges.
   c. Strike Plates, Hinges, Latchsets, Knobs and Other Hardware: Repair where possible, otherwise replace with materials matching design and finish. Refer to other Sections of Division 08 for additional guidance.
   d. Thresholds: Repair where possible. Otherwise replace. Provide new weatherstripping at exterior doors.
6. Window Repair: Where required to salvage existing windows or where windows need minor repairs, repair as follows:
   a. Make windows operable and weathertight. Confirm if Philadelphia Historical Commission requires installation of new sash and spring balance into existing frames.
   b. Replace all deteriorated or missing stops, stools, aprons and trim.
   c. Repair all damaged sashes as required to restore soundness to unit. Replace sashes with rotten corners and missing muntins with matching sashes.
   d. Replace all cracked, broken or missing glass lites with clear sheet glazing-quality glass. Thickness as recommended by manufacturer for size of lite. Install lites using glazier points and glazing compound in accordance with Glass Association of North America (GANA) standards.
7. New Window Installation:
   a. When installing windows in new construction, unless otherwise directed by manufacturer, exterior of building is to be entirely sealed with housewrap prior to installation.
   b. Install windows with restraining strap to ensure plumbness of window; only after shimming and installation shall strap be cut.
   c. Seal gaps around windows with minimally expanding foam designed for window applications.
8. New Door Installation:
   a. When installing doors in new construction, unless otherwise directed by manufacturer, exterior of building is to be entirely sealed with housewrap prior to installation.
   b. Install doors plumb and level. Ensure that door sings properly.
   c. Seal gaps around doors with minimally expanding foam designed for door applications.

END OF DOCUMENT

SECTION 08 01 10 - OPERATION AND MAINTENANCE OF DOORS AND FRAMES

A. SUMMARY

1. Section Includes:
   a. Repair of existing wood doors and frames.
2. Sustainable Design: Comply with Division 01 Section “Sustainable Design Requirements.”

B. REPAIR OF EXISTING WOOD DOORS AND FRAMES

1. Remove and replace damaged, rotted, or missing, stops, jambs, heads, and casings.
   a. Carefully cut out existing damaged components to sound wood. If repair will provide unsightly conditions remove entire component and replace to match existing.
   b. Mortise-in new wood as required to complete component.
   c. At hinge locations, restore wood jambs as required to provide sound mounting of hinges.
   d. At strike location, restore wood jamb to provide sound mounting of strike plate and solid latching of door keeper and/or deadbolt.
   e. Provide new wood of same species as existing wood, in sizes to match existing.
2. Remove and replace missing or damaged strike plates, hinges, latch sets, locksets, operating hardware, and other hardware items with materials matching the design, finish and size of existing hardware items, unless hardware is specified to be replaced in Section 08 71 00. Replace items in accordance with manufacturer's written instructions and in accordance with the provisions of Section 08 71 00.
3. Remove existing paint and other finishes, sand surfaces, and fill holes and dents to provide a smooth surface ready for new paint finish.
4. Repair or replace existing worn, damaged or missing thresholds.
5. Provide new weatherstripping at exterior doors.

END OF SECTION

SECTION 08 01 53 - WOOD WINDOW REPAIR

A. SUMMARY

1. Section Includes:
   a. Wood Window Repair work:
      1) Temporary protection of existing opening.
      2) Repair and renovation of existing sash and frames.
      3) Replacement of damaged, missing, or deteriorated window sashes, sash components, frames and frame components, and sills/stools/aprons.
      4) Fixing operable window sashes in place.
2. Sustainable Design: Comply with Division 01 Section “Sustainable Design Requirements.”

B. QUALITY ASSURANCE

1. Contractor Qualifications: Contractor for work of this Section to have a minimum of 10 years experience in replication and renovation of wood windows, and shall have completed not less than three (3) wood window renovation projects on buildings of comparable size and scale.
2. The Quality Standards, latest edition, of the Architectural Woodwork Institute shall apply to the work of this Section.
   a. Provide “Custom Grade” work unless otherwise indicated.
3. The Inspector shall judge the acceptable level of renovations of the existing windows for structural soundness, operation, visual appearance, and weather- and air-tightness.
4. Coordinate and cooperate with the Historic Commission on the repair or replacement of existing wood windows.

C. FIELD CONDITIONS

1. Verify window openings by field measurements before fabrication.
2. Coordinate fabrication schedule with construction progress to avoid delaying the work.

D. DELIVERY, STORAGE, AND HANDLING

1. Keep materials and fabricated items dry and protected from damage, soiling, and deterioration prior to installation.
2. Comply with manufacturer’s written instructions for minimum and maximum temperature requirements for storage of patching materials.

E. SEQUENCING AND SCHEDULING

1. Perform repairs and renovations of wood windows in the following sequence:
   a. Remove designated existing wood windows for repair, refinishing, and reinstallation.
   b. Repair deteriorated and damaged wood members.
   c. Replace damaged or missing wood window members.

d. Re-glaze existing wood windows.
e. Refinish existing wood windows.

2. Frames and decorative brick moldings shall then be repaired.

F. PRODUCTS

1. Materials:
   a. Replicated Window sash and Frame Components: Honduran Mahogany, heartwood, clear, select kiln dried, cured to 10 percent moisture content.
   b. Wood Trim and Stool/Sill: Southern Yellow Pine, paint grade, select kiln dried, cured to 10 percent moisture content.
   c. Rails and Stiles: Solid stock, in configurations to match existing, unless otherwise indicated or directed by the Inspector.
2. Wood Preservative and Shop Primer: New work, replacement work, and exposed wood.
   a. After joinery operations have been completed, treat all wood components with copper or zinc naphenate (Borate Preservative), three (3) flood coats of three (3) minute dip. Allow three (3) days drying time before application of primer. Apply brush coat of preservative to surfaces cut after initial preservative treatment.
   b. Apply prime paint in shop. Comply with requirements for material and application in Section 09 92 00 - Painting.
3. Epoxies and Wood Fillers:
   a. Prior to using epoxy repair or wood fillers, submit request to Inspector with product data and anticipated area of use, for approval.
      1) Epoxy products are to be compatible for adhesion with borate preservatives applied prior to epoxy.
4. Weatherstripping: Install spring bronze weatherstripping at the head, jamb, meeting rail, and sills of double-hung windows, unless directed otherwise on drawings or by Inspector, as follows:
   a. Sill: #16 gauge.
   b. Head: #12 gauge.
   c. Jamb: #10 gauge.
   d. Meeting Rail: #12 gauge.
5. Hardware: Maintain existing hardware in place unless it interferes with repairing window in place.
   a. Replace missing hardware to match existing at other windows.
6. Glass and Glazing Materials:
   a. Glass: Match existing.
   b. Glazing System: Oil-based glazing putty and glazing points.

G. EXECUTION

1. Prior to removal of existing windows or sash, have materials in place and ready for erection of temporary closures and protection of existing openings.

2. Fabricate window replacement members and units to comply with AWI Section 1000 requirements for Custom Grade.
   a. Fabricate replacement wood sash members and frame members that are reglazable without dismantling sash.
   b. Mullions: Provide replacement mullions as shown, matching existing units, complete with anchors for support to structure and installation of window units.
   c. Glazing Stops: Provide replacement glazing stops coordinated with glazing system indicated. Provide glazing stops to match sash frames.
   d. Molded Profiles of Replacement Members: Match existing profiles.
   e. Sash Members: Fabricate with mortise and tenon joints, coped, glued under pressure, and pinned. Half-lap muntin bars at intersections.
   f. Frame Members: Dado, rabbet, and plant assemble.
3. Replace all deteriorated, rotted, or missing stops, parting beads, stools, aprons and trim.
   a. Match existing profiles.
4. Repair all damaged sash as required to restore soundness and integrity to the unit. Replace all sashes having rotten corners and missing muntins with matching sash. Finished windows to be fully intact, structurally sound, and weathertight.
   a. For holes, depressions, and gouges less than 1 inch square in surface area and 1/2 inch in depth, use epoxy wood fillers to patch existing material. For larger holes, or to replace large areas employ wood Dutchmen.
      1) Mix and apply epoxy wood filler in accordance with manufacturer's written instructions.
5. Rails and Stiles: Replace rotted or structurally unsound rails or stiles with new members matching the profile of existing components.
6. Replace all cracked, broken and missing lights with clear sheet glazing-quality glass, or glass to match existing, thickness as recommended by manufacturer for size of light. Install glass using glazier points and glazing compound in accordance with the standards of the Flat Glass Marketing Association.
7. If both sashes are replaced, remove weights and chains, insulate sash weight cavity with non-expanding foam, and install new spring balances, appropriately sized for weight of sash. Remove parting bead and install new vinyl or aluminum sash track.
   a. Assure smooth and proper operation of both sashes.
8. Clean and prepare all surfaces for painting. Scrape off excess and loose paint, and sand to smooth condition.
9. Install new sash locks as required.
10. Cleaning and Protection:
    a. Clean interior and exterior surfaces immediately after installation. Exercise care to avoid damage to protective coatings and finishes. Remove excess glazing materials, sealant, dirt, and other substances.
    b. Clean glass after installing windows.

c. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during the construction period.

END OF SECTION

SECTION 08 11 00 - DOORS AND FRAMES

A. SUMMARY

1. Section Includes:
   a. Pre-hung embossed steel exterior doors.
   b. Pre-hung fiberglass exterior doors.
   c. Solid core wood interior doors.
   d. Hollow core wood interior doors.
2. Sustainable Design: Comply with Division 01 Section “Sustainable Design Requirements.”
   a. Exterior doors are required to meet or exceed ENERGY STAR guidelines based on the EPA performance standards for the North-Central Climate Zone.

B. REFERENCES

1. Architectural Woodwork Institute:
   a. AWI - Architectural Woodwork Quality Standards Illustrated.
2. International Code Council:
   a. ICC A117.1 - Accessible and Usable Buildings and Facilities.

C. QUALITY ASSURANCE

1. Perform work in accordance with AWI Quality Standard Section 1300, Economy Grade.
2. Accessibility Requirements: Conform to ICC A117.1.

D. DELIVERY, STORAGE, AND HANDLING

1. Package, deliver, and store doors in accordance with AWI Section 1300 and Section 1700.
2. Mark each door on top rail with opening number.
3. Protect doors with resilient packaging sealed with heat shrunk plastic.
4. Delivery:
   a. Deliver wood interior doors after building is enclosed, HVAC system is operational, and interior environment is stabilized with air temperature between 50 and 90 degrees F and relative humidity between 25 and 55 percent.
   b. Maintain interior environment as indicated for occupied conditions until residency is established.
   c. Deliver steel or fiberglass doors in manufacturer’s original, unopened, and undamaged containers with identification labels intact.
5. Storage:
   a. Do not store wood doors in damp or wet locations; or where light might bleach veneer.

b. Store wood doors flat and level, off floor, in a dry, well ventilated location. Do not store on edge.
c. Protect wood doors from dirt, water, and abuse.
d. Store steel or fiberglass doors as instructed by manufacturer's written instructions.

6. Handling:
   a. When handling wood doors, always lift and carry. Do not drag doors across other doors or surfaces.
   b. Handle doors with clean hands or clean soft gloves.

E. FIELD CONDITIONS

1. Coordinate work with door opening construction, door frame and hardware installation.

F. WARRANTY

1. Provide manufacturer's standard warranty indicating that doors will be free from material and workmanship defects from date of completion for the period indicated:
   a. Steel Door Systems: 10 years.
   b. Fiberglass Door Systems: 25 years.

G. PRODUCTS

1. Pre-hung embossed steel exterior door:
   a. Steel Skins: Minimum 24 gauge, cold-rolled galvanized steel.
   b. Stiles and Rails: Steel edge construction: 22 gauge continuous roll-formed steel.
   c. Core: Custom-fitted polystyrene.
   d. Door Thickness: 1-3/4 inch.
   e. Door Style: As selected by Inspector from manufacturer's full range of styles.
   f. Door Shape: Squared top.
   g. Door Finish: Manufacturer's standard rust-inhibitive primer, baked on.
   h. Pre-hung Hardwood System:
      1) Single door system.
      2) Frame: Solid wood, Pine. keyed for integral vinyl weatherstripping, width of frame unit to suit rough opening depth.
      3) Casing: As selected by Inspector from manufacturer's range of options.
      4) Hinges: 1-1/2 pair, solid brass, concealed bearing, non-removable pins, minimum 4 by 4 inches.
         a) Finish: as selected by Inspector from manufacturer's full range.
      5) Sill: Aluminum, finish as selected by inspector from manufacturer's full range.
      6) Glazing: As selected by Inspector from manufacturer's full range of options.
   i. Fabrication: Manufacturer's standard method of bonding steel skins to stiles and rails.

2. Pre-hung Fiberglass exterior door:

a. Fiberglass Skins: Long fiber injection (LFI) technology, incorporating multiple layers of resins, tinted resins, base colors and reinforcing materials.
b. Stiles and Rails: Engineered wood (Laminated veneer lumber).
c. Core: Custom-fitted polystyrene.
d. Door Thickness: 1-3/4 inches.
e. Door Style: As selected by Inspector from manufacturer's full range of styles.
f. Door Shape: Squared top.
g. Pre-hung Hardwood System:
    1) Single Door System.
    2) Frame: Solid wood, Pine; keyed for integral vinyl weatherstripping, width of frame unit to suit rough opening depth.
    3) Casing: As selected by Inspector from manufacturer's full range of options.
    4) Hinges: 1-1/2 pair, solid brass, concealed-bearing, non-removable pins, minimum 4 by 4 inches.
        a) Finish: As selected by Inspector from manufacturer's full range.
    5) Sills: Aluminum, finish as selected by Inspector from manufacturer's full range.
    6) Glazing: As selected by Inspector from manufacturer's full range of options.
h. Fabrication: Manufacturer's standard bonding system that adheres skins to engineered wood frame with core material and bonding agents that permanently lock skin to frame.

3. Exterior Door Only:
    a. In special situations the Historical Commission may require that the existing frame be repaired (see Section 08 01 10) and that a new exterior door of appropriate design be hung in the existing frame.
4. Solid core Wood interior doors:
    a. Solid core wood doors, style as indicated or as selected by developer; wood veneer facing material; non-fire-rated type; without glazing or louvers; not factory pre-fit to opening; unfinished; wood doors.
        1) Interior Solid Core Doors: 1-3/8 inches thick; five ply fully bonded construction, formaldehyde free.
5. Hollow core flush wood doors: Wood veneer facing material; non-fire-rated type; without glazing or louvers; not factory pre-fit to opening, unfinished; wood doors:
    a. Flush Interior Hollow Core Doors: 1-3/8 inches thick; manufacturer's standard bonded cardboard honeycomb core, formaldehyde free; reinforced with solid wood blocking for hardware; construction.
6. Veneer Facing for Painted Finish: 1/8 inch thick, pressed board (Masonite).
7. Veneer Facing for Transparent Finish: 1/8 inch thick, Mahogany or Luan
8. Facing Adhesive: Type I - waterproof, formaldehyde free.
9. Interior wood frame: 1 inch nominal milled clear pine frame with applied stop.

H. EXECUTION

1. Cut, plane, and fit non pre-hung doors with 1/8 inch clearance at head and jamb. Install doors and jambs plumb, straight, and true.
2. Undercut all interior doors to allow for carpeting, ventilation, and, where applicable, return air egress.
3. Install hardware using templates provided by manufacturer and employing drills and routers in appropriate jigs and frames. Hand chiseling of mortises shall be limited to minor accessory hardware only. Provide wedged shimming behind frame at hinges.
4. Mount doors to fit tightly and swing freely. Warped and defective or damaged doors will be rejected. Hinge bound doors shall be rehung.
5. Pre-fit, pre-hung doors shall fit frame squarely with 1/8 inch even clearance at head and jambs. Install frame, including threshold, in accordance with manufacturer's written instructions.
6. Adjust hardware and provide keys to owner at project closeout.
7. Shim and grout thresholds to prevent movement.

END OF SECTION

SECTION 08 11 13 - HOLLOW METAL DOORS AND FRAMES

A. SUMMARY

1. Section Includes:
   a. Exterior thermally insulated steel doors.
   b. Interior non-fire rated steel doors.
   c. Non-rated steel door frames.
2. Sustainable Design: Comply with Division 01 Section “Sustainable Design Requirements.”
   a. Exterior doors are required to meet or exceed ENERGY STAR guidelines based on the EPA performance standards for the North-Central Climate Zone.

B. REFERENCES

1. American National Standards Institute:
   a. ANSI A250.8 - Recommended Specifications for Standard Steel Doors and Frames.
   b. ANSI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.
2. ASTM International:
   a. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
   b. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
   c. ASTM C1363 - Standard Test Method for the Thermal Performance of Building Assemblies by Means of a Hot Box Apparatus.

C. DELIVERY, STORAGE, AND HANDLING

1. Accept doors and frames on site in manufacturer’s packaging. Inspect for damage.
   a. Break seal on site to permit ventilation.

D. FIELD CONDITIONS

1. Coordinate Work with frame opening construction, door and hardware installation.

E. PRODUCTS

1. Exterior Doors: ANSI A250.8, 1-3/4 inch thick, thermally insulated.
   a. Level 2 - Heavy Duty, Model 1, full flush design.
2. Interior Doors - Non-Fire-Rated: ANSI A250.8, 1-3/4 inch thick, thermally insulated at locations where space on one side is not insulated, nor heated.
   a. Level 2 - Heavy Duty, Model 1, full flush design.
3. Door Faces: Steel sheet in accordance with ANSI A250.8.

a. Exterior Doors (and Interior doors where space on one side of door is not insulated, nor heated): Galvanized to ASTM A653/A653M A60 or G60, zinc coating.
b. Interior Doors: ASTM A1008/A1008M, Commercial Steel Type B, non-galvanized.

4. Door End Closure: Channel, 0.04 inch thick.
5. Door Core:
   a. Thermally Insulated Doors: Polyurethane; total minimum insulation R-Value of 8, measured in accordance with ASTM C 1363.
   b. Non-Fire-Rated Doors: Cardboard honeycomb.
6. Frames: ANSI A250.8; standard shop fabricated steel frames:
   a. Non-Fire-Rated types.
   b. Exterior and Interior Frames: Nominal 16 gauge/0.053 inch thick material, base metal thickness. Corners welded and ground smooth.
7. Sheet Metal for Frames:
   a. Exterior Frames (and Interior frames where space on one side of door is not insulated, nor heated): Galvanized to ASTM A653/A653M A60 or G60 zinc coating.
   b. Interior Frames: ASTM A1008/A1008M, Commercial Steel Type B, non-galvanized.
8. Primer: ANSI A250.10 rust inhibitive type.
9. Silencers: Specified in Section 08 71 00.
10. Weatherstripping: Specified in Section 08 71 00.

F. FABRICATION

1. Fabricate doors and frames with hardware reinforcement welded in place.
   a. Provide mortar guard boxes for frames built into masonry construction.
2. Close top and bottom edge of exterior doors with flush steel channel closure. Seal joints watertight.
3. Close top and bottom edge of interior doors with inverted steel channel closure.
4. Fabricate frames as:
   a. Welded unit.
   b. Gypsum board slip on type, except for exterior.
5. Prepare frames for silencers. Provide three single silencers for single doors on strike side.

G. SHOP FINISHING

1. Primer: Baked-on type.
2. Coat inside of frame profile with bituminous coating to minimum thickness of 1/16 inch for frames built into masonry walls and partitions.

H. EXECUTION

1. Verify opening sizes and tolerances are acceptable.

2. Install doors and frames in accordance with ANSI A250.8.
3. Coordinate installation of door and frames with installation of hardware specified in Section) 8 71 00.
4. Frames shall be rigidly attached to masonry, wood, or steel construction with anchors supplied by manufacturer and designed for the conditions at each opening. A minimum of 6 anchors per opening shall be installed, with one anchor at each hinge location and one anchor at strike location. All frames shall have an integral or welded sill anchor.
5. All necessary modifications shall be made to install door frames in existing masonry openings.
6. At new masonry openings, anchors shall be built into wall as masonry is installed.
   a. Fill frames with grout as specified in Section 04 20 00.
7. Finish paint as specified in Section 09 90 00.
8. Erection Tolerances:
   a. Maximum Diagonal Distortion: 1/16 inch measured with straight edge, corner to corner.
9. Adjusting:
   a. Adjust door for smooth and balanced door movement.

END OF SECTION

SECTION 08 20 00 - STORM DOORS AND WINDOWS

A. SUMMARY

1. Section Includes:
   a. Aluminum Storm Door.
   b. Aluminum Storm Windows, exterior mounted.
   c. Storm Windows, interior mounted.
2. Sustainable Design: Comply with Division 01 Section “Sustainable Design Requirements.”

B. PRODUCTS

1. Storm Doors: Pre-finished aluminum combination storm door.,
   a. Finish: Manufacturer’s standard baked enamel finish.
      1) Color: White.
         a) Verify with Historical Commission if white finish is acceptable, if not provide color required by Historical Commission.
      2) Insect Screening: Coated aluminum.
      3) Storm Panel: Plexiglas.
      4) Hardware: Continuous hinge, pneumatic closer(s), lever style latchset with thumb latch inside, and chain stop mounted at top of door.
2. Storm Windows, Exterior mounted (for use with single-pane primary windows): Pre-finished aluminum storm windows.
   a. Style: 3 track combination storm and screen.
      1) Interior screen storage.
      2) Sash and screen to be designed to be removable from interior of building.
   b. Aluminum Alloy: 6063 T5;
   c. Nominal wall thickness: 0.050 inches.
   d. Construction: Miter cut four corners.
      1) Continuous meeting rail, align with prime window.
      2) Provide integral weeps and condensation drains.
   e. Finish: Manufacturer’s standard powder coated finish.
      1) Color: White, unless directed otherwise by Inspector.
   f. Glazing: Manufacturer’s standard clear safety glass mounted in vinyl gasket.
      1) Sash Handles: Recess into frame, not visible to exterior.
         a) Provide option for Low-E Glass.
      2) Weatherstripping: Manufacturer’s standard.
   g. Insect Screen: Manufacturer’s standard coated aluminum.
   h. Fasteners: Manufacturer’s standard screws, color matched to frame.
3. Storm Window, Interior Mounted (for special situations where required by Historical Commission):

a. The Historical Commission may require either (1) vertically operating interior storm windows or (2) removable, rigid interior fixed storm panels. See Park Service publication "Window Directory for Historic Buildings" cited in Section 08 52 00. When such windows are required, product literature shall be submitted to the Historical Commission for approval.

C. EXECUTION

1. Install storm doors and windows in strict accordance with manufacturer's written instructions.
2. Set mounting flanges in a continuous bead of sealant at all frames.
3. Size storm windows and doors to meet frame and opening sizes and requirements.
4. Installed storm windows and doors square in openings, without twist or racking.
5. Following installation, ensure all parts operate smoothly without binding.
6. Insure that weep holes are installed and open before completing installation.
7. When interior storm windows are installed, weep holes shall be provided under primary window.
   a. Attach a neoprene strip, with several small gaps, under the bottom rail of the lower outside sash.

END OF SECTION

SECTION 08 30 00 - SPECIALTY DOORS AND FRAMES

A. SUMMARY

1. Section Includes:
   a. Wood Bi-Fold Closet Doors.
   b. Metal Bi-Fold Closet Doors.
   c. Wood Sliding Closet Doors.
   d. Metal Sliding Closet Doors.
   e. Wood Panel Overhead Garage Doors.
   f. Metal Panel Overhead Garage Doors.
   g. Fiberglass Panel Overhead Garage Doors.
   h. Metal Basement Access Doors.
2. Sustainable Design: Comply with Division 01 Section “Sustainable Design Requirements.”

B. DELIVERY, STORAGE, AND HANDLING

1. Package, deliver, and store wood doors in accordance with AWI Section 1300 and Section 1700.
2. Package, deliver, and store metal doors in manufacturer’s original, unopened, and undamaged containers with identification labels intact, in accordance with manufacturer’s written recommendations.
3. Deliver interior doors after building is enclosed, HVAC system is operational, and interior environment is stabilized with air temperature between 50 and 90 degrees F. and relative humidity between 25 and 55 percent.
4. Maintain interior environment as indicated for occupied conditions until residency is established.
5. Storage:
   a. Do not store wood doors in damp or wet locations; or where light might bleach veneer.
   b. Store doors flat and level, off floor, in a dry, well ventilated location. Do not store on edge.
   c. Protect doors from dirt, water, and abuse.
6. Handling:
   a. Lift and carry doors. Do not drag doors across other doors or surfaces.
   b. Handle doors with clean hands or clean soft gloves.

C. FIELD CONDITIONS

1. Coordinate work with door opening construction, door frame and hardware installation.

D. PRODUCTS

1. Wood Bi-Fold or Sliding Closet Doors:
   a. Hollow core flush wood doors: 1-3/8 inch thick; manufacturer's standard bonded cardboard honeycomb core; reinforced with solid wood blocking for hardware.
      1) Veneer Facing for Painted Finish: 1/8 inch thick, pressed board (Masonite).
      2) Veneer Facing for Transparent Finish: 1/8 inch thick lauan or mahogany.
      3) Facing Adhesive: Type I - waterproof.
2. Metal Bi-Fold or Sliding Closet Doors:
   a. Header and Jamb Members: Form interior door panels of ASTM A 653 commercial quality cold rolled steel.
      1) Doors to be formed from 0.023 inch, 24 gauge smooth steel. Panels to be 1 inch thick with stiffener braces at top, center, and bottom.
      2) Provide Hardware for bi-folding doors as follows:
         a) Zinc plated guide and pivot pins.
         b) Pins to be nylon tipped and allow for vertical adjustment of 1-1/4 inches.
         c) Top and bottom pins to be of the captive type.
         d) Provide spring loaded top pin guide rods.
         e) Provide three hinges on each pair of bi-folding doors.
      3) Provide Hardware for sliding doors as follows:
         a) Zinc plated hangers with two ball bearing nylon wheels per carrier.
      4) Side Trim: Formed steel: 1-1/4 inches wide, 24 gauge minimum.
      5) Handles: Manufacturer's standard design; Finish to match room door latch set finish.
      6) Track:
         a) Top and bottom tracks for bi-folding doors: Extruded aluminum, 5/8 inches high.
         b) Top track for sliding doors, with bottom guide: Extruded aluminum
         c) Extend tracks full width of opening, less 1/2 inch
      7) Finish: Manufacturer's standard baked-on synthetic enamel, applied over a cleaned and phosphate coated surface.
         a) Electrostatically applied finish method.
         b) Dry film thickness: minimum 1 mil.
         c) Finish shall pass 100 hour salt spray test in accordance with ASTM B 117 and 200 hour humidity test in accordance with ASTM D 1735, with no blistering.
3. Overhead Garage Doors: Provide one of the following as indicated or as directed:
   a. Sectional wood panel upward acting garage door:
      1) Stiles and rails to be minimum 1-3/8 inch thick with minimum 1 lb density polystyrene insulation infill panels.
      2) Face panels to be premium grade 1/4 inch hardboard; Flush design.

b. Sectional metal panel upward acting garage door:
   1) 16 gauge, non-insulated, galvanized steel panel sections with rabbeted meeting rails to form weathertight joints and to provide full-width interlocking structural rigidity.
      a) Provide “raised panel” design with embossed wood grain appearance unless otherwise indicated or directed by Inspector.
      b) Provide manufacturer’s standard weatherstripping with bulb-type bottom seal.
   2) Center and end stiles to be 16 gauge galvanized steel.
   3) Provide manufacturer’s standard two coat baked-on polyester paint finish.
      a) Color as selected from manufacturer’s full range.
c. Sectional fiberglass panel upward acting garage door:
   1) Wood-grain-patterned fiberglass outer surface bonded to steel with foamed-in-place polyurethane insulation bonded to each steel inner section. Integral hinges, factory installed, between sections. Meeting rails to be rabbeted to form weathertight joints, and to provide interlocking structural rigidity.
      a) Provide manufacturer’s standard panel design as indicated or as selected from manufacturer’s full range.
      b) Provide fiberglass in manufacturer’s standard stained finish; color as indicated or as selected from manufacturer’s full range.
      c) Interior steel panels to be finished in manufacturer’s standard white baked-on finish.
      d) Provide manufacturer’s standard weatherstripping with bulb-type bottom seal.
d. Tracks and accessories for each type of upward acting overhead door:
   1) Track to be 2 inch galvanized steel channel shaped.
   2) Rollers to be steel ball bearing.
   3) Counter-balance shall be oil tempered, helically wound torsion spring.
   4) Provide all necessary mounting brackets, key locking hardware and latch mechanism, and lift handles on both sides. Door to be manually operated, provide rope to assist with closing door.

4. Metal Basement Access Door:
   a. Basement door assembly to be constructed of 0.090 to 0.100 inch thick, (12 gauge) steel and supplied with gas spring operators. Basement door to be factory prime coated with manufacturer’s standard flow-coated and baked-on finish. Furnish complete assembly with sloped top steel side panels (for installation on level foundation walls), assembly bolts and anchors for securing to masonry or concrete, size as required, with interior slide bolt. All hardware components to be corrosion resistant. Construction to allow for one-handed operation.
      1) Unit to be in compliance with applicable codes for egress from occupied basement.
      2) Unit to be able to withstand minimum 200 lb live load.

E. EXECUTION

1. Install specialty doors in accordance with manufacturer's written instructions.
   a. Install wood jambs, head boards and casings, to match other trim in room, at all sliding and bi-fold doors. Split head boards to conceal metal tracks on both sides of track.
2. Undercut closet doors where necessary to clear carpeting.

F. CLEANING

1. Remove any temporary coverings.
2. Repair or replace damaged units.
3. Clean surfaces in accordance with manufacturer’s written recommendations.

END OF SECTION

SECTION 08 50 00 - WINDOWS

A. SUMMARY

1. Section Includes:
   a. New Operating Sash Windows
2. Sustainable Design: Comply with Division 01 Section “Sustainable Design Requirements.”
   a. Exterior windows are required to meet or exceed ENERGY STAR guidelines based on the EPA performance standards for the North-Central Climate Zone.
3. Applicability: This section applies universally except where precluded by special requirements of OHCD/PHDC/ RDA or the Historical Commission.

B. REFERENCES

1. American National Standard Institute:
   a. ANSI/AAMA/NWWDA 101/I.S.2: Voluntary Specifications for Aluminum, Vinyl (PVC), and Wood Windows and Glass Doors.
2. National Fenestration Rating Council (NFRC): 101: Procedure for Determining Fenestration Product Thermal Properties.
3. Window and Door Manufacturers Association (WMDA): 101/I.S.2 WDMA Hallmark Certification Program.

C. QUALITY ASSURANCE

1. Regulatory Requirements: Emergency Egress or Rescue: Comply with requirements for sleeping units of IBC International Building Code.
2. Aluminum Windows: Fabricate assemblies in accordance with ANSI/AAMA 101 for types of windows required.
3. Insulated Glass: Fabricate insulated glass units in accordance with Insulating Glass Certification Council or Insulating Glass Manufacturers Alliance.
4. Safety Glass: Conform to CPSC 16 CFR 1201, Category II.

D. DELIVERY, STORAGE, AND HANDLING

1. Deliver in manufacturer’s original packaging.
2. Store in a dry location, above ground, and protected from the weather.
3. Store windows in an upright position.
4. Prime or seal wood surfaces, including surfaces to be concealed by wall construction.
5. Protect factory finished surfaces with strippable coating. Do not use adhesive papers or sprayed coatings that bond when exposed to sunlight or weather.

E. FIELD CONDITIONS

1. Field Measurements: Verify window openings by field measurements before fabrication.

F. PRODUCTS

1. Provide aluminum, vinyl (PVC) or aluminum clad wood windows, conforming to R 15 or higher voluntary specification in ANSI/AAMA/NWWDA 101/I.S.2.
   a. Windows to be labeled with the “AAMA” or “WDMA Hallmark” label.
2. Windows to be NFRC-labeled and certified by the manufacturer. showing compliance with the following:
   a. U-factor to be determined in accordance with NFRC 100 by an accredited, independent laboratory.
   b. Solar Heat Gain Coefficient (SHGC) of glazed products to be determined in accordance with NFRC 200 by an accredited, independent laboratory.
   c. Products unable to be NFRC-labeled are not permitted.
3. Windows to meet or exceed ASTM E 588 for forced-entry resistance.
4. Window style shall be double-hung, one over one, unless indicated otherwise.
5. Glazing:
   a. Select quality complying with ASTM C 1036. Insulating glass SIGMA/IGCC certified to performance level CBA when tested in accordance with ASTM E 2190.
   b. Glazing Method: Insulating glass.
   c. Glass Type: Clear with Low E II film on #2 surface, and argon filled air space.
      1) Provide Obscure Glass for bottom sash of windows installed in bathrooms.
   d. Glazing Seal: Silicone bedding on interior, acrylic foam tape on exterior.
   e. Re-Glazing: Fabricate frames so disassembly of frames is not required to replace glass units.
6. Construction, Aluminum Windows:
   a. Aluminum: Comply with requirements of AAMA/WDMA/CSA 101/I.S.2/A440, 6063-T5 temper for strength, corrosion resistance and application of required finish.
   b. Extruded frame members to be 0.060 inch thick for structural walls.
   c. Fabricate frames and sashes with mechanically joined corners, fastened with corrosion-resistant screws and sealed with acrylic sealant. Frames to be “thermally-broken” construction.
7. Construction, Vinyl (PVC) Windows:
   a. Vinyl: Integral color PVC compound containing impact-resistant solid plasticizer, titanium dioxide UV inhibitor, and surface and color stabilizers, complying with ASTM D 4216 and ANSI/AAMA 101/I.S.2.
   b. Fabricate frames and sash with mitered and fusion welded corners and joints. Trim and finish corners and welds to match adjacent surfaces.
   c. Provide concealed metal reinforcement in sash frames for attaching lock mechanism.
8. Construction, Aluminum Clad Wood Windows:
   a. Wood Components: Clear Pine or Douglas Fir.
      1) Kiln dried to a moisture content no greater than 12 percent at time of fabrication.
      2) Water repellent preservative treated in accordance with WDMA I.S. 4.

b. Frame Construction: Finger joined edge-glued with interior clear veneer.
c. Exterior Cladding: Extruded aluminum minimum 0.050 inch thick.
d. Removable exterior vinyl glazing stops. Bottom rail bevel: 14 degrees.
e. Sash to tilt to interior for cleaning or removal.

9. Hardware:
   a. Balance System for Aluminum and Aluminum Clad Wood Windows: Concealed coil spring block and tackle with nylon cord and fiber filled nylon clutch.
   b. Jamb Carrier for Aluminum Clad Wood Windows: Vinyl extrusion with wood and aluminum inserts. Color as selected from manufacturer’s standard color range.
   c. Lock: High pressure zinc die-cast cam lock and keeper. Two locks on units 36 inches and wider.
      1) Plated brass.
   d. Weatherstrip: Manufacturer’s standard continuous type weatherstripping.
10. Finish, Aluminum Clad Wood Windows: Fluoropolymer modified acrylic topcoat over primer, meeting or exceeding AAMA 2605 requirements.
    a. Color: As selected from manufacturer’s standard colors.
    b. Brick molds, and exterior trim to be finished to match.
    c. Interior Finish: Manufacturer’s standard latex prime coat (white) or treated bare wood.
11. Removable Grills: Manufacturer’s standard rectangular pattern grill, finished to match interior sash finish.
12. Insect Screen: Factory installed full screen, outside-mounted, aluminum-framed, fiberglass or coated-aluminum screen removable from inside.
    a. Frame Color: To match window frame.
    b. Screen Mesh: 18 by 16; charcoal color.

G. EXECUTION

1. Install windows in accordance with manufacturer's written instructions.
2. Construct rough frames, as required, of milled 2 X lumber, primed. Air sealing of frame openings shall conform to Section 07 96 00.
3. In living space locations, provide drywall returns to window frame, or where depth of window aligns with parallel gypsum board surface, provide wood casing, sill, and apron trim.
4. Provide and install all necessary exterior moldings and trims at mullions and casings to provide a complete assembly.

H. CLEANING AND PROTECTION

1. Remove visible labels and adhesive residue from glass according to manufacturer’s written instructions.
2. Leave window components and glass in a clean condition.

3. Protect windows from damage by chemicals, solvents, paint, or other construction that may cause damage.
4. Replace broken glass.

END OF SECTION

SECTION 08 52 00 - WOOD WINDOWS

A. SUMMARY

1. Section Includes:
   a. Custom Wood Windows.
2. Sustainable Design: Comply with Division 01 Section “Sustainable Design Requirements.”
   a. Wood windows are required to meet or exceed ENERGY STAR guidelines based on the EPA performance standards for the North-Central Climate Zone.

B. REFERENCES

1. U.S. Department of the Interior, National Park Service, Preservation Assistance Division: “Window Directory for Historic Buildings.”

C. QUALITY ASSURANCE

1. This section applies where the Historical Commission requires custom wood windows to comply with historical guidelines.
2. New wood windows to be manufactured to match the existing window configuration by a manufacturer with a minimum of 10 years experience in replication of historic wood windows.
3. The Quality Standards, latest edition of the Architectural Woodwork Institute, shall apply to the work of this Section.
   a. Except as otherwise indicated, provide “Custom Grade” work.

D. DELIVERY, STORAGE, AND HANDLING

1. Keep materials and fabricated items dry and protected from damage, soiling, and deterioration.

E. FIELD CONDITIONS

1. Field Measurements: Verify window openings by field measurements before fabrication.
2. Coordinate fabrication schedule with construction progress to avoid delaying the work.

F. PRODUCTS

1. Window Sash and Frame Components: Honduran Mahogany, heartwood, clear, select kiln dried, cured to 10 percent moisture content.
2. Wood Trim and Stool/Sill: Southern Yellow Pine, paint grade, select kiln dried, cured to 10 percent moisture content.
3. Rails and Stiles to be solid stock, in configurations as indicated, or as directed by the Historic Commission.

4. Wood Preservative and Shop Primer:
   a. After joinery operations have been completed, treat all wood components by manufacturer's standard method and with manufacturer's standard preservative materials. Allow to thoroughly dry before applying primer.
      1) Apply brush coat of preservative to surfaces cut after initial treatment.
   b. Apply prime paint in shop. Comply with requirements for material and application in Section 09 90 00 - Painting.
5. Windows shall be double glazed, or single glazed with storm windows, as directed by the Historical Commission, or the Inspector with Historical Commission authorization.
   a. Provide oil-based glazing putty and glazing points.
6. Windows shall have plastic or aluminum sash tracks and spring balances appropriately sized for weight of sash.
7. Weatherstripping: Provide spring bronze weatherstripping at head, meeting rail, and sill of double-hung windows. Provide manufacturer's standard weatherstripping at jambs.
8. Wood basement windows, when required by the Historical Commission, shall be multi-paned fixed or awning units.
9. Hardware: Provide locking hardware to lock windows in closed position.

G. EXECUTION

1. Prior to removal of existing windows have materials in place and ready for erection of temporary closures and protection.
2. Windows shall be installed plumb and level, and securely fastened in rough opening.
3. Installation shall also conform to the provisions in Section 08 50 00 - Windows.
4. Clean interior and exterior surfaces immediately after installation. Remove excess glazing material and sealants, dirt, and other foreign substances. Exercise care to avoid damage to protective coatings and finishes.
5. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during the construction period.

END OF SECTION

SECTION 08 56 00 - SECURITY SCREENS AND DOORS

A. SUMMARY

1. Section Includes:
   a. Aluminum Security Screens.
   b. Aluminum Security Storm Doors.
2. Sustainable Design: Comply with Division 01 Section “Sustainable Design Requirements.”

B. DELIVERY, STORAGE, AND HANDLING

1. Package, deliver, and store security screens and doors in manufacturer’s original, unopened, and undamaged containers with identification labels intact, in accordance with manufacturer’s written instructions.

C. FIELD CONDITIONS

1. Coordinate work with window and door opening construction; window and door installation.

D. PRODUCTS

1. Aluminum Security Screens:
   a. Main frame to be channel design, extruded from 6063-T6-aluminum alloy. Weight to be not less than 0.927 lbs./ft.; nominal thickness of 0.125 inches. Corners to be continuously welded on both sides and ground smooth.
      1) A removable interlocking concealment plate, extruded from 6063-T6 aluminum alloy, 0.062 inch thick, 0.290 lbs./ft. to be attached to main frame with TORX tamper-resistant screws. Install braces when required.
   b. Sub-frame to be of channel design, extruded from 6063-T6-aluminum alloy. Weight to be 0.515 lbs./ft. Wall thickness to be 0.090 inch. Miter corners, secure with manufacturer’s standard internal tension coupling assembly. Unit to be resistant to both torsion and flexural failure.
      1) Sub-frame to have a continuous groove retaining a combination cushioning strip/insect shield.
   c. Wire Cloth: Type 304 stainless steel, 0.028 inch diameter wire, double crimped, woven to 12-mesh.
      1) Attaching wire cloth: Fold 90 degrees and hold securely in place by means of a removable interlocking concealment plate and TORX tamper-resistant screws.
      2) TORX tamper-resistant screws to penetrate the removable interlocking concealment plate, wire cloth, and main frame approximately 4 inches on center.
   d. Locks and Releases: Equip each screen with a concealed, ball-bearing, 1/2 inch diameter, case-hardened steel bolts. Bolts to operate simultaneously from one key station with a special Bitt key, manufacturer’s standard Type 107 lock.
      1) Provide emergency Push-Quick release that conforms to NFPA 101 (5-2.1.7.1)

e. Hardware: Provide each screen with two or more concealed 13-gauge, electroplated steel hinges with 1/4 inch diameter hardened, loose stainless steel pins and integral compression guards.
   1) Each screen shall have 0.062-inch thick aluminum scribes. The 3/4 by 1 inch scribes to be supplied at the head and jambs as required.
   2) Each screen to be fully assembled and tested at the factory.
f. Finish: Thoroughly clean aluminum in a 5-step bonderizing process. Electrostatically apply thermoplastic, polyester powder coating and bake to a hard mar-resistant finish.
   1) Color: As selected by Inspector from manufacturer's standard colors.

2. Aluminum Security Storm Door:
   a. Extruded aluminum frame, 1-1/2 inches thick, with maintenance-free factory finish.
      1) Provide security grille integral with frame.
      2) Provide single-vent window and half-screen for bottom ventilation.
      3) Provide brass finish interior and exterior handles with built-in deadbolt security lock; continuous hinge, adjustable pneumatic closers, and spring-loaded safety chain.
      4) Equip door with plush wool pile weatherstripping and adjustable bottom expander.
      5) Finish: Manufacturer's standard baked-on powder coat.
         a) Color: As selected by Inspector from manufacturer's standard colors.

E. INSTALLATION

1. Security window screens shall be custom manufactured to fit each window opening.
2. Install security screens on each window at ground level adequately anchored and in accordance with manufacturer's written instructions.
   a. Plumb and align faces in a single plane and erect screens square and true.
   b. All anchoring devices shall be concealed when security screen is in locked position.
   c. Securely anchor each security screen and door to wall construction on exterior of building.
3. Install security storm door in accordance with manufacturer's written instructions.

END OF SECTION

SECTION 08 71 00 - DOOR HARDWARE

A. SUMMARY

1. Section Includes:
   a. Hardware for Wood, Steel, and Fiberglass Doors.
   b. Door Gaskets, including weatherstripping and seals, and thresholds.
2. Sustainable Design: Comply with Division 01 Section “Sustainable Design Requirements.”

B. REFERENCES

1. Builders Hardware Manufacturers Association:
   a. ANSI/BHMA - A156 series.

C. PERFORMANCE REQUIREMENTS

1. Fire-Rated Openings: Provide door hardware listed by UL or Intertek Testing Services (Warnock Hersey Listed), or other testing laboratory approved by authorities having jurisdiction.
   a. Hardware: Tested in accordance with NFPA 252.

D. DELIVERY, STORAGE, AND HANDLING

1. Deliver locksets and latch sets to site in manufacturer’s original packaging.
2. Store hardware in a secure location on site, until installed.
   a. Do not use finish hardware for construction operations; provide temporary locksets as necessary to secure building until completion.
   b. Do not make copies of keys for finish hardware. Turn all finish hardware keys over to Inspector at completion.

E. COORDINATION

1. Coordinate work with other directly affected sections involving manufacturer or fabrication of internal reinforcement for door hardware and recessed items.
   a. Provide templates or actual hardware to ensure proper preparation of doors and frames.

F. PRODUCTS

1. Components:
   a. Where not specifically indicated, comply with applicable ANSI A156 standard for type of hardware required. Provide each type of hardware with accessories as required for applications indicated and for complete, finished, operational doors.
      1) Templates: Furnish templates or physical hardware items to door and frame manufacturers sufficiently in advance to avoid delay in work.
      2) Fasteners: Furnish as recommended by hardware manufacturer and as required to secure hardware.

a) Finish: To match hardware item being fastened.

b. Hinges: ANSI A156.1, full mortise type complying with the following:
   1) Widths: Sufficient to clear trim projection when door swings 180 degrees.
   2) Number: Provide minimum three hinges for all exterior doors and doors up to 90 inches high, four hinges for doors between 90 and 120 inches high, for each leaf.
      a) Residential hollow core or interior flat panel wood doors: Provide minimum two hinges.
   3) Size and Weight: 4-1/2 inch heavy duty weight typical for 1-3/4 inch doors.
      a) Doors over 40 inches wide: Extra heavy weight ball or oiltie bearing hinges.
      b) Doors 1-3/8 inch thick: 3-1/2 inch size
   4) Pins: Provide nonferrous hinges with non-removable pins (NRP) at exterior and locked outswinging doors, non-rising pins at interior doors.
   5) Tips: Flush tips.

c. Locksets: Provide locksets with specified cylinders. Typical 2-3/4 inch backset. Furnish standard strikes with extended lips to protect trim from being marred by latch bolt verify type of cutouts provided in metal frames. Provide ADA compliant lever trim as indicated or as selected by developer.
   1) Bored (Cylindrical) Locksets: ANSI/BHMA A156.2, Series 4000, Grade 1 unless otherwise indicated
   2) Preassembled (Unit) Locksets: ANSI/BHMA A156.12, Series 2000, Grade 1 unless otherwise indicated.
   3) Interconnected Locksets: ANSI/BHMA A156.12, Series 5000, Grade 1 unless otherwise indicated.
   4) Auxiliary Locksets: ANSI/BHMA A156.5, Grade 1, bored dead locks unless otherwise indicated.

d. Bathroom and Bedroom Locksets: Provide with push-button or turn-button locking on bathroom or bedroom side of door to lock outer lever. Outer side of door to have opening to allow unlocking by special device (as provided with lockset). Opening door to unlock outer lever. Closing door to unlock outer lever. (Door must be closed to permit locking from inside)

e. Latch Sets: Match locksets. Typical 2-3/4 inch backset. Furnish standard strikes with extended lips to protect trim from being marred by latch bolt, verify type of cutouts provided in metal frames.
   1) Bored (Cylindrical) Latch Sets: ANSI/BHMA A156.2, Series 4000, Grade 1 unless otherwise indicated.

f. Cylinders: Integral with lockset and as provided by lockset manufacturer.
   1) All locksets/deadbolts within one residence to be keyed alike.
   2) Locksets for each residential unit being worked on to be keyed differently.
   3) Keys: Manufacturer’s standard non-corrosive metal (aluminum not permitted), minimum two keys per lockset/deadbolt.

g. Sliding and Bi-Folding Door Hardware: ANSI/BHMA A156.14; provide complete hardware sets for operational installation.

h. Weatherstripping: Provide continuous compressible vinyl bulb weatherstripping at top and sides of exterior doors and doors between heated and unheated interior spaces.
   1) Pre-hung doors to provide manufacturer's standard weatherstripping.
i. Fire-Rated Gaskets: Provide continuous fire rated gaskets at top and sides of fire rated doors.
j. Thresholds: Maximum 1/2 inch height.
k. Wall Stops: Minimum 2-1//2 inch long, with integral screw base for attaching to baseboard, and rubber tip.

2. Accessories:
   a. Fasteners: Furnish hardware items with machine screws required for installation.
   b. Lock Trim: Provide levers with rose as selected by Inspector from manufacturer's full range of levers and roses.
   c. Viewer: Through door type, one way viewing (interior to exterior).
3. Finishing:
   a. Finishes: ANSI/BHMA A156.18; provide one of the following finishes for all doors unless otherwise indicated:
      1) Satin nickel, bright brass, oil-rubbed bronze, antique bronze, satin chrome, polished chrome, or other as acceptable to developer and when approved in writing by OHCD/PHDC/RDA.
         a) All finishes to match throughout residence including plumbing fixtures and bathroom accessories.
         b) Replace non-matching hinges at pre-hung doors to match other hardware selections.
      2) Thresholds: BHMA 628, satin aluminum, clear anodized.

G. EXECUTION

1. Examination: verify doors and frames are ready to receive door hardware and dimensions are as instructed by manufacturer.
2. Installation:
   a. Install hardware in accordance with manufacturer's written instructions.
   b. Coordinate mounting height with door and frame manufacturers. Use templates provided by hardware item manufacturer.
   c. Mounting Heights from Finished Floor to Center Line of Hardware Item: Comply with manufacturer's recommendations and applicable codes where not otherwise indicated:
      1) Locksets and Latch Sets: 38 inches.
      2) Top Hinge: Jamb manufacturer's standard, but not greater than 10 inches from head of frame to center line of hinge.
      3) Bottom Hinge: Jamb manufacturer's standard, but not greater than 12-1/2 inches from floor to center line of hinge.
      4) Intermediate Hinge: Equally spaced between top and bottom hinge.

5) Hinge mortise on Door Leaf: 1/4 inch to 5/16 inch from stop side of door.

3. Field Quality Control:
   a. After final check, make required adjustments, replacements and repairs. Leave hardware in proper operating condition.
   b. Blemished or defective hardware will be rejected even though set in place before defects are discovered. Remove and replace with new hardware and repair any resultant damage to other work.
   c. Adjust hardware for smooth operation.
   d. Do not permit adjacent work to damage hardware or hardware finish.

END OF SECTION

SECTION 08 90 00 - LOUVERS AND VENTS

A. SUMMARY

1. Section Includes:
   a. Fixed louvers and frames.
   b. Jalousie windows.
   c. Bird Screening.
2. Sustainable Design: Comply with Division 01 Section “Sustainable Design Requirements.”

B. PRODUCTS

1. Vents in masonry walls: Aluminum jalousie window.
   a. Window blades to be 4 inch wide fully tempered clear glass. Glass retainer clips to be rounded on ends. Blades to be interconnected so all blades operate as one unit. Equip unit with hand operated crank to operate blades.
   b. Provide bird screen with aluminum frame mounted on inside of window.
      1) Screen to be removable.
   c. Aluminum block or brick vents are not acceptable.
2. Vents in gable ends of attics: Framed openings: Prefabricated aluminum louver with fixed blades spaced approximately 1-1/2 inches on center, Total depth of louver approximately 1 inch. Louver to be factory finished with manufacturer’s standard baked-on powder coating. Louver to have nailing flange to secure louver to framing over sheathing. Provide bird screen on inside of louver with aluminum frame. Screen to be removable.
3. All vents to be shop fabricated or pre-manufactured standard products, Field assembled vents are not permitted.

C. EXECUTION

1. Install vents in accordance with manufacturer's written instructions.
   a. Install where indicated, and in the following locations:
      1) All crawl spaces outside the thermal boundary.
      2) Closed porch foundations.
      3) Gable ends of attic spaces.

END OF SECTION

DIVISION 09 FINISHES

DIVISION 09 FINISHES
QUALITY STANDARDS AND 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. Manual of Lathing and Plastering, John R. Diehl, MAC Publishers Association, c.1960.
   b. The Gypsum Construction Handbook, United States Gypsum, latest edition.
   c. Tile Council of North America (TCA), "TCA Handbook for Ceramic Tile Installation," current edition.
2. General: Products in this Division shall meet shall meet all fire safety requirements and standards of code and the City of Philadelphia and minimum ASTM standards required by code and as stated in other Division 09 Sections.
3. Adhesives, sealants, grouts and other similar products used in installation of finishes specified in other Sections of this Division shall meet VOC level requirements per Section 01 81 20 "Sustainable Design Requirements."
4. Paints and coatings specified in other Sections of this Division shall meet VOC level requirements per Section 01 81 20 "Sustainable Design Requirements."
5. Surfaces to receive finishes shall be prepared in accordance with requirements specified in other Sections of this Division.
6. Provide cementitious backer board at bath and shower surrounds to be tiled and floor areas to be tiled. Moisture and mold resistant drywall is not permitted in these areas. Backerboard to be installed with manufacturer recommended fasteners at recommended spacing. Drywall screws are not acceptable.
7. Provide fire-resistance rated gypsum wallboard in assemblies where required by Code.
8. Do not puncture paper facing of gypsum wallboard during installation.
9. Finish gypsum wallboard as directed in other Sections of this Division unless directed by OHCD/PHDC/RDA to finish gypsum wallboard in another manner.
10. Provide moisture and mold resistant drywall in bathrooms at all areas except bath and shower surrounds, and at all finished basement levels from finished floor to minimum 4 feet above finished floor
11. Tile spacing will be in accordance with TCA guidelines and will be consistent and square throughout tile installation.
12. Grout color in tile work in a room will be uniform and of the same color.

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

1. Storage and Installation General: Do not deliver and store on site, or install, absorptive products until building is closed in and weathertight.

2. Environmental Conditions - General: Do not install materials or products specified in other parts of this Division unless environmental conditions are within ranges required by the manufacturer or by applicable standards.
3. Do not mix or prepare products intended for exterior use within the interior of the building.
4. Mechanically mix Portland cement plaster. Do not mix by hand.
5. Do not install metal lath showing evidence of rust or which has damage to the finish coating.
6. Prepare surfaces and substrates to receive finishes in accordance with instructions outlined in each individual Section. Ensure that surfaces and substrates are level and plumb and smooth. Underlayments installed shall meet requirements specified in other Sections of this Division.
7. When patching existing exterior stucco on a building, match surface finish. Match existing color as closely as possible.
8. Repair cracks in exterior stucco surfaces that are 1/8 inch and greater in width. Do not caulk or touch-up paint crack. If crack shows evidence of previous repairs, do not patch crack. Refer to other parts of this Division for further instruction.
9. Moisture content of wood framing shall be 16 percent or less at time of drywall installation.
10. Nail pops, blistering in tape joints, protruding or uneven joints, or other visible blemishes on gypsum wallboard visible from a distance of two feet under normal lighting conditions are considered excessive and will be corrected by the contractor.
11. Repair cracks in gypsum wallboard surfaces with joint compound. Touch up paint as required. Gypsum wallboard finish and paint color to match adjacent surface. Repaint entire wall if touch-up patch is identifiable from 4 feet under normal lighting conditions.
12. Gypsum wallboard ceilings exhibiting noticeable sag will be removed. Install new sheets in accordance with practices identified in The Gypsum Construction Handbook.
13. Levelness of newly installed walls and floors shall meet levelness ranges meeting those specified in the References listed in this Section.

END OF DOCUMENT

SECTION 09 23 00 - GYPSUM PLASTER

A. SUMMARY

1. Section Includes:
   a. Gypsum plasterwork on expanded-metal lath.
2. Sustainable Design: Comply with Division 01 Section “Sustainable Design Requirements.”

B. FIELD CONDITIONS

1. Comply with ASTM C 842 requirements or gypsum plaster manufacturer’s written recommendations, whichever are more stringent.

C. PRODUCTS

1. Expanded-Metal Lath:
   a. ASTM C 847, cold-rolled carbon-steel sheet, ASTM A 653/A 653M, G60, hot-dip galvanized zinc coated.
   b. Diamond-Mesh Lath: Flat, 2.5 lb/sq. yd.
2. Accessories:
   a. Comply with ASTM C 841 and coordinate depth of trim and accessories with thicknesses and number of plaster coats required.
   b. Metal Accessories:
      1) Cornerite: Fabricated from expanded-metal lath with ASTM A 653/A 653M, G60, hot-dip galvanized zinc coating.
      2) Striplath: Fabricated from expanded-metal lath with ASTM A 653/A 653M, G60, hot-dip galvanized zinc coating.
      3) Cornerbeads: Fabricated from zinc-coated (galvanized) steel.
         a) Small-nose style; use unless otherwise indicated.
      4) Casing Beads: Fabricated from zinc-coated (galvanized) steel; square-edge style; with expanded flanges.
3. Miscellaneous Materials:
   a. Water for Mixing and Finishing Plaster: Potable and free of substances capable of affecting plaster set or of damaging plaster, lath, or accessories.
   b. Bonding Compound: ASTM C 631.
   c. Steel Drill Screws: For metal-to-metal fastening, ASTM C 1002 or ASTM C 954, as required by thickness of metal being fastened; with pan head that is suitable for application; in lengths required to achieve penetration through joined materials of no fewer than three exposed threads.
   d. Fasteners for attaching Metal Lath to Substrates: Complying with ASTM C 841.
   e. Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, not less than 0.0475 inch diameter, unless otherwise directed.
4. Base-Coat Plaster Materials:

a. Base-Coat Plasters, General: ASTM C 28/C 28M.
b. Gypsum Neat Plaster: For use with job-mixed aggregates.

5. Finish-Coat Plaster Materials:
   a. Provide one of the following finish-coat plaster systems, that is compatible with base-coat plaster and matches existing plaster finish:
      1) Gypsum Gaging Plaster, ASTM C 28/C28M; mixed with lime putty.
      2) Gypsum Ready-Mixed Finish Plaster: Manufacturer's standard, mill-mixed, gaged, interior finish.
   b. Lime: ASTM C 206, Type N, normal finishing hydrated lime.
   c. Aggregates for Float Finishes: ASTM C 35, sand; graded per ASTM C 842.
6. Plaster Mixes:
   a. Comply with ASTM C 842 and manufacturer's written instructions for applications indicated.

D. EXECUTION

1. Repairing or Replacing Missing Existing Plaster Areas:
   a. Remove loose and damaged plaster and lathing materials. At areas of loose plaster and exposed wood lath, carefully and selectively cut defective or loose pieces of wood lath without damage to existing wood lath or sound plaster adjacent to damaged area. Force fit rolled wire lath into openings and wire tie to sound lath to provide backing for plaster repair.
   b. Install new materials in accordance with specified standards. Feather joints to provide smooth meeting of old to new surfaces.
   c. Provide backing at holes prior to filling and finishing.
   d. Repair cracks by preparing and widening existing cracks using the "V" groove method. Use plaster of paris at crack repairs when appropriate.
   e. Spackle minor cracks and fissures as required to provide surface ready for painting.
2. New Plaster Installation:
   a. Install expanded-metal lath according to ASTM C 841.
      1) Partition Framing and Vertical Furring: Install flat diamond-mesh lath.
      2) Flat-Ceiling and Horizontal Framing: Install flat diamond-mesh lath.
      3) Curved-Ceiling Framing: Install flat diamond-mesh lath.
   b. Installing Accessories:
      1) Install according to ASTM C 841.
      2) Cornerbeads: Install at external corners.
      3) Casing Beads: Install at terminations of plasterwork, except where plaster passes behind and is concealed by other work and where metal screeds, bases, or frames act as casing beads.
   c. Plaster Application:
      1) Comply with ASTM C 842.
      2) Bonding Compound: Apply on unit masonry and concrete plaster bases.

3) Base Coats:
   a) Base Coats over Expanded-Metal Lath: Gypsum neat plaster with job-mixed sand for scratch and brown coats.
   b) Base Coats over Unit Masonry or Concrete: Gypsum neat plaster with job-mixed sand.
4) Finish Coats:
   a) Finish-Coat Mix for Smooth-Troweled or Float Finishes: Gypsum gaging plaster.
5) Plaster Finishes:
   a) Provide troweled finish unless otherwise indicated.
   b) Provide float finish as directed.
   c) In houses that have existing plaster finishes match existing finish.

d. Plaster Repairs:
   1) Repair or replace work to eliminate cracks, dents, blisters, buckles, crazing and check cracking, dry outs, efflorescence, sweat outs, and similar defects and where bond to substrate has failed.

END OF SECTION

SECTION 09 24 00 - PORTLAND CEMENT PLASTERING (STUCCO)

A. SUMMARY

1. Section Includes:
   a. Exterior Portland cement plasterwork (stucco) on metal lath and unit masonry.
2. Sustainable Design: Comply with Division 01 Section “Sustainable Design Requirements.

B. DELIVERY, STORAGE, AND HANDLING

1. Deliver manufactured materials in original unopened packages or containers, with manufacturer's label intact and legible.
2. Keep cement and lime dry, stored off ground, under cover, and away from damp surfaces. Protect against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes.
3. Remove wet and deteriorated materials from project site.

C. FIELD CONDITIONS

1. Comply with ASTM C 926 requirements.
2. Exterior Plasterwork:
   a. Apply and cure plaster to prevent plaster drying out during curing period. Use procedures required by climatic conditions, including moist curing, providing coverings, and providing barriers to deflect sunlight and wind.
   b. Cold Weather Requirements:
      1) Do not use frozen materials in cement plaster mixes.
      2) Do not apply cement plaster to frozen surfaces or surfaces containing frost.
      3) Do not apply cement plaster when ambient temperature is less than 40 degrees F.
      4) Protect plaster coats from freezing for not less than 48 hours after set of plaster coat has occurred.
   c. Hot Weather Requirements: Protect cement plaster from uneven and excessive evapora-tion during hot, dry weather.
3. Factory-Prepared Finishes: Comply with manufacturer’s written recommendations for environmental conditions for applying finishes.
4. Protection: Protect finished surfaces and equipment installed prior to stuccoing by covering with plastic film.

D. PRODUCTS

1. Metal Lath:
   a. Expanded-Metal Lath: ASTM C 847 with ASTM A 653/A653M, G60, hot-dip galvanized zinc coating.
      1) Diamond-Mesh Lath: Flat or self-furring, 3.4 lb/sq. yd.

2. Accessories:
   a. Comply with ASTM C 1063 and coordinate depth of trim and accessories with thickness and number of plaster coats required.
   b. Metal Accessories:
      1) Foundation weep screed: Fabricated from hot-dip galvanized-steel sheet, ASTM A 653/A 653M, G60 zinc coating.
      2) Cornerite: Fabricated from metal lath with ASTM A 653/A 653M, G60, hot-dip galvanized zinc coating.
      3) Cornerbeads: Fabricated from zinc-coated (galvanized) steel. Small-nose style, unless otherwise indicated.
      4) Casing Beads: Fabricated from zinc-coated (galvanized) steel; square-edged style; with expanded flanges.
      5) Control Joints: Fabricated from zinc-coated (galvanized) steel; one-piece-type, folded pair of unperforated screeds in M-shaped configuration; with perforated flanges and removable protective tape on plaster face of control joint.
      6) Expansion Joints: Fabricated from zinc-coated (galvanized) steel; folded pair of unperforated screeds in M-shaped configuration; with expanded flanges.
3. Miscellaneous Materials:
   a. Water for Mixing: Potable and free of substances capable of affecting plaster set or of damaging plaster, lath, or accessories.
   b. Fiber for Base Coat: Alkaline-resistant glass or polypropylene fibers, 1/2 inch long, free of contaminants, manufactured for use in Portland cement plaster.
   c. Bonding Compound: ASTM C 932.
   d. Steel Drill Screws: For metal-to-metal fastening, ASTM C 1002 or ASTM C 954, as required by thickness of metal being fastened; with pan head that is suitable for application; in lengths required to achieve penetration through joined materials of no fewer than three exposed threads.
   e. Fasteners for Attaching Metal Lath to Substrates: Complying with ASTM C 1063.
   f. Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, not less than 0.0475 inch diameter, unless otherwise indicated.
4. Plaster Materials:
   a. Portland Cement: ASTM C150, Type I.
      1) Color for Finish Coats: White.
   b. Colorants for Job-Mixed Finish Coats: Colorfast mineral pigments that produce finish plaster color that matches Inspector’s sample or selection.
   c. Lime: ASTM C 206, Type S; or ASTM C 207, Type S.
   d. Sand Aggregate: ASTM C 897.
      1) Color for Job-Mixed Finish Coats: White
   e. Ready-Mixed Finish-Coat Plaster: Mill-mixed Portland cement, aggregates, coloring agents, and proprietary ingredients.
      1) Color: As selected by Inspector from manufacturer’s full range of standard colors.

f. Acrylic-Based Finish Coatings: Factory-mixed acrylic-emulsion coating systems, formulated with colorfast mineral pigments and fine aggregates; for use over Portland cement plaster base coats. Include manufacturer's recommended primers and sealing topcoats for acrylic-based finishes.
   1) Color: As selected by Inspector from manufacturer's full range.

5. Plaster Mixes:
   a. Comply with ASTM C 926 for application indicated.
      1) Fiber Content: Add fiber to base-coat mixes after ingredients have mixed at least 2 minutes. Comply with manufacturer's written instructions for fiber quantities in mixes, but do not exceed 1 lb of fiber/cu. yd. of cementitious materials.
   b. Base-Coat Mixes for Use over Metal Lath: Scratch and brown coats for three-coat plasterwork as follows:
      1) Portland Cement Mixes:
         a) Scratch Coat: For cementitious material, mix 1 part Portland cement and 0 to 3/4 parts lime. Use 2-1/2 to 4 parts aggregate per part of cementitious material (sum of separate volumes of each component material).
         b) Brown Coat: For cementitious material, mix 1 part Portland cement and 0 to 3/4 parts lime. Use 3 to 5 parts aggregate per part of cementitious material (sum of separate volumes of each component material).
      2) Factory-Prepared Finish-Coat Mixes: For ready-mixed finish-coat plasters, comply with manufacturer's written instructions.
   c. Base-Coat Mixes: Single base coat for two-coat plasterwork over "low-absorption" plaster bases as follows:
      1) Portland Cement Mix: For cementitious material, mix 1 part Portland cement and 0 to 3/4 parts lime. Use 2-1/2 t0 4 parts aggregate per part of cementitious material.
   d. Base-Coat Mixes: Single base coats for two-coat plasterwork over "high-absorption" plaster bases as follows:
      1) Portland Cement Mix: For cementitious material, mix 1 part Portland cement and 3/4 to 1-1/2 parts lime. Use 2-1/4 to 4 parts aggregate per part of cementitious material.
   e. Job-Mixed Finish-Coat Mixes:
      1) Portland Cement Mix: For cementitious materials, mix 1 part Portland cement and 3/4 to 1-1/2 parts lime. Use 1-1/2 to 3 parts aggregate per part of cementitious material.
   f. Factory-Prepared Finish-Coat Mixes: For ready-mixed finish-coat or acrylic-based finish coatings, comply with manufacturer's written instructions.

E. EXECUTION

1. Preparation:
   a. Protect adjacent work from soiling, spattering, moisture deterioration, and other harmful effects caused by plastering.
   b. Masonry walls:

1) Remove all obstructions, embedments (nails, hooks, wood plugs, etc.) and loose masonry materials to expose a sound surface for new plasterwork.
2) Patch all voids with compatible masonry materials.

c. Frame walls:
1) Over drainage membrane, install vertical nailing strips at 12" o.c. for attachment of metal lath.

2. Installing Metal Lath:
a. On Solid Surfaces, Not Otherwise Furred: Install self-furring, diamond-mesh lath.
b. On Nailing Strips: Install flat diamond-mesh lath.
c. Install metal lath over entire area to be plastered, overlap sheets 2 inches at edges.
1) End sheets of lath over vertical nailing strips.

3. Installing Accessories:
a. Install according to ASTM C 1063 and at locations indicated on Drawings.
b. Reinforcement at External and Internal Corners: Install cornerbead.
c. Control/Expansion Joints: Install control joints at locations indicated on Drawings, or as directed by Inspector to delineate plasterwork into areas (panels) of the following maximum sizes:
1) Vertical Surfaces: 144 sq. ft.
2) Horizontal and other Non-vertical Surfaces: 100 sq. ft.
3) At distances between control joints of not greater than 18 feet.
4) As required to delineate plasterwork into areas (panels) with length-to-width ratios of not greater than 2: 1.
5) Where control joints occur in surface of construction directly behind plaster.
6) Where plasterwork areas change dimensions, to delineate rectangular-shaped areas (panels) and to relieve the stress that occurs at the corner formed by the dimension change.
d. Casing Bead: Install at top and sides of plasterwork abutting different materials.
1) Install sealant between casing bead and adjacent material.
e. Foundation Weep Screed: Install at bottom of plasterwork above grade; and above flashing at heads of windows and doors.
f. At masonry/concrete walls, install accessories as indicated above, using appropriate fasteners to prevent pull-out of fastener.

4. Plaster Mixing:
a. General: Accurately proportion materials for each plaster batch with measuring devices of known volume. Size batches for complete use within maximum of one hour after mixing. Retemper plaster stiffened from evaporation, but do not use or retemper partially hydrated cement plaster. Do not use frozen, caked, or lumped materials, and remove such materials from job site immediately. Use moist, loose, sand in mix pro-portions. Withhold 10% of mixing water until mixing is almost complete, then add as needed to produce necessary consistency.

b. Mechanical Mixing: Clean mixer of set or hardened materials before loading for new batch. Maintain mixer in continuous operation while adding materials. Conform to mixing sequence, cycle of operations, and time recommended by manufacturer of plaster materials.

c. Do not hand mix. Do not mix in building.

5. Plaster Application:
   a. Comply with ASTM C 926.
   b. Bonding Compound: Apply on unit masonry and concrete plaster bases.
   c. Walls; Base-Coat Mixes for Use over Metal Lath: Scratch and brown coats for three-coat plasterwork; 3/4 inch thickness; Portland cement mixes.
   d. Ceilings; Base-Coat Mixes for Use over Metal Lath: Scratch and brown coats for three-coat plasterwork; 1/2 inch thickness; Portland cement mixes.
   e. Walls; Base-Coat Mix: Scratch coat for two-coat plasterwork; 3/8 inch thickness; Portland cement mixes.
   f. Plaster Finish Coats: Apply to provide float finish, free of trowel marks, unless otherwise directed by Inspector. Nominal thickness: 1/8 inch.
   g. Acrylic-Based Finish Coatings: Apply coating system, including primers, finish coats, and sealing topcoats, according to manufacturer’s written instructions.
      1) Provide float finish free of trowel marks, unless otherwise directed by Inspector.
      2) Finish Thickness: Manufacturer’s recommended minimum.
   h. Concealed Exterior Plasterwork: Where plaster application will be used as a base for adhered finishes, omit finish coat.
   i. Apply cement plaster by hand. Apply with sufficient material to form keys through metal lath. Embed and fill all spaces of lath and scratch vertical surfaces horizontally. Interrupt cement plaster only at junctions of plaster places, at openings, or at control joints. Tool through second and finish coats to produce "V" joint at intersection of frames or other items of metal or wood which act as plaster grounds. Apply second coat to first coat, bringing out to grounds, flat to true surface, and free of imperfections which would reflect in finish coat. Reconsolidate second coat by floating, and roughen to assure bond with finish coat.
   j. Dampen surfaces by fine fog spray prior to application of each coat. Cure each coat by fog spraying at 12 hour intervals, and allow 24 hours curing prior to application of finish coat. Cure finish coat for a minimum of 4 days following application unless environmental conditions provide adequate moisture retention.
6. Cleaning: Remove plaster and protective materials from expansion and perimeter beads and remove plaster drippings from adjacent surfaces and yard areas. Remove protective plastic film from doors, openings, and equipment.
7. Repairs to Existing Plastered Surfaces:
   a. Repair existing plasterwork on neighboring properties as required to remedy any damaged caused during demolition or by the new work.
   b. Cut away defective areas and install lath and base coats as required for new work. Install finish coat to match existing color and texture of adjacent stucco materials. Blend and feather finish of old to new work by hand troweling and brushing.

8. Other Repair Work:
   a. Plaster materials may be used for repair as required by other Divisions of this Specifica-tion and as required on the Drawings or Work List, particularly at repairs to deteriorated stonework or "Formstone" type facing materials.
   b. Remove loose materials and clean, tool or chisel existing surfaces to provide bond. Install galvanized metal lath or other non-staining anchors or embedments to provide positive keying and bond for new materials.
   c. Mix finish plaster materials with approved color additives to create color match with existing materials. Contractor shall make sample batches of color matching materials for Inspector's approval. Samples shall be matched to existing in a cured state and not when freshly mixed.
   d. Install plasterwork to match existing configuration, detail and finish. When covering over existing stonework, match existing architectural detail and configuration to greatest possible degree.
9. Plaster Repairs:
   a. Repair or replace work to eliminate cracks, dents, blisters, buckles, crazing and check cracking, dry outs, efflorescence, sweat outs, and similar defects and where bond to substrate has failed.

END OF SECTION

SECTION 09 29 00 - GYPSUM BOARD

A. SUMMARY

1. Section Includes:
   a. Interior Gypsum Board.
   b. Joint Treatment.
2. Sustainable Design: Comply with Division 01 Section “Sustainable Design Requirements.”

B. QUALITY ASSURANCE

1. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.
2. Perform work in accordance with the following Gypsum Association reference standards: The following may be downloaded from: http: //www.gypsum.org/download.html.
   a. GA-214 - Recommended Specification: Level of Gypsum Board Finish.
   b. GA-216 - Recommended Specifications for the Application of Gypsum Board Finish.
   c. GA-600 - Fire Resistance Design Manual.

C. DELIVERY, STORAGE, AND HANDLING

1. Delivery and Handling: Deliver materials to the project site with manufacturer's labels intact and legible. Handle materials with care to prevent damage. Deliver fire-resistance-rated materials bearing testing agency label and required fire classification numbers.
2. Storage: Store materials inside under cover, stack panels flat to prevent sagging, off floor. Stack panels so that long lengths are not over short lengths. Avoid overloading floor systems.

D. FIELD CONDITIONS

1. Environmental Limitations: During cold weather, in areas receiving gypsum board, maintain temperature between 55 degrees F and 70 degrees F for 24 hours before, during and after gypsum board installation and joint treatment application, unless more stringent requirements are specified in ASTM C 840 or gypsum board manufacturer’s written recommendations.
   a. Do not install interior products until installation areas are enclosed and conditioned.
   b. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.
   c. Ventilation: To avoid moisture problems, provide ventilation during and following joint treatment applications. Use temporary air circulators in enclosed areas lacking natural ventilation, unless otherwise recommended by gypsum board manufacturer.
2. Trapped Moisture:
   a. Moisture content of wood framing shall be 16% or less at time of drywall installation.

1) Exception: Gypsum board may be applied to one side of partitions to reduce stud movement, providing the other side of partition is left open until lumber meets moisture content requirement.

b. Interior masonry walls that have become moisture saturated during demolition shall be dry before gypsum board installation.

E. PRODUCTS

1. General:
   a. Size: Provide in maximum lengths and widths available that will minimize joints in each area and that correspond with support system.
2. Interior Gypsum Board: Comply with ASTM C 36/C 36M or ASTM C 1396/C 1396M, as applicable to type of gypsum board indicated and whichever is more stringent.
   a. Regular Type:
      1) Thickness: 1/2 inch.
      2) Long Edges: Tapered.
   b. Fire-Resistance-Rated: Type X:
      1) Thickness: 1/2 inch or 5/8 inch, to meet fire-resistance requirements.
      2) Long Edges: Tapered.
   c. Abuse-Resistant Type: Manufacturer to produce greater resistance to surface indentation, through-penetration (impact resistance), and abrasion than standard, regular-type and Type X gypsum board.
      1) Core: 1/2 inch, regular core; or 5/8 inch Type X core.
      2) Long Edges: Tapered.
   d. Water-resistant gypsum board - ASTM C630:,
      1) Thickness: 1/2 inch regular core.
      2) Long Edges: Tapered.
3. Trim Accessories:
   a. Corner Bead.
   b. L-Bead: L-shaped; exposed long flange receives joint compound.
4. Fasteners: Steel drill screws: ASTM C 1002, unless otherwise indicated.
   a. Nails are prohibited.
5. Joint Treatment Materials: Comply with ASTM C 475/C 475M.
   a. Joint Tape:
      1) Interior Gypsum Board: Paper.
      2) Glass-Mat Gypsum Sheathing Board: 10-by-10 glass mesh.
      3) Tile Backing Panels: As recommended by panel manufacturer.
   b. Joint Compound for Interior Gypsum Board: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
      1) Prefilling: At open joints and damaged surface areas, use setting-type taping compound.

2) Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use drying-type, all-purpose compound.
3) Fill Coat: For second coat, use drying-type, all-purpose compound.
4) Finish Coat: For third coat; use drying-type, all-purpose compound.

F. EXECUTION

1. Examination:
   a. Verify that site conditions are ready to receive work and opening dimensions are as indicated.
   b. Reject panels that are wet, moisture damaged, and mold damaged.
2. Applying Panels:
   a. Install gypsum board in accordance with GA-216 and GA-600.
   b. Erect single layer gypsum board vertically or horizontally, with edges occurring over firm bearing.
   c. Double Layer Applications:
      1) Secure second layer to first with fasteners.
      2) Place second layer parallel to first layer. Offset joints of second layer from joints of first layer.
   d. At stairwell and other walls extending for heights greater than one floor, install gypsum board horizontally with ends staggered and occurring over framing.
   e. Treat cut edges and holes of water resistant gypsum board with sealant.
   f. Place corner bead at external corners. Use longest practical length.
   g. Place edge trim where gypsum board abuts dissimilar materials or as directed.
   h. Install ceiling panels across framing, unless directed otherwise, to minimize the number of abutting end joints. Stagger abutting end joints of adjacent panels not less than one framing member.
      1) Install ceiling panels before installing wall panels.
   i. Applying Interior Gypsum Board:
      1) Apply bead of sealant to framing members prior to installing gypsum board panels.
      2) Install interior gypsum board in the following locations:
         a) Regular Type: Vertical and Horizontal surfaces, unless otherwise indicated or directed.
         b) Type X: Where indicated, or as directed, for fire-resistance-rated assembly.
         c) Abuse-Resistant Type: As indicated, or as directed.
         d) Moisture- and Mold-Resistant Type: As indicated, or as directed.
   j. Bottom edge of drywall shall overlap bottom plate by at least 1 inch.
   k. All electrical boxes shall be caulked or mudded to drywall.
3. Install specified tile or shower-surround backer board full wall height at all walls abutting tubs or shower stalls.

4. Finishing Panels:
   a. Finish in accordance with the following GA-214 Levels:
      1) Level 1: Wall surfaces above finished ceilings, concealed from view.
      2) Level 2: Wall and ceiling surfaces indicated to receive tile finish.
      3) Level 3: Not used.
      4) Level 4: Wall and ceiling surfaces exposed to view.
      5) Level 5: Not used.
   b. Joints Exposed to View: Feather coats on to adjoining surfaces so that camber is maximum 1/32 inch.

END OF SECTION

SECTION 09 30 00 - TILING

A. SUMMARY

1. Section Includes:
   a. Ceramic mosaic tile.
   b. Paver Tile.
   c. Glazed wall tile.
   d. Stone thresholds installed as part of tile installation.
   e. Tile backing panels.
   f. Waterproof membrane for tile installation.
   g. Waterproofing and Crack-suppression membrane for thin-set tile installation.
2. Sustainable Design: Comply with Division 01 Section “Sustainable Design Requirements.”

B. REFERENCES

1. American National Standards Institute:
   1) ANSI A108.1 - Installation of Ceramic Tile, A collection.
   2) ANSI A108.10 - Specifications for Installation of Grout in Tilework.
   3) ANSI A108.4 - Specifications for Ceramic Tile Installed with Organic Adhesives or Water-Cleanable Tile Setting Epoxy Adhesive.
   4) ANSI A108.5 - Specifications for Ceramic Tile Installed with Dry-Set Portland Cement Mortar or Latex-Portland Cement Mortar.
   5) ANSI A108.6 - Specifications for Ceramic Tile Installed with Chemical-Resistant, Water-Cleanable Tile-Setting and -Grouting Epoxy.
   6) ANSI A118.1 - Standard Specification for Dry-Set Portland Cement Mortar.
   7) ANSI A118.3 - Chemical-Resistant, Water-Cleanable, Tile-Setting and -Grouting Epoxy and Water-Cleanable Tile-Setting Epoxy Adhesive.
   8) ANSI A118.4 - Latex-Portland Cement Mortar.
   9) ANSI A118.6 - Ceramic Tile Grouts.
   10) ANSI A137.1 - Ceramic Tile.
2. Tile Council of North America:
   a. TCNA - Handbook for Ceramic Tile Installation, latest edition.

C. PERFORMANCE REQUIREMENTS

1. Static Coefficient of Friction: For tile installed on floor surfaces, provide products with the following values as determined by testing identical products per ASTM C 1028:
   a. Level Surfaces: Minimum 0.6.

D. QUALITY ASSURANCE

1. Conform to ANSI A137.1

2. Conform to TCNA Handbook for Ceramic Tile Installation.
3. Source Limitations for Tile: Obtain all tile of same type from one source or producer.
4. Obtain tile from same production run and of consistent quality in appearance and physical properties for each contiguous area.
5. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from a single manufacturer and each aggregate from one source or producer.
6. Source Limitations for Other Products: Obtain each of the following products specified in this Section through one source from a single manufacturer for each product:
   a. Stone Thresholds.
   b. Waterproofing.
7. Tiling Subcontractor: Retain a tiling subcontractor that specializes in tiling and has a minimum of 5 years experience with tiling projects of this type.

E. DELIVERY, STORAGE, AND HANDLING

a) Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirement in ANSI A137.1 for labeling sealed tile packages.
b) Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.
c) Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
d) Store liquid latexes in unopened containers and protected from freezing.

F. FIELD CONDITIONS

1. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.
2. Ventilation: Provide ventilation during and following the application of adhesive. Use temporary air circulators in enclosed areas lacking natural ventilation.

G. PRODUCTS

1. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1, "Specifications for Ceramic Tile," for types, compositions, and other characteristics indicated.
   a. Developers may propose to provide other tile types and installation methods, meeting TCNA and ANSI Ceramic Tile Standards, not specified herein, and may proceed when approved in writing by OHCD/PHDC/RDA.
2. Tile Materials:
   a. Unglazed Ceramic Mosaic Tile: Factory mounted flat tile as follows:
      1) Composition: Porcelain.

2) Surface: Smooth, without abrasive admixture.
3) Module Size: 1 by 1 inch, 2 by 2 inch, or a mix of 1 by 1 and 1 by 2 inch tiles, as indicated on Drawings, or as selected by Inspector from manufacturer's full range of combinations.
4) Nominal Thickness: 1/4 inch.
5) Face: Plain with cushion edges.
6) Color: As indicated by Architect or as selected by developer from manufacturer's full range of products.

b. Unglazed Paver Tile: Flat tile as follows:
1) Composition: Porcelain.
2) Surface: Smooth or textured, without abrasive admixture.
3) Facial Dimensions (Nominal): 6 x 6; 8 x 8; 12 x 12, 18 x 18 inches, or other manufactured standard size approved by OHDC/PHDC/RDA.
4) Nominal Thickness: 5/16 inch.
5) Face: Plain with cushion edges or textured with square edges.
6) Color: As indicated by Architect or as selected by developer from manufacturer's full range of products.
7) For latex-portland cement-mortared and grouted paver tile, precoat with temporary protective coating as recommended by tile and grout manufacturers.

c. Glazed Wall Tile: Flat tile as follows:
1) Module Size: Provide any manufacturer's standard size tile.
2) Nominal Thickness: 5/16 inch.
3) Face: Plain with modified square edges or cushion edges, and integral spacer lugs.
4) Finish: Bright or matte finish, opaque glaze.
5) Color: As indicated by Architect or as selected by developer from manufacturer's full range of products.

d. Tile Trim Units: Matching characteristics of adjoining flat tile and coordinated with sizes and coursing of adjoining flat tile where applicable. Provide shapes as follows, selected from manufacturer's standard shapes, for thin-set application:
1) Cove Base.
2) Inside and outside cove base corners.
3) Bullnose, eased edges, one and two sides.
4) Bullnose corner.
5) Color: As indicated by Arcxhitect or as selected by developer from manufacturer's full range of products.

3. Thresholds:
a. Fabricate to sizes and profiles required to provide transition between adjacent floor finishes.
1) Bevel edges at 1: 2 slope, aligning lower edge of bevel with adjacent floor finish. Limit height of bevel to 1/2 inch or less, finish bevel to match face of threshold.

b. Marble Thresholds: ASTM C 503 with a minimum abrasive resistance of 12 per ASTM C 1353 or ASTM C 241 and with polished finish.
   1) Color: White, with light grey veining, unless otherwise indicated by Architect or as selected by developer.

4. Tile Backing Panels:
   a. Concrete tile-backer board, fiberglass-reinforced both sides, nominal 1/2 inch thickness.
      1) Provide screws approved for use with backer board by backer board manufacturer.
5. Waterproofing Materials for shower and bathtub walls:
   a. Soft polyethylene, covered on both sides with fleece webbing, bonded sheet waterproofing membrane, designed for thin-set mortar installations. Provide pre-cut, minimum 5 inches wide, sections of material for inside and outside corners and pipe collars.
6. Waterproofing and Crack-Suppression Membrane for bathroom floors:
   a. Polyethylene membrane with a grid structure of square cavities, each cut back in a dovetail configuration, with an anchoring fleece laminated to the underside.
7. Setting and Grouting Materials:
   a. Portland Cement Mortar (Thickset): ANSI A108.1A and as follows:
      1) Cleavage Membrane: Asphalt felt, ASTM D 226, Type I (No. 15); or polyethylene sheeting, ASTM D 4397, 4.0 mils thick.
      2) Latex Additive: Manufacturer's standard water emulsion, serving as replacement for part or all of gaging water, of type specifically recommended by latex-additive manufacturer for use with field-mixed Portland cement and aggregate mortar bed.
   b. Latex-Portland Cement Mortar (Thin-Set): ANSI A118.4, consisting of the following:
      1) Prepackaged dry-mortar mix containing dry, redispersible, ethylene vinyl acetate additive to which only water must be added at Project site.
         a) For wall applications, provide nonsagging mortar that complies with paragraph F-4.6.1 in addition to the other requirements in ANSI A118.4.
   c. Polymer-Modified Tile Grout: ANSI A118.7:
      1) Polymer Type: Ethylene vinyl acetate, in dry, redispersible form, prepackaged with dry ingredients.
         a) Unsanded grout mixture for joints 1/8 inch and narrower.
         b) Sanded grout mixture for joints 1/8 inch and wider.
         c) Color: As indicated by Architect or as selected by developer from manufacturer's full range.

H. EXECUTION

1. Preparation:
   a. Protect surrounding work from damage or disfiguration.

b. Mixing mortars and grout:
   1) Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.
   2) Add materials, water, and additives in accurate proportions.
   3) Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.
c. Install tile backer board with backer board screws in accordance with manufacturer's written instructions and ANSI A108.11, but not to exceed 6 inches on center.
   1) Install backer board under all tile floors, and on walls of showers or bathtub surrounds, extending backer board 6 inches beyond exposed face of shower or bathtub.
   2) Tape joints with 2 inch wide fiberglass mesh tape in accordance with manufacturer's written instructions.
   3) Bridge joint between backer board and gypsum board with fiberglass mesh tape, set in thin set mortar. Cover joint with tile.
d. Vacuum clean substrate and damp clean.
e. Seal substrate cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances.

2. Tile Installation:
   a. Install tile, grout, and thresholds to TCNA Handbook for Ceramic Tile Installation as follows:
      1) Thin Set Wall Tile: TCNA Method W244, waterproof membrand at showers and bathtubs, latex Portland cement bond coat; unsanded grout.
      2) Thin Set Floor Tile: TCNA Method F147, uncoupling membrane, latex Portland cement bond coat, sanded grout.
      3) Thickset Floor Tile: TCNA Method F121, waterproofing membrane, latex Portland cement bond coat, sanded grout.
   b. Install waterproofing membranes in accordance with manufacturer's written instructions.
   c. Lay tile to pattern indicated or as directed by Inspector. Do not interrupt tile pattern through openings,
   d. Cut and fit tile tight to penetrations through tile, allowing room for repairs to piping without removing tile.
   e. Lay out work to provide neat joints, end and corner joint conditions. Center tile pattern between walls, avoid cut tiles of less than half a tile.
   f. Sound tile after setting. Replace hollow sounding units.
   g. Use silicone sealant to seal penetrations through tile and to shower valve escutcheon to tile.
   h. Allow tile to set 48 hours prior to grouting.
   i. Do not permit traffic on tile floors for 24 hours after grouting is complete.
      1) Clean and protect as specified below.

3. Existing Bathroom Sub-Floors (Prior to installing backer board):
   a. Over existing sound sub-floors install new 1/2 inch plywood underlayment.
      1) Secure with construction adhesive and screw to existing sub-floor with galvanized screws at 6 inches on center around perimeter and 8 inches on center both ways in field of panel.
      2) Where sub-floor does not exist; install 3/4 inch plywood sub-floor prior to 1/2 inch plywood underlayment, secured as specified above.
         a) Offset joints between plywood layers at least one joist space.
4. Cleaning and Protection:
   a. Clean tile surfaces. Remove excess grout and mortar materials from tile and surrounding finishes.
   b. Do not permit traffic over finished tile surface. Protect with heavy kraft paper, taped in place with joints taped.

END OF SECTION

SECTION 09 50 00 - RESILIENT FLOORING

A. SUMMARY

1. Section Includes:.
   a. Vinyl Composition Floor Tile (VCT).
   b. Vinyl Sheet Flooring
   c. Vinyl Base.
2. Sustainable Design: Comply with Division 01 Section “Sustainable Design Requirements.”

B. DELIVERY, STORAGE, AND HANDLING

1. Deliver materials in manufacturer’s original unopened containers.
2. Store floor tile and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 degrees F. or more than 95 degrees F.
3. Store floor tiles on flat surfaces.
4. Protect roll materials from damage by storing in accordance with manufacturer’s written instructions.

C. FIELD CONDITIONS

1. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 degrees F. or more than 95 degrees F. in spaces to receive resilient flooring for no less than 48 hours prior to installation, during installation, and for 48 hours after installation.

D. PRODUCTS

1. Vinyl Composition Tile: ASTM F 1066, Class 2, through pattern.
   a. Size: 12 x 12 inches.
   b. Thickness: 0.125 inches.
   c. Pattern: Marbleized.
   d. Color: As selected from manufacturer’s full range.
   e. Seams: Butted.
   f. Extra Material: Provide 10 percent extra tile, leave in original packaging in a secure location for homeowner.
2. Vinyl Sheet Flooring:
   a. Backed Vinyl Sheet: ASTM F 1303, Type II, Grade 1, color and pattern through wear layer thickness:
      1) Total Thickness: 0.085 inch nominal.
      2) Wear Layer Thickness: 0.050 inch minimum.
      3) Sheet Width: 72 inches minimum.

4) Color and Pattern: As selected from manufacturer's full range.
5) Seams: Butted.

3. Vinyl Base: 4 inches high, roll form.
   a. Top set coved.
   b. Reference Standard: ASTM F 1861.
   c. Type TV - thermoplastic.
   d. Thickness: 0.080 inches.
   e. Color and Pattern: As selected from manufacturer's full range.
   f. Finish: Satin.
   g. Accessories: Premolded ends.
4. Accessories:
   a. Underlayment: 3/8 inch in kitchen, 1/2 inch in bath rooms if resilient flooring is employed. Grade: CC Plugged - EXT-APA.
   b. Subfloor Filler: Premix latex; type recommended by adhesive material manufacturer.
   c. Primers and Adhesives: Waterproof, types recommended by flooring material manufacturer for substrate.
      1) Interior Adhesives: Maximum volatile organic compound content in accordance with SCAQMD Rule 1168.
   d. Moldings and Edge Strips: Same material as flooring, profile to suit flooring material transitions.
   e. Sealer and Wax: Types recommended by flooring manufacturers.

E. EXECUTION

1. Installing Underlayment: See Section 06 10 00.
2. Preparation:
   a. Remove sub-floor or underlayment ridges and bumps. Fill minor low spots, cracks, joints, holes, and other defects with sub-floor filler to achieve smooth, flat, hard surface.
      1) Prohibit traffic until filler is cured.
   b. Install flooring materials after other finish systems have been installed, including paint.
   c. Clean substrate.
   d. Apply primer as required to prevent "bleed-thru" or interference with adhesion by substances that cannot be removed.
3. Vinyl Composition Tile Floor Installation:
   a. Install tile flooring in accordance with manufacturer's written instructions.
   b. Mix tile from container to ensure shade variations are consistent when tiles are placed.
   c. Lay flooring with joints and seams parallel to building lines to produce symmetrical tile pattern.

   d. Allow minimum 1/2 full size tile width at room perimeter, unless otherwise indicated.
   e. Scribe flooring to walls, cabinets, and other appurtenances to produce tight joints.
   f. Where floor finishes are different on opposite sides of door, terminate flooring under centerline of door.
   g. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated.

4. Vinyl Sheet Flooring Installation:
   a. Install sheet flooring in accordance with manufacturer's written instructions.
   b. Lay flooring with joints and seams parallel to building lines to produce minimum number of seams. Lay out seams to avoid widths less than 1/3 of roll width; match patterns carefully at seams.
   c. Double cut sheet, provide butt joints
   d. Where floor finishes are different on opposite sides of door, terminate flooring under centerline if door
   e. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated.
   f. Scribe flooring to walls, cabinets, and other appurtenances to produce tight joints.
   g. Seal cut edges and penetrations through flooring with sealing compound.
   h. Butt joints to form uniform, hairline joint without bubbles, ridges, or gaps.
5. Base Installation:
   a. Install base in accordance with manufacturer's written instructions.
   b. Fit joints tightly and make vertical. Maintain minimum dimension of 60 inches between joints.
   c. Miter internal corners. At external corners, "V" cut back of base strip to 2/3 of its thickness and fold. Maintain minimum 24 inches between corners and joints. At exposed ends, use premolded units.
   d. Install base on solid backing. Bond tightly to wall and floor surfaces.
   e. Scribe and fir to door frames and other interruptions.
6. Cleaning:
   a. Remove excess adhesive from floor, base, and wall surfaces without causing damage.
   b. Clean, seal, and maintain resilient flooring products as recommended by manufacturer.
7. Protection:
   a. Prohibit traffic on resilient flooring for 48 hours after installation.
   b. Cover flooring with heavy kraft paper after cleaning.
      1) Tape joints and seams.
      2) Remove when directed.

END OF SECTION

SECTION 09 64 00 - WOOD FLOORING

A. SUMMARY

1. Section Includes:
   a. Pre-finished Hardwood Flooring (New floors)
   b. Re-finishing existing hardwood flooring.
2. Sustainable Design: Comply with Division 01 Section “Sustainable Design Requirements.”

B. DELIVERY, STORAGE, AND HANDLING

1. Deliver materials in manufacturer’s original unopened containers.
2. Store material in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 degrees F. or more than 95 degrees F.
3. Store wood products on flat surfaces.

C. FIELD CONDITIONS

1. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 degrees F. or more than 95 degrees F. in spaces to receive wood flooring for no less than 48 hours prior to installation, during installation, and for 48 hours after installation.

D. PRODUCTS

1. Solid Hardwood Flooring:
   a. Plank Thickness: 3/4 inch as standard with manufacturer for species selected.
   b. Plank Width: Minimum 2-1/4 inch to 6 inch, as selected from manufacturer’s standard products.
   c. Plank Length: Provide longest length available.
   d. Plank Cut: Quarter sawn or plain sawn.
   e. Edge/End Detail: Square Cut.
   f. Wood Grade: Select (Clear or First-Grade).
   g. Species and Color: As selected from manufacturer’s available products.
   h. Finish: Prefinished using manufacturer’s standard stain and top-coats.
      1) Gloss: Low.
   i. Warranty: Manufacturer’s standard warranty, minimum 30 year.
2. Engineered Hardwood Flooring:
   a. Plank Thickness: 3/4 inch.
      1) Thickness of finish (top) layer: Minimum 1/16 inch.
   b. Plies: Manufacturer’s standard number, minimum 3, maximum 10.
   c. Plank Width: Minimum 2/1/4 inch, maximum 7 inches.

d. Plank Length: Provide longest length available.
e. Face Veneer Cut: Quarter sawn.
f. Edge/End Detail: Square Cut.
g. Face Veneer Wood grade: Select (Clear or First-Grade).
h. Face Veneer Species and Color: as selected from manufacturer's available products.
i. Finish: Prefinished using manufacturer's standard stain and top-coats.
   1) Gloss: Low.
j. Warranty: Manufacturer's standard warranty, minimum 30 years.

E. EXECUTION

1. Remove sub-floor ridges and bumps. Fill minor low spots, cracks, joints, holes, and other defects with sub-floor filler to achieve smooth, flat, hard surface.
   a. Prohibit traffic until filler is cured.
2. Install wood flooring in accordance with manufacturer's written instructions.
   a. Use "nail-down" installation when installing wood flooring over plywood sub-floor.
   b. Use "glue-down" installation when installing wood flooring over concrete.
      1) Use engineered wood flooring for below grade installations over concrete.
3. Coordinate installation of wood flooring with installation of trim.
4. Protection: Cover wood flooring with heavy kraft paper after cleaning.
   a. Tape joints and seams.
   b. Remove when directed.

F. RE-FINISHING EXISTING HARDWOOD FLOORING

1. Re-finishing existing hardwood flooring to be completed by a qualified wood floor professional with a minimum of three years experience re-finishing wood floors of the type encountered in this Project.
   a. Inspect existing hardwood flooring to verify that the existing can be successfully re-finished.
   b. Prepare existing hardwood floors to receive a new coat of stain, as indicated or as directed, and a minimum of two coats of clear, satin finish urethane. Completely remove existing top coat finish by sanding existing floor, using care to take only the bare minimum of the existing wood. Vacuum all dust and sanding residue and prepare surface to receive finish coats. Prepare surface and install stain and finish coats in strict accordance with stain and coating manufacturer's written instructions.
      1) All products used to be child, pet, and environmentally friendly.
   c. Prior to finish operations repair or replace any broken, cracked, or chipped wood pieces, and any stained or water damaged boards; and replace any missing planks with new boards matching size, species, grain, color and design of existing hardwood flooring. Assure that all exposed nails are set properly to allow for new finishing operations.

END OF SECTION

SECTION 09 68 00 - CARPETING

A. SUMMARY

1. Section Includes:
   a. Textured Carpet.
   b. Carpet Cushion.
   c. Accessories
2. Sustainable Design: Comply with Division 01 Section “Sustainable Design Requirements.”

B. REFERENCES

1. Carpet and Rug Institute:
   a. CRI Carpet Installation Standard.
2. Consumer Products Safety Commission:
   a. CPSC 16 CFR 1630 - Standard for the Surface Flammability of Carpets and Rugs.
3. National Fire Protection Association:
   a. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source.

C. QUALITY ASSURANCE

1. Fire-Test-Response Ratings: Where indicated, provide carpet and carpet cushion identical to those of assemblies tested for fire response per NFPA 253 by a qualified testing agency.
2. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years documented experience.
3. Installer: Company specializing in performing work of this Section with minimum three years documented experience.

D. DELIVERY, STORAGE, AND HANDLING

1. Comply with CRI 104.

E. ENVIRONMENTAL REQUIREMENTS

1. Comply with CRI 104 for temperature, humidity, and ventilation requirements.
   a. Store materials in area of installation for 48 hours prior to installation.

F. PRODUCTS

1. Carpet: Provide the following as indicated or as directed:
   a. Textured Pile Carpet:
      1) Fiber Content: 100 percent nylon, type 6.
      2) Pile Characteristic: Level-loop.

3) Pile Construction: Textured loop.
4) Style: Continuous filament, solution dyed.
5) Face Weight: Minimum 26 oz./sq. yd.
6) Total Weight: Minimum 48 oz./sq. yd.
7) Backing: Action backing over pad.
8) Traffic Class: Heavy.
9) Width of Roll: 12 feet.
10) Color and Pattern: As selected from manufacturer's full range.

b. Textured Pile Carpet:
1) Fiber Content: 100 percent PET Polyester.
2) Pile Characteristic: Level-loop, or Level tip shear
3) Yarn Twist: 3.5 TPI
4) Density: 3188.
5) Pile Height: 19/32 inches for finished carpet per ASTM 6859.
6) Stitches: 7.5 per inch.
7) Face Weight: Minimum 26 oz./sq. yd.
8) Total Weight: Minimum 48 oz./sq. yd.
9) Primary Backing: Woven Polypropylene.
10) Secondary Backing: Woven Polyester.
11) Width of Roll: 12 feet.
12) Applied Soil-Resistance Treatment: Manufacturer's standard material.
13) Dye method. Beck.
14) Color and Pattern: As selected from manufacturer's full range.

2. Carpet Cushion:
a. Polyurethane-Foam Cushion Type: MFCB A Hi-Density Mechanically frothed Chemically Blown Closed Cell Foam Cushion.
1) Thickness: 7/16 inches.
b. Performance Characteristics: As follows:
1) Emissions: Provide carpet cushion that complies with testing and product requirements of CRI's "Green Label" program.

3. Accessories:
a. Tackless Carpet Stripping: Water-resistant plywood, in strips as required to match cushion thickness and that comply with CRI 104, Section 12.2.
b. Edge guard: Heavy-gauge aluminum
c. Reducer strip: Vinyl or rubber
d. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet cushion manufacturer.
e. Seam Adhesive: Hot-melt adhesive tape or similar product recommended by carpet manufacturer for sealing and taping seams and butting cut edges at backing to form secure seams and to prevent pile loss at seams.

G. EXECUTION

1. Verify that floor surfaces are smooth and flat and are ready to receive work.
2. Preparation: Comply with CRI 104, Section 7.3, ‘Site Conditions; Floor Preparation,” and with carpet manufacturer’s written installation instructions for preparing substrates.
   a. Vacuum clean substrate.
3. Installation: Comply with CRI 104 and Carpet and carpet cushion manufacturers’ written installation instructions for the following:
   a. Stretch-in Installation: Comply with CRI 104, Section 12, “Stretch-in Installations”
   b. Stair Installation: Comply with CRI 104, Section 13,: Carpet on Stairs” for stretch-in installation.
4. Comply with carpet manufacturer’s written recommendations for seam locations and direction of carpet; maintain uniformity of carpet direction and lay of pile. At doorways, center seams under door in closed position.
5. Verify carpet match before cutting to ensure minimal variation between dye lots.
6. Cut and fit carpet to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet manufacturer.
7. Extend carpet into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.
8. Install pattern parallel to walls and borders to comply with CRI 104, Section 15, “Patterned Carpet Installations” and with carpet manufacturer’s written recommendations.
   a. Cut carpet seams with accurate pattern match and minimum waste. Make cuts straight, true, and unfrayed,
9. Comply with carpet cushion manufacturer’s written recommendations
10. Bundle and deliver unused carpet and scraps larger than 1 sq. yd. to home owner.
11. Remove all other scraps and padding and legally dispose of offsite.
12. Install edge guards and reducer strips as required.
13. Perform the following operations immediately after installing carpet:
    a. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet manufacturer.
    b. Remove yarns that protrude from carpet surface.
    c. Vacuum carpet using commercial machine with face-beater element.
14. Protect installed carpet to comply with CRI 104, Section 16, “Protecting Indoor Installations.”

END OF SECTION

SECTION 09 90 00 - PAINTING AND COATING

A. SUMMARY

1. Section Includes:
   a. Surface preparation and field application of paints and other coatings.
2. Sustainable Design: Comply with Division 01 Section “Sustainable Design Requirements.”

B. REFERENCES

1. ASTM International:
   a. ASTM D 16 - Terminology relating to Paint, Varnish, Lacquer, and Related Products.
   b. ASTM D 4442 - Test Methods for Direct Moisture Content Measurement of Wood and Wood-Base Materials.
2. National Paint and Coatings Association:
   a. NPCA - Guide to U.S. Government Paint Specifications.
3. Painting and Decorating Contractors of America:
   a. PDCA - Architectural Specification Manual.

C. DEFINITIONS

1. Conform to ASTM D 16 for interpretation of items used in this Section.

D. QUALIFICATIONS

1. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum five years documented experience.
2. Applicator: Company specializing in performing the work of this section with minimum three years documented experience.

E. DELIVERY, STORAGE, AND HANDLING

1. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
   a. Container Label: Include manufacturer’s name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
2. Paint Materials: Store at minimum ambient temperature of 45 degrees F. and a maximum of 90 degrees F., in ventilated area, and as required by manufacturer’s written instructions.

F. FIELD CONDITIONS

1. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

2. Do not apply exterior coatings during rain or snow when relative humidity is outside the humidity ranges, or moisture content of surfaces exceed those required by the paint product manufacturer.
3. Minimum Application Temperatures for Latex Paints: 45 degrees F. for interiors; 50 degrees F. for exterior; unless required otherwise by manufacturer's written instructions.
4. Minimum Application Temperature for Varnish and Stain Finishes: 65 degrees F. for interior or exterior, unless required otherwise by manufacturer's written instructions.
5. Provide lighting level of 80 ft. candles measured at mid-height of substrate during painting operations.

G. PRODUCTS

1. Coatings: Ready mixed, except for field catalyzed coatings. Prepare coatings:
   a. To a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating.
   b. For good flow and brushing properties.
   c. Capable of drying or curing free of streaks or sags.
   d. Flat and Non-Flat Paints: Maximum volatile organic compound content in accordance with Green Seal Standard GS-11.
   e. Anti-Corrosive Paints: Maximum volatile organic compound content in accordance with Green Seal Standard GC-03.
   f. Clear Wood Finishes: Maximum volatile organic compound content in accordance with SCAQMD Rule 1113.
   g. All interior and exterior paints to be lead free.
2. Accessory Materials: Linseed oil, shellac, turpentine, paint thinners and other materials not specifically indicated but required to achieve the finishes specified; commercial quality.
   a. Clear Wood Finishes: Maximum volatile organic compound content in accordance with SCAQMD Rule 1113.
3. Patching Materials: Latex filler.
4. Fastener Head Cover Materials: Latex filler.

H. FINISHES

1. Refer to schedule at end of Section for surface finish schedule.
2. Colors:
   a. All new wood doors shall be natural clear finish.
   b. All interior walls shall be off-white. Interior trim shall be white semi-gloss enamel.
   c. Exterior trim colors shall be matched to existing adjoining trim colors or neighboring properties.

I. EXECUTION

1. Examination:

a. Verify that surfaces and substrate conditions are ready to receive coatings as instructed by the product manufacturer.
b. Test shop applied primer for compatibility with subsequent cover materials.
c. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
   1) Plaster and Gypsum Board: 12 percent.
   2) Masonry, Concrete, and Concrete Unit Masonry: 12 percent
   3) Interior Wood: 15 percent, measured in accordance with ASTM D 4442.
   4) Exterior Wood: 15 percent, measured in accordance with ASTM D 4442.
   5) Concrete Floors: 8 percent.

2. Preparation:
   a. Surface Appurtenances: Remove electrical plates, hardware, light fixture trim, escutcheons, and fittings prior to preparing surfaces or finishing.
   b. Surfaces: Correct defects and clean surfaces which affect work of this section.
   c. Marks: Seal with shellac those which may bleed through surface finishes.
   d. Impervious Surfaces: Remove mildew by scrubbing with solution of tetra-sodium or tri-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.
   e. Aluminum Surfaces Scheduled for Paint Finish: Remove surface contamination by steam or high pressure water. Remove oxidation with acid etch and solvent washing. Apply etching primer immediately following cleaning.
   f. Asphalt, Creosote, or Bituminous Surfaces Scheduled for Paint Finish: Remove foreign particles to permit adhesion of finishing materials. Apply compatible sealer or primer.
   g. Insulated Coverings: Remove dirt, grease, and oil from canvas and cotton.
   h. Concrete Floors: Remove contamination, acid etch, and rinse floors with clear water. Verify required acid-alkali balance is achieved. Allow to dry.
   i. Gypsum Board Surfaces: Fill minor defects with filler compound. Spot prime defects after repair.
   j. Galvanized Surfaces: Remove surface contamination and oils and wash with solvent. Apply coat of etching primer.
   k. Concrete and Concrete Masonry Unit Surfaces Scheduled to Receive Paint Finish: Remove dirt, loose mortar, scale, salt or alkali powder, and other foreign matter. Remove oil and grease with a solution of tri-sodium phosphate; rinse well and allow to dry. Remove stains caused by weathering of corroding metals with a solution of sodium metasilicate after thoroughly wetting with water. Allow to dry.
   l. Uncoated Steel and Iron Surfaces: Remove grease, mill scale, weld splatter, dirt, and rust. Where heavy coatings of scale are evident, remove by hand, power tool, wire brushing or sandblasting; clean by washing with solvent. Apply a treatment of phosphoric acid solution, ensuring weld joints, bolts, and nuts are similarly cleaned. Spot prime paint after repairs.

m. Shop Primed Steel Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces.

n. Interior Wood Items Scheduled to Receive Paint Finish: Wipe off dust and grit prior to priming. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats.

o. Interior Wood Items Scheduled to Receive Transparent Finish: Wipe off dust and grit prior to sealing, seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after sealer has dried; sand lightly between coats.

p. Wood Doors Scheduled for Painting: Seal wood door top and bottom edge surfaces with clear sealer or tinted primer.

q. Metal Doors Scheduled for Painting: Prime metal door top and bottom edge surfaces.

r. Existing exterior and interior trim shall be well scraped, brushed, sanded and cleaned leaving a surface free of blister, scaling and flaking paint.

3. Application:

a. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

b. Apply each coat to uniform appearance. Apply each coat of paint slightly darker than preceding coat unless specified otherwise.

c. Sand wood and metal surfaces lightly between coats to achieve required finish.

d. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

e. Where clear finishes are required, tint fillers to match wood. Work fillers into the grain before set. Wipe excess from surface.

f. Prime concealed surfaces of woodwork with primer paint.

g. Prime concealed surfaces of interior wood surfaces scheduled to receive stain or varnish finish with gloss varnish reduced 25 percent with thinner.

h. Provide painting repairs to neighboring properties as required to restore damage caused during demolition or new work to sound condition, matching color and type of paint used on adjoining materials.

i. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

J. CLEANING

1. Collect waste material which may constitute a fire hazard, place in closed metal containers, and remove daily from site.

K. SCHEDULE - EXTERIOR SURFACES - ALKYD

1. Shop Primed Ferrous Metal - High Gloss Alkyd Enamel:

a. Finish: Two coats Rust-inhibiting Enamel, 2.0 mils dry film thickness each coat.

2. Ferrous Metals - High Gloss Alkyd Enamel:

a. Primer: One coat Rust-inhibiting Primer, 2.0 mils dry film thickness.
b. Finish: Two coats Rust-inhibiting Enamel, 2.0 mils dry film thickness each coat.

3. Galvanized Metals - High Gloss Alkyd Enamel:
   a. Primer: One coat Rust-inhibiting Primer, 2.0 mils dry film thickness.
   b. Finish: Two coats Rust-inhibiting Enamel, 2.0 mils dry film thickness each coat.

L. SCHEDULE - INTERIOR SURFACES - LATEX

1. Shop Primed Ferrous Metal - Semi-Gloss Latex:
   a. Finish: Two coats Latex Semi-Gloss, 1.5 mils dry film thickness each coat.
2. Ferrous Metal - Semi-Gloss Latex:
   a. Primer: One coat Rust-inhibiting Primer, 3.0 mils dry film thickness.
   b. Finish: Two coats Latex Semi-Gloss, 1.5 mils dry film thickness each coat.
3. Galvanized Metals - Semi-Gloss Latex: Pretreat as required by manufacturer.
   a. Primer: One coat Rust-inhibiting Primer, 3.0 mils dry film thickness.
   b. Finish: Two coats Latex Semi-Gloss, 1.5 mils dry film thickness each coat.
4. Wood - Semi-Gloss Latex:
   a. Primer: One coat Latex Sealer Undercoater, 2.0 mils dry film thickness.
   b. Finish: Two coats Latex Semi-Gloss, 1.5 mils dry film thickness each coat.
5. Concrete Masonry Units - Semi-Gloss Finish:
   a. Filler Coat: Block Filler.
   b. Finish: Two coats Latex Semi-Gloss, 1.5 mils dry film thickness each coat.
6. Gypsum Board: Flat Finish:
   a. Primer: One coat Latex Primer. 2.0 mils dry film thickness.
   b. Finish: Two coats Latex Flat. 1.5 mils dry film thickness each coat.
7. Gypsum Board: Eggshell Finish:
   a. Primer: One coat Latex Primer, 2.0 mils dry film thickness.
   b. Finish: Two coats Acrylic Latex Eggshell, 1.5 mils dry film thickness each coat.
8. Gypsum Board: Semi-Gloss Finish:
   a. Primer: One coat Latex Primer, 2.0 mils dry film thickness.
   b. Finish: Two coats Latex Semi-Gloss, 1.5 mils dry film thickness each coat.
9. Wood: Semi-Gloss Finish:
   a. Primer: One coat Latex Primer, 2.0 mils dry film thickness.
   b. Finish: Two coats Latex Semi-Gloss, 1.5 mils dry film thickness each coat.

M. SCHEDULE - INTERIOR SURFACES - ALKYD

1. Wood - Polyurethane - Clear Satin Finish:
   a. Primer: Filler, if required by paint manufacturer.

   b. Finish: Two coats Waterborne Polyurethane Satin Varnish, 1.0 mil dry film thickness each coat.

2. Wood - Polyurethane - Clear Satin Stain Finish:
   a. Primer: Filler, if required by paint manufacturer.
   b. Stain: Stain color as selected.
   c. Finish: Two coats Clear Polyurethane; 1.1 mils dry film thickness each coat.

END OF SECTION

DIVISION 10 SPECIALTIES

DIVISION 10 SPECIALTIES
QUALITY STANDARDS AND 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: ICC A117.1 - Accessible and Usable Buildings and Facilities; current version per the City of Philadelphia Building Code.

   2. Where required to meet accessibility requirements, provide specialties meeting the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)," or ANSI A117.1, as directed by the OHCD/PHDC/RDA.

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

   1. Install all specialties to be level and plumb and securely fastened and in accordance with manufacturer’s written instructions.

   2. Provide blocking as specified in other Sections of this Division, at all required locations.

   3. Install specialties at mounting heights in accordance with current code requirements.

END OF DOCUMENT

SECTION 10 28 00 - TOILET AND BATH ACCESSORIES

A. SUMMARY

1. Section Includes:
   a. Bathroom Accessories.
2. Sustainable Design: Comply with Division 01 Section “Sustainable Design Requirements.”

B. REGULATORY REQUIREMENTS

1. Conform to ICC A117.1 and applicable code for provisions for the physically handicapped.

C. PRODUCTS

1. Medicine Cabinet with mirrored door: 1 in each bath or powder room: Recessed or semi-recessed cabinet with manufacturer’s standard painted finish on manufacturer’s standard base metal. Door to have manufacturer’s standard glass mirror with polished chrome edging, full length piano-type hinge, and is to be reversible for left or right hand opening. Equip cabinet with minimum two glass shelves with mounting brackets designed to prevent shelves from becoming dislodged, except for cleaning. Cabinet shelves to be able to be height adjusted in cabinet.
   a. Overall size: Minimum 24 inches wide by 30 inches high by 5-7/8 inches deep.
   b. Powder room cabinet to be same style, but sized to fit in 16 inch stud spacing. Unit height may be reduced to 24 inches.
   c. Provide surface mounted medicine cabinets where existing construction depth is insufficient to allow semi-recessed or recessed cabinet installation.
2. Towel Bars: 2 in each bath; 1 in each powder room: Manufacturer’s standard base metal, 1 inch square or round cross bar mounted in two end brackets designed to hold bar minimum 1-1/2 inches clear of wall. Cross bar to be 24 inches long for towel bars in bathrooms and 18 inches long for towel bars in powder rooms.
3. Soap Dish: 1 in each bath at tub or shower and 1 at each lavatory in bathroom and powder room: Manufacturer’s standard base metal. Soap tray to hold standard bath soap bar, and to be mounted on single pedestal wall mounting bracket. Soap tray to have perforations to allow water to drain into tub or shower.
4. Toilet Tissue Holder: 1 in each bathroom and powder room at Toilet: Manufacturer’s standard base metal. Tissue bar to be spring loaded to allow easy replacement of tissue roll. Tissue bar to be mounted to two end brackets spaced to hold standard size toilet tissue rolls.
5. Tooth Brush/Tumbler Holder: 1 in each bath at lavatory: Manufacturer’s standard base metal. To match Soap Dish. Tray to have 6 slots designed to hold toothbrushes, three on each side of tumbler holder. Tumbler holder to be recessed into tray.
6. Robe Hook: 2 in each bath: Manufacturer’s standard base metal. Unit to have two prongs projecting a minimum of 1 inch from mounting base.

7. Shower rod: 1 at each tub or shower: Manufacturer’s standard base metal. Bar to be adjustable, twist tension type to mount between walls without cutting or drilling. Unit to have non-marring PVC end caps. Minimum bar diameter: 1 inch.
8. Fabrication:
   a. Provide non-corrosive metal mounting plates for each accessory designed to mount accessory to wall with concealed fasteners.
   b. Flat surfaces to be formed without distortion. Welds to be ground smooth.
9. Finish: Provide manufacturer’s standard polished chrome, satin chrome, or other finish as acceptable to Inspector. All accessories to have the same finish.

D. EXECUTION

1. Verify blocking has been installed between studs behind each accessory location.
2. Install accessories according to manufacturer's written instructions, at proper mounting height, in accordance with applicable codes.
   a. Coordinate mounting of medicine cabinet with rough framing prior to closing wall.
3. Install plumb and level, securely and rigidly anchored to blocking behind wall finish.
   a. Do not anchor into gypsum board.
4. Caulk rim of medicine cabinet to wall finish.

END OF SECTION

DIVISION 11 EQUIPMENT

DIVISION 11 EQUIPMENT
QUALITY STANDARDS AND 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: ENERGY STAR website; www.energystar.gov. Click on “Products” to be directed to website pages listing products with the ENERGY STAR label.
2. Provide ENERGY STAR labeled equipment and appliances for all products eligible to receive the ENERGY STAR label unless instructed by the OHCD/PHDC/RDA to install non ENERGY STAR labeled equipment.
3. Provide equipment and appliances with CFM (cubic feet per minute) ratings as required by other Sections of this Division, where such rating is applicable.
4. Provide equipment and appliances meeting current UL, NFPA, ANSI and NEMA standards.
5. Where required to meet accessibility requirements, provide equipment and appliances meeting the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)," or ANSI A117.1, as directed by the OHCD/PHDC/RDA.

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

1. Install and securely fasten all equipment and appliances to be level and plumb and in accordance with manufacturer’s written instructions.
2. Verify that all connection hook-ups are properly installed and prepared prior to installing equipment and appliances. Notify the OHCD/PHDC/RDA immediately if any improper conditions are discovered.
3. Test all equipment and appliances for proper functioning.
4. Leave all warranties, operating manuals and installation instructions in top drawer of drawer base kitchen cabinet.
5. Install anti-tip bracket on range.
6. Install finished end panels along exposed side of dishwasher; install filler strip as necessary where dishwasher is adjacent to return wall

END OF DOCUMENT

SECTION 11 31 00 - RESIDENTIAL APPLIANCES

A. SUMMARY

1. Section Includes:
   a. Kitchen and laundry appliances.
2. Sustainable Design: Comply with Division 01 Section “Sustainable Design requirements.”

B. SUBMITTALS

1. Product Data: Product data and power requirements for appliances, including certification that qualifying appliances meet energy star standards.

C. OPERATION AND MAINTENANCE DATA

1. Operating and Maintenance Instructions: Include appliance manufacturer’s standard instructions

D. DELIVERY, STORAGE, AND HANDLING

1. Deliver materials in manufacturer’s original unopened containers.
2. Store appliances inside building in dry spaces protected from the weather.

E. QUALITY ASSURANCE

1. Appliances: Conform to applicable code for UL approvals.
2. Appliances: All appliances to be Energy Star Rated where applicable or product type is available with energy star rating.

F. PRODUCTS

1. Refrigerator: Top mount freezer compartment, minimum 17.5 cubic feet capacity, frost free, with 3 refrigerator section and one freezer section wire shelves, 2 vegetable/fruit crisper compartments, two refrigerator section door shelves with gallon container storage, 1 freezer section door shelf, 2 ice trays.
2. Dishwasher: Automatic, solid state control, selectable cycles, delay start, adjustable upper rack and flat lower rack, silverware basket with handle, rinse aid dispenser, sound insulated.
3. Range: Provide one of the following:
   a. Freestanding 30 inch wide natural gas sealed burner range, electronic pilotless ignition, glass oven door, 3 oven racks, broiler pan, 4 range top burners with heavy cast iron grills, storage drawer, clock/timer, automatic oven timer, self cleaning oven. Controls on front panel.
   b. Freestanding 30 inch wide electric range, 220V, solid state control, glass oven door, clock/timer, automatic oven timer, self cleaning oven, broiler pan, flat surface glass cook top with 4 burner positions, storage drawer; black cook top. Controls on back panel.

4. Range Hood: Vented to exterior, two speed fan control, cook top light, washable grease filter.
5. Microwave Oven:
   a. Over the Range model with turntable, 1.5 cu. ft. capacity, minimum 900 watts, one touch convenience cooking controls, exhaust vent to exterior. (this model replaces separate Range Hood) and the following characteristics:
      1) Ratings: 180 cfm minimum; 4.5 sones maximum sound rating.
      2) Fan/Motor Assembly: Two speed minimum, resiliently mounted to housing.
      3) Air Inlet; Protect with removable, washable aluminum filters.
      4) Controls: Separate built-in controls for fan and light.
6. Clothes Washer: Automatic, 3.5 cu. ft. capacity, 4 cycles, selectable wash/spin speed and wash/rinse temperature combinations, 5 water levels, sound insulated.
7. Clothes Dryer: Provide one of the following:
   a. Natural gas, automatic, 7.0 cu. ft. capacity, 3 cycles (automatic moisture, timed dry, and air-only), 3 temperature selections, wrinkle guard, signal on-off control. Vent to exterior.
   b. Electric, 220V., 7.0 cu. ft. capacity, 3 cycles as above, 4 temperature selections, signal on-off control; white. Vent to exterior.
8. Accessories:
   a. Provide all necessary power cords, vent ducts, and exterior self-closing exhaust covers as required.
   b. Alternative Appliances: Other types, sizes, capacities, and features are permitted when approved in writing by OHCD/PHDC/RDA.
9. Finishes: Provide manufacturer's standard color as approved by OHCD/PHDC/RDA.

G. EXECUTION

1. Verify that utility services and power match appliance requirements.
2. Install equipment in accordance with manufacturer's written instructions.
3. Set and adjust equipment level and plumb.
4. Connect appliances to utilities and make units operational.
5. Adjust appliances for smooth operation under loaded conditions.
6. Vent applicable appliances to exterior in compliance with building code and manufacturer's written instructions.

END OF SECTION

DIVISION 12 FURNISHINGS

DIVISION 12 FURNISHINGS
QUALITY STANDARDS AND 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. Architectural Woodwork Standards, Architectural Woodwork Institute (AWI), c. 2009; most current edition.
      b. HUD Severe Use Criteria - ANSI/HPMA HP 1983.
   2. Particleboard or agri-fiberboard products are not permitted as substrates for countertops at wet areas or where sinks will be installed.

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

   1. Install all furnishings aligned, level and plumb and securely fastened and where there are operational components, to have smooth and correct operation.
   2. Where cuts are made for drop-in sinks, seal edges of plywood substrates with a low-VOC sealant as approved by OHCD/PHDC/RDA.
   3. Leave all warranties, operating manuals and installation instructions in top drawer of drawer base kitchen cabinet.
   4. Install finished end panels along exposed sides; install filler strips as necessary.

END OF DOCUMENT

SECTION 12 20 00 - WINDOW TREATMENTS

A. SUMMARY

1. Section Includes:
   a. Window Treatments
2. Sustainable Design: Comply with Division 01 Section “Sustainable Design requirements.”

B. DELIVERY, STORAGE, AND HANDLING

1. Deliver materials in manufacturer’s original unopened containers.
2. Store window treatments inside building in dry spaces protected from the weather.

C. FIELD CONDITIONS

1. Verify window opening dimensions by field measurement prior to ordering window treatments.

D. COORDINATION

1. Coordinate window treatment installation and placement of concealed blocking to support window treatments.

E. PRODUCTS

1. Provide one of the following at each window:
   a. Horizontal Louver Blinds, Metal Slats:
      1) Metal Slats: 1 inch wide, 0.006 inch thick spring tempered pre-finished aluminum horizontal slats, crowned to prevent visible sag, radiused corners, with manufacturing burrs removed.
         a) Blinds at bedrooms to be “Room Darkening” type.
      2) Slat Support: Braided polyester, ladder configuration, 14.2 slats per foot.
      3) Head Rail: Channel shaped, pre-finished steel, internally fitted with hardware for blind operation.
      4) Bottom Rail: Tubular shaped, pre-finished steel, crowned top surface to match slats, fitted with matching end caps.
      5) Operation: Bottom up.
      6) Lifting Cord: Braided polyester; continuous loop, with crash proof cord lock and tassel free at end.
      7) Control Wand: Extruded hollow plastic, non-slip grip, removable without tools, length for convenient operation.
      8) Head Support Bracket: Pre-finished steel, end and intermediate brackets for overhead head rail attachment.
      9) Accessory Hardware: Type recommended by blind manufacturer.
   b. Horizontal Louver Blinds, Vinyl (PVC)Slats:

1) Vinyl (PVC) Slats: 1 inch wide, white vinyl slats with radiused corners.
   a) Blinds at bedrooms to be “Room Darkening” type.
2) Slat Support: Braided polyester, ladder configuration, 14.2 slats per foot.
3) Head Rail: Channel shaped, vinyl (PVC), internally fitted with hardware for blind operation.
4) Bottom Rail: Tubular shaped vinyl (PVC), fitted with matching end caps.
5) Operation: Bottom up.
6) Lifting Cord: Braided polyester; continuous loop, with crash proof cord lock and tassel free at end.
7) Control Wand: Extruded hollow plastic, non-slip grip, removable without tools, length for convenient operation.
8) Head Support Bracket: Pre-finished steel, end and intermediate brackets for overhead head rail attachment.
9) Accessory Hardware: Type recommended by blind manufacturer.

c. Horizontal Roller Shade, Vinyl:
   1) Vinyl fabric roll-up shade, minimum 6 mil thickness.
      a) Shades at bedrooms to be “Room Darkening” type.
   2) Operation: Bottom up, spring loaded roll up.
   3) Support Brackets: Metal, at each end, supplied with blind.

2. Accessories:
   a. Provide all necessary mounting hardware.
3. Fabrication:
   a. Fabricate to cover window sash completely.
   b. At openings requiring multiple blind units, provide separate blind assemblies with space of 1/2 inch between assemblies, occurring at window mullion centers.

F. EXECUTION

1. Install window treatments in accordance with manufacturer’s written instructions.
2. Secure in place with concealed fasteners where possible.
3. Provide clearance between window sash and blind for operation of sash and sash hardware.
4. Set and adjust equipment level and plumb.
5. Adjust window treatments for smooth operation.

END OF SECTION

SECTION 12 35 30 - RESIDENTIAL CASEWORK

A. SUMMARY

1. Section Includes:
   a. Wood-faced Cabinets of stock design.
   b. Plastic-laminate countertops.
2. Sustainable Design: Comply with Division 01 Section “Sustainable design Requirements.”

B. DEFINITIONS

1. Exposed Portions of Cabinets: Surfaces visible when doors and drawers are closed, including bottoms of cabinets more than 48 inches above floor, and surfaces visible in open cabinets.
2. Semi-exposed Portions of Cabinets: Surfaces behind opaque doors, such as interiors of cabinets, shelves, dividers, interiors and sides of drawers, and interior faces of doors. Tops of cases 78 inches or more above floor are included.
3. Concealed Portions of Cabinets: Surfaces not usually visible after installation, including sleepers, web frames, dust panels, and ends and backs that are placed directly against walls or other cabinets.
4. Hardwood Plywood: A panel product composed of layers or plies of veneer, or of veneers in combination with lumber core, hardboard core, MDF core, or particleboard core, joined with adhesive, and faced both front and back with hardwood veneers.

C. QUALITY ASSURANCE

1. Source Limitations: Obtain manufactured wood casework from single source from single manufacturer.
2. Quality Standard: Unless otherwise indicated, comply with requirements for modular cabinets in AWI’s “Architectural Woodwork Standards.”
3. Product Designations: Drawings indicate sizes, configurations, and finish material of manufactured wood casework by referencing designated manufacturer’s catalog numbers. Other manufacturers’ casework of similar sizes and door and drawer configurations, of same finish material, and complying with the specifications may be considered.

D. DELIVERY, STORAGE, AND HANDLING

1. Deliver manufactured wood casework only after painting, utility roughing-in, and similar operations that could damage, soil, or deteriorate casework have been completed in installation areas. If casework must be stored in other than installation areas, store only in areas where environmental conditions meet requirements specified in "Field Conditions" Article.
2. Keep finished surfaces covered with polyethylene film or other protective covering during handling and installation.

E. FIELD CONDITIONS

1. Environmental Limitations: Do not deliver or install manufactured wood casework until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above ceilings is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
2. Field Measurements: Verify actual dimensions of construction contiguous with manufactured wood casework by field measurements before fabrication.
3. Coordinate layout and installation of framing and reinforcements in walls and partitions for support of manufactured wood casework.

F. PRODUCTS

1. Materials, General:
   a. Low-Emitting Materials: Fabricate casework, including countertops, with adhesives and composite wood products that contain no urea formaldehyde.
   b. Maximum Moisture Content for Lumber: 7 percent for hardwood and 12 percent for softwood.
   c. Hardwood Plywood: HPVA HP-1, either veneer core or particleboard core unless otherwise indicated.
   d. Softwood Plywood: DOC PS 1.
   e. Hardboard: AHA A135.4, Class 1 Tempered.
   f. Plastic Laminate: High-pressure decorative laminate complying with NEMA LD 3.
   g. Edgebanding for Plastic Laminate: Plastic laminate matching adjacent surfaces.
   h. Edgebanding for Wood-Veneered Construction: Wood veneer of same species as face veneer.
      1) Select wood edgebanding for grain and color compatible with face veneers.
2. Cabinet Materials:
   a. Exposed Cabinet Materials:
      1) Wood Species: Red Oak, White Oak, Cherry, Ash. Other species may be provided when approved in writing by OHCD/PHDC/RDA.
      2) Plywood: Hardwood plywood with face veneer of species indicated, selected for compatible color and grain. Grade A exposed faces at least 1/50 inch thick, and Grade J crossbands. Provide backs of same species as faces.
         a) Face Veneer Cut: Rift Cut (Red Oak); Plain Sliced (all other species).
      3) Solid Wood: clear hardwood lumber of species indicated and selected for grain and color compatible with exposed plywood.
   b. Semi-exposed Cabinet Materials:
      1) Solid Wood: Sound hardwood lumber, selected to eliminate appearance defects, of same species as exposed wood.
      2) Plywood: Hardwood plywood of same species as exposed wood. Grade B faces and Grade J crossbands. Provide backs of same species as faces.

3) Unless otherwise indicated, provide specified edgebanding on all semi-exposed edges.

c. Concealed Cabinet Materials:

1) Solid Wood: Any hardwood or softwood species, with no defects affecting strength or utility.

2) Plywood: Hardwood plywood. Provide backs of same species as faces.

3. Design, Color, and Finish:

a. Design: Provide casework of the following design:

1) Reveal overlay.

2) Door Style: Style as indicated by Architect or as selected by developer from manufacturer's full range.

3) Drawer Fronts: Style to coordinate with door style.

b. Wood Colors and Finishes:

1) As indicated by Architect or as selected by developer from casework manufacturer's full range, unless otherwise indicated.

c. Other styles of cabinets (frameless or plastic laminate faced) which do not conform to the standards specified, but are judged by OHCD/PHDC/RDA to be of good quality may be accepted at the developer's request. Deviation from the standard is not permitted unless approved in writing by OHCD/PHDC/RDA.

1) OHCD/PHDC/RDA is under no obligation to approve cabinetry not meeting these specifications.

4. Cabinet Fabrication:

a. Wood-Faced Cabinet Construction: As required by referenced quality standard, but not less than the following:

1) Bottoms of Cabinets and Tops of Wall Cabinets: 3/4 inch veneer core hardwood plywood.

2) Ends of Cabinets: 3/4 inch hardwood plywood.

3) Shelves: 3/4 inch veneer-core hardwood plywood.

a) All shelves to be adjustable, Provide two columns of holes on each side panel designed to receive shelf supports specified.

4) Base Cabinet Stretchers: 3/4 by 4-1/2 inch plywood strips or solid wood boards at front and back of cabinet, glued and pinned or screwed.

5) Backs of Cabinets: 3/4 inch hardwood plywood where exposed, 1/4 inch veneer-core hardwood plywood dadoed into sides, bottoms, and tops where not exposed.

6) Drawer Fronts: 3/4 inch solid hardwood.

7) Drawer Sides and Backs: 1/2 inch solid-wood or veneer-core hardwood plywood, with glued dovetail or multiple-dowel joints.

8) Drawer Bottoms: 1/4 inch veneer-core hardwood plywood glued and dadoed into front, back, and sides of drawers. Use 1/2 inch material for drawers more than 24 inches wide.

9) Doors 48 inches or Less in Height: 3/4 inch thick, with solid hardwood stiles and rails and hardwood face veneers and crossbands.
10) Doors More than 48 inches in Height: 1/1/8 inches thick, with solid wood hardwood stiles and rails and hardwood face veneers and crossbands.

b. Finish for Wood-Faced Manufactured Casework:
1) Preparation: Sand lumber and plywood before assembling. Sand casework after assembly for uniform smoothness and to eliminate machine marks, cross sanding, or other surface blemishes.
2) Staining: Remove fibers and dust and apply wash-coat sealer and stain to exposed and semi-exposed surfaces as required to provide uniform color and to match selected finish color.
3) Finishing Wood: Apply manufacturer's standard baked, clear finish consisting of a thermosetting catalyzed sealer and a minimum of one coat of a thermosetting catalyzed conversion varnish. Sand and wipe clean between applications of sealer and topcoat and between topcoats. Topcoats may be eliminated on concealed surfaces.

5. Casework Hardware and Accessories:
a. Frameless Concealed Hinges (European Type): BHMA A156.9, Type B01602, 100 degrees of opening.
b. Pulls: Solid stainless steel, brass, or material to match door hardware; style and finish as selected from mid-range price category of supplier of cabinets,
c. Drawer Slides: BHMA A156.9, Type B05091.
1) Standard Duty (Grades 1, 2, and 3): Side mounted, full-extension type; zinc-plated steel with polymer rollers.
d. Adjustable Shelf Supports: 2-pin locking plastic shelf rests complying with BHMA A156.9, Type B04013.

6. Vanity Cabinets:
a. Vanity cabinets shall be standard size, 21 in. deep x minimum 24 in. wide unless otherwise noted on construction documents or as approved by OHCD/PHDC/RDA. They shall conform to requirements for kitchen cabinets as specified above, with the following additional provisions:
1) Frame shall be solid wood.
2) Finish: As indicated by Architect or as selected by developer.

7. Countertops:
a. Provide smooth, clean exposed tops and edges in uniform plane free of defects.
b. Plastic-laminate sheet, shop bonded to both sides of 3/4 inch plywood. Sand surfaces to which plastic laminate is to be bonded.
1) Plastic Laminate for Flat Tops: Grade HGL.
2) Plastic Laminate for Backing: Grade BKL.
3) Provide plastic-laminate edgings of the same material as top on front edge of top, on top edges of back and side splashes, and on ends of tops and splashes.
4) Provide 1-1/2 in. face.

5) Provide 1 inch overhang at front and exposed ends over base cabinets.
6) Tops shall have 4 inch high back and end splashes.
7) Use exterior plywood or exterior glue particleboard for countertops containing sinks.
8) Shop fabricated with conventional joints.

G. EXECUTION

1. Install cabinets straight, level, plumb, and true, using mounting hardware designed for installing cabinets; shim as required, using concealed shims. Where casework abuts other finished work, apply filler strips and scribe for accurate fit. Conceal fasteners.
   a. Use only screws with washers designed for installing cabinets. Screws designed for installing gypsum board are not acceptable.
2. Mount cabinets to firm backing and to each other with concealed screws through framing member of cabinet.
3. Install hardware uniformly and precisely. Adjust and align hardware so moving parts operate freely and contact points meet accurately.
   a. Adjust hardware so doors and drawers operate smoothly without warp or bind. Lubricate operating hardware as recommended by manufacturer.
4. Installation of Tops:
   a. Field Joining: Where possible make in the same manner as shop jointing, using dowels, splines, adhesive, and fasteners recommended by manufacturer.
      1) Secure field joints in plastic-laminate countertops with concealed clamping devices located within 6 inches of front and back edges and at intervals not exceeding 24 inches. Tighten according to manufacturer's written instructions to exert a constant, heavy-clamping pressure at joints.
   b. Secure tops to cabinets with Z- or L-type fasteners or equivalent, using two or more fasteners at each front, end, and back.
   c. Abut top and edge surfaces in one true plane, with internal supports placed to prevent deflection.
   d. Secure back and end splashes to tops with concealed metal brackets at 16 inches on center.
   e. Seal junctures of tops, splashes, and walls with mildew-resistant silicone sealant recommended by countertop material manufacturer.
   f. Where sink openings are cut into laminated countertops, seal the cut edges of the plywood with oil-based enamel or spray lacquer to reduce the risk of swelling if the caulk under sink rim leaks.
5. Shim vanity cabinets 1/8 to 1/4-in. off the floor and seal around the bottom with mildew-resistant silicone sealant.
6. Cleaning and Protection:
   a. Repair or remove and replace defective work.
   b. Clean finished surfaces, touch-up as required, and remove or refinish damaged or soiled areas to match original factory finish.

c. Protection: Provide suitable water-resistant covering over countertop surfaces. Tape to underside of countertop. Remove when directed.

END OF SECTION

DIVISION 22 PLUMBING

DIVISION 22 PLUMBING
QUALITY STANDARDS AND 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. All work shall conform to current applicable code standards. Contractor is responsible for having a working knowledge of all codes.
2. All pipe and fitting materials shall conform to the latest issue of American National Standards Institute (ANSI), American Society for Testing Material (ASTM), and American Water Works Association (AWWA).
3. Piping materials shall be as specified in other Sections of this Division.
4. Corrugated Stainless Steel Tubing (CSST) is not permitted for gas piping.
5. New gas service and meter installation shall conform to all codes and regulations as set forth by the Philadelphia Gas Works (PGW). Service shall be sized in accordance with PGW recommendations for gas equipment consumption and length of run.
6. Testing for gas leaks shall be in accordance with PGW standards.
7. Clean outs shall be provided at the base of each stack and in the main drain line at 90 degree turns, at the front of the house, and not greater than 50 feet apart.
8. Where combination storm/sanitary sewers are present, all rain water stacks shall have deep seal traps at base, inside basement.
9. Slope drain lines minimum 1/4 inch per foot unless approval in writing is received from Philadelphia Department of Licenses and Inspections to slope drain 1/8 inch per foot.
10. Plumbing fixtures shall conform to current Federal and local (whichever is more stringent) water usage standards for gallons per flush (gpf) and gallons per minute (gpm).
11. Venting methods for hot water heaters (HWH) shall be as described in other Sections of this Division. Atmospherically vented HWH's are not permitted unless aprroved in writing by the OHCD/PHDC/RDA
12. Electric domestic hot water heaters are not permitted unless authorized in writing for use by the OHCD/PHDC/RDA.
13. Ensure that existing piping and fixtures to remain have no leaks. Properly repair all leaks. Replace piping and fittings as necessary to properly repair leaks.

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

1. Verify all existing site conditions prior to commencing work.
2. Provide shut-off valves at all equipment and all meters.
3. Fully sweat and wipe clean all soldered joints.
4. Fully bond all plastic pipe joints with correct sealant.

5. Soil lines in basements shall be supported from clevis hangers or on stuccoed, solid masonry piers.
6. Provide a distribution manifold at the source-end termination of PEX piping.

END OF DOCUMENT

SECTION 22 00 00 - PLUMBING AND DRAINAGE

A. SUMMARY

1. Section Includes
   a. Alterations and additions to the sanitary water drainage systems, including a new house drainage system, house trap, new lateral from trap to fresh air inlet, new fresh air inlet and cleaning of the existing lateral from the curb to the City sewer.
   b. Curb shut off valve and valve box, serving line, meter, hot water heater, piping and accessories.
   c. Connections to plumbing fixtures.
   d. Excavation and backfilling in connection with work under this section.
   e. Cutting in existing work required and cost of patching same.
   f. Cleaning, testing, balancing, adjusting and performance tests for all equipment and materials furnished or installed under this Section.
   g. Connection of downspouts to drainage system, including downspouts previously in common with neighboring property, and new or existing porch, bay or shed downspouts.
2. Sustainable Design: Comply with Division 01 Section “Sustainable Design Requirements.

B. QUALITY ASSURANCE

1. Materials and installation shall comply with the Philadelphia Plumbing Code.

C. MATERIALS

1. Underground Sanitary Piping: uncoated service weight, cast iron, bell-and-spigot pipe and fittings conforming to ASTM A 74.
   a. Joints: Push-on.
2. Above Ground Sanitary Piping: ABS ASTM D2661, Schedule 40, or PVC ASTM D 2665 drain, waste, and vent.
   a. Joints: Solvent welded.
3. Underground Domestic Water Piping: Type “K” Copper conforming to ASTM B 88.
   a. Joints: Soldered.
4. Aboveground Domestic Water Piping: One of the following
   a. Type “L” Copper conforming to ASTM B 88 with soldered joints.
   b. Cross Linked Polyethylene (PEX), conforming to ASTM F 876 Standard Specification for Cross-linked Polyethylene (PEX) Tubing, ASTM F 877 Standard Specification for Cross-linked Polyethylene (PEX) Plastic Hot and Cold Water Distribution Systems, ASTM F 1807 Standard Specification for Metal Insert Fittings Utilizing a Copper Crimp.
      1) PEX fittings shall be of manufacture and type recommended for use by the PEX Piping manufacturer. All fittings shall be barbed and utilize a crimp-ring to secure the fitting. No “Sharkbite” or other snap-on, removable fittings shall be allowed.

D. SANITARY WASTE, VENT AND RAINWATER DRAINAGE SYSTEMS

1. Minimum house drain, house trap, and fresh air inlet at curb shall be 4 inches. Normal slope of drain line shall be 1/4 inch per foot. Use 1/8 inch per foot slope only if sewer connection cannot be made at normal slope and only with prior approval from L&I.
2. Clean out shall be provided at the base of each stack and in main drain line at 90 degree turns, at front of house, and not more than 50 ft. apart.
3. Where combination storm/sanitary sewers are present, all rain water stacks shall have deep seal traps at base, inside basement.

E. DOMESTIC WATER PIPING SYSTEMS

1. Contractor shall be responsible for water meter installation in accordance with the Water Department Standards but in no case less than 5/8 inch in size.
2. Minimum Water Service Size: 3/4 inch.
3. Minimum Water Supply Pipe Sizes:
   a. To each living unit, hot water heater, first branch off: 3/4 inch.
   b. Branch supplies to fixtures: 1/2 inch.

F. EXECUTION

1. Install piping in concealed locations unless otherwise indicated.
2. Install piping perpendicular and parallel to building framing and partitions.
3. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
4. Install aboveground copper tubing according to CDA's "Copper Tube Handbook."
5. Install aboveground ABS piping according to ASTM D 2661.
6. Install aboveground PVC piping according to ASTM D 2665.
7. Install PEX piping in accordance with manufacturer’s installation instructions.
   a. Distribute piping to individual fixtures from central manifold.
8. Support piping at intervals used in standard engineering practice.
9. Provide all necessary fittings, valves, hangers, supports and specialties required for complete operating system.

G. TESTING AND CLEANING PIPING SYSTEMS

1. After erection, inspect and test piping systems for leaks. Repair leaks to make systems watertight.
2. Remove foreign substances which may have accumulated in the systems during installation.
3. Clean and disinfect domestic water piping in accordance with the Philadelphia Plumbing Code and AWWA C601.

END OF SECTION

SECTION 22 36 00 - DOMESTIC WATER HEATERS

A. SUMMARY

1. Section Includes:
    1) Condensing water heaters.
    2) Non-condensing water heaters.
    3) Tankless water heaters.
    4) Electric water heaters.
    5) Indirect fired water heaters.
    6) Water heater accessories.
2. Sustainable Design: Comply with Division 01 Section "Sustainable Design Requirements."
3. Provide ENERGY STAR labeled domestic water heaters, unless approved in writing by OHCD/PHDC/RDA.
4. Related Requirements:
    a. Section 23 51 23 - Gas Vents.
    b. Section 23 52 16 - Heating Boilers: Heat source for indirect fired water heaters.

B. REFERENCES

1. ANSI Z21.10.1/CSA 4.1 - Gas Water Heaters Volume I, Storage Water Heaters with Input Ratings of 75,000 BTU Per Hour or Less.
2. ANSI Z21.10.3/CSA 4.3 - Gas Water Heaters - Volume III, Storage Water Heaters with Input Ratings Above 75,000 BTU per Hour, Circulating and Instantaneous.

C. DESIGN DATA

1. Domestic Hot Water Temperature: Set controls to deliver water at maximum 120 degrees F.
2. Size water heaters in accordance with applicable code to meet fixture and occupant demand.
3. Storage Water Heater Sizing: Select water heater with minimum 67 gallons per hour, first hour rated capacity and additional rated capacity as follows:
    a. 3-Bedroom Units: 70 gallons per hour for first hour.
    b. 4-Bedroom Units: 80 gallons per hour for first hour.
    c. 5-Bedroom Units: 90 gallons per hour for first hour.
4. Tankless and Indirect Water Heater Sizing: Select water heater with minimum 2.5 gallons per minute with 77 degrees F temperature rise capacity.

D. SUBMITTALS

1. Product Data: Submit data indicating water heater capacities and efficiency ratings.

2. Operation and Maintenance Data: Submit one manufacturer's standard owner's manual for maintenance and troubleshooting water heaters to Owner for distribution to residents of each residential unit.

E. WARRANTY

1. Provide 10-year manufacturer's warranty on water heaters unless the approved model is not available with such a warranty.

F. RESIDENTIAL, GAS-FIRED, DOMESTIC WATER HEATERS

1. Domestic Water Heaters: Gas-fired, with anti-convection loop or Heat Trap (anti-convection valve) either factory-installed or site-supplied on both feed and outlet lines.
2. Condensing, Storage Water Heaters; ANSI Z21.10.1/CSA 4.1; rated for 150 psig. Factory installed appurtenances shall include steel tank, anode rod, drain valve, steel jacket, power vented burner, automatic ignition, temperature control, and combination temperature-and-pressure relief valve.
3. Non-Condensing, Storage Water Heaters; ANSI Z21.10.1/CSA 4.1; rated for 150 psig. Factory installed appurtenances shall include steel tank, anode rod, drain valve, jacket, burner, automatic ignition, temperature control, and combination temperature-and-pressure relief valve. Furnish draft hood and automatic damper for field installation.
   a. Non-condensing water heaters are permitted only when approved in writing by OHCD/PHDC/RDA.
4. Tankless Water Heaters; ANSI Z21.10.3/CSA 4.3 with direct vent room-sealed combustion, certified by CSA International, with multi-pass heat exchanger, combustion air fan, automatic and diagnostic controls, lime accumulation sensor, suitable for horizontal or vertical venting and interior or exterior installation.
   a. Tankless Water Heaters are permitted only when approved in writing by OHCD/PHDC/RDA.

G. RESIDENTIAL, ELECTRIC, DOMESTIC WATER HEATERS

1. Electric Water Heaters: UL 174; rated for 150 psig. Factory installed appurtenances shall include steel tank, anode rod, drain valve, steel jacket, minimum R-20 insulation, electric screw-in immersion heating elements, temperature control, and combination temperature-and-pressure relief valve. Electric power must be off-peak metered.
   a. Electric water heaters are permitted only when approved in writing by OHCD/PHDC/RDA.

H. INDIRECT-FIRED WATER HEATER

1. When a boiler is used for space heating, an immersed hot coil or double tank indirect-fired heat exchanger/storage tank, with heat traps as specified for gas fired water heaters, may be used.
   a. Indirect-fired water heaters are permitted only when approved in writing by OHCD/PHDC/RDA.
2. Connect storage tank as a separate zone with priority over space heating.

I. WATER HEATER ACCESSORIES

1. Compression Tank: Sized for system volume and temperature range.
2. Drain Pans for Storage Water Heaters: Corrosion-resistant material with side drain connection 3/4 inch minimum.
3. Trim: Manufacturer's recommended preformed copper heat traps, gas shutoff valves, vacuum relief valves, and stands or wall mounting brackets.
4. Gas Vent: B vent system as specified in Section 23 51 23 or power vented kits and PVC solvent welded joint pipe system to suit application.
5. Piping: As specified in Section 22 00 00 for service and drain piping.

J. EXECUTION

1. Install water heaters and accessories in accordance with manufacturer’s installation instructions and NFPA-54.
2. Install indirect fired water heaters with boilers specified in Section 23 52 00.
3. Connect non-condensing water heater combustion outlet to gas vent specified in Section 23 51 23.
4. Provide protective vent cap for gas vents located within 8-feet of ground or personnel.

END OF SECTION

SECTION 22 40 00 - PLUMBING FIXTURES

A. SUMMARY

1. Kitchen fixtures and trim.
2. Bath fixtures and trim.
3. Maintenance fixtures and trim.
4. Sustainable Design:
   a. Comply with Division 01 Section "RDA Sustainability Requirements."
   b. Provide fixtures and trim complying with LEED H WE Credit 3 Indoor Water Use.

B. QUALITY ASSURANCE

1. Provide plumbing fixture fittings in accordance with ASME A112.18.1 that prevent backflow from fixture into water distribution system.

A. FIXTURES AND TRIM - GENERAL:

1. Fixture Color: White, except when approved by PHDC/RDA.
2. Trim Finish: Chromium-plated brass for faucets, valve controls, drain assemblies and other fittings.

B. KITCHEN FIXTURES AND TRIM:

1. Kitchen Sink - Standard Unit: 19 inches wide x 16 inches long x 7.5 inches deep minimum size, 18 gauge, 304 stainless steel, punched for faucet trim.
2. Kitchen Sink - ADA Accessible Unit: 19 inches wide x 16 inches long minimum size, x maximum depth as required for minimum 27 inches clearance between bottom of bowl and finished floor, 18 gauge, 304 stainless steel, punched for faucet trim.
3. Sink Trim:
   a. Faucet: High-arc, swing spout with aerator; 8 inch centers.
   b. Accessories: Furnish 1-1/2 inch brass trap and tail-piece assembly to wall, escutcheon, drain, crumb basket strainer, and 3/8 inch brass stops with round handle.
      1) Concealed traps within cabinets may be PVC.

C. BATHROOM FIXTURES AND TRIM:

1. Toilets: Floor mounted, tank type, vitreous china, close coupled, gravity, with elongated bowl.
   a. Water Flow Rate: Comply with one of the following:
      1) Maximum 1.6 gallons per flush. Furnish WaterSense labeled single flush or dual flush controls, as necessary, to suit project sustainable design requirements.
      2) Gravity flush with a large water surface achieving no less than 900 grams of solid waste per single flush based on test results as measured by National Association

of Home Builders Research Center (NAHBRC) study, (http://www.cwwa.ca/pdf_files/Map-Report-14th-Ed-05-2009.pdf), as updated.

b. Seat: White, plastic, shape to match toilet bowl, closed front with soft close, non-corroding hinges.
c. Supply: 3/8 inch chrome plated with round handle.
d. Bolt caps: White.
e. Seat Height: Standard or ADA accessible height as required to suit application.

2. Bathroom Lavatory: Cultured marble or solid surface with integral oval bowl, rear deck punched for matching single lever center-set faucet.
   a. Minimum Size: Sized to suit vanity base cabinet specified in Section 12 35 20, except when approved by PHDC/RDA.
   b. Faucet: WaterSense labeled, single handle, center-set, ceramic cartridge with aerator.
   c. Drain: Pop-up.
   d. Accessories: Furnish 1-1/4 inch brass trap and tail-piece assembly to wall with escutcheon, and 3/8 inch brass stops with round handle.
      1) Concealed traps within cabinets may be PVC.
3. Bathtub: 30 inches wide x 60 inches long x 14 inches high, porcelain enameled steel, with integral apron, three-sided flanged, non-skid floor with bottom foam support.
   a. Verify left or right drain location to suit application.
   b. Bath and Shower trim: WaterSense labeled, balled shower head, bath spout with diverter valve, and pressure balanced bath and shower fitting with ceramic disk cartridge.
   c. Bath Drain: 1-1/2 inch bath waste and overflow with lift and turn drain, solid brass.

D. MAINTENANCE FIXTURES AND TRIM:

1. Hose Bibb: 1/2 inch frost free sillcock, bronze with hose end connection and integral vacuum breaker.

E. INSTALLATION:

1. Install each fixture with trap, easily removable for servicing and cleaning.
2. Install fixtures complete with all necessary water supply piping connections and soil, waste, and vent piping connections to sanitary drainage system.
3. Install stop valve placed close to the fixture to permit each water supply pipe to the fixture to be shut off separately.
4. Install chrome escutcheon plates on exposed piping passing through floors, walls or ceiling.
5. Install hose bibb 16 inches above grade. Provide interior shut-off valve in basement, crawl space, or other accessible location.

END OF SECTION

DIVISION 23	HEATING, VENTILATING, AND AIR CONDITIONING (HVAC)

DIVISION 23 HEATING, VENTILATING, AND AIR CONDITIONING (HVAC)
QUALITY STANDARDS AND 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. Reference: Builder's Guide to Mixed-Humid Climates, Joseph Lstiburek, Ph.D., PE, Building Science Corporation, c. 2005; Chapter 12 "HVAC."
   b. Duct Manual and Sheet Metal Construction for Ventilation and Air Conditioning, Sheet Metal and Air Conditioning Contractors of America (SMACNA).
   c. Manual D, Residential Duct Systems, Air Conditioning Contractors of America (ACCA), most current edition.
   d. Manual J, Residential Load Calculation, Air Conditioning Contractors of America (ACCA), most current edition.
   e. "Specifications of Energy-Efficient Installation and Maintenance Practices for Residential HVAC Systems," Consortium for Energy Efficiency, July 2000, available at http: //www.cee1.org/resid/rs-ac/reshvacspec.pdf.
2. All work shall conform to current applicable code standards. Contractor is responsible for having a working knowledge of all codes.
3. All equipment and ductwork shall be sized in accordance with ACCA Manual J and to maintain an interior temperature of 70 degrees F when exterior temperature is 10 degrees F and an interior temperature of 75 degrees F when exterior temperature is 95 degrees F.
4. The heating capacity (output) rating of furnaces and boilers and cooling capacity of air conditioning systems shall not exceed the calculated design heat load and cooling load by the percentages specified in other Sections of this Division. Submit documentation of design heat and cooling load to OHCD/PHDC/RDA before beginning installation of equipment.
5. Dryer venting shall be as specified in other Sections of this Division. No other type of venting is permitted.
6. Equipment venting shall be as specified in other Sections of this Division and meet UL and NFPA requirements where required.
7. Exhaust systems and ductwork for heating and cooling systems shall be designed and installed as specified in other Sections of this Division.
8. The Annual Fuel Utilization Efficiency (AFUE) rating of heating equipment shall not be less than that specified in other Sections of this Division.
9. The Seasonal Energy Efficiency Rating (SEER) of cooling equipment shall not be less than that specified in other Sections of this Division.
10. Locate all ductwork within the thermal boundary. Do not locate ductwork in attics unless within the thermal boundary.
11. Properly seal all joints and seams in ductwork against air leakage as specified in other Sections of this Division.

12. Alternate space heating methods, for example, electric resistance heat, are not permitted unless approved in writing by the OHCD/PHDC/RDA. In such cases where approval is sought, follow protocol for submitting required information to OHCD/PHDC/RDA as specified in other Sections of this Division.
13. All systems shall be tested and balanced to verify proper operation in accordance with Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.

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

1. Verify all existing site conditions prior to commencing work.
2. Provide required clearances around equipment as specified in other Sections of this Division.
3. Install all equipment to be level and plumb.
4. Seal off unused chimneys. Demolish and cap or repair and make sound deteriorated portions.
5. Clean heating and cooling systems equipment and distribution system in accordance with requirements specified in other Sections of this Division.

END OF DOCUMENT

SECTION 23 05 93 - TESTING, ADJUSTING AND BALANCING FOR HVAC

A. SUMMARY

1. Section Includes:
   a. Testing and adjusting ducted air system.
   b. Testing and verification of air conditioning system airflow and refrigerant charge.
   c. Testing and adjusting hydronic systems.
2. Sustainable Design: Comply with Division 01 Section “Sustainable Design Requirements.
3. Applicability:
   a. All furnaces, air conditioners, and ducted air distribution systems.
   b. All boilers and hydronic piping distribution systems.
4. Qualified testers - testing contractor shall be a company experienced in adjusting air distribution systems, commissioning air conditioning equipment, and adjusting hydronic systems to suit installed systems.

B. RELATED REQUIREMENTS

1. Section 07 97 00 - Blower Door Air Leakage Testing
2. Section 23 30 00 - HVAC Air Distribution.
3. Section 23 21 13 - Hydronic Piping.
4. Section 23 50 00 - Central Heating System Requirements.
5. Section 23 52 16 - Heating Boilers.
6. Section 23 54 00 - Furnaces.
7. Section 23 81 26 Split System Air Conditioners

C. SUBMITTALS

1. Required information -
   a. Upon completion of work, testing and adjusting reports shall be submitted to OHCD/PHDC/RDA in specified format, with identifying label on cover. Each report shall be signed by the technician(s) who performed the test. The reports are (1) certified proof that the systems have been tested and adjusted in accordance with the referenced standards; (2) an accurate representation of how the systems have been installed and are operating; and (3) an accurate record of all final quantities measured to establish normal operating values of the systems.
   b. Include set of reduced drawings with supply air outlets, return air inlets, and equipment identified to correspond with data sheets, and indicating thermostat locations. If information is incomplete or further testing and adjusting is deemed necessary, submit final complete report after those further steps have been taken.
2. Format:

a. Bind report forms in letter sized folder, or three-ring binder, or portfolio binders. Label on front cover shall include the title HVAC Testing and Ajusting Report and the name and address of the property.

b. Title Page:

1) Testing company name, address and telephone number, Name, signature, and registration number of each technician performing test, Property name and location, Project Architect, Project Contact, or OHCD/PHDC/RDA Inspector, Date of report, and testing methods used for each test. Identify Airflow test method (Static Pressure or Temperature Split), and refrigerant charge adjustment method (Subcooling test or Weigh-in).

c. Instrument List:

1) Type of instrument

2) Manufacturer

3) Model

4) Range

d. Fully completed City of Philadelphia “Air Conditioning Commissioning Report” form (if applicable), including:

1) System Description showing manufacturer, model number, serial number and installation dates for Air Handler/Evaporator and for outside condensing units.

2) System Airflow Requirements, including Manufacturer, Model Number of AC and Air Handler/Furnace unit, Rated Capacity, Load calculations as specified in Section 23 52 16 and Section 23 54 00, Targeted System Airflow at 450 cfm per ton (as determined by load calculations), Estimated System Airflow per manufacturer’s data in cooling and heating modes, difference between targeted and estimated airflow.

3) Verification of proper airflow, using Static Pressure method or Temperature Split method.

4) System Charging Verification Test, using Subcooling method (if ambient temperature is above manufacturer-specified minimum), otherwise Weigh-in method.

5) The following required information:

a) Name and address of development

b) Name of General Contractor

c) Name and phone number of company employing the technician(s)who commissioned the system

d) Name(s) of technician(s) commissioning the system (on each form) and certification of results by same.

D. TESTING AND ADJUSTING DUCTED AIR SYSTEM

1. Examination:

a. Before commencing work, verify that systems are complete and operable. Ensure the following:

1) Equipment is operable and in a safe and normal condition.

2) Temperature control systems are installed complete and operable.
3) Proper thermal overload protection is in place for electrical equipment.
4) Final filters are clean and in place (if required, install temporary media in addition to final filters).
5) Duct systems are clean of debris.
6) Fan rotation is correct.
7) Fire and volume dampers are in place and open.
8) Coil fins have been cleaned and combed.
9) Access doors are closed and duct end caps are in place
10) Air outlets are installed and connected.
11) Duct system leakage has been minimized.

b. Report any defects or deficiencies noted during performance of services to Architect/Engineer and to OHCD/PHDC/RDA.
c. Promptly report abnormal conditions in mechanical systems or conditions which prevent system balance.
d. If, for design reasons, system cannot be properly balanced, report as soon as observed. Beginning of work means acceptance of existing conditions.

2. Preparation: Provide instruments required for testing and adjusting operations. Make instruments available to Architect/Engineer and to OHCD/PHDC/RD to facilitate spot checks during testing.
3. Air system testing procedure:
   a. Test system with blower in Cooling or “Fan ON” mode.
   b. Measure air quantities at furnace supply and return duct. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct. Adjust furnace and duct system to operate with supply and return air volumes required by system design.
   c. Adjust air handling and distribution systems to provide uniform space temperatures free from objectionable drafts and noise.
   d. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters. Adjust furnace and duct system to operate with pressure drop required by system design.
4. Recording:
   a. Recorded data shall represent actually measured or observed condition.
   b. Record results on Report form approved by OHCD/PHDC/RDA.
   c. Provide system schematic with required and actual air quantities recorded at furnace.
5. Final Steps:
   a. Permanently mark settings of dampers and other adjustment devices, allowing settings to be restored. Set and lock stops.

b. Leave systems in proper working order, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

c. At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by OHCD/PHDC/RDA.

E. AIR CONDITIONING SYSTEM COMMISSIONING STEP 1 - VERIFICATION OF AIRFLOW THROUGH INDOOR COIL

F. General:

1. Measured airflow over the indoor coil should be (a) as indicated in the manufacturer's installation literature, or (b) the equivalent of 400 to 450 cfm per ton for a wet coil (condensation on coil) or 425 to 475 cfm per ton for a dry coil. "Targeted Airflow" on the Commissioning Report form is defined as 450 cfm per ton. Indoor coil airflow must always be measured after any duct and plenum sealing has been completed.

2. Examination: Same as ducted air system above.

3. Preparation: Same as ducted air system above.

4. Test Methods:

   a. Static Pressure.

   b. Temperature Split.

5. Choice of Method:

   a. The Air Conditioner Commissioning Report form assumes use of the Static Pressure method. This default test is unreliable, however, unless ducts near the air handler are fairly straight. If there are sharp bends or dead ends in the duct work, it is recommended that the Temperature Split method be used to verify that the system is producing proper airflow across the coil. A supplemental form is available for recording Temperature Split method results.

6. Static Pressure method:

   a. Required equipment:

      1) Digital or analog manometer

      2) Static pressure probe or pitot tube

      3) Drill and bits

      4) Screw or nut drivers

   b. Procedure:

      1) Using drill, make hole to gain access to both sides of the coil and air handler. Attach static pressure probes to tubes leading to the ports on the manometer. For analog manometers, attach the high side port to the probe inserted downstream of the coil or air handler. Consult manufacturer's literature for a table relating static pressure difference to airflow. Find airflow for the static pressure measured above.

      2) If estimated airflow is less than the minimum flow specified in the manufacturer's installation literature (or 400 cfm per ton wet coil / 425 cfm per ton dry coil),

installer must increase flow by eliminating restrictions in the duct system, increasing blower speed, or opening registers. After adjustment, re-measure.

3) On Air Conditioning Commissioning Report form, record adjustments made, final results, and if target airflow could not be achieved, document reason.

7. Temperature Split Method:
   a. Background:
      1) With this method, the air temperature drop across the cooling coil is compared to a reference value read from a table. This drop is called the “temperature split.” The Actual Temperature Split is the difference between the dry bulb temperature in the return (entering the evaporator) and the dry bulb temperature in the supply (leaving the evaporator).
      2) The Target Temperature Split depends on return air wet-bulb temperature and return air dry-bulb temperature.
   b. Instrumentation:
      1) Digital thermometer with thermocouple compatibility (type K and J) and Celsius or Fahrenheit readout;
         a) Accuracy: ±(0.1% of reading + 1.3º F),
         b) Resolution: 0.2º F to 1.0º F.
      2) Thermocouples: five heavy-duty beaded low-mass wire thermocouples and one cotton wick for measuring web-bulb temperatures.
      3) Standard multipoint refrigerant manifold gauge set.
   c. Procedure:
      1) This procedure may be used only when the outdoor temperature is 55° F or higher. The HVAC system must first be installed and charged in accordance with the manufacturer’s specifications.
         a) Calculate the Actual Temperature Split as the return air dry-bulb temperature minus the supply air dry-bulb temperature. Actual Temperature Split = ($T_{return, db}$)- ($T_{supply, db}$)
         b) Determine the Target Temperature Split from the table on the back of the supple-mental form, using the return air wet-bulb temperature ($T_{return, wb}$)and return air dry-bulb temperature ($T_{return, db}$).
         c) Calculate the difference between target and actual temperature split (Actual Temper-ature Split minus Target Temperature Split).
            (1) If the difference is within plus 3 degrees F and minus 3 degrees F, then airflow is adequate.
            (2) If the difference is greater than plus 3 degrees F, then airflow is insufficient; installer must increase flow by eliminating restrictions in the duct system, increasing blower speed, or opening registers. After corrective measures are taken, repeat measurement procedure as often as necessary to establish adequate airflow range. Allow system to stabilize for 15 minutes before repeating measurement procedure.

(3) If the difference is between minus 3 degrees F and minus 25 degrees F, repeat the measure-ment procedure - making sure that temperatures are measured at the center of the airflow.

(4) If the re-measured difference is between plus 3 degrees F and minus 3 degrees F, system airflow is acceptable. If the re-measured difference is between minus 3 degrees F and minus 25 degrees F, the system passes - but it is likely that capacity is low (it is also possible, though unlikely, that airflow is higher than average).

d) On Air Conditioning Commissioning Report form, record adjustments made, final results, and - if target airflow could not be achieved - why not.

G. AIR CONDITIONING SYSTEM COMMISSIONING STEP 2 - VERIFICATION OF REFRIGERANT CHARGE

1. Examination: Same as ducted air system above.
2. Preparation: Same as ducted air system above.
3. Test methods:
   a. Subcooling method
   b. Weigh-in method
4. Choice of method:
   a. Although the Subcooling method provides the most accurate verification of refrigerant charge in a TXV-equipped system, at ambient temperatures below a manufacturer-specified minimum (typically 75° - 80° F) it requires calibrated partial blocking of the condenser's airflow to simulate design temperatures. Accordingly, the Weigh-in method is approved for use in cooler weather. The Weigh-in method assumes that the compressor unit has been delivered with the correct factory charge and adjusts refrigerant quantity by formula to account for variations in the line length between the compressor unit and indoor coil.
5. Subcooling method:
   a. Background:
      1) Subcooling is the heat removed from the refrigerant after it has changed to a liquid. Modern condensing units are designed to obtain their capacities and efficiencies at a at a given subcooling value. Any variance from the design subcooling will reduce capacity and efficiency. Note that the "evaporator superheat" method is accurate only for capillary coils and those having a fixed orifice; it may not be used with PHDC/RDA approved systems.
   b. Instrumentation and equipment:
      1) Refrigerant manifold gauge set Contact digital thermometer, accurate to tolerances specified for Verification of Airflow Through Indoor Coil, with auxiliary devices as needed to establish good contact for the thermometer probe DOT-approved recovery cylinder.
   c. Setup:
      1) Before the test is performed, proper airflow across the coil must be verified by static-pressure or temperature-split method.

2) Air conditioner should be running for 10 minutes prior to the test.

d. Procedure:

1) Test must be performed when outside temperature is above minimum set by manufacturer (or, absent such guidelines, 80° F).
2) Follow the manufacturer's guidelines for the test. If they are not available, follow the instructions below.
3) Measure the compressor discharge pressure. Convert this pressure to the condensing temperature, using temperature-pressure table for the system's refrigerant. Or, simply measure the surface temperature of a protruding loop of tubing in the center of the condenser between that section's inlet and outlet.
4) Measure the temperature of the liquid refrigerant leaving the condenser.
5) Subtract the liquid-refrigerant temperature from the condensing temperature. This is the subcooling temperature.
6) Find the correct subcooling temperature from the permanent sticker inside the condenser unit, from manufacturer's literature or from a manufacturer's slide rule.
7) Add refrigerant if the measured subcooling temperature is lower than recommended. Subtract refrigerant if the subcooling temperature is higher than recommended. Refrigerant must be removed into an empty DOT-approved recovery cylinder or one containing the same refrigerant being removed.
8) Allow the system to run for 10 minutes to adjust to the new operating conditions. Repeat the test until the results match the manufacturer's recommendations.

e. Recording:

1) Record the results of this test on Furnace/Air Conditioning Commissioning Report - Subcooling Attachment form. Each unit must be tested and reported.

6. Weigh-in Method:

a. Instrumentation and equipment:

1) Electronic scale for accurate measurement of refrigerant added or removed.
2) Tape measure
3) Vernier caliper
4) Refrigerant of the type used in the system to be adjusted.
5) DOT-approved recovery cylinder.

b. Procedure:

1) All lengths and quantities mentioned below are to be recorded on Furnace/Air Conditioning Commissioning Report form.
2) Measure and record total feet of line set at site (one way) between compressor unit and indoor coil.
3) Record length of line set included with factory charge.
4) Subtract record length of line from the measured total fee of line installed. Record difference. This is the Line Set Adjustment.
5) Measure the outside diameters of suction and liquid lines. Circle the appropriate row in Charging Data table on reverse of form. Record the Rated Line Set Charge in ounces per foot.

6) Multiply the line set adjustment by the rated line set charge. Record the resulting Charge Adjustment.
7) If the charge adjustment is negative, remove the indicated quantity of refrigerant to the recovery cylinder. If it is positive, add the indicated quantity of refrigerant to the unit.

H. TESTING AND ADJUSTING HYDRONIC SYSTEMS

1. Prepare test reports with pertinent design data, and number in sequence starting at pump to end of system. Check the sum of branch-circuit flows against the approved pump flow rate. Correct variations that exceed plus or minus 5 percent.
2. Prepare schematic diagrams of systems' "as-built" piping layouts.
3. Prepare hydronic systems for testing and balancing according to the following, in addition to the general preparation procedures specified above:
   a. Open all manual valves for maximum flow.
   b. Check liquid level in expansion tank.
   c. Check makeup water-station pressure gage for adequate pressure for highest vent.
   d. Check flow-control valves for specified sequence of operation, and set at indicated flow.
   e. Set differential-pressure control valves at the specified differential pressure. Do not set at fully closed position when pump is positive-displacement type unless several terminal valves are kept open.
   f. Set system controls so automatic valves are wide open to heat exchangers.
   g. Check pump-motor load. If motor is overloaded, throttle main flow-balancing device so motor nameplate rating is not exceeded.
   h. Check air vents for a forceful liquid flow exiting from vents when manually operated.
4. Measure water flow at pumps. Use the following procedures except for positive-displacement pumps:
   a. Verify impeller size by operating the pump with the discharge valve closed. Read pressure differential across the pump. Convert pressure to head and correct for differences in gage heights. Note the point on manufacturer's pump curve at zero flow and verify that the pump has the intended impeller size.
      1) If impeller sizes must be adjusted to achieve pump performance, obtain approval from Owner and comply with requirements in Section 232123 "Hydronic Pumps."
   b. Check system resistance. With all valves open, read pressure differential across the pump and mark pump manufacturer's head-capacity curve. Adjust pump discharge valve until indicated water flow is achieved. Monitor motor performance during procedures and do not operate motors in overload conditions.
   c. Verify pump-motor brake horsepower. Calculate the intended brake horsepower for the system based on pump manufacturer's performance data. Compare calculated brake horsepower with nameplate data on the pump motor. Report conditions where actual amperage exceeds motor nameplate amperage.
   d. Report flow rates that are not within plus or minus 10 percent of design.

5. Measure flow at all automatic flow control valves to verify that valves are functioning as designed.
6. Measure flow at all pressure-independent characterized control valves, with valves in fully open position, to verify that valves are functioning as designed.
7. Set calibrated balancing valves, if installed, at calculated presettings.
8. Measure flow at all stations and adjust, where necessary, to obtain first balance. System components that have Cv rating or an accurately cataloged flow-pressure-drop relationship may be used as a flow-indicating device.
9. Measure flow at main balancing station and set main balancing device to achieve flow that is 5 percent greater than indicated flow.
10. Adjust balancing stations to within specified tolerances of indicated flow rate as follows:
    a. Determine the balancing station with the highest percentage over indicated flow.
    b. Adjust each station in turn, beginning with the station with the highest percentage over indicated flow and proceeding to the station with the lowest percentage over indicated flow.
    c. Record settings and mark balancing devices.
11. Measure pump flow rate and make final measurements of pump amperage, voltage, rpm, pump heads, and systems' pressures and temperatures including outdoor-air temperature.
12. Measure the differential-pressure-control-valve settings existing at the conclusion of balancing.
13. Check settings and operation of each safety valve. Record settings.

END OF SECTION

SECTION 23 11 23 - FACILITY NATURAL-GAS PIPING

A. SUMMARY

1. Section Includes:
   a. Natural gas piping and accessories.

B. QUALITY ASSURANCE

1. Materials and installation shall comply with the International Fuel Gas Code.
2. Minimum Operating-Pressure Ratings: Piping and Valves: 150 psig.

C. MATERIALS

1. Steel Pipe: ASTM A 53/A 53M, black steel, Schedule 40.
2. Malleable-Iron Threaded Fittings: ASME B16.3, Class 150, as approved by Philadelphia Gas Works.
3. Appliance Flexible Connectors: Comply with ANSI Z21.24, as approved by Philadelphia Gas Works. Maximum Length: 72 inches.
   a. Flexible connectors are not permitted for connection to furnaces, boilers, and water heaters.
4. Gas shutoff valves: Comply with ASME B16.33, threaded ends.
5. Corrugated stainless steel tubing and fittings as approved by Philadelphia Gas Works.

D. Execution:

1. Arrange for gas service and meter with Philadelphia Gas Works.
2. Size new service in accordance with Philadelphia Gas Works recommendations for gas equipment consumption and length of run.
3. Install drip leg, union, and shutoff valve near each appliance.
4. Provide shut-off valve at meter.
5. Extend relief vent connection for service regulator and terminate with weatherproof vent cap.
6. Support piping at intervals used in standard engineering practice.
7. Test piping and appliance connections for leaks in accordance with Philadelphia Gas Works requirements.

END OF SECTION

SECTION 23 21 13 - HYDRONIC PIPING

A. SUMMARY

1. Hydronic piping, valves, and piping accessories
2. Radiation units.
3. Sustainable Design: Comply with Division 01 Section “Sustainable Design Requirements.”

B. REFERENCES

1. Air Conditioning Contractors of America:
   a. ACCA Manual J - "Manual J Residential Load Calculation."
2. Reference: Builder’s Guide to Mixed and Humid Climates, Joseph Lstiburek, Ph.D., PE, Building Science Corporation, c. 2005

C. DESIGN DATA

1. Supply Temperature: 200 degrees F.
2. Return Temperature: 180 degrees F.
3. Flowing Velocity: 3 feet/second.
4. Radiation Sizing: By room to accommodate heat loss from room.

D. SUBMITTALS

1. Product Data: Submit data indicating radiation capacities.
2. Design Calculation: Submit heat loss calculations showing environmental design conditions and required radiation by room.

E. PIPING MATERIALS:

1. Piping: ASTM B88, Type L, hard or soft drawn tubing.
   a. Fittings: Wrought or cast copper.
   b. Joints: Soldered.
2. Solder: 95/5 lead-free type.
3. Valves: 125# rated brass.
   a. Shut-Off Valves: Ball type.
   b. Other Valves: Globe, ball, or gate type.
4. Unions: Cast copper to copper, metal seat.
   a. Dielectric Unions: Use to separate all ferrous and non-ferrous metals in the system.
   b. Pipe Supports: Type recommended by piping manufacturer to suit application.
5. Vents:
   a. Accessible Vents: Manual type.

b. Inaccessible Vents: Automatic type with vent pipe routed to readily visible receptacle for inspection.

6. Insulation: 5/8-inch thick closed-cell polyethylene foam.

F. RADIATION UNITS:

1. Baseboard: IBR rated, with 3/4 inch copper tubing, 1-1/2 x 2-1/4 inch aluminum element.
   a. Output Rating: 640 BTUH per foot at 190 degrees F average water temperature.
   b. Flow Rate: Based on 20 degree F temperature drop.
   c. Cover: Continuous type with adjustable damper for full length of wall where radiation is installed
   d. Fittings and Accessories: As required for complete installation.

G. EXECUTION

1. Install drain valves at each system low point.
2. Install strainer before each control valve, orifice, and trap.
3. Install thermometers on inlet and outlet of boiler and at each heating zone.
4. Install pressure gauges on inlet and outlet of each pump, strainer, and control valve.
5. Install vacuum breaker to automatically drain the system.
6. Install dielectric unions to separate dissimilar piping materials when connecting new piping to existing piping.
   a. Remove fitting joining dissimilar piping materials within existing piping system and install dielectric unions to join dissimilar piping system materials.
7. Provide expansion tank to prevent significant changes in system pressure caused by expansion and contraction of fluids due to temperature changes.
8. Provide water makeup system to automatically feed water to the system at a preset pressure using an approved reduced pressure backflow preventer, certified for service and acceptable to the authority having jurisdiction.
9. Provide expansion compensation for the system in the form of expansion loops, or joints.
10. Provide escutcheons on each side of wall or floor to provide a finished appearance when penetration is exposed in finished construction.
11. Clean pipe system to remove trash, mill scale, cutting oil, and splatter from the piping before control devices are installed.
12. Perform hydrostatic testing at 1.5 times operating pressure, but no less than 125 psi.
    a. Test pipe and fittings before insulation or other covering is applied.
    b. Hold test pressure for two hours with no drop in pressure.
13. Install insulation after testing on all piping, fittings and valves, whether exposed or not.
    a. Wrap and tape fittings (ells, tees, and valves) with foil tape.
    b. Seal and tape joints.

14. Balance system in accordance with ASHRAE recommended procedures.
15. Provide control circuits for the following:
    a. Automatic circulator pump operation on opening of any zone control valve.
    b. Automatic boiler operation based on ambient temperature below 60 degrees F.
    c. Interlock with air conditioning system to prevent simultaneous heating and cooling operation.
    d. Three way zone control valve, bypass balance valve, and circuit balancing valve for each heating circuit.
16. Provide valved 1/2 inch bleeder line installed between supply and return header to prevent deadheading of circulator pump when all zone valves are closed.
17. Provide calibrated balancing valves for major branch takeoffs and every heat using circuit.

END OF SECTION

SECTION 23 30 00 - HVAC AIR DISTRIBUTION

A. SUMMARY

1. Section Includes:
   a. Metal ductwork.
   b. Flexible ductwork.
   c. Supply air outlets.
   d. Return air inlets.
2. Sustainable Design: Comply with Division 01 Section “Sustainable Design Requirements.

B. RELATED REQUIREMENTS

1. “Duct Manual and Sheet Metal Construction for Ventilation and Air Conditioning" - Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA)
2. “Manual D, Residential Duct Systems” - Air Conditioning Contractors of America (ACCA).

C. PERFORMANCE REQUIREMENTS

1. Duct Sealing: Seal installed ductwork in accordance with IECC to minimize air leakage within duct system.

D. SUBMITTALS

1. Submit ductwork layout drawing showing duct routing, duct sizes, and air flow at each outlet and inlet, and outlet and inlet sizes.

E. PRODUCTS

1. All ductwork, plenums, casings, construction and erection methods, including metal gauges, reinforcing, fittings, connections, access doors, and all other accessories shall be in accordance with Section 1 and 2 of the SMACNA Duct Manual.
2. Metal Ductwork: Galvanized steel of gauges noted in SMACNA manual.
3. Flexible Ductwork. Flex duct may be permitted for branch runs of less 8 feet serving a single register when approved in writing by OHCD/PHDC/RDA.
4. Supply Air Outlets: Formed metal with volume adjustment damper, factory finish painted.
5. Return Air Inlets: Formed metal, factory finish painted.
6. Insulation: Free of asbestos, lead, mercury, or mercury compounds
   a. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin and factory-applied ASJ or FSK facing. Comply with ASTM C 553, Type II and ASTM C 1290.
   b. Mineral-Fiber Board Insulation: Mineral or glass fibers bonded with a thermosetting resin and factory-applied ASJ or FSK facing. Comply with ASTM C 612, Type IA or Type IB.

c. Adhesives, Tapes, Sealants and Mastics: Manufacturer's recommended type, compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated.

F. SUPPLY SYSTEM

1. Ductwork: Arrange trunks and branch runs as short and compact as possible. Arrange ductwork so all ductwork is installed on inside the building thermal boundary.
2. Supply Air Outlets:
   a. Ground Floor: Locate low on the wall.
   b. Upper Floors: Locate high on the wall.
   c. Locate at exterior wall below windows.
      1) When windows conform to thermal performance requirements of Section 08 50 00, supply air outlets may be located high on the interior wall opposite windows, arranged to direct airflow across ceiling and down the exterior wall.
3. System Pressure Drop: Maximum 0.2 inch w.c. per 100 equivalent feet of run.
4. Maximum Velocity: 600 feet per minute.
5. Ductwork Sizing: Size branch runs for airflow required by the heating and cooling load calculated for each room as specified in Section 23 52 00 and Section 23 81 26. As an alternative to duct system engineered in accordance with ACCA Manual D, ducts may be sized according to the following table.

Air Flow (cfm)	Round Duct (inches)	Rectangular Duct (inches)
0 - 65	5	6 x 3.5
66 - 110	6	10 x 3.5, 8 x 4, 6 x 5
111 - 160	7	14 x 3.5, 12 x 4, 8 x 6
161 - 230	8	18 x 3.5, 16 x 4, 10 x 6, 8 x 8
231 - 410	10	26 x 4, 16 x 6, 12 x 8, 10 x 10
411 - 650	12	24 x 6, 16, x 8, 12 x 10
651 - 1000	14	32 x 6, 22 x 8, 16 x 10, 14 x 12
1001 - 1400	16	30 x 8, 22 x 10, 18 x 12, 16 x 14

G. RETURN SYSTEM

1. Return Air Inlets: Locate return air inlets in a central area communicating directly with all closable rooms
   a. One- and two-story units. Install a single non-closing inlet low on the walls.
      1) In a two-story unit, locate inlet on the lower floor.
   b. Three- and four-story units. Install two non-closing inlets, one low on a ground floor wall and one high on a top-floor wall.
2. Ductwork:
   a. Provide ducted return system, except as noted below.
   b. Seal ducted return system joints with mastic.

c. Cavity Returns - General: Joist panning is permitted where the joist cavity is exposed (e.g. unfinished basement). Seal throughout, including all joints, corners and penetrations.
   1) Cavity returns are permitted only when approved in writing by OHCD/PHDC/RDA, and only when LEED compliance is not required.
   2) Cavities must be fully metal panned, sealed and functional for inspection before drywall is installed.
   3) After drywall is installed, pressure test when required by OHCD/PHDC/RDA to prove seal. Perform test with air handler fan running. Pressure shall not be more than 1 Pascal or 3 inches w.c. greater than atmospheric pressure in framing cavities adjacent to the ducted section and in the mechanical room itself.

d. Wood Framed Return Plenums: May be used with return air inlets to permit air egress from closed rooms to central return. Subject to the same sealing and testing requirements specified for special case cavity returns, other return plenums may also be wood-framed.
   a) Wood framed plenum returns are permitted only when approved in writing by OHCD/PHDC/RDA.

e. Filter retainer: Provide with hinged galvanized closure or install inside fan compartment.

3. Duct Cross-Section:
   a. The net free area of each return grille and the cross sectional area of each return duct shall not be less than either (a) 90% of the cumulative cross-sectional areas of the supply ducts, or (b) 24 sq. inches for each 100 cfm of supply air.

H. RETURN AIR EGRESS FROM ROOMS

1. Provide room supplied with conditioned air with a non-closable means for air egress. Comply with one of the following:
   a. Prescribed Area Method: Provide transfer grilles or ducts which - in combination with an optional door undercut not more than 3/4" - have a minimum total cross-section at least twice the supply duct area. (Example: for a bedroom served by one 5-inch round supply duct, the Air Egress Area shall be at least 39.3 sq. inches. Maximum allowable door undercut provides 22 sq. inches.) For bathrooms only, when approved in writing by OHCD/PHDC/RDA, a door grille or 1-5/8" door undercut may be used instead of the through-wall or ducted transfer grille described below.
   b. Performance Test: With doors closed, air handler shall not pressurize the room more than 3 Pascals (0.01 inches w.c.) relative to the area containing the main return register; air flow measured at the supply register shall not decrease by more than 10 percent. Total airflow may not be less than the cfm calculated for the room and shown on the duct plan.

2. Configuration of transfer duct/grilles (required except for bathrooms):
   a. Through wall (preferred method):
      1) Prefabricated Unit: Through-wall pressure relief vent with sound-absorbent baffle. Use 4 X 12-inch size for rooms with a single 5-inch round or 3.5 X 6-inch

rectangular duct. Use 4 X 24-inch size for rooms with duct cross-sectional area up to 48 sq. inches.

2) Site-Built Unit: Offset grilles connected through wall. Utilize wood stud cavity, or box in steel framing with wood 2x lumber. Use sealed 2x blocking or batt-in-plastic bag pillow to block off remainder of stud cavity within 6 inches of grille openings. Offset room- and hallway-side grilles by 2 to 3 feet between openings and seal to drywall. Sealant must be visible to inspector upon removal of grille. Where wall configuration does not permit offset as described, place grilles above door with fixed uni-directional vanes oriented upward to minimize light transmission.

b. Ducted: For other than through-wall above, use galvanized steel. Do not run in exterior walls or outside thermal boundary.

I. INSTALLATION - GENERAL

1. Install ductwork in accordance with NFPA 90-B.
   a. Install ductwork within thermal boundary of each residential unit.
   b. Install ductwork to avoid branch runs within exterior walls.
      1) When unavoidable, provide clearance to permit continuous un-compressed building thermal insulation on the cold side of the duct as specified in Section 07 20 00.
2. Install balancing dampers near takeoff in all accessible supply runs. Dampers are not required in engineered systems.
3. Return damper in air-conditioned, three- and four-story units - Provide (labeled) damper to switch between upper and lower return. Label shall indicate “Position for air conditioning”(lower return closed) and “Position for heating” (upper return closed).
4. Install ductwork concealed from view in completed construction.
   a. Exposed ducts are permitted in basements and furnace rooms only.
5. Secure tight fitting joints in ductwork with two screws spaced 120 degrees apart. Provide additional screws to eliminate possibility of damage to seal by joint movement before close-in.
6. Sealing of ductwork:
   a. Seal supply and return ductwork with mastic at all joints and gaps, including joist panning, plenum connections, and register boots.
   b. Embed fiberglass mesh tape in mastic if joint rotation is possible or joint opening exceeds 1/8 inch.
7. Install combustion air transfer grilles as required by National Fuel Gas Code.
8. Install supply air outlets and return air inlets at duct openings.

J. LEAKAGE TESTING

1. Verify leakage performance when ductwork is installed outside the thermal boundary of the conditioned space with duct blaster or other OHCD/PHDC/RDA approved method. Ductwork installed inside the thermal boundary need not be tested.

2. Comply with SMACNA's "HVAC Air Duct Leakage Test Manual" before ducts are concealed by other construction. Submit a test report for each test as specified in Section 23 05 93.
3. Ducts with a Pressure Class Higher Than 3-Inch wg: Test representative duct sections totaling no less than 25 percent of total installed duct area for each designated pressure class.

K. CLEANING

1. Comply with NADCA ACR 2006.
2. Remove visible surface contaminants and deposits from within the HVAC system.
3. Systems and Components to Be Cleaned: All air devices for supply and return air, air-terminal units, ductwork, air-handling units, filters and filter housings.
4. Collect debris removed during cleaning. Ensure that debris is not dispersed outside the HVAC system during the cleaning process. For particulate collection equipment, include adequate filtration to contain debris removed. Locate equipment downwind and away from all air intakes and other points of entry into the building.
   a. Use HEPA filtration with 99.97 percent collection efficiency for particles sized 0.3 micrometer or larger where the particulate collection equipment is exhausting inside the building,
   b. Control odors and mist vapors during the cleaning and restoration process. Debris removed from the HVAC system shall be disposed of according to applicable Federal, state, and local requirements.
5. Restore and repair HVAC air-distribution equipment, ducts, plenums, and components after cleaning is completed.

L. INSULATION INSTALLATION

1. Install insulation materials in accordance with manufacturer’s installation instructions.
2. Insulate ductwork with minimum R-6 insulation in unheated basements and minimum r-12 insulation in attics.
3. Insulate ductwork for air conditioning systems with 1-1/2 inch thick insulation.
4. Tape and seal joints in vapor retarder facings and jackets to prevent condensation within insulation and on ductwork.

M. COMMISSIONING

1. After construction, HVAC installer or third-party air balancer must balance the system and verify that air flow at each supply air outlet equals the planned flow plus or minus no more than 10 percent.
   a. Balance system in heating mode.
   b. Balance system in cooling mode when air conditioning is provided as part of the Work.

2. Balance each unit and submit balancing report to OHCD/PHDC/RDA on approved form in accordance with the instructions in Section 23 05 93.

END OF SECTION

SECTION 23 35 00 - EXHAUST SYSTEMS

A. SUMMARY

1. Section Includes:
   a. Ducted kitchen range hood.
   b. Duct for owner-installed clothes dryer.
   c. Whole-house ventilation system.
   d. Bath exhaust fan.
2. Sustainable Design: Comply with Division 01 Section “Sustainable Design Requirements.

B. RELATED REQUIREMENTS

1. Section 23 30 00 - HVAC Air Distribution.

C. KITCHEN RANGE HOOD

1. Ratings: 180 cfm minimum; 4.5 sones maximum sound rating.
2. Housing Construction: Steel, primed and finish painted in color selected by Owner.
3. Fan/Motor Assembly; Two speed; resiliently mounted to housing.
4. Air Inlet: Protect with removable, washable aluminum filters.
5. Work Area Light: Protected with removable lens.
6. Controls: Separate built-in switches for fan and light.
7. Vent Cap: Weatherproof, painted galvanized steel or plastic roof or wall cap.

D. MICROWAVE OVEN OVER THE RANGE

1. Vent Cap: Weatherproof, painted galvanized steel or plastic roof or wall cap.

E. CLOTHES DRYER VENT

1. Vent: 4 inch diameter, UL Listed, rigid steel type.
2. Vent Cap: Weatherproof, painted galvanized steel or plastic roof or wall cap with integral backdraft damper.

F. WHOLE-HOUSE VENTILATION SYSTEM

1. Ratings: Continuous duty, single speed fan, with a permanent split capacitor motor, maximum 1.5 sones as rated by the Home Ventilating Institute.
2. Fan Capacity: Determined by number of bedrooms in unit::
   a. 1 to 3 bedrooms: 50 cfm.
   b. 4 bedrooms: 90 cfm.
   c. 5 or more bedrooms: 110 cfm.
3. Fan Assembly:

a. Housing: Steel, lined with acoustical insulation.
b. Fan: Centrifugal type, steel construction mounted directly on and secured to motor shaft using steel set screw. Connect fan shroud, motor and wheel assembly to housing using rubber-in-shear isolators, removable for service.
c. Discharge: Include integral backdraft damper.
d. Grille: Manufacturer's standard with flange attachment to housing; factory painted finish.

4. Controls: Control fan by (1) by the bathroom light switch (or adjacent crank timer) and (2) by a clearly labeled switch mounted in basement or furnace room, near furnace safety switch.

Sam - we should discuss this (whole house ventilation using bath fans) tomorrow. I don't understand the point of this. I believe it was included to alleviate the "sick house" issue of houses being too tight but I think with the blower door requirements we can make better educated use of this - in most homes, esp. moderate rehabs, this simply wastes energy. Response: Do you wish to eliminate the whole house ventilation option in favor of simple 50 cfm bath exhaust for each bathroom?

a. Mark "Off" position of basement switch “SUMMER ONLY.”
b. When basement switch is on, fan runs continuously.
c. When basement switch is off, fan runs only when bathroom light (or crank timer) is on.

5. Vent Cap: Weatherproof, painted galvanized steel or plastic roof or wall cap.

G. BATH EXHAUST FAN

1. Ratings: Continuous duty, single speed fan, with a permanent split capacitor motor, maximum 1.5 sones as rated by the Home Ventilating Institute.
2. Fan Capacity: 50 cfm, minimum.
3. Fan Assembly:
   a. Housing: Steel, lined with acoustical insulation.
   b. Fan: Centrifugal type, steel construction mounted directly on and secured to motor shaft using steel set screw. Connect fan shroud, motor and wheel assembly to housing using rubber-in-shear isolators, removable for service.
   c. Discharge: Include integral backdraft damper for connection to duct to exterior, unless recirculating type is approved in writing by OHCD/PHDC/RDA.
   d. Grille: Manufacturer's standard with flange attachment to housing; factory painted finish.
4. Controls: Control fan by (1) by the bathroom light switch (or adjacent crank timer).
5. Vent Cap: Weatherproof, painted galvanized steel or plastic roof or wall cap.

H. INSTALLATION

1. Install exhaust systems in accordance with NFPA 90-B, duct requirements specified in section 23 30 00 and manufacturer's instructions.

   a. Install exhaust systems using shortest path to exterior with minimum number off elbows.
   b. Connect exhaust systems to vent cap on roof or exterior wall. Seal vent cap to prevent air infiltration and water intrusion to building interior.
2. Kitchen Range Hood:
   a. Install kitchen range hood ducted to exterior using Schedule 40 PVC or metal ductwork.
3. Clothes Dryer Vent:
   a. Install clothes dryer vent from dryer location near required 20-amp receptacle in basement or laundry area as indicated or as directed by Inspector.
4. Whole-House Ventilation System:
   a. Install whole-house ventilation system, unless Building Performance Institute (BPI) auditor determines it is not necessary.
   b. Install fan in bathroom ceiling ducted to exterior using Schedule 40 PVC or metal ductwork sized to match fan discharge diameter.
   c. Seal ductwork joints air tight.
   d. Slope horizontal runs in unheated spaces toward discharge and seal to wall cap forming air tight and watertight joint.
5. Bath Exhaust Fan:
   a. Install bath exhaust fan in each bathroom when whole house ventilation system is not installed.
   b. Install fan in bathroom ceiling ducted to exterior using Schedule 40 PVC or metal ductwork sized to match fan discharge diameter unless recirculating type is approved in writing by OHCD/PHDC/RDA..
   c. Seal ductwork joints air tight.
   d. Slope horizontal runs in unheated spaces toward discharge and seal to wall cap forming air tight and watertight joint.

END OF SECTION

SECTION 23 51 23 - GAS VENTS

A. SUMMARY

1. Section Includes:
   a. Gas vents for domestic water heaters.
   b. Gas vents for heating boilers.
   c. Gas vents for furnaces.
2. Sustainable Design: Comply with Division 01 Section “Sustainable Design Requirements.

B. RELATED REQUIREMENTS

1. Section 22 36 00 - Domestic Water Heaters.
2. Section 23 52 16 - Heating Boilers.
3. Section 23 54 00 - Furnaces.

C. PRODUCTS

1. Listed Chimney Liners to be used on existing chimneys.
   a. Description: Single-wall chimney liner tested according to UL 1777 and rated for 1000 deg F continuously and 2100 deg F for 10 minutes; with negative or positive flue pressure complying with NFPA 211.
   b. Accessories: Fittings: Tees, elbows, increasers, draft-hood connectors, metal caps with bird barriers, adjustable roof flashings, storm collars, support assemblies, thimbles, firestop spacers, and fasteners; fabricated from similar or compatible materials and designs.
   c. Sealant: Manufacturer's standard high-temperature sealant. Insulating.
   d. Fill: Manufacturer's standard high-temperature insulation fill material in annular space surrounding chimney liner including high-temperature, ceramic-fiber insulation required to seal chimney at top and bottom.
2. Listed Type B Vents to be used with gas fired units.
   a. Description: Double-wall metal vents tested according to UL 441 and rated for 480 deg F continuously for Type B, with neutral or negative flue pressure complying with NFPA 211.
   b. Construction: Inner shell and outer jacket separated by at least a 1/4-inch airspace.
   c. Accessories: Tees, elbows, increasers, draft-hood connectors, terminations, adjustable roof flashings, storm collars, support assemblies, thimbles, firestop spacers, and fasteners; fabricated from similar materials and designs as vent-pipe straight sections; all listed for same assembly.
   d. Termination: Stack cap designed to exclude minimum 90 percent of rainfall.
3. Listed Type L Vents to be used with oil fired units.

a. Description: Double-wall metal vents tested according to UL 641 and rated for 570 deg F continuously and 1700 deg F for 10 minutes; with neutral or negative flue pressure complying with NFPA 211.
b. Construction: Inner shell and outer jacket separated by at least a 1/4-inch airspace filled with high-temperature insulation.
c. Accessories: Tees, elbows, increasers, draft-hood connectors, terminations, adjustable roof flashings, storm collars, support assemblies, thimbles, firestop spacers, and fasteners; fabricated from similar materials and designs as vent-pipe straight sections; all listed for same assembly.
d. Termination: Stack cap designed to exclude 90 percent of rainfall.

4. Barometric Dampers.
   a. Construction: High-temperature-enamel-painted steel damper and housing with galvanized-steel breeching connection and adjustable counterweight with lock.
   b. Include knife-edge bearings that do not require lubrication.
5. Vent Dampers, when approved in writing by OHCD/PHDC/RDA.
   a. Construction: Stainless-steel damper blade, shaft, and vent pipe with metal, prelubricated bearings.
   b. Electric Motor: Sized to power damper open and closed in approximately 15 seconds in each direction. Power is off when damper is at rest. Comply with ANSI Z21.66.
   c. Controls: Control transformer. Keyed wiring harness. Damper end-switch to prove damper is open. Interlock with boiler to permit burner operation when damper is open. Hold-open switch for troubleshooting boiler controls.

D. INSTALLATION

1. Locate to comply with minimum clearances from combustibles and minimum termination heights according to product listing or NFPA 211, whichever is most stringent.
2. Seal between sections of positive-pressure vents according to manufacturer's written installation instructions, using sealants recommended by manufacturer.
3. Support vents at intervals recommended by manufacturer to support weight of vents and all accessories, without exceeding unit loading.
4. Slope breechings down in direction of unit, with condensate drain connection at lowest point piped to nearest drain.
5. Lap joints in direction of flow.
6. After completing system installation, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finishes.
7. Clean breechings internally, during and after installation, to remove dust and debris. Clean external surfaces to remove welding slag and mill film. Grind welds smooth and apply touchup finish to match factory or shop finish.
8. Provide temporary closures at ends of breechings, chimneys, and stacks that are not completed or connected to equipment.

E. APPLICATION

1. Condensing Units: Vent using plastic pipe in accordance with the National Fuel Gas Code and the manufacturer's instructions.
2. Non-Condensing Units Vented Horizontally: Vent through a side or rear wall using Listed B-Vent or Listed L-Vent in accordance with the National Fuel Gas Code and the manufacturer's instructions.
   a. Water heaters shall be vented horizontally.
   b. Furnaces and boilers may be vented horizontally.
3. Non-Condensing Units Vented Vertically:
   a. When approved in writing by OHCD/PHDC/RDA, the use of an approved furnace common-vented with an atmospheric water heater may be permitted only where the chimney has been sized appropriately for this combined venting and has been lined with a stainless steel or galvanized steel vent approved for this application. Under no circumstances may an unlined masonry chimney be used for venting gas fired-appliances. Approval will be granted only for single-family rehab units (not new construction); the units may not be centrally air conditioned. Any such installation must comply with manufacturers' instructions for common-venting fan-assisted and atmospherically-vented units and with all applicable requirements of the National Fuel Gas Code (Part 7, Venting of Equipment and Part 11, Sizing of Category I Venting Systems). In addition,
      1) The combustion equipment must be in a basement;
      2) the B-vent must be inside the thermal envelope;
      3) the water heater vent connector must be no larger than 3" in diameter;
      4) the final as-tested infiltration rate must be not less than 1400 CFM50;
   b. In other special situations when approved in writing by OHCD/PHDC/RDA, the use of an approved power-vented or passive direct-vented water heater and approved furnace vented vertically may be permitted. Neither may be common-vented with any other unit; each must have a dedicated code-approved vent.

F. Units Located in an Equipment Room in the Living Space:

1. Approved direct-vent units may be located in the living space.
2. Approved power-vented, non-direct-vent units (each with its own dedicated vent) may be located in the living space. The equipment room shall then have permanently open ventilation registers to admit combustion air from the living space. Size ventilation registers to provide the required net free area per 1,000 BTU of gas input in accordance with the National Fuel Gas Code. Combustion air shall not be drawn from a bedroom or bathroom.
3. Under no circumstances may atmospherically vented non-direct-vent units be installed in the living space.

G. Chimneys:

1. Unused chimneys shall be sealed off at top and bottom.

2. Deteriorated Chimneys: Repair to make sound or demolish and cap to make building air tight and watertight.

END OF SECTION

SECTION 23 52 00 - CENTRAL HEATING SYSTEM REQUIREMENTS

A. SUMMARY

1. Section Includes
   a. Complete new heating system consisting of one of the following:
      1) Hydronic System: Boiler, water supply connection, hydronic distribution system, fuel system, temperature control system, and all required accessories.
      2) Air System: Furnace, air distribution system, fuel system, temperature control system, and all required accessories.
   b. Housekeeping pad for furnace and boiler.
   c. Cutting and patching to connect new Work to existing systems.
   d. Cleaning, testing, balancing, adjusting, and performance tests for all equipment and materials furnished or installed under this section.
   e. New electrical wiring on dedicated circuit, including switch at top of basement stairs for oil burner and switch near heater for gas system.
   f. Low voltage control wiring and electrical equipment necessary for the proper operation of the systems.
   g. Final fuel connections to equipment installed under this section.
2. Sustainable Design: Comply with Division 01 Section “Sustainable Design Requirements.

B. RELATED REQUIREMENTS

1. Section 23 05 93 - Testing, Adjusting, and Balancing for HVAC.
2. Section 23 30 00 - HVAC Air Distribution.
3. Section 23 52 16 - Heating Boilers.
4. Section 23 54 00 - Furnaces.

C. REFERENCES

1. “HVAC Quality Installation Specification, Standard Number: ANSI/ACCA 5 QI-2007”, Air Conditioning Contractors of America Available for The Consortium for Energy Efficiency (CEE) as a free download from their website at www.cee1.org.
2. “Manual J, Residential Load Calculation” - Air Conditioning Contractors of America (ACCA), most recent edition.

D. DESIGN DATA

1. Exterior Design Temperature: 10 degrees F.
2. Interior Design Temperature: 70 degrees F.
3. Load calculations: Comply with ACCA Manual J or approved alternate method.
4. Heating Equipment Sizing: Select equipment with least rated output meeting the maximum design load.

a. Maximum Heating Capacity (Output) Rating: 130% of calculated design heat load.

E. SUBMITTALS

1. System Design Calculation: Submit heat loss calculations showing environmental design conditions and required heating equipment and distribution system sizes.
   a. Indicate thermal resistance properties for each building envelope assembly used for calculations.
2. Energy Cost Analysis: Submit estimated system operation cost when developer proposes alternative heating system.
   a. Indicate annual operating costs based on calculated heating loss and proposed equipment heating output using manufacturer's rated efficiency.

F. PROJECT CONDITIONS

1. Normal Space Heating System Requirement:
   a. Where a sound hydronic heat distribution system does not exist, forced warm air (FWA) is the required means of heating a living unit unless an alternative system is permitted when approved in writing by OHCD/PHDC/RDA.
   b. A new hot-water boiler may be installed (1) when there is a sound hot water heat distribution system; (2) when there is a sound two-pipe steam heat distribution system, which shall then be changed from steam to hydronic; or (3) in other special circumstances when approved in writing by OHCD/PHDC/RDA.
   c. Steam boilers may be permitted in repair and partial rehab applications when approved in writing by OHCD/PHDC/RDA.
   d. When gas service is available, provide gas fired equipment.
2. Alternative Space Heating System Requirements:
   a. OHCD/PHDC/RDA recognizes that there may be unusual situations in which it is appropriate to use heating equipment other than equipment specified in Sections 23 52 16 and 23 54 00. For example, electric resistance heat may be cost-effective for zoned backup in a superinsulated solar dwelling.
   b. Developers who propose an alternative heating system must demonstrate that operating costs of the proposed system will be affordable. Accordingly, the developer must submit results of a building energy analysis simulation (using eQUEST 3.64 available at www.doe2.com, or similar approved software) to show the predicted cost, at current Philadelphia energy prices, of maintaining specified interior design temperature throughout the heating season in a standard Philadelphia weather year.
   c. When approved in writing by OHCD/PHDC/RDA, an alternative system for the proposed development if and only if predicted heating cost is no greater than the Standard Heating Cost of a dwelling, or multi-unit building, of the same size may be permitted. Standard Heating Cost, the estimated average cost to heat a dwelling, or multi-unit building, rehabilitated to OHCD/PHDC/RDA energy efficiency requirements calculated based on current energy costs for loads determined in accordance with Manual J.

G. INSTALLATION - GENERAL

1. Comply with manufacturer's installation instructions and the following:
   a. City of Philadelphia Fire Code
   b. Oil Fired Equipment: NFPA 31 Installation of Oil Burning Equipment,
   c. Gas Fired Equipment: NFPA 54, National Fuel Gas Code,
   d. Electrical Service: NFPA 70 National Electrical Code,
   e. Air Distribution System: NFPA 90B Installation of Warm Air Heating and Air Conditioning Systems.

H. EQUIPMENT INSTALLATION

1. Floor Mounted Equipment: Install equipment on 4 inch thick continuous solid masonry housekeeping pad placed on floor slab.
2. Suspended Equipment: Install equipment hung from joists above.
3. Clearance for Service Access: Install equipment positioned to permit operational clearances and maintenance and servicing access. Provide the following minimum clearances between equipment and adjacent walls, structures, other objects:
   a. 36 inches on the side containing the service panel.
   b. 12 inches on all other sides.
   c. 48 inches above vertical discharge unit.
   d. As specified by manufacturer or required by PGW, if greater than above.

I. Thermostatic Control:

1. Hydronic System: As specified in Section 23 52 16.
2. Air System: As specified in Section 23 54 00.

J. Commissioning: Test adjust and balance entire system as specified in Section 23 05 93.

1. Verify correct operation of space heating equipment and distribution system.

END OF SECTION

SECTION 23 52 16 - HEATING BOILERS

A. SUMMARY

1. Section Includes:
   a. Condensing boilers.
   b. Circulators.
   c. Expansion tanks.
   d. Thermostats.
2. Sustainable Design: Comply with Division 01 Section “Sustainable Design Requirements.

B. REFERENCES

1. Air Conditioning Contractors of America:
   a. ACCA Manual J - "Manual J Residential Load Calculation."
2. Reference: Builder’s Guide to Mixed and Humid Climates, Joseph Lstiburek, Ph.D., PE, Building Science Corporation, c. 2005

C. DESIGN DATA

1. Exterior Design Temperature: 10 degrees F.
2. Interior Design Temperature: 70 degrees F.
3. Load calculations: Comply with ACCA Manual J or approved alternate method.
4. Boiler Sizing: Select boiler with least rated output meeting the maximum design load.

D. SUBMITTALS

1. Product Data: Submit data indicating boiler capacities and efficiency ratings.
2. Equipment Design Calculation: Submit heat loss calculations showing environmental design conditions and required boiler size.
3. Operation and Maintenance Data: Submit one manufacturer's standard owner's manual for maintenance and troubleshooting boilers and controls for residents of each residential unit.

E. CONDENSING BOILERS

1. Description: Factory-fabricated, -assembled, and -tested, natural gas fired, condensing boiler with heat exchanger sealed pressure tight, including insulated jacket; flue-gas vent; combustion-air intake connections; water supply, return, and condensate drain connections; and controls.
2. Features: Heat Exchanger: stainless steel, primary and secondary combustion chamber. Burner: Natural gas, self-aspirating and self-venting after initial start. Blower: Centrifugal fan to operate only during start of each burner sequence. Gas Train: Combination gas valve with manual shutoff and pressure regulator. Ignition: Spark ignition with 100

percent main-valve shutoff with electronic flame supervision. Casing: Sheet metal with protective finish, insulated. Control Compartment Enclosure: NEMA 250, Type 1A.

3. Characteristics and Capacities: Electric power shall be 120/1/60. Minimum AFUE shall be 85%, ENERGY STAR labeled, IBR rated, and UL labeled.

F. AUXILIARY BOILER COMPONENTS

1. Circulator: Non-overloading, in-line pump with split-capacitor motor having thermal-overload protection and lubricated bearings; designed to operate at specified boiler pressures and temperatures; sized for the total head and gpm required by the system. Electric power shall be 120/1/60.
2. Expansion Tank: ASME approved bladder type steel tank, equipped with airtrol fitting and drain and air discharge valve, sized as follows:
   a. Up to 125 MBH: 15 gallon tank
   b. 125 to 175 MBH: 18 gallon tank
   c. 176 to 200 MBH: 24 gallon tank
   d. 201 to 250 MBH: 30 gallon tank
3. Water Feed: Provide automatic and manual water feeds.
   a. Automatic water feed, capable of filling the system to its maximum height.
   b. Manual water feed with separate stop valve on discharge (boiler) side.
4. Safety Devices and Other Trim: As required by authority having jurisdiction.

G. THERMOSTATS

1. Programmable Thermostat: Controls shall comply with requirements in ASHRAE/IESNA 90.1, "Controls." Solid-State Thermostat: Wall-mounting, digital, programmable, microprocessor-based, with automatic heat/cool switching, 7-day programmability, four temperature presets per day, battery backup.
2. Non-Programmable Thermostat: Solid-State Thermostat: Wall-mounting, digital, with manual heat/cool switching.
   a. Non-programmable thermostats will be permitted only upon written request.

H. INSTALLATION

1. Install boiler per manufacturer’s installation instructions and in accordance with NFPA 54. Assemble and install boiler trim. Install electrical power with disconnect. Install control wiring to field-mounted thermostat.

END OF SECTION

SECTION 23 54 00 - FURNACES

A. SUMMARY

1. Section Includes:
   a. Gas fired condensing furnaces.
   b. Gas fired non-condensing furnaces.
   c. Oil fired condensing and non-condensing furnaces.
   d. Thermostats.
2. Sustainable Design: Comply with Division 01 Section “Sustainable Design Requirements.

B. REFERENCES

1. Air Conditioning Contractors of America:
   a. ACCA Manual J - "Manual J Residential Load Calculation."

C. DESIGN DATA

1. Exterior Design Temperature: 10 degrees F.
2. Interior Design Temperature: 70 degrees F.
3. Load calculations: Comply with ACCA Manual J or approved alternate method.
4. Furnace Sizing: Select furnace with least rated output meeting the maximum design load.

D. SUBMITTALS

1. Product Data: Submit data indicating furnace capacities and efficiency ratings.
2. Equipment Design Calculation: Submit heat loss calculations showing environmental design conditions and required furnace size.
3. Operation and Maintenance Data: Submit one manufacturer's standard owner's manual for maintenance and troubleshooting furnaces and controls to Owner for distribution to residents of each residential unit.

E. GAS-FIRED FURNACES, CONDENSING

1. General Requirements for Gas-Fired, Condensing Furnaces: Factory assembled, piped, wired, and tested; complying with ANSI Z21.47/CSA 2.3, "Gas-Fired Central Furnaces," and with NFPA 54.
2. Furnace shall be housed in galvanized steel, painted cabinet. Fan: Centrifugal, factory balanced, resilient mounted, direct drive, multi-tapped, multi-speed. Heat Exchangers: Primary and secondary: Stainless steel. Burner: Gas Valve: two-stage or modulating main gas valve, main shutoff valve, safety pilot with electronic flame sensor, limit control, transformer, and combination ignition/fan timer control board. Ignition: Electric pilot. Combustion-Air Inducer: Centrifugal fan with thermally protected motor. Furnace Controls: Solid-state board integrates ignition, heat, cooling, and fan speeds.

3. Capacities and Characteristics: output heating requirement: Air flow to provide 50 deg F maximum temperature rise. 120/1/60 power. 92% AFUE minimum, ENERGY STAR labeled.
4. When equipped for air conditioning as specified in Section 23 81 26 size furnace blower rated capacity to meet cooling requirements but no larger. Furnaces with oversized blowers will not be accepted.

F. GAS-FIRED FURNACES, NON-CONDENSING

1. General Requirements for Gas-Fired, Non-condensing Furnaces: Factory assembled, piped, wired, and tested; complying with ANSI Z21.47/CSA 2.3, "Gas-Fired Central Furnaces," and with NFPA 54.
2. Furnace shall be housed in painted, galvanized steel, cabinet. Fan shall be centrifugal, factory balanced, resilient mounted, direct drive, multi-tapped, multi-speed with internal thermal protection and permanent lubrication. Heat Exchanger: Stainless steel. Burner Gas Valve: 100 percent safety two-stage main gas valve, main shutoff valve, pressure regulator, safety pilot with electronic flame sensor, limit control, transformer, and combination ignition/fan timer control board. Ignition: Electric pilot. Gas-Burner Safety Controls: Electronic Flame Sensor. Combustion-Air Inducer: Centrifugal fan with thermally protected motor and sleeve bearings. Furnace Controls: Solid-state board integrating ignition, heat, cooling, and fan speeds.
3. Capacities and Characteristics: Output heating requirement: Air flow to provide 50 deg F maximum temperature rise. 120/1/60 power. 80% AFUE.
4. When equipped for air conditioning as specified in Section 23 81 26 size furnace blower rated capacity to meet cooling requirements but no larger. Furnaces with oversized blowers will not be accepted.
   a. Non-condensing gas fired furnaces are permitted only when approved in writing by OHCD/PHDC/RDA.

G. OIL-FIRED FURNACES, CONDENSING AND NON-CONDENSING

1. General for Oil-Fired Furnaces: Factory assembled, piped, wired, and tested; complying with UL 727 "Oil Fired Central Furnaces" and with NFPA 31, Standard for the Installation of Oil Burning Equipment.
2. Furnace shall be housed in galvanized steel, painted cabinet. Fan: Centrifugal, factory balanced, resilient mounted, direct drive, multi-tapped, multi-speed. Heat Exchangers: Primary and secondary: Stainless steel. Burner: Flame retention, pressure-atomizing, forced-draft, gun type; with integral fuel pump and electronic spark ignition, flame safety, oil-pressure switch safety device, limit control, transformer, and combination ignition/fan timer control board. Ignition: Electric pilot. Centrifugal fan with thermally protected motor. Furnace Controls: Solid-state board integrates ignition, heat, cooling, and fan speeds.
3. Capacities and Characteristics: output heating requirement: Air flow to provide 50 deg F maximum temperature rise. 120/1/60 power. 85% AFUE minimum, ENERGY STAR labeled.

4. When equipped for air conditioning as specified in Section 23 81 26 size furnace blower rated capacity to meet cooling requirements but no larger. Furnaces with oversized blowers will not be accepted.
   a. Oil fired furnaces are permitted only when approved in writing by OHCD/PHDC/RDA.

H. THERMOSTATS

1. Programmable Thermostat: Controls shall comply with requirements in ASHRAE/IESNA 90.1, "Controls." Solid-State Thermostat: Wall-mounting, digital, programmable, microprocessor-based, with automatic heat/cool switching, 7-day programmability, four temperature presets per day, battery backup.
2. Non-Programmable Thermostat: Solid-State Thermostat: Wall-mounting, digital, with manual heat/cool switching.
   a. Non-programmable thermostats are permitted only when approved in writing by OHCD/PHDC/RDA.

I. AIR FILTERS

1. Disposable Filters: 1-inch thick, fiberglass media with MERV 6 rating in sheet metal frame.

J. INSTALLATION

1. Install gas-fired furnaces and associated fuel and vent features and systems according to NFPA 54.
2. Install oil-fired furnaces and associated fuel and vent piping according to NFPA 31.
3. Install thermostats at mounting height of 60 inches above floor.
4. Install gas piping in accordance with 23 11 23.
5. Comply with ASME B31.9, "Building Services Piping," for fuel-oil piping materials, installation, testing, and inspecting.
6. Connect ducts to furnace with flexible connector.
7. Adjust airflow and initial temperature set points. Set controls, burner, and other adjustments for optimum heating performance and efficiency. Adjust heat-distribution features, including shutters, dampers, and relays, to provide optimum heating performance and system efficiency.
8. Install new filters in each furnace within 14 days after Substantial Completion.

END OF SECTION

SECTION 23 81 26 - SPLIT-SYSTEM AIR-CONDITIONERS

A. SUMMARY

1. Section Includes:
   a. Indoor cooling coil.
   b. Outdoor condensing unit.
   c. Thermostats.
   d. Refrigerant piping.
   e. Condensate pump.
   f. Condensate piping.
   g. Condenser pad.
2. Sustainable Design: Comply with Division 01 Section “Sustainable Design Requirements.

B. RELATED REQUIREMENTS

1. Section 23 30 00 - HVAC Air Distribution.
2. Section 23 05 93 - Testing, Adjusting and Balancing for HVAC

C. REFERENCES

1. Air Conditioning Contractors of America:
   a. ACCA Manual J - "Manual J Residential Load Calculation."
   b. ACCA HVAC Quality Installation Specification Residential and Commercial Heating, Ventilating, and Air Conditioning (HVAC) Applications. Available as a free download from their website at www.acca.org.
2. The Air-Conditioning, Heating, and Refrigeration Institute (AHRI):
   a. Directory of Certified Product Performance.
3. Reference: Builder’s Guide to Mixed and Humid Climates, Joseph Lstiburek, Ph.D., PE, Building Science Corporation, c. 2005

D. DESIGN DATA

1. Exterior Design Temperature: 90 degrees F dry bulb and 74 degrees F wet bulb.
2. Interior Design Temperature: 75 degrees F.
3. Load calculations: Comply with ACCA Manual J or approved alternate method.
4. Air Conditioner Sizing: Select air conditioner with rated capacity not greater than 115% of the maximum design load rounded up to the next 1/2 ton increment. Oversized systems are not permitted.

E. SUBMITTALS

1. Product Data: Submit data indicating air conditioning system capacities and efficiency ratings.

2. Equipment Design Calculation: Submit cooling load calculations showing environmental design conditions and required air conditioning equipment size.
3. Operation and Maintenance Data: Submit one manufacturer's standard owner's manual for maintenance and troubleshooting air conditioning equipment and controls to Owner for distribution to residents of each residential unit.

F. INDOOR COOLING COIL (5 TONS OR LESS)

1. Casing: Galvanized steel with finished paint, designed to mate with matching gas furnace. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins and thermal-expansion valve to comply with ARI 210/240. Condensate Drain Pan: Single-wall, galvanized steel with 1/2” drain connection.

G. OUTDOOR AIR-COOLED CONDENSING UNITS (5 TONS OR LESS)

1. Casing: Steel, finished with baked enamel, with removable panels for access to controls, weep holes for water drainage, and mounting holes in base. Provide brass service valves, fittings, and gage ports on exterior of casing. Compressor: Hermetically sealed with crankcase heater and mounted on vibration isolation device, with thermal- and current-sensitive overload devices, start capacitor, relay, and contactor. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins and liquid subcooler to comply with ARI 210/240. Fan: Aluminum-propeller type, directly connected to permanently lubricated, motor with integral thermal-overload protection.

H. CAPACITIES AND CHARACTERISTICS

1. Cooling Capacity: Minimum 14.5 SEER with evaporator coil rated to match condenser coil, as listed in ARI Directory; ENERGY STAR labeled.
2. Outdoor Unit: Electrical Characteristics: 208/240-volt, 1-phase, 60 hertz.

I. THERMOSTATS

1. Thermostats: As specified in Section 23 52 16 for use with boilers.
2. Thermostats: As specified in Section 23 54 00 for use with furnaces.

J. ACCESSORIES

1. Refrigerant Line Kits: ACR soft-annealed copper suction and liquid lines factory cleaned, dried, pressurized, and sealed; factory-insulated suction line with flared fittings at both ends; sized to suit system capacity.
2. Refrigerant Suction Line Insulation: 3/8-inch minimum wall thickness of closed-cell elastomeric material.
3. Low ambient kits: to permit operation down to 45 deg F.
4. Condensate Pump: Rated for use with the condensate of high efficiency gas furnaces and air conditioning units, and of sufficient head capacity for application.
5. Condensate Piping: PVC solvent-weld type.

6. Condenser Pad: Plastic, made for this application, sized per manufacturer's instructions, minimum 2 inches high. In no case shall its depth or width be less than that of the condensing unit.

K. EXECUTION

1. Install ground-mounted, condensing unit on 4-inch- thick, reinforced concrete base that is 4 inches larger, on each side, than unit. Bolt condensing unit to concrete base. Install seismic restraints.
   a. Allow sufficient space around outdoor units for proper operation and servicing in accordance with manufacturer's instructions. Minimum clearances between equipment and adjacent structures, walls or other objects shall be 36 inches on the service panel side, 12 inches on all other sides, 48 inches above vertical discharge.
   b. Keep area surrounding condenser free of shrubs, trees and other plantings for a distance of three feet.
   c. Install code-compliant electric service and disconnect for each condensing unit.
2. Install cooling coils over gas furnaces.
   a. Install coil on supply side of furnace with air-tight connection.
   b. Provide means for gravity removal of condensate to wastewater plumbing, using traps where required. Provide condensate pump and piping to nearest drain where gravity drainage is not possible.
   c. Remove identifying label from coil and attach label to ductwork nearby in clearly visible location.
   d. Provide access door for inspecting thermostatic expansion valve.
3. Install refrigerant line kit.
   a. Insulate suction lines. Do not insulate liquid lines. Protect insulation exposed to weather with waterproof, UV light resistant covering.
   b. Install refrigerant lines with maximum 50 feet horizontal run and 20 feet vertical run. When it is necessary to exceed these limits, comply with manufacturer's instructions.
   c. When installing air condition within an existing system, perform cutting and patching required to install new equipment.
4. Cleaning and Testing:
   a. Clean, evacuate, charge, balance and test equipment to confirm proper operation.
   b. Certify subcooling test and amount of refrigerant added or subtracted from system for each unit.

END OF SECTION

DIVISION 26 ELECTRICAL

DIVISION 26 ELECTRICAL
QUALITY STANDARDS AND 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. All work shall conform to current applicable code standards. Contractor is responsible for having a working knowledge of all codes.
2. An Underwriter's Inspection Certificate shall be issued at the end of the project.
3. All materials and equipment shall bear the label of approval of the Underwriters' Laboratories.
4. Install electric meters in accordance with PECO standards and regulations and in location as directed by PECO.
5. Wire for circuits shall maintain the same size throughout the circuit.
6. Aluminum conductors are not permitted except where specified in other Sections of this Division.
7. Wiremold is not permitted.
8. Provide GFCI receptacles in all locations specified in other Sections of this Division and where otherwise directed by OHCD/PHDC/RDA.
9. Install approved smoke and carbon monoxide detectors in number and in locations required by Code.

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

1. Verify all existing site conditions prior to commencing work.
2. Install receptacles at locations and heights as specified in other Sections of this Division.
3. Install wiring as specified in other Sections of this Division to comply with air-sealing requirements. Seal all electrical boxes with caulk or mastic.

END OF DOCUMENT

SECTION 26 00 00 - ELECTRICAL

A. SUMMARY

1. Section Includes:
   a. Service entrance.
   b. Wiring.
   c. Wiring devices.
   d. Panelboards.
   e. Lighting fixtures.
   f. Ceiling fans.
   g. Door bell system.
   h. Smoke detectors.
   i. Carbon monoxide detectors.
2. Sustainable Design: Comply with Division 01 Section “Sustainable Design Requirements.

B. REFERENCES

1. Section 07 96 00 - Air Sealing.
2. Section 11 31 00 - Residential Appliances.
3. Section 22 36 00 - Domestic Water Heaters.
4. Section 23 35 00 - Exhaust Systems.
5. Section 23 52 00 - Central Heating System Requirements.
6. Section 23 52 16 - Heating Boilers.
7. Section 23 54 00 - Furnaces.
8. Section 23 81 26 - Split System Air Conditioners.

C. SUBMITTALS

1. Submit Underwriter's Inspection Certificate at completion of the project.

D. MATERIALS - GENERAL

1. Underwriter's Labels: Furnish materials and equipment bearing the label of Underwriters' Laboratories or other testing agency approved by authority having jurisdiction.

E. WIRING

1. Conductors: Copper. Wire and cable utilizing aluminum conductors shall not be used in any part of the work, except service entrance cable.
2. Wire for each circuit shall maintain the same size throughout the circuit. All sizes specified are American Wire Gauge sizes.

F. WIRING DEVICES

1. Receptacles: Duplex grounding type.
2. Switches: Toggle or rocker type.
   a. Install switches where shown on the drawings, where specified, or as required for the work, in accordance with all applicable codes. Where more than 1 switch occurs at a given point, the switches shall be installed under a common gang plate.
   b. Switches shall be quiet type, high capacity flush type, rated not less than 15 amps.
3. Switches and Receptacle Plates: Furnish a suitable plate for each switch, combined switches and receptacle. Metal wall plates for flush type outlets shall be Ivory color.

G. PANELBOARDS

1. Lighting and appliance branch circuit panelboard shall be circuit-breaker equipped, type 1, class 1.
2. Panelboard shall be rated at 120/240 volts, single phase, 3 wire bus and 2-pole main circuit breaker matching specified service rating with single pole branch circuit breakers and space for a minimum of 20 circuit breakers.
   a. Units with Fewer than 3 Bedrooms: 150 amp service rating.
   b. Units with 3 or More Bedrooms: 200 amp service rating.
3. There shall be a minimum of 12 branch circuits; number of breakers shall suit circuit requirements.
4. Single pole breakers shall be full module size. Two pole breakers shall not be installed in a single module. Multipole circuit breakers shall be of the common-trip type having a single operating handle.

H. LIGHTING FIXTURES

1. Kitchen under 100 sq. ft.: Surface mounted fluorescent (2) T8 lamps.
2. Kitchen over 100 sq. ft.: Surface mounted fluorescent (3) T8 lamps.
3. Bathroom Ceiling: Surface mounted fluorescent (1) 28w cf.
4. Bathroom Wall: Surface mounted fluorescent (1) 28w cf.
   a. NOTE: Bathroom wall fixture may be omitted if furnished integrally with medicine cabinet.
5. Dining Room: Surface mounted incandescent (2) 60w A19.
6. Hall: Surface mounted fluorescent (1) 13w compact fluorescent.
7. Basement and Garage: Porcelain lampholder (1) 28w compact fluorescent.
8. Exterior Rear: Progress Surface mounted fluorescent (1) 28w compact fluorescent.
9. Exterior Front: Wall mounted fluorescent (1) 28w compact fluorescent
10. Bedroom Ceilings: Surface mounted fluorescent (1) 28w compact fluorescent.

11. Other fixture and lamp types may be permitted when approved in writing by OHCD/PHDC/RDA.

I. CEILING FANS

1. Ceiling Fan: Five blade, 52 inch diameter unless otherwise required for indicated space, three speed reversible motor, speed control by pull chain operated switch, 3/4 inch down rods for suspended mounting when required.
2. Light Kit: Manufacturer's standard compact fluorescent fixture to suit fan. Furnish appropriate lamps to suit fixture.

J. DOOR BELL SYSTEM

1. For each residential unit the system shall consist of push-button, bell or chime, 120/24 volt transformer and 24 volt wire. The equipment shall be manufactured by one manufacturer.

K. SMOKE DETECTORS

1. Detector: Direct-wired smoke detector with battery back-up.

Also interconnect to CO detector in basement. Response: Are you asking for CO detectors be connected to smoke detectors?

L. CARBON MONOXIDE DECTECTORS

1. Detector: UL 2034 listed, direct wired.

M. INSTALLATION

1. Install electrical system in accordance with NFPA-70 National Electrical Code.
   a. Install electrical devices in accordance with manufacturer's instructions.
2. Service Entrance: Install electrical service to each residential unit.
   a. Single Family Residence: As specified for electrical panel service capacity.
   b. Multifamily Residences: Sized to accommodate connected load in accordance with NFPA 70, PECO Energy and OHCD/PHDC/RDA.
   c. Install meter box at location approved by PECO Energy and OHCD/PHDC/RDA.
3. Wiring: Wiring above basement level shall be concealed. Wiremold shall not be used.
4. Switches:
   a. Install switches where shown on the drawings, where specified, or as required for the work, in accordance with all applicable codes. Where more than 1 switch occurs at a given point, install switches under a common gang plate.
   b. Install single pole switch at the entrance to each room or area to control light fixture or receptacle to be used for light fixture.
   c. Connect all bathroom light fixtures to wall switch.
   d. Install 3-way switches at the top and bottom of each flight of stairs, controlling required light within stairway, and in rooms have two or more entrances.

5. Receptacle Outlets:
   a. Install receptacles at locations and frequency required by code.
      1) In each dwelling area, install receptacles so no point along the floor line in any wall space is more than 6 ft. from a receptacle.
      2) Install two or more 20-amp small appliance circuits to serve the receptacles in the kitchen and dining area.
      3) In the kitchen, install receptacle above each counter space wider than 12 inches. Install receptacles so no point on the wall above a counter space is more than 24 inches from a receptacle.
      4) Install one wall receptacle in each powder room and bathroom.
      5) For residential units without central air conditioning:
         a) Install one receptacle on a 20-amp dedicated circuit under a ground floor window at a location suitable for a window air conditioner.
         b) Install one receptacle on a 20-amp dedicated circuit under a window in each bedroom.
      6) Install two switched outdoor receptacles accessible at grade level: one in the front and one in the rear of the house.
      7) Install one receptacle on a 20 amp dedicated circuit in the basement at the laundry area.
      8) Install at least one receptacle, in addition to the laundry receptacle, in each basement and in each garage.
      9) For hallways of 10 ft. or more in length, install at least one receptacle.
      10) In crawlspaces, if equipment is installed therein requiring servicing.
      11) For interior switched receptacles, install receptacle with only half of the receptacle controlled by switch.
   b. Install arc-fault circuit interrupter (AFCI) protection for all receptacles located in family rooms, living rooms, dining rooms, parlors, dens, bedrooms, closets, hallways, foyers, or similar rooms or areas.
   c. Ground-fault circuit-interrupter protection:
      1) The following receptacles shall be GFCI protected:
         a) All bathroom and powder room receptacles.
         b) All receptacles in garages.
         c) All receptacles installed outdoors.
         d) All basement receptacles, including dedicated laundry circuit
         e) All counter-height receptacles in the kitchen.
         f) All receptacles within 6-feet of a sink.
         g) Crawlspaces
   d. When receptacles must be installed in party walls (plaster applied directly to masonry), shielded wiring shall be recessed in a channel cut in the masonry, secured and patch-plastered over.

e. Location of Outlets and Equipment: Unless otherwise indicated, outlet boxes in walls shall be located with center line at the following elevations above the finished floor line.
   1) Switch outlets: 48 in, maximum, to centerline.
   2) Convenience receptacle outlets: 18 in, minimum (to bottom outlet).
   3) Receptacle outlets for counter tops, refrigerator, bathrooms, laundry, and garage: 42 inches, to centerline.

6. Special Connections - The contractor shall install the following connections:
   a. Exhaust fans in kitchen and bathroom.
   b. Heating system, including shut-off switch.
   c. Range.
   d. Clothes dryer.
7. Panelboards: Surface mounted so the height of the top operating handle will not exceed 78" from the floor. Clearly mark breakers in panel box as to circuits served. Mount panelboard and meter (if located inside) on squarely cut 3/4-inch plywood, properly secured to foundation walls with anchors and spacers.
8. Equip living room, dining room, and all bedrooms for ceiling light. Use metal wiring box adequately supported for subsequent replacement of original fixture with combination ceiling light and fan. Install ceiling light fixture in all rooms, unless approved in writing by OHCD/PHDC/RDA.
9. Light fixtures shall be hung in place, and secured true and straight. Install appropriate lamps in each fixture.
10. Ceiling Fans: Install at locations indicated on drawings in accordance with manufacturer's instructions.
    a. Suspend fan from ceiling with drop tube when ceiling is minimum 8 feet above floor.
    b. Surface mount fan when ceiling is less than 8 feet above floor.
    c. Install light fixture with fan where indicated.
11. Door Bell System:
    a. In single-family, two family and multiple unit occupancies, install a complete and operable door bell system in accordance with manufacturer's instructions.
    b. Locate chime on wall adjacent to main stairs of a multi-story unit, or otherwise in a location providing audible signal throughout the unit.
12. Smoke Detectors:
    a. Install smoke detectors in accordance with manufacturer's instructions and most recently adopted codes.
    b. Install one detector on each floor of structure, including basement.
    c. Hard wire and interconnect smoke detectors so all detectors sound when any unit is activated.
13. Carbon Monoxide Detectors:

a. Install carbon monoxide detectors in residential units with fuel fired appliances in accordance with manufacturer's instructions and most recently adopted codes.
b. Install one detector in each space containing fuel fired heating equipment located near equipment.
c. Install one detector outside each separate sleeping area in the vicinity of bedrooms.
d. Hard wire and interconnect carbon monoxide detectors so all detectors sound when any unit is activated.

14. Grounding: Install a 5/8” diameter x 8 ft. copper-clad steel ground rod, fully driven outdoors in soil, or through basement slab, or wall. Install supplementary ground rod at least 6-fet away from primary ground rod. Connect bonding jumper from ground rods to metal water pipe entering basement within 5-feet of entrance. Furnish bonding jumper connecting piping up and down stream of water meter with enough length to allow easy removal of water meter. Install grounding electrode conductor from panelboard to water pipe. Furnish bonding jumper from cold water inlet piping to hot water outlet piping at water heater. Use connectors approved for the purpose.
15. Testing: Check entire system for proper operation, including continuity, polarity, and grounding.
16. Insulation and air-sealing requirements:
    a. Where batt insulation is to be used, install wiring so insulation does not have to be pieced, slit or wrinkled around it. Wherever possible, wiring on studded exterior walls shall be run behind the studs. Otherwise, such wiring shall be secured along the bottom plate and run through notches in the bottom of the studs, or holes drilled not more than 1/2 inches from the bottom plate.
    b. After rough wiring, seal all holes in electrical boxes with caulk, mastic, or fire rated spray foam.

END OF SECTION

DIVISION 31 EARTHWORK

DIVISION 31 EARTHWORK
QUALITY STANDARDS AND 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. Reference: Approved Reference Procedures for Subterranean Termite Control, Wood Destroying Organisms Committee, National Pest Control Association Inc., George W. Rambo, ed., 1985.
2. Implement soil erosion and sedimentation control measures in accordance with local codes and standards.
3. Protect and maintain all benchmarks, monuments and other reference markers. If destroyed, replace as directed by the OHCD/PHCD/RDA.
4. Remove and legally dispose of cleared materials to an EPA approved landfill.
5. Use only termiticides which bear a federal registration number and which comply with the U.S. Environmental Protection Agency (EPA) regulations. Provide a one year guarantee on services.

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

1. Verify all existing site conditions prior to commencing work.
2. Do not close or obstruct streets, sidewalks or other occupied or used facilities without obtaining permission from authorities having jurisdiction.
3. Disconnect and remove or cap all utility services on site prior to commencing any earthwork activities.
4. Protect all areas and vegetation adjacent to limit of work. If damaged, notify the OHCD/PHCD/RDA immediately.
5. Prepare all areas to receive foundations and slabs-on-grade in manner specified in other Sections of this Division. Test for maximum density as per ASTM D1557 using 90 percent density for landscaped areas and 95 percent density for all others.
6. Grade all finished grades so that they slope away from the building. Do not grade in such a way to allow water to drain onto an adjacent property. Grade within the following tolerances of required finished elevations:
   a. Walks: Plus or minus 0.10 ft.
   b. Pavements: Plus or minus 1/2 inch.
7. Install termiticides in accordance manufacturer's written instructions and as specified in other Sections of this Division.
8. Coordinate grading as to not adversely affect adjacent properties

END OF DOCUMENT

SECTION 31 10 00 - SITE CLEARING

A. SUMMARY

1. Section Includes:
   a. All necessary operations in connection with the clearing of the project site, including but not necessarily limited to:
      1) Clearing and grubbing.
      2) Vegetation, shrub and tree removal.
      3) Protection of existing trees to remain.
      4) Topsoil stripping.
      5) Disposal of material.
2. Sustainable Design: Comply with Division 01 Section “Sustainable Design Requirements.”

B. FIELD CONDITIONS

1. Arrange and pay for disconnecting, removing, capping, and plugging utility services. Notify affected utility companies in advance and obtain approval before starting this Work.
   a. Obtain from the appropriate utility company or City Department, verification of the current status and locations of existing underground structures or utilities adjacent to the project site. See Article E below for information regarding PA One Call System.
      1) Remove any abandoned underground utility piping or conduits interfering with new construction.
   b. Place markers to indicate location of disconnected services. Identify service lines and capping locations on Project Record Documents.
2. Existing conditions: It is the contractor's responsibility to visit and inspect the site and to verify the actual site conditions.
3. Protection of reference points - Maintain all benchmarks, monuments and other reference markers. If a marker is disturbed or destroyed, replace it as directed.
4. Protection of existing elements indicated to remain: Protect existing trees, structures, utilities, sidewalks, pavements, and other elements indicated to remain from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

C. PRODUCTS

1. Structural Fill: Obtain from off-site. Use as directed by Inspector.
   a. Structural Fill: Material classified as GW, GM, GW-SM, SW, SM, or SW-SM according to ASTM D 2487 with a maximum particle size of three inches and no more than 30 percent (by weight) passing a No. 200 sieve. Material to be free of debris, waste, frozen materials, vegetation and other deleterious matter.

D. EXECUTION

1. Traffic: Conduct site-clearing operations to ensure minimum interference with roads, streets, sidewalks, and other adjacent occupied or used facilities. Do not close or obstruct streets, sidewalks, or other occupied or used facilities without permission from authorities having jurisdiction.
2. Protection of Existing Improvements: Provide protections necessary to prevent damage to improvements on adjoining properties and to existing improvements that are indicated to remain in place.
3. Repair of damage: Restore damaged improvements to their original condition, as acceptable to property owners.
4. Clearing and grubbing:
   a. Remove all vegetation, unless designated to remain, debris, organic matter and otherwise objectionable material which is not suitable for use as fill or support of structural loads or slabs.
   b. Remove all roots and matted root systems to a depth of not less than 12 inches below the original ground level. Unless further excavation is required, depressions made by grubbing shall be filled and compacted to the density of the surrounding soil; filled surface shall conform to the contour of adjacent ground.
   c. Removal includes digging out and off-site disposal of stumps. Completely remove stumps and other debris protruding through ground surface. Use only hand methods for grubbing inside drip line of trees indicated to remain. Cut minor roots and branches of trees indicated to remain in a clean and careful manner where such roots and branches obstruct installation of new construction.
5. Tree and shrub removal: Remove, in their entirety, all trees and shrubs not designated to remain.
6. Topsoil: Topsoil is defined as friable clay loam surface soil found in a depth of not less than 4 inches. Satisfactory topsoil is reasonably free of subsoil, clay lumps, stones, and other objects over 2 inches in diameter, and without weeds, roots, and other objectionable material. Strip topsoil to whatever depths encountered in a manner to prevent intermingling with underlying subsoil or other objectionable material. Remove heavy growths of grass from areas before stripping. Stockpile topsoil in storage piles in areas indicated or as directed by Inspector. Construct storage piles to provide free drainage of surface water. Cover storage piles, if required, to prevent wind erosion. Dispose of unsuitable or excess topsoil as specified for disposal of waste material.
7. Disposal:
   a. Remove all cleared and grubbed material from the site. Remove waste materials and unsuitable or excess topsoil. No trees, stumps, brush or other material shall be buried on the site.
   b. Burning of trees, stumps or other debris is not permitted.
8. Fill:
   a. Fill depressions in yard areas caused by clearing and grubbing operations with satisfactory soil material, unless further excavation or earthwork is indicated. Place

fill material in horizontal layers not exceeding 6 inches loose depth, and thoroughly compact each layer to a density equal to adjacent original ground.

1) Fill areas that will be beneath new construction with structural fill, unless new construction work starts immediately after removal of existing site improvements.
2) Place structural fill in lifts not exceeding eight inches in loose thickness. Compact to at least 95 percent of maximum dry density according to ASTM D 1557, Modified Proctor.

b. Removal of improvements: See Section 02 41 00 - Demolition.

E. PA ACT 121 OF 2008

1. The Contractor shall be responsible for locating all underground structures and utilities, such as water mains, sewers, telephone and electric conduits, etc., and above ground utilities, which may be encountered during construction. Test holes shall be dug to determine the position of the underground structures and utilities, or the Contractor shall arrange with the owners of such underground structures and utilities to assign a representative to mark the locations. The Contractor shall pay the cost of digging test holes and likewise he shall pay the cost of the service of the representatives of the owners of such utilities for locating the said utilities. The cost of determining the locations is to be included in the prices bid. The location of existing structures and utilities as shown in the contract documents is simply for the guidance of the Contractor and have not been field located and, since the information is as furnished by the respective utilities, or taken from non-as-built plans, the engineer is not responsible for the accuracy of the plans in this respect.
2. Anyone utilizing these contract documents for construction is advised to conform with the requirements of PA Act 121 of 2008 prior to excavation.
3. The contractor to contact Pennsylvania One Call System, Inc (dial 811) to initiate the process of locating underground facilities.

END OF SECTION

SECTION 31 20 00 - EARTH MOVING

A. SUMMARY

1. Section Includes:
   a. Earth Moving Includes, but is not limited to:
      1) Protection of all existing utilities and existing improvements to remain.
      2) Preparing and grading subgrades for slabs-on-grade, walks, pavements.
      3) Drainage and moisture-control fill course for slabs-on-grade.
      4) Excavating, backfilling, compaction and grading for site improvements, underground mechanical, electrical utilities, building floor slabs, foundations, footings, paving, walls, pits, steps, utilities, lawn areas and appurtenances.
      5) Backfilling against structure(s) and walls to maintain positive drainage.
      6) Rough grading all areas to obtain the subgrades as required or specified.
      7) Placing and compacting gravel base for slabs and paving.
      8) Materials for subbase, pavements, and improvements.
      9) Supply of additional materials from offsite if required for fill, backfill, rough grading and compaction.
      10) Legal disposal of unsuitable and surplus excavated materials.
2. Sustainable Design: Comply with Division 01 Section “Sustainable Design Requirements.”

B. DEFINITIONS

1. Backfill: Soil materials used to fill an excavation.
   a. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
   b. Final Backfill: Backfill placed over initial backfill to fill a trench.

   Base Course: The layer placed between the subbase and surface pavement in a paving system
2. Bedding Course: Layer placed over the excavated subgrade in a trench before laying pipe.
3. Borrow: Satisfactory soil imported from off-site for use as fill or backfill.
4. Drainage Course: Layer supporting slab-on-grade used to minimize capillary flow of pore water.
5. Excavation: Removal of material encountered above subgrade elevations.
   a. Additional Excavation: Excavation below subgrade elevations as directed by Inspector. Additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
   b. Bulk Excavation: Excavations more than 10 feet in width and pits more than 30 feet in length or width.

c. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated dimensions without direction by Inspector, Unauthorized excavation, as well as remedial work directed by Inspector, shall be without additional compensation to the Contractor.

6. Fill: Soil materials used to raise existing grades.
7. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.
8. Sub-base: The layer placed between the subgrade and base course in a paving system or the layer placed between the subgrade and surface of a pavement or walk.
9. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, drainage fill, or topsoil materials.
10. Utilities: Include on-site underground pipes, conduits, ducts, and cables, as well as under-ground services within building lines.

C. FIELD CONDITIONS

1. Existing Utilities:
   a. Contact utility locator service for area where Project is located before excavating.
   b. Observe all rules and regulations governing the various utilities serving the site and adjacent properties.
   c. Protect existing utility lines remaining in service from any damage.
   d. Contractor is responsible for any damage, and subsequent repair, to existing utility lines damaged or disrupted by construction activities.
2. Adjacent Property:
   a. Protect all areas adjacent to the limits of the Work.
   b. If any adjacent property features are damaged, the contractor is to repair the damage to the satisfaction of the adjacent property owner and as directed by OHCD/PHDC/RDA at no expense to OHDC/PHDC/RDA.
3. Finished Grade
   a. Grade areas outside the structure with uniform slopes to maintain positive drainage away from the structure.
   b. Provide a vertical curb at locations where there is an abrupt change in slope.
4. Compaction
   a. Fill shall be compacted in individual layers in accordance with the following requirements:
      1) Ordinary fill, granular fill, and bank run gravel - not less than 95% of maximum dry density.
      2) Crushed stone - mechanically compacted as further specified below.
   b. Before any fill is placed, proof roll the subgrade to not less than 75% of maximum dry density.
   c. Place all fill in layers not more than 8 inches deep before compaction.

d. All compaction shall be by mechanical means designed specifically for the purpose. OHCD/ PHDC/RDA reserves the right to engage a testing agency to perform compaction tests. The contractor to re-compact any areas found to be improperly compacted at his expense.

5. Miscellaneous
   a. All material to be placed where the specifications or drawings call for fill, backfilling or rough grading is to be ordinary fill.
   b. Under exterior concrete paving slabs and walks, fill shall be granular fill except the top 6 inches directly under the slab, which shall be crushed stone.
   c. Do not place fill over frozen material. No fill material shall be placed, spread, or rolled during unfavorable weather conditions.
   d. Do not begin backfill of foundations until construction below grade has been approved, any form work has been removed, and excavation has been cleaned of debris.
   e. Do not place backfill against a wall unless the wall is braced or has cured sufficiently to develop design strength. Do not place backfill against a dampproofed wall until 7 days after dampproofing was applied. If fill is required on both sides of a wall, bring it up simultaneously and evenly on both sides. Avoid damage to the walls and to waterproofing, dampproofing, and other work in place.
6. Testing and inspection: OHCD/PHDC/RDA will engage the services of a Special Inspector and an approved testing laboratory to supervise the installation of controlled compacted fill.
   a. OHDC/PHDC/RDA will pay for the services of the Special Inspector and testing laboratory.
   b. The contractor is responsible for the cost of any re-testing or re-inspection of work which fails to comply with the requirements of the Contract Documents.

D. PRODUCTS

1. Provide borrow soil materials from off-site when sufficient satisfactory soil and controlled fill materials are not available from excavations.
2. Satisfactory Soils: ASTM D 2487 soil classification groups GW, GP, GM, SW, SP, and SM, or a combination of these group symbols; free of rock or gravel larger than 2 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.
   a. All material is not to contain more than 20 percent finer than No, 200 Sieve and have a plasticity index not more than 8.
      1) Recycled crushed asphalt, concrete and masonry materials that are uniformly graded, have a maximum size of 6 inches, containing not more than 15 percent larger than 3 inches and not more than 20 percent passing the #200 sieve with a plasticity index not more than 10 are acceptable.
      2) PennDOT Course Aggregate No 2A or Select Granular Material (2RC) are acceptable.

3. Unsatisfactory Soils: ASTM D 2487 soil classification groups GC, SC, ML, MH, CL, CH, OL, OH, and PT, or a combination of these group symbols.
   a. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.
4. Backfill and Fill: Satisfactory soil materials.
5. Load Bearing Fill: Satisfactory soil materials.
6. Bedding: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand: ASTM D 2940; except with 100 percent passing a 1 inch sieve and not more than 8 percent passing a No. 200 sieve.
7. Drainage Fill: Washed, narrowly grades mixture of crushed stone, or crushed or uncrushed gravel; ASTM D 448; course-aggregate grading Size 57; with 100 percent passing a 1-1/2 inch sieve and 0 to 5 percent passing a No. 8 sieve.
8. Granular Fill: To consist of hard durable sand and gravel, conforming to the following gradation requirements:

sieve size	% passing
4 in.	100
1/2 in.	50-85
#4	40-75
#40	10-35
#200	0-10

9. Subbase and Base Material: - Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand, ASTM D 2940, with at least 95 percent passing a 1-1/2-inch sieve and not more than 8 percent passing a No. 200 sieve.
10. Engineered Fill: Subbase or base material
11. Warning Tape: Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility.
    a. Tape Colors: Provide tape colors to utilities as follows: Red - Electric; Yellow - Gas, oil, steam, and dangerous materials; Orange - Telephone and other communications; Blue - Water systems; Green - Sewer systems.
12. Detectable Warning Tape: Acid- and alkali-resistant polyethylene film warning tape manufac-tured for marking and identifying underground utilities, 6 inches wide and 4 mils thick minimum, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 2'-6" deep.
13. Subsurface Drainage Geotextile: Nonwoven needle-punched geotextile, manufactured for subsurface drainage applications, made from polyolefins or polyesters; with elongation greater than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:
    a) Survivability: Class 2; AASHTO M 288.
    b) Grab Tensile Strength: 157 lbf; ATSM D 4632.

c) Sewn Seam Strength: 142 lbf; ASTM D 4632.
d) Tear Strength: 56 lbf; ASTM D 4533.
e) Puncture Strength: 56 lbf: ASTM D 4833.
f) Apparent Opening Size: No. 70 sieve, maximum; ASTM D 4751.
g) Permittivity: 0.1 per second, minimum; ASTM D 4491.
h) UV Stability: 50 percent after 500 hours' exposure: ASTM D 4355.

E. EXECUTION

1. Preparation:
   a. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations,
   b. Protect subgrades and foundation soils against freezing temperatures of frost. Provide protective insulating materials as necessary.
   c. Provide erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

   Existing Utilities: Do not interrupt existing utilities serving facilities occupied by the Owner or others except when permitted in writing by the Inspector and then only after acceptable temporary utility services have been provided. Provide a minimum 48-hours' notice to the Inspector and receive written notice to proceed before interrupting any utility. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies to shutoff services if lines are active.

2. Dewatering:
   a. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.
   b. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.
      1) Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.
      2) Install a dewatering system to keep subgrades dry and convey ground water away from excavations. Maintain until dewatering is no longer required,
3. Explosives: Do not use explosives.
4. Excavation, General:
   a. Unclassified Excavation: Excavation is unclassified and includes excavation to required subgrade elevations regardless of the character of materials and obstructions encountered, including rock, soil materials, and obstructions. No changes in Contract Sum or Contract time will be authorized for rock excavation or removal of obstructions.
      1) If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.

2) Where rock is encountered, remove to a depth of 12 inches below proposed subgrade, bottom of footing, or trench bottom and replace with satisfactory material.

5. Regulatory compliance - Comply with local codes, ordinances, and requirements of authorities having jurisdiction to maintain stable excavations.
6. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
7. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Appurtenances: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 0.10 foot. Do not disturb bottom of excavations intended for bearing surface.
8. Excavation under walks and pavements: Excavate surfaces under walks and pavements to indicated cross sections, elevations, and grades.
9. Excavation of utility trenches:
   a. Excavate utility trenches to indicated slopes, lines, depths, and invert elevations.
   b. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.
   c. Excavate trenches to uniform widths to provide a working clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 in higher than top of pipe or conduit, unless otherwise indicated. Clearance: 12 inches each side of pipe or conduit.
   d. Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove stones and sharp objects to avoid point loading.
   e. For pipes or conduit less than 6 inches in nominal diameter and flat-bottomed, multiple--duct conduit units, hand-excavate trench bottoms and support pipe and conduit on an undisturbed subgrade. For pipes and conduit 6 in or larger in nominal diameter, shape bottom of trench to support bottom 90 degrees of pipe circumference. Fill depressions with tamped sand backfill. Where encountering rock or another unyielding bearing surface, carry trench excavation 6 inches below invert elevation to receive bedding course.
10. Notification: Notify Inspector when excavations have reached required subgrade.
11. Additional Excavation: When Inspector determines that unforeseen unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed. Unforeseen additional excavation and replacement material will be paid according to the Contract provisions for changes in Work.
12. Restoration of subgrades: Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by the Inspector.
13. Filling Unauthorized Excavation:

a. Fill unauthorized excavation under foundations or wall footings by extending indicated bottom elevation of concrete foundation or footing to excavation bottom, without altering required top elevation. When acceptable to the Inspector, lean concrete fill may be used to bring elevations to proper position.
b. Fill unauthorized excavations under other construction as directed by the Inspector.

14. Where indicated widths of utility trenches are exceeded, provide stronger pipe, or special installation procedures, as required by the Inspector.
15. Stockpile borrow materials and satisfactory soil materials. Stockpile soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent wind-blown dust.
    a. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.
16. Backfill:
    a. Preparation: Remove vegetation, topsoil, debris, wet, and unsatisfactory soil materials, obstructions, and deleterious materials from ground surface prior to placing fills. Plow strip, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing surface.
    b. Place fill material in layers to required elevations for each location listed below:
        1) Under walks and pavements, use subbase or base material, or satisfactory excavated or borrow soil material.
        2) Under steps and ramps, use subbase material.
    c. 3) Under footings and foundations, use engineered fill. Uniformly moisten or aerate subgrade and each subsequent fill or backfill layer before compac-tion to within 2 percent of optimum moisture content. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice. Remove and replace, or scarify and air-dry satisfactory soil material that is too wet to compact to specified density. Stockpile or spread and dry removed wet satisfactory soil material.
    d. Place and compact backfill using load bearing fill in excavations promptly, but not before completing the following: -
        1) Acceptance of construction below finish grade including, where applicable, dampproofing, waterproofing, and perimeter insulation.
        2) Surveying locations of underground utilities for record documents.
        3) Testing, inspecting, and approval of underground utilities.
        4) Concrete formwork removal.
        5) Removal of trash and debris from excavation.
        6) Removal of temporary shoring and bracing, and sheeting.
        7) Installing permanent or temporary horizontal bracing on horizontally supported walls.
    e. Place backfill materials in layers not more than 12 inches in loose depth for material compacted by heavy compaction equipment, and not more than 6 inches in loose depth for material compacted by hand-operated tampers.

1) Place backfill and fill evenly on all sides of structure to required elevations. Place backfill and fill uniformly along the full length of each structure.

f. Compact soil to not less than the following percentages:

1) Under structures, steps, and slabs: Compact each layer of fill material at 95 percent of maximum dry unit weight according to ASTM D 1557. If using granular fill material with insufficient fines to produce a normal density curve, compact each layer to 85 percent of maximum according to ASTM D 4353/4354.

17. Utility Trench Backfill: Place and compact bedding course on rock and other unyielding bearing surfaces and to fill unauthorized excavations. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

    a. Concrete backfill trenches that carry below or pass under footings and that are excavated within 18 inches of footings. Place concrete to level of bottom of footings.

    b. Provide 4-inch-thick concrete base slab support for piping or conduit less than 2'-6" below surface of roadways. After installation and testing, completely encase piping or conduit in a minimum of 4 inches of concrete before backfilling or placing roadway subbase.

18. Place and compact initial backfill of satisfactory soil material or subbase material, free of particles larger than 1 inch, to a height of 12 inches over the utility pipe or conduit.

19. Carefully compact material under pipe haunches and bring backfill evenly up on both sides and along the full length of utility piping or conduit to avoid damage or displacement of utility system.

20. Coordinate backfilling with utilities testing.

21. Fill voids with approved backfill materials as shoring and bracing, and sheeting is removed.

22. Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

23. Subsurface Drain: Place a layer of filter fabric around perimeter of drainage trench or at footing, as indicated. Place a 6-inch compacted course of filtering material on filter fabric to support drainage pipe. After installing and testing, encase drainage pipe in a minimum of 6 inches of compacted filtering material and wrap in filter fabric, overlapping edges at least 6 inches.

24. General Grading: Uniformly grade areas to a smooth surface, free from irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and eleva-tions indicated. Provide a smooth transition between existing adjacent grades and new grades. Cut out soft spots, fill low spots, and trim high spots to conform to required surface tolerances.

25. Site Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:

    a. Walks - Plus or minus 0.10 ft.

    b. Pavements - Plus or minus 1/2 inch.

26. Under pavements and walks, place subbase course material on prepared subgrades. Place base course material over subbases to pavements. Compact subbase and base courses at optimum moisture content to required grades, lines, cross sections and thickness to not less than 95 percent of ASTM D 4254 relative density. Shape subbase and base to required crown elevations and cross-slope grades. When thickness of compacted subbase or base course is 6 inches or less, place materials in a single layer. When thickness of compacted subbase or base course exceeds 6 inches, place materials in equal layers, with no layer more than 6 inches thick or less than 3 inches thick when compacted.
27. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.
28. Repair and re-establish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or lose compaction due to subsequent construction operations or weather conditions.
29. Scarify or remove and replace material to depth directed by the Inspector; reshape and recompact at optimum moisture content to the required density.
30. Settling: Where settling occurs during the Project correction period, remove finished surfacing, backfill with additional approved material, compact, and reconstruct surfacing.
31. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to the greatest extent possible.
32. Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off the Owner's property.
33. Remove waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off the Owner's property.

END OF SECTION

SECTION 31 31 16 - TERMITE CONTROL

A. SUMMARY

1. Section Includes:
   a. Termite control.
2. Sustainable Design: Comply with Division 01 Section “Sustainable Design requirements.”

B. QUALITY ASSURANCE

a. Retain the services of a specialty subcontractor having a minimum of five years experience in the field of termite control, with an established local office, and that uses registered termiticides approved by authorities having jurisdiction

C. WARRANTY

1. Provide a one year guarantee on services performed.

D. EXECUTION

1. Do not apply soil treatment to frozen or excessively wet soils or during inclement weather.
2. Treat soil surrounding property by pressure injection method, or by method standard with specialty subcontractor.
3. Treat wood framing members at exterior grade and at interior ground floor framing by injection method, or by method standard with specialty subcontractor.
4. Soil treatment shall be accomplished by an approved water-based emulsion chemical type, mix and spreading rate suited to the intended use and recommended by the National Pest Management Association "Approved Reference Procedures for Subterranean Termite Control" (WDO Library CD), applicable codes and ordinances.
5. Plug all holes drilled in existing sidewalks, steps and patios using suitable grouting material following soil treatment operations.

END OF SECTION

DIVISION 32 EXTERIOR IMPROVEMENTS

DIVISION 32 EXTERIOR IMPROVEMENTS
QUALITY STANDARDS AND 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. Reference:
   a. "Standard City Specifications: Specification for Paving and Repaving," City of Philadelphia, Department of Streets.
   b. Reference: American Concrete Institute (ACI); published standards, most current versions.
2. All concrete mixes shall conform to ASTM C94 "Standard Specification for Ready Mixed Concrete."
3. All proper permits for relating to work encompassing streets, sidewalks and curbs shall be obtained from the City of Philadelphia Streets Department prior to commencing work.
4. New sidewalks and other footways shall be minimum 4-inch thick concrete.
5. New paved areas shall have straight edges, smooth turnings and grade transitions, and proper alignment with walls, steps and property lines.
6. Provide expansion joints in all new paving and curb work not to exceed 25 feet in any direction. Install 1/2 inch bituminous fill material where specified in other Sections of this Division.
7. Construction tolerances for concrete paving shall not exceed 1/8 inch in 10 feet for grade and alignment of top of forms and 1/4 inch in 10 feet for vertical face on longitudinal axis.
8. Concrete for fence posts shall be minimum 2500 psi at 28 days.

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

1. Verify all existing site conditions prior to commencing work.
2. Slope all new paving work away from structures and adjacent properties to provide proper drainage.
3. Set all forms for new paved areas with straight pieces of clean lumber, securely staked to prevent buckling or tipping when filled with wet concrete and having tops set at smooth finish grade suitable for use as screed when placing and leveling concrete. Forms shall not be removed for 24 hours minimum following concrete placement.
4. Install all fencing materials and products to be level and plumb, straight and true and secure. Do not install fencing until final grading is complete.

END OF DOCUMENT

SECTION 32 00 00 - PAVING

A. SUMMARY

1. Section Includes:
   a. Hot-Mixed Asphalt Paving Over Prepared Subbase for:
      1) Patching or repair of existing asphalt surfaces which are intended to remain in service and which are damaged or have been damaged or disturbed as a result of new construction activities for this project. Replace damaged or disturbed areas with new materials of equal thickness.
      2) New asphalt surfaces as indicated on the drawings. New surfaces shall be over compacted fill and appropriate sub-base.
2. Sustainable Design: Comply with Division 01 Section “Sustainable Design Requirements.”

B. REFERENCES

1. Pennsylvania Department of Transportation (PennDOT): Publication 408 Specifications.
2. Philadelphia Streets Department, Standard Specifications for Paving and Repaving.
3. Philadelphia Streets Department, Standard Construction Items.

C. QUALITY ASSURANCE

1. Construction Tolerances:
   a. Base Course Thickness: 1/2 in.
   b. Surface Course Thickness: 1/4 in.
   c. Base Course Surface Smoothness: 1/4 in.
   d. Surface Course Surface Smoothness: 3/16 in.
   e. Crowned Surfaces: 1/4 in. variance from template.

D. FIELD CONDITIONS

1. Environmental Requirements: Do not place paving materials when ambient air or stone base course surface temperature is less than 40 degrees F., nor when surface is wet or frozen.

E. PRODUCTS

1. Binder Course: Bituminous concrete, ID-2 BC.
2. Wearing Course: Bituminous concrete, ID-2, WC.
3. Tack Coat: Emulsified asphalt, E-6
4. Sealer: Bituminous cement, AC-20.
5. Herbicide Treatment: Commercial chemical for weed control registered by Environmental Protection Agency and acceptable to authorities having jurisdiction.

6. Lane and Parking Area Markings: Where existing pavement markings are disturbed, restore, in kind, and to the extent determined by the Inspector.

F. EXECUTION

1. Cutbacks:
   a. All cutback lines, both asphalt paving and concrete base, to be sawcut full depth from street grade. After restoring disturbed paving, seal the edges between existing and new paving with hot asphalt cement after placing the wearing course.
   b. Surface course paving restoration to cover the concrete base and extend 6 inches beyond on each side. Bituminous surface course includes both binder and wearing course.
   c. Concrete pavement restoration to cover full area between original joints of the slab disturbed, unless the Inspector permits smaller paving blocks to be sawcut from the slab. Saw cutting of new joints to be at least 12 inches beyond payment lines fixed for excavation, and perpendicular to the direction of traffic.
   d. Where side of trench is less than 3 feet from curb, extend paving restoration to curb.
   e. Remove curb, where necessary, to nearest joint.
2. Cartway Paving Reconstruction in City Streets:
   a. Restore cartway paving disturbed as follows:
      1) Prepare subgrade and restore with an 8 inch concrete base flush with existing base, topped with 1-1/2 inch binder course and 1-1/2 inch wearing course of ID-2.
      2) Where concrete base restoration exceeds 50 percent of the street width, place 2A modified stone subbase, 6 inch depth, prior to concrete base restoration.
      3) Adjust manhole frames and covers where necessary.
      4) Restore paving over existing manholes where frames and covers are removed outside the payments limits defined for excavation. Match existing cartway structure to the satisfaction of the Inspector and the City.
   b. Placing Bituminous Paving:
      1) Place bituminous mixture when temperature is not more than 15 degrees F. from the temperature of the completed mixture at the plant.
      2) Place wearing course within two hours of placing and compacting binder course. If not placed within two hours, apply tack coat over binder course to assure adhesion.
      3) Compact pavement by rolling with minimum 10 ton roller, unless otherwise approved by the Inspector and the City. Do not disturb or extrude pavement from position. Hand compact in areas inaccessible to rolling equipment with hot iron tampers, weighing not less than 25 lbs.
      4) Perform rolling with consecutive passes to achieve even and smooth finish, without roller marks.
3. Curb, Sidewalk, and Driveway Paving:
   a. Where existing curb, sidewalk, or driveways are disturbed, restore in kind, to extent determined by the Inspector. Where existing curb, sidewalk, or driveway is on

adjacent property restore to the satisfaction of the Inspector and adjacent property owner.

b. Within the limits of sidewalk and/or driveway restoration, furnish and install L&I approved vent covers and water service boxes to replace non-conforming boxes. Existing boxes that meet code to be reset. All work and materials shall be in accordance with the Philadelphia Streets Department, Standard Construction Items and the Philadelphia Plumbing Code.

4. Joint Sealing:
   a. All joints between new and existing bituminous wearing course shall be sealed with hot asphalt cement, 12 inches wide, before surface has cooled.
   b. Apply seal evenly to the surface by squeegee immediately after final rolling. Seal with hot irons to completely fill surface voids and provide a watertight joint.
   c. After the bituminous wearing course is placed adjacent to manhole frames or inlet frames or City-owned structures, or other utility owned structures and before the surface has cooled, the joint between the frame and wearing course shall be sealed with hot asphalt cement for a distance of 6 inches from the edge of the frame.
   d. The seal shall be evenly applied to the surface by squeegee immediately after final rolling to completely fill the surface voids and provide a watertight joint between the edge of the frame and the bituminous wearing course.
   e. Precaution shall be taken so that no hot asphalt cement is poured between the frame and the cover or grate. The cover or grate must be easily removed and put back in its frame after the hot asphalt cement has cured
   f. Before acceptance of the resurfacing work, all manhole frames and inlet frames shall be sealed properly as stated in the aforementioned paragraph. The area at the edge between the manhole frame and manhole cover, the area at the edge between the inlet frames and inlet grates, all pickholes and lift holes and vent openings shall be free of asphalt cement.
5. Protection:
   a. Immediately after placement, protect pavement from mechanical injury until adequate stability and adhesion have been obtained and the material has cooled sufficiently to prevent distortion or loss of fines.
   b. Do not permit vehicular traffic on new surfaces for a minimum of 6 hours after the surface has been finished.
   c. Exercise care to ensure that a continuous grade exists along the new paving and that no pockets exist for water to collect and remain dormant. If such condition occurs, correct the problem to assure continuous grade and the removal of pockets.

END OF SECTION

SECTION 32 13 13 - PORTLAND CEMENT CONCRETE PAVING

A. SUMMARY

1. Cast-In-Place Concrete Paving Over Prepared Subbase for:
   a. New and replacement walkways, curbs, and driveways.
   b. Repair/replacement of existing surfaces damaged during construction.
2. Sustainable Design: Comply with Division 01 Section “Sustainable Design Requirements.”

B. REFERENCES

1. American Concrete Institute (ACI):
   a. ACI 301- Specifications for Structural Concrete for Buildings.
   b. ACI 318 - Building Code Requirements for Reinforced Concrete.
2. Concrete Reinforcing Steel Institute (CRSI):
   a. CRSI - Manual of Standard Practice.

C. QUALITY ASSURANCE

1. Concrete Manufacturer’s Qualifications: Manufacturer of ready-mix concrete products complying with ASTM C 94 requirements for production facilities and equipment.
2. Concrete Testing Service: Engage a qualified independent testing agency to perform materials evaluation tests and to design concrete mixes. Provide laboratory test reports for evaluation of concrete materials and mix design tests.
3. Concrete paving and curbs to conform to “Standard Specifications for Paving and Repaving,” City of Philadelphia, Department of Streets.

D. FIELD CONDITIONS

1. Traffic Control: Maintain access for vehicular and pedestrian traffic as required.

E. PRODUCTS

1. Concrete: ASTM C 150, Type 1, Portland cement; ASTM C 33, normal weight aggregates; potable water:
   a. Design Mix: ASTM C 94, 3000 psi, 28 day minimum compressive strength.
   b. Slump Limits: 8 inches minimum with superplasticizer, 3 inches otherwise.
   c. Air Content: 5 to 8 percent.
   d. Finish: Broom finish, unless noted otherwise.
2. Steel Reinforcement:
   a. Reinforcing Bars: ASTM A 615, Grade 60, deformed.
   b. Joint Dowel Bars: ASTM A 615, Grade 60, plain.
   c. Plain-Steel Wire: ASTM A 82, as drawn.

d. Plain-Steel Welded Wire Fabric: ASTM A 185, fabricated from as-drawn steel wire into flat sheets. Rolls not acceptable.

3. Curing Materials: White polyethylene sheeting, burlap or clear or white liquid membrane-forming curing compound in accordance with PennDOT Specifications, Publication 408, latest edition; or City of Philadelphia, Department of Streets, specifications.
4. Bonding Compound: Polyvinyl acetate or acrylic base.
5. Expansion Joints: 1/2 inch thick fiber expansion joint filler.
6. Aggregate Sub-Base: Provide AASHTO No. 57 material meeting the requirements of Section 703.2, PennDOT Specifications, Publication 408, latest edition; or to City of Philadelphia, Department of Streets, specifications.
7. Geotextile Fabric: Non-woven, polypropylene fiber, needle punched and heat set, meeting or exceeding the following:
   a. Weight: 6.0 oz./sy, when tested in accordance with ASTM D 5261.
   b. Tensile Strength: 160 lbs. when tested in accordance with ASTM D 4632.
   c. Elongation @ Break: 50 percent, when tested in accordance with ASTM D 4632.
   d. Puncture Strength: 90 lbs., when tested in accordance with ASTM D 4833.
   e. Apparent Opening Size: 70 US Sieve, when tested in accordance with ASTM D 4751
   f. Permittivity: 1.50 Sec-1, when tested in accordance with ASTM D 4491.
   g. Water Flow Rate: 110g/min/sf, when tested in accordance with ASTM D 4491.

F. EXECUTION:

1. Subgrade Preparation:
   a. Excavate area to proposed subgrade line.
      1) Remove and dispose of excess material.
      2) Subgrade line to be parallel to finished grade. When directed remove and replace unsuitable material with acceptable material, as approved by the Inspector.
   b. Compact subgrade to a firm, even surface and moisten as necessary to prevent absorption of water from the concrete.
   c. Reset all sewer vent boxes, gas and water service valve boxes to finish grade.
2. Geotextile Fabric Placement: Install geotextile fabric on prepared subgrade in accordance with manufacturer's written instructions.
3. Aggregate Placement:
   a. Place aggregate on prepared subgrade over geotextile fabric to form a thoroughly compacted base 4 inches thick, unless otherwise indicated or required by authorities having jurisdiction.
   b. The top surface of the aggregate base to be the required depth below and parallel to the finished grade.
4. Formwork:
   a. Provide acceptable wood or metal forms extending the full depth of the concrete.

b. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for paving to required lines, grades, and elevations to the following tolerances:
   1) Top of Forms: Not more than 1/8 inch in 10 feet.
   2) Vertical face of Longitudinal Axis: Not more than 1/4 inch in 10 feet.
c. Construct forms to allow continuous placement of concrete, so that forms can remain in place for minimum 12 hours after placing concrete.
d. Do not remove forms until at least 12 hours after placing concrete.
e. After removing forms, honeycombed areas to be filled with mortar.
f. After the concrete has cured for a minimum of 48 hours and the forms have been removed, backfill the space adjacent to the concrete using acceptable material.

5. Joints:
   a. Expansion joints to be placed at the following locations:
      1) Opposite expansion joints in adjacent curb.
      2) Between the sidewalk and the curb.
      3) Between the sidewalk and rigid structures.
      4) Elsewhere at intervals shown on the plans, or as directed by the Inspector.
   b. Extend joint material full width and depth of joint, in one piece where possible.
      1) Where two or more sections of joint filler material are required, lace or clip sections together, aligning tops
      2) Rake out joint filler material to a minimum depth of 1/2 inch and maximum depth of 1 inch where joint is to be filled with sealant.
      3) Protect top edge of joint filler with metal or plastic temporary cap prior to placing concrete and during concrete placement. Remove after concrete has been placed on both sides of joint.
   c. Contraction Joints:
      1) Contraction joints to be 1 inch deep and 1/4 inch wide and to be formed by scoring the pavement at intervals indicated, or as directed.
   d. All joints to be neatly edged with a 1/4 inch radius edging tool.

6. Placing and Finishing Concrete:
   a. Remove loose material from compacted subbase surface immediately before placing concrete.
   b. Remove snow, ice, and frost from subbase surface and from reinforcing prior to placing concrete.
      1) Do not place concrete on frozen surfaces.
   c. Inspect and complete formwork, reinforcing, and items that are to be embedded or cast into the concrete.
   d. Comply with requirements and with ACI 304R for measuring, mixing, transporting, and placing concrete.
      1) Submit copies of all concrete delivery slips, indicating quantity and mix design, to Inspector daily for each delivery.
   e. Deposit and spread concrete in a continuous operation between expansion joints.

1) Do not push or drag concrete into place, or use vibrators to move concrete into place.

f. Apply a bonding agent to in place concrete, according to manufacturer's written instructions, prior to placing fresh concrete.

g. Consolidate concrete by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. Use equipment and procedures to consolidate concrete complying with ACI 309R. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand-spreading and consolidation. Consolidate with care to prevent dislocating reinforcing, dowels, and joint devices.

h. Screed paved surfaces with a straight edge and strike off. Use bull floats or darbies to form a smooth surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces prior to beginning finishing operations.

i. Curbs: When automatic machine placement is used for curb placement, submit revised mix design and laboratory test results that meet or exceed requirements. Produce curbs and gutters to required cross section, lines, grades, finish, and jointing as specified for formed concrete. If results are not acceptable, remove and replace with formed concrete.

j. Concrete Finishing: Float Finish: Begin floating when bleed water sheen has disappeared and the concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats, or by hand-floating if area is small or inaccessible to power units. Finish surfaces to true planes within a tolerance of 1/4 inch in 10 feet as determined by a 10-foot-long straightedge placed anywhere on the surface in any direction. Cut down high spots and fill low spots. Refloat surface immediately to a uniform granular texture. Medium-to-Fine-Textured Broom Finish: Draw a soft bristle broom across concrete surface perpendicular to line of traffic to provide a uniform fine line texture finish.

k. Final Tooling - Tool edges of paving, gutters, curbs, and joints formed in fresh concrete with a jointing tool to the following radius. Repeat tooling of edges and joints after applying surface finishes. Eliminate tool marks on concrete surfaces.

1) Radius: 1/2 inch.

7. Protection and Curing:

a. Traffic to be excluded and the sidewalk or pavement protected and cured for a minimum of 14 days after completion.

b. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with the recommendations of ACI 306R for cold weather protection and ACI 305R for hot weather protection during curing.

c. Evaporation Control: In hot, dry, and windy weather, protect concrete from rapid moisture loss before and during finishing operations with an evaporation-control material. Apply according to manufacturer's instructions after screeding and bull floating, but before floating.

d. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.

e. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound, or a combination.
   1) If polyethylene sheets or burlap are used, properly weigh down and keep concrete moist through the curing period.

f. Antispalling Treatment - Apply treatment to concrete no sooner than 28 days after placement to clean dry concrete surfaces free of oil, dirt, or other foreign material. Apply in 2 sprayed applications at rate of 40 sq. yd. per gallon for the first application and 60 sq. yd. per gallon for the second application. Allow complete drying between applications.

8. Acceptance:
   a. All defects found to be repaired or replaced as directed by the Inspector.
   b. Concrete sidewalk that ponds water at any location is not acceptable and is to be removed and replaced as directed by the Inspector.
   c. Drill test cores where directed by Architect when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with portland cement concrete bonded to paving with epoxy adhesive.
   d. Maintain concrete paving free of stains, discoloration, dirt, and other foreign material.
      1) Sweep concrete paving not more than 2 days prior to date scheduled for final inspection.

END OF SECTION

SECTION 32 31 13 - CHAIN LINK FENCES AND GATES

A. SUMMARY

1. Section Includes:
   a. Chain link fences and swing gates.
2. Sustainable Design: Comply with Division 01 Section “Sustainable Design Requirements.”

B. QUALITY ASSURANCE

1. Installer Qualifications: Engage an experienced installer who has at least three years' experience and has completed at least five chain link fence projects with same material and of similar scope to that indicated for this project with a successful construction record of in-service performance.
2. Single-Source Responsibility: Obtain chain link fences and gates, including accessories, fittings, and fastenings, from a single source or manufacturer.

C. PRODUCTS

1. Chain-Link Fence Fabric:
   a. Provide fabric in one-piece heights measured between top and bottom of outer edge of selvage knuckle or twist. Comply with CLFMI Product Manual and with the following requirements:
      1) Fabric Height: 48 inches, unless otherwise indicated.
      2) Steel Wire Fabric: Wire with a diameter of 0.148 inches, 9 gauge.
         a) Mesh Size: 2 inches.
         b) Zinc-Coated Fabric: ASTM A 392, Type II, Class I, 1.2 oz./sq. ft. with zinc coating applied before weaving.
      3) Selvage: Knuckled at both selvages.
2. Fence Framing:
   a. Posts and Rails: Comply with ASTM F 1043 for framing, including rails; braces; and line, terminal; and corner posts. Provide members with minimum dimensions and wall thickness according to ASTM F 1043 based on the following:
      1) Fence Height: 4 feet, unless otherwise indicated.
      2) Light Industrial Strength: Material Group IC-L, round steel pipe, electric-resistance-welded pipe.
         a) Line Posts: 1.9 inches in diameter.
         b) End, Corner, and Pull Posts: 2.375 inches in diameter.
         c) Horizontal Framework Members: Top and bottom rails complying with ASTM F 1043.
            (1) Top and Bottom Rails: 1.375 inches in diameter.
         d) Brace Rails: Comply with ASTM F 1043.
         e) Metallic Coating for Steel Framing:

(1) Type A zinc coating.

3) Provide end caps, or finials, on all exposed pipe ends.

3. Swing Gates:
   a. Comply with ASTM F 900 for gate posts and single and double swing gate types.
      1) Gate Leaf Width:
         a) Single Gate: 36 inches.
         b) Double Gates: 48 inches, each leaf.
         c) Gate Fabric Height: 48 inches or less, to match fence height.
      2) Pipe and Tubing:
         a) Zinc-Coated Steel: Comply with ASTM F 1043 and ASTM F 1083; protective coating and finish to match fence framing.
      3) Gate Posts: Round tubular steel.
      4) Gate Frames and Bracing: Round tubular steel.
      5) Frame Corner Construction: Welded.
      6) Hardware:
         a) Hinges: 180 degree inward swing.
         b) Latches permitting operation from both sides of gate with provisions for padlocking accessible from both sides of gate.
         c) Padlock and Chain: Provided by homeowner.
4. Grout and Concrete:
   a. Nonshrink, Nonmetallic Grout: Premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout, recommended in writing by manufacturer, for exterior applications.
   b. Concrete: Ready-mix, 2500 psi minimum at 28-days.
5. Fittings and Accessories; Material: Comply with ASTM F 626. Mill-finished galvanized steel to suit manufacturer's standards. Zinc Coating: Unless specified otherwise, galvanize steel fence fittings and accessories in accordance with ASTM A 153, with zinc weights as per Table I.
6. Post Brace Assembly: Manufacturer's standard adjustable brace at end posts and at both sides of corner and pull posts, with horizontal brace located at mid-height of fabric. Use same material as top rail for brace, and truss to line posts with 3/8-inch diameter rod and adjustable tightener. Provide manufacturer's standard galvanized-steel, cast-iron or cast-aluminum cap for each end.
7. Tension or Stretcher Bars: Hot-dip galvanized steel with a minimum length 2 inches less than the full height of fabric, a minimum cross section of 3/16 inch by 3/4 inch, and a minimum of 1.2 oz. of zinc coating per sq. ft. Provide one bar for each gate and end post, and two for each corner and pull post, except where fabric is integrally woven into the post.
8. Tension and Brace Bands: 3/4-inch-wide minimum hot-dip galvanized steel with a minimum of 1.2 oz. of zinc coating per sq. ft.
   a. Tension Bands: 0.074 inch thick (14 gage) minimum.

b. Brace Bands: 0.105 inch thick (12 gage) minimum.

9. Tie Wires: 0.106-inch-diameter (12-gage) galvanized steel with a minimum of 0.80 oz. per sq. ft. of zinc coating according to ASTM A 641, Class 3.

D. EXECUTION

1. Field Measurements: Verify layout information for fences and gates shown on the Drawings in relation to the property survey and existing structures. Verify dimensions by field measurements.
2. Install fence to comply with ASTM F 567, unless more stringent requirements are indicated.
3. Do not begin installation and erection before final grading is completed, unless otherwise permitted by Inspector.
4. Stake locations of posts, gates, and terminal posts.
   a. Notify Inspector before fence posts are installed.
5. Lay out fence posts at equal spacing not exceeding eight feet on center.
6. Fencing shall be rigid, straight and plumb, following grade levels where practicable.
7. Post holes: Terminal, corner, and gate posts shall be set in 12-inch diameter, 36-inch deep concrete footings. Line posts shall be set in 9-inch diameter, 36-inch deep concrete footings.
8. Keep surface of concrete footing 2 inches below grade unless post is set in paving, where concrete shall meet surface of paving.
9. Excavation - Drill or hand-excavate (using post-hole digger) holes for posts to diameters and spacing indicated, in firm, undisturbed or compacted soil.
10. If not indicated on Drawings, excavate holes for each post to minimum diameter recommended by fence manufacturer, but not less than four times the largest cross section of post.
11. Unless otherwise indicated, excavate hole depths approximately 3 inches lower than post bottom, with bottom of posts set not less than 36 inches below finish grade surface.
12. Setting Posts: Center and align posts in holes 3 inches above bottom of excavation. Space a maximum of 8 feet on center. unless otherwise indicated.
13. Protect portion of posts above ground from concrete splatter. Place concrete around posts and vibrate or tamp for consolidation. Check each post for vertical and top alignment, and hold in position during placement and finishing operations.
14. Stretch fabric between terminal posts and position 1 inch above ground level. Cut fabric to form one continuous length between terminal posts. Attach fabric to terminal posts using tension bars and tension bands. Tension band spacing shall not exceed 15 inches on center. Attach top and bottom edge of fabric to top and bottom rail using wire ties or clips, spaced no more than 24 inches apart.

15. Top Rails: Run rail continuously through line post caps, bending to radius for curved runs and at other posts terminating into rail end attached to posts or post caps fabricated to receive rail. Provide expansion couplings as recommended by fencing manufacturer.
16. Bottom Rails: Install bottom rails in one piece between posts and flush with post on fabric side, using rail ends and special offset fittings where necessary.
17. Brace Assemblies: Install braces at end and gate posts and at both sides of corner and pull posts. Locate horizontal braces at mid-height of fabric on fences with top rail. Install so posts are plumb when diagonal rod is under proper tension.
18. Fabric: Leave approximately 2 inches between finish grade and bottom selvage unless otherwise indicated. Pull fabric taut and tie to posts and rails. Install fabric on security side of fence, and anchor to framework so that fabric remains under tension after pulling force is released.
19. Tension or Stretcher Bars: Thread through fabric and secure to end, corner, pull, and gate posts with tension bands spaced not over 15 inches on center.
20. Tie Wires: Use wire of proper length to secure fabric firmly to posts and rails. Bend ends of wire to minimize hazard to persons or clothing.
21. Maximum Spacing: Tie fabric to line posts 12 inches on center and to rails and braces 24 inches on center.
22. Fasteners: Install nuts for tension bands and carriage bolts on the side of the fence opposite the fabric side. Peen ends of bolts or score threads to prevent removal of nuts for added security.
23. Install gates plumb, level, and secure for full opening without interference. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation and lubricate where necessary. Install gates according to manufacturer's instructions, plumb, level, and secure.
24. Gates: After repeated operation of completed installation equivalent to 3 days' use by normal traffic, readjust gates for optimum operating condition and safety. Lubricate operating equipment and clean exposed surfaces.

END OF SECTION

SECTION 32 31 23 - PLASTIC FENCES AND GATES

A. SUMMARY

1. Section Includes:
   a. Plastic fences and swing gates.
2. Sustainable Design: Comply with Division 01 Section “Sustainable Design Requirements.”

B. QUALITY ASSURANCE

1. Installer Qualifications: Engage an experienced installer who has at least three years' experience and has completed at least five wood fence projects with same material and of similar scope to that indicated for this project with a successful construction record of in-service performance.
2. Single-Source Responsibility: Obtain plastic fences and gates, including accessories, fittings, and fastenings, from a single source or manufacturer.

C. PRODUCTS

1. Plastic Fence Panels:
   a. Provide plastic (Vinyl) panels in one-piece heights measured between top and bottom edges. Comply with the following requirements:
      1) Panel Height: 68.5 inches, unless otherwise indicated.
      2) Panel Width: 66.875 inches.
      3) Panel Style: Closed picket with lattice top.
      4) Panel/Picket Thickness: 1.5 inches.
      5) Color Family: White.
      6) Manufacturer Warranty: Limited lifetime warranty.
2. Fence Posts:
   a. Plastic (Vinyl) Posts, Nominal 4 by 4 inches: Comply with the following:
      1) Post Height: Minimum 100 inches, align top of post with top of fence.
      2) Provide end caps, or finials, on post top.
3. Swing Gates:
   a. Gate Leaf Width:
      1) Single Gate: 36 inches.
      2) Double Gates: 48 inches, each leaf.
      3) Gate Height: 68.5 inches, to match fence height.
      4) Gate Posts: Same as fence posts.
      5) Hardware:
         a) Hinges: 180 degree inward swing.
         b) Latches permitting operation from both sides of gate with provisions for padlocking accessible from both sides of gate.

c) Padlock and Chain: Provided by homeowner.

4. Grout and Concrete:
   a. Nonshrink, Nonmetallic Grout: Premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout, recommended in writing by manufacturer, for exterior applications.
   b. Concrete: Ready-mix, 2500 psi minimum at 28-days.

D. EXECUTION

1. Field Measurements: Verify layout information for fences and gates shown on the Drawings in relation to the property survey and existing structures. Verify dimensions by field measurements.
2. Do not begin installation and erection before final grading is completed, unless otherwise permitted by Inspector.
3. Stake locations of posts, gates, and terminal posts.
   a. Notify Inspector before fence posts are installed.
4. Lay out fence posts at equal spacing not exceeding 67 inches.
5. Fencing shall be rigid, straight and plumb, following grade levels where practicable.
6. Post holes: Terminal, corner, and gate posts shall be set in 12-inch diameter, 36-inch deep concrete footings. Line posts shall be set in 9-inch diameter, 36-inch deep concrete footings.
7. Keep surface of concrete footing 2 inches below grade unless post is set in paving, where concrete shall meet surface of paving.
8. Excavation: Drill or hand-excavate (using post-hole digger) holes for posts to diameters and spacing indicated, in firm, undisturbed or compacted soil.
9. Unless otherwise indicated, excavate hole depths approximately 3 inches lower than post bottom, with bottom of posts set not less than 36 inches below finish grade surface.
10. Setting Posts: Center and align posts in holes 3 inches above bottom of excavation.
11. Protect portion of posts above ground from concrete splatter. Place concrete around posts and vibrate or tamp for consolidation. Check each post for vertical and top alignment, and hold in position during placement and finishing operations.
12. Insert panels between posts and position 1 inch above ground level. Secure panels to posts with colored fasteners designed by fence manufacturer to securely attach panels.
13. Brace Assemblies: Install diagonal braces as required at end and gate posts and at both sides of corner posts, in accordance with manufacturer’s written instructions.
14. Install gates plumb, level, and secure for full opening without interference. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation and lubricate where necessary. Install gates according to manufacturer's written instructions.

15. Gates: After repeated operation of completed installation equivalent to 3 days' use by normal traffic, readjust gates for optimum operating condition and safety. Lubricate operating equipment and clean exposed surfaces.

END OF SECTION

SECTION 32 31 29 - WOOD FENCES AND GATES

A. SUMMARY

1. Section Includes:
   a. Wood fences and swing gates.
2. Sustainable Design: Comply with Division 01 Section “Sustainable Design Requirements.”

B. QUALITY ASSURANCE

1. Installer Qualifications: Engage an experienced installer who has at least three years' experience and has completed at least five wood fence projects with same material and of similar scope to that indicated for this project with a successful construction record of in-service performance.
2. Single-Source Responsibility: Obtain wood fences and gates, including accessories, fittings, and fastenings, from a single source or manufacturer.

C. PRODUCTS

1. Wood Fence Panels:
   a. Provide wood panels in one-piece heights measured between top and bottom edges. Comply with the following requirements:
      1) Panel Height: 42 inches, unless otherwise indicated.
      2) Panel Width: 98 inches.
      3) Panel Style: Gothic Picket
      4) Backer Rails: 2, one near top and one near bottom of pickets; 2 inch thick by 3 inch wide.
      5) Panel/Picket Thickness: 0.437 inches.
      6) Picket width: 4 inches.
      7) Number of Pickets per Panel: 26.
      8) Primary Wood Species: Spruce (Picea).
      9) Secondary Wood Species: Fir (Abies).
      10) Color Family: Light brown wood, unfinished, un-treated.
      11) Manufacturer Warranty: 15 year limited warranty.
   b. Site built fences using board type panels may be provided when approved in writing by OHCD/PHDC/RDA.
      1) All lumber to be pressure preservative treated.
      2) Submit design to OHCD/PHDC/RDA for approval.
2. Fence Posts:
   a. Wood Posts, Nominal 4 by 4 inches: Comply with the following:
      1) Posts to be pressure preservative treated.
      2) Post Height: Top of post to be 4 inches below top of fence.

3) Provide end caps, or finials, on post top.

3. Swing Gates:
   a. Gate Leaf Width:
      1) Single Gate: 36 inches.
      2) Double Gates: 48 inches, each leaf.
      3) Gate Height: 42 inches, to match fence height.
   b. Gate Posts: Same as fence posts.
   c. Gate Frames and Bracing: Minimum 2 by 3 inch lumber.
   d. Frame Corner Construction: Provide galvanized steel “L” brackets, with minimum 4 inch legs.
   e. Hardware:
      1) Hinges: 180 degree inward swing.
      2) Latches permitting operation from both sides of gate with provisions for padlocking accessible from both sides of gate.
      3) Padlock and Chain: Provided by homeowner.
4. Grout and Concrete:
   a. Nonshrink, Nonmetallic Grout: Premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout, recommended in writing by manufacturer, for exterior applications.
   b. Concrete: Ready-mix, 2500 psi minimum at 28-days.

D. EXECUTION

1. Field Measurements: Verify layout information for fences and gates shown on the Drawings in relation to the property survey and existing structures. Verify dimensions by field measurements.
2. Do not begin installation and erection before final grading is completed, unless otherwise permitted by Inspector.
3. Stake locations of posts, gates, and terminal posts.
   a. Notify Inspector before fence posts are installed.
4. Lay out fence posts at equal spacing not exceeding eight feet.
5. Fencing shall be rigid, straight and plumb, following grade levels where practicable.
6. Post holes: Terminal, corner, and gate posts shall be set in 12-inch diameter, 36-inch deep concrete footings. Line posts shall be set in 9-inch diameter, 36-inch deep concrete footings.
7. Keep surface of concrete footing 2 inches below grade unless post is set in paving, where concrete shall meet surface of paving.
8. Excavation: Drill or hand-excavate (using post-hole digger) holes for posts to diameters and spacing indicated, in firm, undisturbed or compacted soil.

9. Unless otherwise indicated, excavate hole depths approximately 3 inches lower than post bottom, with bottom of posts set not less than 36 inches below finish grade surface.
10. Setting Posts: Center and align posts in holes 3 inches above bottom of excavation. Space a maximum of 8 feet unless otherwise indicated.
11. Protect portion of posts above ground from concrete splatter. Place concrete around posts and vibrate or tamp for consolidation. Check each post for vertical and top alignment, and hold in position during placement and finishing operations.
12. Insert panels between posts and position 1 inch above ground level. Nail panels to posts with galvanized nails.
13. Brace Assemblies: Install diagonal wood braces at end and gate posts and at both sides of corner posts.
14. Install gates plumb, level, and secure for full opening without interference. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation and lubricate where necessary. Install gates according to manufacturer's written instructions.
15. Gates: After repeated operation of completed installation equivalent to 3 days' use by normal traffic, readjust gates for optimum operating condition and safety. Lubricate operating equipment and clean exposed surfaces.

END OF SECTION