SECTION 018115

PASSIVE HOUSE REQUIREMENTS

1. GENERAL
   1. GENERAL PROVISIONS
      1. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.
   2. DESCRIPTION OF WORK
      1. Work Included: General requirements and procedures for compliance with Passive House Standards. Comply with the following:
         1. Passive House PHIUS 2021 Core or Zero certification.
         2. US DOE Zero Energy Ready Homes (ZERH).
         3. US EPA Energy Star Multifamily New Construction (MFNC) or New Homes (ESTAR).
         4. US EPA Indoor airPLUS (IAP) certifications
         5. US EPA WaterSense Guide for Efficient Hot Water Delivery.

Note: Add special requirements for owners, funders, or local authorities, if applicable:

* + 1. Related Work: The following items are not included in this Section and will be performed under the designated Sections:

Note: Coordinate with table of contents. Indicate only items which a reasonable person might think are included in this section:

* + - 1. Section 011000 - GENERAL REQUIREMENTS for general submittal procedures, project meetings, and other requirements.
      2. Section 013300 - SUBMITTAL PROCEDURES for general submittal procedures and requirements.
      3. Section 014330 - MOCKUPS for mockup requirements.
      4. Section 014525 - AIR TIGHTNESS TESTING REQUIREMENTS for other testing requirements.
      5. Section 018113 - SUSTAINABLE DESIGN REQUIREMENTS for other sustainable design certification requirements.
      6. Section 019100 - COMMISSIONING for other testing requirements.
      7. Divisions 01 through 49 Sections for passive house requirements specific to the work of each of these Sections. Requirements may or may not include reference to passive house standards.
  1. PERFORMANCE REQUIREMENTS
     1. Passive House Air Tightness:
        1. Individual Unit Air Tightness for Residential Units (Compartmentalization), Air Leakage: 0.30 CFM50 per sq. ft. of unit enclosure area, or less, demonstrated through blower door testing performed by the PHIUS Verifier.
        2. Whole Building Air Tightness for Multifamily Housing: Demonstrated through a blower door test performed by the PHIUS Verifier, at one of the following rates, or less:
           1. At 50 Pascals: 0.060 CFM50 per sq. ft. of gross enclosure surface area,
           2. At 75 Pascals: 0.080 CFM75 per sq. ft of gross enclosure surface area.
     2. Passive House General Ventilation Requirements: Balance according to the following:
        1. Fresh Air Per Person: 18 cfm for residential, 9-12 CFM for schools/daycare, 35 cfm for sports halls. Bedrooms must have fresh air supply.
        2. Kitchen Exhaust: Not less than 25cfm continuous, 100 cfm intermittent for range hoods or 5AVG based on kitchen volume.
        3. For additional requirements refer to the applicable PHIUS Certification Guidebook.
     3. Passive House Source Energy and Space Conditioning Targets: Refer to PHIUS Performance Criteria Calculator, applicable version.
     4. Passive House Performance Testing:
        1. Passive House Domestic Hot Water Temperature Rise Testing: The hot water distribution system in each unit shall be installed so that no more than 0.5 gallons of water is stored in the piping between the recirculation loop or domestic hot water source, and each water fixture in the unit. Compliance will be verified at final testing by the PHIUS Verifier. Each fixture in each unit sampled will be turned on to maximum flow; while measuring the temperature of the hot water stream, no more than 0.6 gallons shall be emitted before the hot water temperature increases by 10 degrees Fahrenheit.
        2. Duct Leakage Testing of In-Unit Heating and Cooling Distribution: At final testing, the sample of units shall each meet the greater of less than 8 CFM25 per 100 ft2 of conditioned floor area, or less than 80 cfm (assumes no ducted returns).
        3. Duct Leakage Testing of Central Exhaust Systems: At final testing, leakage shall not exceed limits of US EPA Energy Star Multifamily New Construction (MFNC).
        4. Ventilation Flowrate Testing: At final testing, ERV supply and exhaust flowrates in each unit will be measured by the PHIUS Verifier to be within +/- 10% of one another, and will be measured to be within +/- 15% of design values.
        5. Domestic Hot Water Temperature Testing: Verifier-measured domestic hot water delivery temperatures at faucets and showerheads comply with limits of EPA WaterSense Guide for Efficient Hot Water Delivery.
     5. EPA's Indoor airPLUS Performance Requirements: Comply with the applicable version of materials requirements from EPA's Indoor airPLUS Construction Specifications, including but not limited to the following:
        1. Comply with requirements of EPA Indoor airPLUS “How to Find Indoor airPLUS Compliant Low-Emission Products,” for the following:
           1. Composite wood products.
           2. Interior paints and coatings.
           3. Carpets and carpet adhesives.
        2. Comply with Divisions 01 through 49 Specification Sections for specific requirements relating to low emitting materials and indoor air quality for each Section.
     6. EPA Energy Star Requirements: Comply with the following:
        1. EPA Energy Star MFNC National Program Requirements.
        2. EPA Energy Star MFNC Rater Design Review Checklist.
        3. EPA Energy Star MFNC Rater Field Checklist.
        4. EPA Energy Star MFNC Water Management System Builder Checklist.
        5. EPA Energy Star MFNC HVAC Design Report.
        6. EPA Energy Star MFNC HVAC Commissioning Checklist.
        7. EPA Energy Star MFNC HVAC Functional Testing Checklist.
        8. EPA Energy Star MFNC Thermal Bypass Checklist.
        9. DOE Zero Energy Ready Homes Checklist.
        10. EPA Indoor AirPLUS Verification Checklist.
  2. SUBMITTALS
     1. Submit documentation to PHIUS where required for Passive House certification, in the format required by PHIUS. Submit PHIUS documentation concurrently with other construction submittals. PHIUS submittal requirements may be specified in other sections.
  3. QUALITY ASSURANCE
     1. General Contractor Qualifications: Qualified as an Energy Star partner, per Energy Star Multifamily New Construction requirements.
        1. Provide, at minimum, a field or site superintendent who has earned the Certified Passive House Builder (CPHB) credential. This individual shall be onsite each day to review progress critical to Passive House certification.
     2. PHIUS Verifiers: Required to provide third-party on-site verification and testing for Passive House projects.
        1. PHIUS Verifier will perform a pre-construction Passive House and air sealing training with Contractor and subcontractors including, but not limited to, insulation, drywall, plumbing, and electrical. Contractor will ensure this training is on the pre-construction schedule.
     3. Passive House Terminology and Definitions: Refer to PHIUS Passive Building Standard Certification Guidebook, applicable edition.
        1. ACH: Air changes per hour.
        2. Annual Cooling Demand (kBTU/ft2/yr): Represent total energy demand for cooling.
        3. Annual Heating Demand (kBTU/ft2/yr): Represents total energy demand for heating.
        4. CPHC: Certified Passive House Consultant.
        5. CFM: Cubic Feet per Minute.
        6. CFM50/CFM75: Testing pressure in Pascals.
        7. Envelope Area: Building exterior envelope area, including partitions to adjacent non-certified spaces or buildings.
        8. Interior Conditioned Floor Area (iCFA): The total iCFA of the building. iCFA is defined as the interior-dimension (drywall-to-drywall) projected floor area of the conditioned spaces with at least seven feet ceiling height. It includes stairs, cabinets, interior walls, mechanical spaces, storage, but excludes open-to-below.
        9. Peak Cooling Load (BTU/ft2/hr): The maximum amount of heat that must be removed to maintain the desired indoor temperature.
        10. Peak Heating Load (BTU/ft2/hr): The maximum amount of heat that would need to be added to a space to maintain the desired indoor temperature.
        11. PHIUS: Passive House Institute United States.
        12. Site Energy: Primary or Secondary energy that is consumed directly for the operation of the building.
        13. Source Energy: Represents the total amount of energy required to operate the building, including transmission from generation source, delivery and production losses.

1. PRODUCTS [Not Used]
2. EXECUTION
   1. FIELD QUALITY CONTROL

Note: Verify if testing agency is paid by Owner or GC/CM.

* + 1. Owner shall engage the PHIUS Verifier to perform air tightness testing and prepare test reports as required, including but not limited to blower door testing.
       1. Engage with the design team and PHIUS Verifier to ensure that the Verifier's inspection requirements are integrated into the project's construction schedule.
       2. Request, schedule, coordinate, and provide qualified management staff for site visits by the PHIUS Certified Passive House Consultant (CPHC) and testing by the PHIUS Verifier. Contractor shall address any concerns documented by the CPHC and PHIUS Verifier in a timely manner before the Owner, Owner's Representative, design team, and consultants.
       3. Refer to Section 014525 - AIR TIGHTNESS TESTING REQUIREMENTS.
    2. Repair or remove work where test results and inspections indicate that it does not comply with specified requirements.
    3. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

END OF SECTION