**Retrofitting Washington** 



## Standard Work Specifications Field Guide for **Multifamily Homes** created by Washington Department of Commerce

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#### **Desired Outcome:**

Firewall separations in unconditioned attics sealed to prevent air leakage, moisture movement, and spread of fire between the unconditioned attic and conditioned space

Note:

## 3.1001.6a - Pre-inspection

#### **Desired Outcome:**

Firewall separations in unconditioned attics sealed to prevent air leakage, moisture movement, and spread of fire between the unconditioned attic and conditioned space

#### Specification(s):

Conduct pre-inspection in accordance with SWS 2.0100.4 Work Area Inspection and Stabilization

Gaps, cracks, and holes in fire separations located within the work area will be visually identified and incorporated into air sealing work scope, including those that span two conditioned or unconditioned spaces.

Where drawings are available that identify specific fire-resistance ratings (i.e., 1 hour, 2 hour), materials and methods will be employed to preserve or restore such rating

Where drawings are unavailable or do not identify specific fire-resistance ratings, the fire-resistance rating of the assembly may be inferred from the current construction (i.e., single 5/8 sheetrock, concrete masonry unit), and materials and methods employed will be consistent with restoring or preserving such inferred fire-resistance rating

Air sealing locations will be identified between the firewall and the attic floor

#### Objective(s):

Ensure a continuous air- and fire-resistance barrier will be appropriately located between conditioned and unconditioned space

#### **Desired Outcome:**

Firewall separations in unconditioned attics sealed to prevent air leakage, moisture movement, and spread of fire between the unconditioned attic and conditioned space

Note:

## 3.1001.6b - Backing and infill

#### **Desired Outcome:**

Firewall separations in unconditioned attics sealed to prevent air leakage, moisture movement, and spread of fire between the unconditioned attic and conditioned space

#### Specification(s):

Where gaps, cracks, or holes are larger than 1/4" across and/or where the air sealing materials will be subject to temperature variations in excess of 50° F, the need for backing or infill will be evaluated

If used, backing or infill will meet specific characteristics of the fire-resistance-rated assembly and be compatible with the characteristics of the gap, crack, or hole, including preservation of any expansion/contraction characteristics for assembly (e.g., expansion joints, steam pipes, or dissimilar material interfaces with differing coefficients of expansion)

Backing or infill will be selected that maintains sealant placement and durability while allowing for the expected movement from expansion, contraction, load deflection, settling at the location, or if existing water control measures are compromised (e.g., rain screen, drip edge, weep holes, gutter and roof drains, scuppers, or other exterior water management elements)

#### Objective(s):

Minimize gap or hole size to ensure successful use of sealant

Ensure closure is permanent and supports appropriate load (e.g., wind, snow, insulation)

Ensure sealant does not fall out

Ensure integrity of the existing water control system

#### **Desired Outcome:**

Firewall separations in unconditioned attics sealed to prevent air leakage, moisture movement, and spread of fire between the unconditioned attic and conditioned space

Note:

## 3.1001.6c - Sealant selection

#### Desired Outcome:

Firewall separations in unconditioned attics sealed to prevent air leakage, moisture movement, and spread of fire between the unconditioned attic and conditioned space

#### Specification(s):

Sealants will be compatible with their intended surfaces and applied in accordance with manufacturer specifications

Selection will be durable, pest resistant, and have a weather-appropriate seal

Indoor sealants will be low volatile organic compounds (VOC) products that meet independent testing and verification protocols, such as Green Seal GS-36, "GREENGUARD Children and Schools," or comparable certifications

Fire-resistance-rated assemblies will be provided with sealants permitted by the authority having jurisdiction and adopted building code

#### **Objective(s):**

Prevent intrusion of moisture and pests into the sealed assembly

Prevent exposing workers or occupants to excessive VOC levels

Ensure sealant meets or exceeds the performance characteristics of the assembly and is compliant with local fire code requirements

#### **Desired Outcome:**

Firewall separations in unconditioned attics sealed to prevent air leakage, moisture movement, and spread of fire between the unconditioned attic and conditioned space

Note:

## 3.1001.6d - Joint seal

#### **Desired Outcome:**

Firewall separations in unconditioned attics sealed to prevent air leakage, moisture movement, and spread of fire between the unconditioned attic and conditioned space

#### Specification(s):

Continuous seal will be installed around seams, cracks, joints, edges, penetrations, and connections at:

- · The intersection between firewall and attic floor
- If firewall assembly is not monolithic (e.g., balloon framing, CMU, open chase, attic bypass, or with similar penetration through the attic floor plane), attic floor plane penetrations within the firewall assembly will be accessed through the firewall, fully sealed, and firewall surface restored to prevent current or future breaches of the firewall below the attic floor plane from establishing an air flow path to the attic space

#### Objective(s):

Provide airtight, durable seal that does not move, bend, or sag

#### **Desired Outcome:**

Firewalls sealed to prevent air leakage, moisture movement, and spread of fire between the conditioned attic and roof assembly

Note:

## 3.1001.7a - Pre-inspection

#### **Desired Outcome:**

Firewalls sealed to prevent air leakage, moisture movement, and spread of fire between the conditioned attic and roof assembly

#### Specification(s):

Conduct pre-inspection in accordance with SWS 2.0100.4 Work Area Inspection and Stabilization

Gaps, cracks, and holes in fire separations located within the work area will be visually identified and incorporated into air sealing work scope, including those that span two conditioned or unconditioned spaces

Where drawings are available that identify specific fire-resistance ratings (i.e., 1 hour, 2 hour), materials and methods will be employed to preserve or restore such rating

Where drawings are unavailable or do not identify specific fire-resistance ratings, the fire-resistance rating of the assembly may be inferred from the current construction (i.e., single 5/8 sheetrock, concrete masonry unit (CMU), and materials and methods employed will be consistent with restoring or preserving such inferred fire resistance rating

Air sealing locations will be identified between the firewall and the roof assembly

#### Objective(s):

Repair breaches in the firewall

Ensure a continuous air and fire-resistance-rated assembly will be appropriately located between conditioned attic and roof assembly

#### **Desired Outcome:**

Firewalls sealed to prevent air leakage, moisture movement, and spread of fire between the conditioned attic and roof assembly

Note:

## 3.1001.7b - Backing and infill

#### **Desired Outcome:**

Firewalls sealed to prevent air leakage, moisture movement, and spread of fire between the conditioned attic and roof assembly

#### Specification(s):

Where gaps, cracks, or holes are larger than 1/4" across and/or where the air sealing materials will be subject to temperature variations in excess of 50° F, the need for backing or infill will be evaluated

If used, backing or infill will meet specific characteristics of the fire-resistance-rated assembly and be compatible with the characteristics of the gap, crack, or hole, including preservation of any expansion/contraction characteristics for assembly (e.g., expansion joints, steam pipes, or dissimilar material interfaces with differing coefficients of expansion)

Backing or infill will be selected that maintains sealant placement and durability while allowing for the expected movement from expansion, contraction, load deflection, settling at the location, or if existing water control measures are compromised (e.g., rain screen, drip edge, weep holes, gutter and roof drains, scuppers, or other exterior water management elements)

#### Objective(s):

Minimize gap or hole size to ensure successful use of sealant

Ensure closure is permanent and supports appropriate load (e.g., wind, snow, insulation)

Ensure sealant does not fall out

Ensure integrity of the existing water control system

#### **Desired Outcome:**

Firewalls sealed to prevent air leakage, moisture movement, and spread of fire between the conditioned attic and roof assembly

Note:

## 3.1001.7c - Sealant selection

#### **Desired Outcome:**

Firewalls sealed to prevent air leakage, moisture movement, and spread of fire between the conditioned attic and roof assembly

#### Specification(s):

Sealants will be compatible with their intended surfaces and applied in accordance with manufacturer specifications

Selection will be durable, pest resistant, and have a weather-appropriate seal

Indoor sealants will be low volatile organic compound (VOC) products that meet independent testing and verification protocols, such as Green Seal GS-36, "GREENGUARD Children and Schools," or comparable certifications

Fire-resistance-rated assemblies will be provided with sealants permitted by the authority having jurisdiction and adopted building code

#### **Objective(s):**

Prevent intrusion of moisture and pests into the sealed assembly

Prevent exposing workers or occupants to excessive VOC levels

Ensure sealant meets or exceeds the performance characteristics of the assembly and is compliant with local fire code requirements

#### **Desired Outcome:**

Firewalls sealed to prevent air leakage, moisture movement, and spread of fire between the conditioned attic and roof assembly

Note:

## 3.1001.7d - Joint seal

#### **Desired Outcome:**

Firewalls sealed to prevent air leakage, moisture movement, and spread of fire between the conditioned attic and roof assembly

#### Specification(s):

Continuous seal will be installed around seams, cracks, joints, edges, penetrations, and connections at:

- The intersection between firewall and roof assembly
- If firewall assembly is not monolithic (e.g., balloon framing, CMU, open chase, attic bypass, or with similar penetration through the attic floor plane), attic floor plane penetrations within the firewall assembly will be accessed through the firewall, fully sealed, and firewall surface restored to prevent current or future breaches of the firewall below the attic floor plane from establishing an air flow path to the attic space

#### Objective(s):

Provide airtight, durable seal that does not move, bend, or sag

#### **Desired Outcome:**

Maintain the integrity of the glazing system as part of a continuous thermal boundary between the conditioned space and unconditioned space to prescribed R-values

Note:

## 3.1005.2a - Worker safety

#### **Desired Outcome:**

Maintain the integrity of the glazing system as part of a continuous thermal boundary between the conditioned space and unconditioned space to prescribed R-values

#### Specification(s):

All worker safety specifications will be in accordance with SWS 2.0100.3 Worker Safety

#### Objective(s):

Ensure worker safety, especially in regard to fall protection considerations and contaminants found in demolition, such as asbestos, lead, polychlorinated biphenyls, etc.

#### **Desired Outcome:**

Maintain the integrity of the glazing system as part of a continuous thermal boundary between the conditioned space and unconditioned space to prescribed R-values

Note:

## 3.1005.2b - Occupant safety

#### **Desired Outcome:**

Maintain the integrity of the glazing system as part of a continuous thermal boundary between the conditioned space and unconditioned space to prescribed R-values

#### Specification(s):

Occupant will be notified of changes or repairs to be made

**Objective(s):** Ensure occupant safety

#### **Desired Outcome:**

Maintain the integrity of the glazing system as part of a continuous thermal boundary between the conditioned space and unconditioned space to prescribed R-values

Note:

## 3.1005.2c - Pre-inspection

#### **Desired Outcome:**

Maintain the integrity of the glazing system as part of a continuous thermal boundary between the conditioned space and unconditioned space to prescribed R-values

#### Specification(s):

Glazing systems and curbs will be inspected for air and water leakage, integrity, proper operation, and security

Repairs will be completed before insulation installation

If the items above cannot be repaired, the glazing systems will be recommended for replacement before installing insulation

Skylight shaft will be inspected to determine insulation strategy

#### Objective(s):

Determine the scope of glazing system repair

Prepare skylight for insulation installation

#### **Desired Outcome:**

Maintain the integrity of the glazing system as part of a continuous thermal boundary between the conditioned space and unconditioned space to prescribed R-values

Note:

## 3.1005.2d - Sealant selection

#### Desired Outcome:

Maintain the integrity of the glazing system as part of a continuous thermal boundary between the conditioned space and unconditioned space to prescribed R-values

#### Specification(s):

Sealants will be compatible with their intended surfaces and applied in accordance with manufacturer specifications

Selection will be durable, pest resistant, and have a weather-appropriate seal

Indoor sealants will be low volatile organic compound (VOC) products that meet independent testing and verification protocols, such as Green Seal GS-36, "GREENGUARD Children and Schools," or comparable certifications

Fire-resistance-rated assemblies will be provided with sealants permitted by the authority having jurisdiction and adopted building code

#### **Objective(s):**

Prevent intrusion of moisture and pests into the sealed assembly

Prevent exposing workers or occupants to excessive VOC levels

Ensure sealant meets or exceeds the performance characteristics of the assembly and is compliant with local fire code requirements

#### **Desired Outcome:**

Maintain the integrity of the glazing system as part of a continuous thermal boundary between the conditioned space and unconditioned space to prescribed R-values

Note:

## 3.1005.2e - Sealing

#### **Desired Outcome:**

Maintain the integrity of the glazing system as part of a continuous thermal boundary between the conditioned space and unconditioned space to prescribed R-values

#### Specification(s):

Holes and penetrations will be sealed

Bypasses will be blocked and sealed

Holes within fire-resistance-rated assemblies will be filled with a material permitted by the authority having jurisdiction and adopted building code

**Objective(s):** Prevent air leakage

Preserve fire-resistant properties of fire-resistance-rated assemblies

#### **Desired Outcome:**

Maintain the integrity of the glazing system as part of a continuous thermal boundary between the conditioned space and unconditioned space to prescribed R-values

Note:

## 3.1005.2f - Insulation installation

#### **Desired Outcome:**

Maintain the integrity of the glazing system as part of a continuous thermal boundary between the conditioned space and unconditioned space to prescribed R-values

#### Specification(s):

Insulation will be installed in accordance with manufacturer specifications, and in full contact with all sides of existing cavity without gaps, voids, compressions, misalignments, or wind intrusions

Fibrous insulation installed on the well walls will be adequately secured to prevent falling or shifting out of place, and will be installed with a continuous backing on the side exposed to the air

Insulation will be installed to prescribed R-value

Insulation will be installed to meet the specific characteristics of the assembly

#### **Objective(s):**

Insulate to prescribed R-value

Meet all applicable codes

#### **Desired Outcome:**

Maintain the integrity of the glazing system as part of a continuous thermal boundary between the conditioned space and unconditioned space to prescribed R-values

Note:

## 3.1005.2g - Building operations staff education

#### **Desired Outcome:**

Maintain the integrity of the glazing system as part of a continuous thermal boundary between the conditioned space and unconditioned space to prescribed R-values

#### Specification(s):

Documentation of material and R-value will be provided to building operations staff

#### **Objective(s):**

Provide occupant with documentation of installation

#### **Desired Outcome:**

Thermal break between the slab edge and outdoors and ground

## 4.1403.1a - Pre-inspection

#### **Desired Outcome:**

Thermal break between the slab edge and outdoors and ground

#### Specification(s):

An exterior and interior inspection will be conducted for water damage, drainage plane failures, grading issues, and breaches unrelated to the specified air sealing and insulating work

Repairs necessary to stabilize work areas and protect or preserve integrity of energy improvement will be completed before subject work begins

Site will be evaluated to determine potential for excavation

Identify all underground utilities entering the building in the work area

#### Objective(s):

Repair moisture and structure-related issues

Provide a stable slab and related assemblies to ensure the durability of the work

Ensure that any underground utility services are located and protected from damage

#### **Desired Outcome:**

Thermal break between the slab edge and outdoors and ground

## 4.1403.1b - Air sealing

#### **Desired Outcome:**

Thermal break between the slab edge and outdoors and ground

#### Specification(s):

Air sealing between conditioned space and unconditioned space will be completed before insulating

#### Objective(s):

Ensure airtight floor assembly

#### **Desired Outcome:**

Thermal break between the slab edge and outdoors and ground

## 4.1403.1c - Excavation

#### **Desired Outcome:**

Thermal break between the slab edge and outdoors and ground

#### Specification(s):

Excavation will be done to expose the slab edge to the required depth

Caution will be exercised to avoid undermining slab footing and to avoid damage of underground utilities

Excavations will be weather protected (moisture and frost) and will be restored to original condition (density, drainage function) as quickly as possible

#### **Objective(s):**

Provide below-grade installation access

Protect slab and utilities from damage

#### **Desired Outcome:**

Thermal break between the slab edge and outdoors and ground

## 4.1403.1d - Clean and prepare surfaces

#### **Desired Outcome:**

Thermal break between the slab edge and outdoors and ground

#### Specification(s):

Slab edge will be prepared for material installation to meet manufacturer specifications

#### Objective(s):

Ensure a durable installation

#### **Desired Outcome:**

Thermal break between the slab edge and outdoors and ground

## 4.1403.1e - Top and bottom flashing

#### **Desired Outcome:**

Thermal break between the slab edge and outdoors and ground

#### Specification(s):

Flashing will be continuous and permanently secured

#### Objective(s):

Preserve the drainage plane of the wall

#### **Desired Outcome:**

Thermal break between the slab edge and outdoors and ground

### 4.1403.1f - Installation

#### **Desired Outcome:**

Thermal break between the slab edge and outdoors and ground

#### Specification(s):

Insulation will be installed to prescribed R-value

Insulation will be installed in contact with the slab edge, without voids, compressions, or misalignments

Insulation will be run tight to any utilities penetrating the slab edge insulation

#### Objective(s):

Provide effective R-value

#### **Desired Outcome:**

Thermal break between the slab edge and outdoors and ground

## 4.1403.1g - Protective cover

#### **Desired Outcome:**

Thermal break between the slab edge and outdoors and ground

#### Specification(s):

Exposed insulation will be covered with a durable, rigid material

#### Objective(s):

Protect insulation from weather and impact

#### **Desired Outcome:**

Thermal break between the slab edge and outdoors and ground

### 4.1403.1h - Termites

#### **Desired Outcome:**

Thermal break between the slab edge and outdoors and ground

#### Specification(s):

Existing termite treatment and inspection gaps will be preserved, and termite control measures consistent with local code requirements will be implemented, as required

#### **Objective(s):**

Prevent pest entry and maintain applicable warranties

#### **Desired Outcome:**

Thermal break between the slab edge and outdoors and ground

### 4.1403.1i - Back fill

#### Desired Outcome:

Thermal break between the slab edge and outdoors and ground

#### Specification(s):

Restore excavated earth and grade to preserve drainage plane

#### Objective(s):

Preserve the drainage plane of the slab edge

#### **Desired Outcome:**

Thermal break between the slab edge and outdoors and ground

## 4.1403.1j - Property manager education

#### **Desired Outcome:**

Thermal break between the slab edge and outdoors and ground

#### Specification(s):

A dated receipt signed by the installer will be provided that includes:

- Coverage area
- Thickness
- R-value
  Objective(s):
  Document job completion to contract specifications

Comply with 16 CFR 460.17

Confirm amount of insulation installed

#### **Desired Outcome:**

Multiport fan system installed to provide required ventilation

#### Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

## 6.6004.1a - Pre-inspection

#### **Desired Outcome:**

Multiport fan system installed to provide required ventilation

#### Specification(s):

Specifications will be field verified as appropriate to site conditions by installer

#### Objective(s):

Ensure appropriate design for installation

#### **Desired Outcome:**

Multiport fan system installed to provide required ventilation

#### Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

### 6.6004.1b - Air flow

#### **Desired Outcome:**

Multiport fan system installed to provide required ventilation

#### Specification(s):

ASHRAE 62.2 and local code requirements should be followed for identifying design airflow rates within apartment dwelling units.

All other areas will follow local code requirements and/or ASHRAE 62.1 requirements

Air flows will be measured in accordance with ANSI/ACCA Standard 5 or ANSI/ASHRAE Standard 111 and adjusted to meet design requirements

#### Objective(s):

Exhaust sufficient air from desired locations to the outdoors

#### **Desired Outcome:**

Multiport fan system installed to provide required ventilation

#### Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

## 6.6004.1c - Fan specification

#### **Desired Outcome:**

Multiport fan system installed to provide required ventilation

#### Specification(s):

Motors of 1 horsepower (HP) or larger will be rated as Premium Efficiency by the National Electrical Manufacturer's Association (NEMA)

Fan will be capable of maintaining a minimum operating static pressure of .25 inches of water column (WC) or the pressure that is required by the system design to ensure proper operation of all system components

Motors less than 1 HP, used for continuous whole-building ventilation, will be rated by the Home Ventilation Institute to provide at least the required ventilation rate at a minimum operating static pressure of .25 inches WC or the pressure that is required by the system design to ensure proper operation of all system components

#### Objective(s):

Ensure proper flow rate sizing of exhaust fans

#### **Desired Outcome:**

Multiport fan system installed to provide required ventilation

#### Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

## 6.6004.1d - Fan outlet termination

#### **Desired Outcome:**

Multiport fan system installed to provide required ventilation

#### Specification(s):

Outlet will be terminated outside of the building shell and will have a louvered cover and bird screen

Minimum distance of exhaust outlet from any doors, windows, or outside air intakes shall be in conformance with the applicable building code

Outlet will be sealed to prevent water intrusion and exhaust air leakage into building cavities

#### Objective(s):

Direct exhaust to the outdoors and prevent re-entry

Prevent entry of weather and pests into building shell

Ensure occupant health and safety

#### **Desired Outcome:**

Multiport fan system installed to provide required ventilation

#### Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

## 6.6004.1e - Wiring

#### **Desired Outcome:**

Multiport fan system installed to provide required ventilation

#### Specification(s):

Wiring will be installed by a licensed contractor

Wiring will be installed in accordance with original equipment manufacturer specifications, and local and national electrical and mechanical codes

Refer to NFPA 70: National Electrical Code

**Objective(s):** Prevent an electrical hazard
#### **Desired Outcome:**

Multiport fan system installed to provide required ventilation

#### Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

### 6.6004.1f - Access

#### **Desired Outcome:**

Multiport fan system installed to provide required ventilation

#### Specification(s):

Fan and service switch will be accessible for maintenance

#### Objective(s):

Ensure unit and service switch are accessible for maintenance or replacement

#### **Desired Outcome:**

Multiport fan system installed to provide required ventilation

#### Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

# 6.6004.1g - Outdoor/indoor fan mounting

#### **Desired Outcome:**

Multiport fan system installed to provide required ventilation

#### Specification(s):

Fan will be oriented so the equivalent length of the duct run is as short as possible

Fan will be mounted securely in accordance with manufacturer specifications and local code requirements (in terms of seismic restraints, vibration, and noise control)

Fan will be isolated from the building framing unless specifically designed to be directly attached

#### Objective(s):

Ensure short duct runs to achieve optimum air flows

Ensure mounting is installed securely

Ensure fan housing or building framing does not shake, rattle, or hum when operating

Minimize noise

#### **Desired Outcome:**

Multiport fan system installed to provide required ventilation

#### Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

### 6.6004.1h - Connecting exposed ductwork

#### **Desired Outcome:**

Multiport fan system installed to provide required ventilation

#### Specification(s):

All exposed ductwork outside of the building will be insulated to a minimum R-8, protected from weather exposure, and sealed at all penetrations into building shell

#### Objective(s):

Ensure durability and energy efficiency of ductwork

#### **Desired Outcome:**

Multiport fan system installed to provide required ventilation

#### Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

### 6.6004.1i - Fan/duct riser connection

#### **Desired Outcome:**

Multiport fan system installed to provide required ventilation

#### Specification(s):

If fan is on curb, the riser will be flashed to the top of the curb and the fan will be sealed to the riser flashing

If the fan is separate from the curb, the riser will be flashed to the top of the curb

Duct connector will be sealed to the top of the riser flashing

Ductwork will be attached via a flexible connection and will maintain the intended fan opening

#### Objective(s):

Provide the most efficient air transfer from targeted location to exhaust location

#### **Desired Outcome:**

Multiport fan system installed to provide required ventilation

#### Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

### 6.6004.1j - Backdraft dampers

#### **Desired Outcome:**

Multiport fan system installed to provide required ventilation

#### Specification(s):

A backdraft damper will be installed at or near the fan

A backdraft damper will be installed at each dwelling unit unless the fan runs on a continuous operating system

#### Objective(s):

Prevent reverse air flow when the system is off

Prevent spread of contaminants between dwelling units

#### **Desired Outcome:**

Multiport fan system installed to provide required ventilation

#### Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

# 6.6004.1k - Combining intake ducts

#### **Desired Outcome:**

Multiport fan system installed to provide required ventilation

#### Specification(s):

All individual intake ducts will be combined on the inlet side of fan (e.g., Y-fitting, T-fitting, collector box)

#### Objective(s):

Exhaust air from desired locations to the outdoors

#### **Desired Outcome:**

Multiport fan system installed to provide required ventilation

#### Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

### 6.6004.11 - Duct connections

#### **Desired Outcome:**

Multiport fan system installed to provide required ventilation

#### Specification(s):

All riser ducts or plenums will be connected and sealed to applicable intakes, collector box, fan, and termination fitting

Sealing activities will not interfere with the operation of fire dampers, balancing dampers, or backdraft dampers

Ducts will be connected and sealed in accordance with the applicable code adopted by the jurisdiction

#### Objective(s):

Exhaust air from desired locations to the outdoors

Preserve integrity of the duct system and building envelope

#### **Desired Outcome:**

Multiport fan system installed to provide required ventilation

#### Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

### 6.6004.1m - Insulation

#### **Desired Outcome:**

Multiport fan system installed to provide required ventilation

#### Specification(s):

All components outside of the thermal envelope will be insulated to a minimum of R-8 or equivalent to local codes

#### Objective(s):

Preserve integrity of the duct system

Prevent condensation in ductwork

Prevent heat loss

#### **Desired Outcome:**

Multiport fan system installed to provide required ventilation

#### Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

### 6.6004.1n - Register boot to interior surface seal

#### **Desired Outcome:**

Multiport fan system installed to provide required ventilation

#### Specification(s):

Register boot will be sealed to interior surfaces with sealants compatible to their intended surfaces

Sealants will be continuous and meet fire barrier specifications

#### Objective(s):

Prevent air leakage around boot

Ensure a permanent seal to the building air barrier

Prevent a fire hazard

#### **Desired Outcome:**

Multiport fan system installed to provide required ventilation

#### Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

# 6.6004.10 - Preventing air leakage caused by exhaust fans

#### **Desired Outcome:**

Multiport fan system installed to provide required ventilation

#### Specification(s):

Walls, ceilings, and floors will be sealed to separate any occupied space from any unconditioned spaces and adjacent dwelling units

Refer to ASHRAE 62.2 Addendum J

#### Objective(s):

Ensure occupant health and safety

Prevent air leakage into the building and dwelling units from other spaces (e.g., adjacent dwelling units, garages, unconditioned crawl spaces, unconditioned attics)

#### **Desired Outcome:**

Multiport fan system installed to provide required ventilation

#### Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

### 6.6004.1p - Balance and flow

#### **Desired Outcome:**

Multiport fan system installed to provide required ventilation

#### Specification(s):

Air flows will be measured and adjusted to match the design specification in accordance with ANSI ACCA Standard 5 or ANSI/ASHRAE Standard 111

#### Objective(s):

Achieve the desired air flows to and from the desired locations

#### **Desired Outcome:**

Multiport fan system installed to provide required ventilation

#### Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

### 6.6004.1q - Combustion zone testing

#### **Desired Outcome:**

Multiport fan system installed to provide required ventilation

#### Specification(s):

Pressure effects caused by fans will be assessed and corrected when found outside of combustion safety standards

#### Objective(s):

Ensure safe operation of combustion appliances

#### **Desired Outcome:**

Multiport fan system installed to provide required ventilation

#### Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

### 6.6004.1r - Fire dampers

#### **Desired Outcome:**

Multiport fan system installed to provide required ventilation

#### Specification(s):

Fire dampers must be accessible for inspection and/or testing by the local authorities; if fire dampers are not accessible from a grill or register, an access door in the ductwork is required

Sealing activities will not interfere with the operation of fire dampers, balancing dampers, or backdraft dampers

Type B fire dampers will be used as required by fire code

#### Objective(s):

Ensure access to fire dampers for safe operation

Minimize static pressure

Maximize air flow

#### **Desired Outcome:**

Multiport fan system installed to provide required ventilation

#### Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

### 6.6004.1s - Occupant/property manager education

#### **Desired Outcome:**

Multiport fan system installed to provide required ventilation

#### Specification(s):

Occupant/property manager will be educated on purpose and value of system

Property manager will be instructed on all maintenance procedures

#### Objective(s):

Ensure occupant health and safety

Preserve integrity of system

#### **Desired Outcome:**

Multiport fan system installed to provide required ventilation

#### Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

### 6.6004.2a - Pre-inspection

#### **Desired Outcome:**

Multiport fan system installed to provide required ventilation

#### Specification(s):

Specifications will be field verified as appropriate to site conditions by installer

#### Objective(s):

Ensure appropriate design for installation

#### **Desired Outcome:**

Multiport fan system installed to provide required ventilation

#### Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

### 6.6004.2b - Air flow

#### **Desired Outcome:**

Multiport fan system installed to provide required ventilation

#### Specification(s):

ASHRAE 62.2 and local code requirements should be followed for identifying design airflow rates within apartment dwelling units.

All other areas will follow local code requirements and/or ASHRAE 62.1 requirements

Air flows will be measured in accordance with ANSI/ACCA Standard 5 or ANSI/ASHRAE Standard 111 and adjusted to meet design requirements

#### Objective(s):

Exhaust sufficient air from desired locations to the outdoors

#### **Desired Outcome:**

Multiport fan system installed to provide required ventilation

#### Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

### 6.6004.2c - Outlet termination

#### **Desired Outcome:**

Multiport fan system installed to provide required ventilation

#### Specification(s):

Outlet will be terminated outside of the building shell and will have a louvered cover and bird screen

Minimum distance of exhaust outlet from any doors, windows, or outside air intakes shall be in conformance with the applicable building code

Outlet will be sealed to prevent water intrusion and exhaust air leakage into building cavities

#### Objective(s):

Direct exhaust to the outdoors and prevent re-entry

Prevent entry of weather and pests into building shell

Ensure occupant health and safety

#### **Desired Outcome:**

Multiport fan system installed to provide required ventilation

#### Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

### 6.6004.2d - Wiring

#### **Desired Outcome:**

Multiport fan system installed to provide required ventilation

#### Specification(s):

Wiring will be installed by a properly licensed contractor

Wiring will be installed in accordance with original equipment manufacturer specifications, and local and national electrical and mechanical codes

Refer to NFPA 70: National Electrical Code for installation requirements

#### Objective(s):

Prevent an electrical hazard

#### **Desired Outcome:**

Multiport fan system installed to provide required ventilation

#### Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

### 6.6004.2e - Access

#### **Desired Outcome:**

Multiport fan system installed to provide required ventilation

#### Specification(s):

Fan and service switch will be accessible for maintenance

#### Objective(s):

Ensure unit and service switch are accessible for maintenance or replacement

#### **Desired Outcome:**

Multiport fan system installed to provide required ventilation

#### Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

### 6.6004.2f - Fan mounting

#### **Desired Outcome:**

Multiport fan system installed to provide required ventilation

#### Specification(s):

Fan will be oriented so the equivalent length of the duct run is as short as possible

Fan will be mounted securely in accordance with manufacturer specifications and local code requirements (in terms of seismic restraints, vibration, and noise control)

Fan will be isolated from the building framing unless specifically designed to be directly attached

Fan will be installed remotely by ducting from intake grilles

#### Objective(s):

Ensure short duct runs to achieve optimum air flows

Ensure mounting is installed securely

Ensure fan housing or building framing does not shake, rattle, or hum when operating

Minimize noise

#### **Desired Outcome:**

Multiport fan system installed to provide required ventilation

#### Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

# 6.6004.2g - Backdraft dampers (required in intermittent systems)

#### **Desired Outcome:**

Multiport fan system installed to provide required ventilation

#### Specification(s):

A backdraft damper will be installed between the fan and the exterior

A backdraft damper will be installed in any duct serving any room with a separate exhaust (e.g., dryer)

#### Objective(s):

Prevent reverse air flow when the system is off

Prevent spread of contaminants between rooms

#### **Desired Outcome:**

Multiport fan system installed to provide required ventilation

#### Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

### 6.6004.2h - Combining intake ducts

#### **Desired Outcome:**

Multiport fan system installed to provide required ventilation

#### Specification(s):

All individual intake ducts will be combined on the intake side of fan (e.g., Y-fitting, T-fitting, collector box)

#### Objective(s):

Exhaust air from desired locations to the outdoors

#### **Desired Outcome:**

Multiport fan system installed to provide required ventilation

#### Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

### 6.6004.2i - Duct connections

#### **Desired Outcome:**

Multiport fan system installed to provide required ventilation

#### Specification(s):

Ducts will be connected and sealed to applicable intakes, collector box, fan, and termination fitting

Ducts will be connected and sealed in accordance with the applicable code adopted by the jurisdiction

#### Objective(s):

Exhaust air from desired locations to the outdoors

Preserve integrity of the duct system and building envelope

#### **Desired Outcome:**

Multiport fan system installed to provide required ventilation

#### Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

### 6.6004.2j - Insulation

#### **Desired Outcome:**

Multiport fan system installed to provide required ventilation

#### Specification(s):

All components outside of the thermal envelope will be insulated to a minimum of R-8 or equivalent to local codes

#### Objective(s):

Preserve integrity of the duct system

Prevent condensation in ductwork

Prevent heat loss

#### **Desired Outcome:**

Multiport fan system installed to provide required ventilation

#### Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

### 6.6004.2k - Boot to interior surface seal

#### **Desired Outcome:**

Multiport fan system installed to provide required ventilation

#### Specification(s):

Register boot will be sealed to interior surfaces with sealants compatible to their intended surfaces

Sealants will be continuous and meet fire barrier specifications

Boots will be connected and sealed in accordance with the applicable code adopted by the jurisdiction

#### Objective(s):

Prevent air leakage around boot

Ensure a permanent seal to the building air barrier

Prevent a fire hazard

#### **Desired Outcome:**

Multiport fan system installed to provide required ventilation

#### Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

### 6.6004.21 - Preventing air leakage caused by exhaust fans

#### **Desired Outcome:**

Multiport fan system installed to provide required ventilation

#### Specification(s):

Walls, ceilings, and floors will be sealed to separate any occupied space from any unconditioned spaces and adjacent dwelling units

Refer to ASHRAE 62.2 Section 6.1

#### Objective(s):

Ensure occupant health and safety

Prevent air leakage into the building from other spaces (e.g., adjacent dwelling units, garages, unconditioned crawl spaces, unconditioned attics)

#### **Desired Outcome:**

Multiport fan system installed to provide required ventilation

#### Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

### 6.6004.2m - Balance and flow

#### **Desired Outcome:**

Multiport fan system installed to provide required ventilation

#### Specification(s):

Air flows will be measured and adjusted to match to the design specification

#### Objective(s):

Achieve the desired air flows to and from the desired locations

#### **Desired Outcome:**

Multiport fan system installed to provide required ventilation

#### Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

### 6.6004.2n - Combustion zone testing

#### **Desired Outcome:**

Multiport fan system installed to provide required ventilation

#### Specification(s):

Pressure effects caused by fans will be assessed and corrected when found outside of combustion safety standards

#### Objective(s):

Ensure safe operation of combustion appliances

#### **Desired Outcome:**

Multiport fan system installed to provide required ventilation

#### Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

### 6.6004.20 - Fire dampers

#### **Desired Outcome:**

Multiport fan system installed to provide required ventilation

#### Specification(s):

Fire dampers must be accessible for inspection and/or testing by the local authorities; if fire dampers are not accessible from a grill or register, an access door in the ductwork is required

Sealing activities will not interfere with the operation of fire dampers, balancing dampers, or backdraft dampers

Type B fire dampers will be used as required by fire code

#### Objective(s):

Ensure access to fire dampers for safe operation

Minimize static pressure

Maximize air flow

#### **Desired Outcome:**

Multiport fan system installed to provide required ventilation

#### Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

### 6.6004.2p - Occupant/property manager education

#### **Desired Outcome:**

Multiport fan system installed to provide required ventilation

#### Specification(s):

Occupant/property manager will be educated on purpose and value of system

Property manager will be instructed on all maintenance procedures

#### Objective(s):

Ensure occupant health and safety

Preserve integrity of system

#### **Desired Outcome:**

Efficient and balanced distribution system

### 6.6202.3a - Pre-inspection

#### **Desired Outcome:**

Efficient and balanced distribution system

#### Specification(s):

Specifications will be field verified as appropriate to site conditions by installer (e.g., duct size, type, shape, register type, duct static pressure)

Access to all dwelling units and elements of distribution system will be ensured by installer

#### Objective(s):

Ensure appropriate design for installation

#### **Desired Outcome:**

Efficient and balanced distribution system

### 6.6202.3b - Preparation

#### **Desired Outcome:**

Efficient and balanced distribution system

#### Specification(s):

Duct cleaning, when performed, will be performed in compliance with ANSI / ACCA 6 HVAC System Cleanliness

Register cleaning or replacement will be performed as specified

Duct sealing will be performed as specified

Stack pressures will be verified for proper operation of flow control device

Presence and type of dampers and smoke control devices will be identified, and installer will ensure the installation of the air flow device will not interfere with proper operation

#### Objective(s):

Establish preconditions for installing flow control device

Ensure health and safety of occupant

#### **Desired Outcome:**

Efficient and balanced distribution system

### 6.6202.3c - Material selection

#### **Desired Outcome:**

Efficient and balanced distribution system

#### Specification(s):

Appropriate selection of air flow regulator or orifice will be confirmed by installer; if custom design is required, it will be determined by installer

Registers will be compatible with selected flow control device

Gasketing or transition system will be compatible with selected flow control device and existing duct components

Sealants and materials will be compatible with their intended surfaces and applied in accordance with manufacturer specifications

Duct sealants will be UL 181 compliant

Sealants and materials will be continuous and in accordance with fire barrier specifications

#### Objective(s):

Ensure sealants and materials meet or exceed the performance characteristics required of the assembly (e.g., fire rating)

Ensure conditions exist for effective installation of flow control device

Ensure conditions exist for the flow control device to meet the design specifications

#### **Desired Outcome:**

Efficient and balanced distribution system

### 6.6202.3d - Installation

#### **Desired Outcome:**

Efficient and balanced distribution system

#### Specification(s):

Transition or adapter will be securely fastened and sealed in accordance with manufacturer specifications

Flow control device will be installed with proper orientation and in accordance with manufacturer specifications

Adjustable devices will be set to preliminary balancing position

#### Objective(s):

Achieve specified design flows

Provide a durable and secure installation

#### **Desired Outcome:**

Efficient and balanced distribution system

### 6.6202.3e - Balance and flow

#### **Desired Outcome:**

Efficient and balanced distribution system

#### Specification(s):

Air flows will be measured and adjusted to match to the design specification in accordance with ANSI/ACCA Standard 5 or ANSI/ASHRAE Standard 111

#### Objective(s):

Achieve the desired air flows to and from the desired locations

#### **Desired Outcome:**

Efficient and balanced distribution system

### 6.6202.3f - Verification

#### **Desired Outcome:**

Efficient and balanced distribution system

#### Specification(s):

Final visual inspection of flow control installation and installer documentation will be completed

Continued operation of dampers and smoke control devices will be verified

#### Objective(s):

Ensure the performance of the ventilation system

Ensure occupant health and safety
# 6.6202.3 - Airflow Control Devices (All Building Types)

#### **Desired Outcome:**

Efficient and balanced distribution system

## 6.6202.3g - Occupant/property manager education

#### **Desired Outcome:**

Efficient and balanced distribution system

#### Specification(s):

Occupant/property manager will be educated on how the system works and its purpose

Occupant/property manager will be educated on how to inspect flow control device upon unit turnover

#### Objective(s):

Ensure the durability of the ventilation system

#### **Desired Outcome:**

Fan controls support ventilation strategy

#### Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

## 6.6202.4a - Primary ventilation fan

#### **Desired Outcome:**

Fan controls support ventilation strategy

#### Specification(s):

Specifications will be field verified as appropriate to site conditions by installer

Controls will be used that can meet the following conditions:

- Run fan continuously or intermittently, depending upon the intended schedule of operation
- · Operate fan to produce the intended flow for each intended flow setting
- Any switch for ventilation system will be labeled

#### Objective(s):

Deliver intended air exchange

Ensure fan controls meet intended ventilation strategy

#### **Desired Outcome:**

Fan controls support ventilation strategy

#### Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

## 6.6202.4b - Spot fan

#### **Desired Outcome:**

Fan controls support ventilation strategy

#### Specification(s):

Controls will be used that meet the following conditions:

- Run fan continuously or intermittently, depending on the intended schedule of operation
- · Run fan for intended time for timed operation
- · Operate fan to produce the intended flow for each intended flow setting

#### Objective(s):

Deliver intended air exchange

Ensure fan controls meet intended ventilation strategy

#### **Desired Outcome:**

Fan controls support ventilation strategy

#### Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

## 6.6202.4c - Wiring

#### **Desired Outcome:**

Fan controls support ventilation strategy

#### Specification(s):

Wiring will be installed by a properly licensed contractor

Wiring will be installed in accordance with original equipment manufacturer specifications, and local and national electrical and mechanical codes

Refer to NFPA 70: National Electrical Code for installation requirements.

#### Objective(s):

Prevent an electrical hazard

Ensure fan controls meet intended ventilation strategy

#### **Desired Outcome:**

Fan controls support ventilation strategy

#### Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

## 6.6202.4d - Occupancy sensors/humidistat

#### **Desired Outcome:**

Fan controls support ventilation strategy

#### Specification(s):

Manual override will be present on all controls

Occupancy sensor and/or humidistat will be calibrated and commissioned effectively, and on a maintenance schedule

Manufacturer specifications will be followed

#### Objective(s):

Allow occupant control

Ensure fan controls meet intended ventilation strategy

Maintain performance of control device

#### **Desired Outcome:**

Fan controls support ventilation strategy

#### Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

## 6.6202.4e - Carbon dioxide sensors (demand control)

#### **Desired Outcome:**

Fan controls support ventilation strategy

#### Specification(s):

Multispeed or variable frequency drive fan will be required

Sensors will be calibrated and commissioned effectively, and on a maintenance schedule

Manufacturer specifications will be followed

#### Objective(s):

Ensure fan controls meet intended ventilation strategy

Maintain performance of control device

#### **Desired Outcome:**

Fan controls support ventilation strategy

#### Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

## 6.6202.4f - Occupant/property manager education

#### **Desired Outcome:**

Fan controls support ventilation strategy

#### Specification(s):

When fan controls are present and controlled by occupant, a system operation guide designed for occupants (nonprofessionals) will be provided to explain how and why to operate system

Every six months, maintenance staff will verify timer systems are in place and are operating properly

#### Objective(s):

Educate occupants about system operation and importance

Deliver intended air exchange

#### **Desired Outcome:**

Heat Recovery Ventilator (HRV) and Energy Recovery Ventilator (ERV) systems installed to specifications

#### Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

## 6.6202.5a - Equipment specification

#### **Desired Outcome:**

Heat Recovery Ventilator (HRV) and Energy Recovery Ventilator (ERV) systems installed to specifications

#### Specification(s):

Specifications will be field verified as appropriate to site conditions by installer

#### Objective(s):

Ensure appropriate equipment is specified

Ensure design and installation are feasible

#### **Desired Outcome:**

Heat Recovery Ventilator (HRV) and Energy Recovery Ventilator (ERV) systems installed to specifications

#### Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

## 6.6202.5b - Air flow

#### **Desired Outcome:**

Heat Recovery Ventilator (HRV) and Energy Recovery Ventilator (ERV) systems installed to specifications

#### Specification(s):

ASHRAE 62.2 and local code requirements should be followed for identifying design airflow rates within apartment dwelling units; all other areas will follow local code requirements and/or ASHRAE 62.1 requirements

Air flows will be measured in accordance with ANSI/ACCA Standard 5 or ANSI/ASHRAE Standard 111 and adjusted to meet design requirements

#### Objective(s):

Provide sufficient outdoor air to desired locations

#### **Desired Outcome:**

Heat Recovery Ventilator (HRV) and Energy Recovery Ventilator (ERV) systems installed to specifications

#### Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

## 6.6202.5c - Wiring

#### **Desired Outcome:**

Heat Recovery Ventilator (HRV) and Energy Recovery Ventilator (ERV) systems installed to specifications

#### Specification(s):

Wiring will be installed by a licensed contractor

Wiring will be installed in accordance with original equipment manufacturer specifications, and local and national electrical and mechanical codes

Refer to NFPA 70: National Electrical Code for installation requirements.

#### Objective(s):

Prevent an electrical hazard

#### **Desired Outcome:**

Heat Recovery Ventilator (HRV) and Energy Recovery Ventilator (ERV) systems installed to specifications

#### Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

## 6.6202.5d - Access

#### **Desired Outcome:**

Heat Recovery Ventilator (HRV) and Energy Recovery Ventilator (ERV) systems installed to specifications

#### Specification(s):

Fans, service switch, filters, drain, and drain pan will be accessible for maintenance or replacement

#### Objective(s):

Maintain designed air flows and system performance

Ensure occupant health and safety

#### **Desired Outcome:**

Heat Recovery Ventilator (HRV) and Energy Recovery Ventilator (ERV) systems installed to specifications

#### Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

## 6.6202.5e - HRV/ERV mounting

#### **Desired Outcome:**

Heat Recovery Ventilator (HRV) and Energy Recovery Ventilator (ERV) systems installed to specifications

#### Specification(s):

HRV/ERV will be mounted securely in accordance with manufacturer specifications and local code requirements (in terms of seismic restraints)

HRV/ERV will be oriented so the equivalent length of the duct run is as short as possible

HRV/ERV will be isolated from the building framing unless specifically designed to be directly attached

#### Objective(s):

Ensure short duct runs achieve optimum air flows

Ensure HRV/ERV is mounted securely

Ensure HRV/ERV housing or building framing does not shake, rattle, or hum when operating

Minimize noise

#### **Desired Outcome:**

Heat Recovery Ventilator (HRV) and Energy Recovery Ventilator (ERV) systems installed to specifications

#### Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

## 6.6202.5f - Condensate drain

#### **Desired Outcome:**

Heat Recovery Ventilator (HRV) and Energy Recovery Ventilator (ERV) systems installed to specifications

#### Specification(s):

Condensation shall be drained to a location approved by the local jurisdiction

#### Objective(s):

Prevent moisture problems

#### **Desired Outcome:**

Heat Recovery Ventilator (HRV) and Energy Recovery Ventilator (ERV) systems installed to specifications

#### Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

## 6.6202.5g - New connecting ductwork

#### **Desired Outcome:**

Heat Recovery Ventilator (HRV) and Energy Recovery Ventilator (ERV) systems installed to specifications

#### Specification(s):

All exposed ductwork outside of the building will be insulated to a minimum R-12, protected from weather exposure, and sealed at all penetrations into building shell

#### Objective(s):

Ensure durability and energy efficiency of ductwork

#### **Desired Outcome:**

Heat Recovery Ventilator (HRV) and Energy Recovery Ventilator (ERV) systems installed to specifications

#### Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

## 6.6202.5h - Distribution systems

#### **Desired Outcome:**

Heat Recovery Ventilator (HRV) and Energy Recovery Ventilator (ERV) systems installed to specifications

#### Specification(s):

Note: HRV/ERV provides the outdoor air supply fan and the exhaust fan

The rest of the ventilation system will be installed in accordance with the following details:

- SWS 6.6104.1 Outdoor Supply Air Handling Unit Serving Multiple Dwelling Units or Corridors )
- SWS 6.6004.1 Central/Common Exhaust Fan Serving Multiple Dwelling Units via Common Duct(s) and Dwelling Unit Branches

#### Objective(s):

Achieve the desired air flows to and from the desired locations

Preserve integrity of the duct system and building envelope

#### **Desired Outcome:**

Heat Recovery Ventilator (HRV) and Energy Recovery Ventilator (ERV) systems installed to specifications

#### Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

## 6.6202.5i - Fire dampers

#### **Desired Outcome:**

Heat Recovery Ventilator (HRV) and Energy Recovery Ventilator (ERV) systems installed to specifications

#### Specification(s):

Fire dampers must be accessible for inspection and/or testing by the local authorities; if fire dampers are not accessible from a grill or register, an access door in the ductwork is required

Sealing activities will not interfere with the operation of fire dampers, balancing dampers, or backdraft dampers

Type B fire dampers will be used as required by fire code

#### Objective(s):

Ensure access to fire dampers for safe operation

Minimize static pressure

Maximize air flow

#### **Desired Outcome:**

Heat Recovery Ventilator (HRV) and Energy Recovery Ventilator (ERV) systems installed to specifications

#### Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

## 6.6202.5j - Occupant/property manager education

#### **Desired Outcome:**

Heat Recovery Ventilator (HRV) and Energy Recovery Ventilator (ERV) systems installed to specifications

#### Specification(s):

Occupant/property manager will be educated on purpose of system, and how and when to change filter and clean drain pan, if applicable, in accordance with manufacturer specifications

#### Objective(s):

Ensure occupant health and safety

Preserve integrity of system

#### **Desired Outcome:**

Heat Recovery Ventilator (HRV) and Energy Recovery Ventilator (ERV) systems installed to specifications

#### Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

## 6.6202.6a - Equipment specifications

#### **Desired Outcome:**

Heat Recovery Ventilator (HRV) and Energy Recovery Ventilator (ERV) systems installed to specifications

#### Specification(s):

Specifications will be field verified as appropriate to site conditions by installer

#### Objective(s):

Ensure appropriate equipment is specified

Ensure design and installation are feasible

#### **Desired Outcome:**

Heat Recovery Ventilator (HRV) and Energy Recovery Ventilator (ERV) systems installed to specifications

#### Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

## 6.6202.6b - Air flow

#### **Desired Outcome:**

Heat Recovery Ventilator (HRV) and Energy Recovery Ventilator (ERV) systems installed to specifications

#### Specification(s):

ASHRAE 62.2 and local code requirements should be followed for identifying design airflow rates within apartment dwelling units.

All other areas will follow local code requirements and/or ASHRAE 62.1 requirements

Air flows will be measured in accordance with ANSI/ACCA Standard 5 or ANSI/ASHRAE Standard 111 and adjusted to meet design requirements

#### Objective(s):

Provide sufficient outdoor air to desired locations

#### **Desired Outcome:**

Heat Recovery Ventilator (HRV) and Energy Recovery Ventilator (ERV) systems installed to specifications

#### Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

## 6.6202.6c - Wiring

#### **Desired Outcome:**

Heat Recovery Ventilator (HRV) and Energy Recovery Ventilator (ERV) systems installed to specifications

#### Specification(s):

Wiring will be installed by a properly licensed contractor

Wiring will be installed in accordance with original equipment manufacturer specifications, and local and national electrical and mechanical codes

Refer to NFPA 70: National Electrical Code for installation requirements

#### Objective(s):

Prevent an electrical hazard

#### **Desired Outcome:**

Heat Recovery Ventilator (HRV) and Energy Recovery Ventilator (ERV) systems installed to specifications

#### Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

## 6.6202.6d - Access

#### **Desired Outcome:**

Heat Recovery Ventilator (HRV) and Energy Recovery Ventilator (ERV) systems installed to specifications

#### Specification(s):

Fans, service switch, filters, drain, and drain pan will be accessible for maintenance or replacement

#### Objective(s):

Maintain designed air flows and system performance

Ensure occupant health and safety

#### **Desired Outcome:**

Heat Recovery Ventilator (HRV) and Energy Recovery Ventilator (ERV) systems installed to specifications

#### Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

## 6.6202.6e - HRV/ERV mounting

#### **Desired Outcome:**

Heat Recovery Ventilator (HRV) and Energy Recovery Ventilator (ERV) systems installed to specifications

#### Specification(s):

Fan will be mounted securely in accordance with manufacturer specifications and local code requirements (in terms of seismic restraints)

Fan will be oriented so the equivalent length of the duct run is as short as possible

Fan will be isolated from the building framing unless specifically designed to be directly attached

#### Objective(s):

Ensure short duct runs achieve optimum air flows

Ensure fan is mounted securely

Ensure fan housing or building framing does not shake, rattle, or hum when operating

Minimize noise

#### **Desired Outcome:**

Heat Recovery Ventilator (HRV) and Energy Recovery Ventilator (ERV) systems installed to specifications

#### Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

## 6.6202.6f - Condensate drain

#### **Desired Outcome:**

Heat Recovery Ventilator (HRV) and Energy Recovery Ventilator (ERV) systems installed to specifications

#### Specification(s):

Condensation shall be drained to a location approved by the local jurisdiction

#### Objective(s):

Prevent moisture problems

#### **Desired Outcome:**

Heat Recovery Ventilator (HRV) and Energy Recovery Ventilator (ERV) systems installed to specifications

#### Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

# 6.6202.6g - Backdraft dampers (required for intermittent operation)

#### **Desired Outcome:**

Heat Recovery Ventilator (HRV) and Energy Recovery Ventilator (ERV) systems installed to specifications

#### Specification(s):

A backdraft damper will be installed between the HRV or ERV and the exterior, unless the system operates continuously

#### Objective(s):

Prevent reverse air flow when the system is off

#### **Desired Outcome:**

Heat Recovery Ventilator (HRV) and Energy Recovery Ventilator (ERV) systems installed to specifications

#### Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

## 6.6202.6h - Fan outlet termination

#### **Desired Outcome:**

Heat Recovery Ventilator (HRV) and Energy Recovery Ventilator (ERV) systems installed to specifications

#### Specification(s):

Minimum distance of exhaust outlet from any doors, windows, or outside air intakes shall be in conformance with the applicable building code

Outlet will be sealed to prevent water intrusion and exhaust air leakage into building cavities

#### Objective(s):

Direct exhaust to the outdoors and prevent re-entry

Prevent entry of weather and pests into building shell

Ensure occupant health and safety

#### **Desired Outcome:**

Heat Recovery Ventilator (HRV) and Energy Recovery Ventilator (ERV) systems installed to specifications

#### Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

## 6.6202.6i - Intake location

#### **Desired Outcome:**

Heat Recovery Ventilator (HRV) and Energy Recovery Ventilator (ERV) systems installed to specifications

#### Specification(s):

Intake will be installed in accordance with the following:

- A minimum of 6" above grade
- A minimum of 10' from contaminant sources
- Above local snow or flood line
- A minimum of 18" above an asphalt-based roof

Minimum distance between exhaust outlet and air intake will be 6' or in accordance with manufacturer specifications

#### Objective(s):

Ensure occupant health and safety

Prevent entry of contaminants

Ensure unrestricted airflow

#### **Desired Outcome:**

Heat Recovery Ventilator (HRV) and Energy Recovery Ventilator (ERV) systems installed to specifications

#### Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

## 6.6202.6j - Intake/exhaust fitting

#### **Desired Outcome:**

Heat Recovery Ventilator (HRV) and Energy Recovery Ventilator (ERV) systems installed to specifications

#### Specification(s):

Intake/exhaust fitting will have integrated collar that is at least the same diameter as the duct

Fitting will be appropriate for regional weather conditions and installation location on exterior of building

#### Objective(s):

Effectively draw the required volume of air from outside

Preserve integrity of the building envelope

Ensure durable installation

#### **Desired Outcome:**

Heat Recovery Ventilator (HRV) and Energy Recovery Ventilator (ERV) systems installed to specifications

#### Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

## 6.6202.6k - Weatherproofing

#### **Desired Outcome:**

Heat Recovery Ventilator (HRV) and Energy Recovery Ventilator (ERV) systems installed to specifications

#### Specification(s):

Exterior termination fittings will be flashed or weather sealed

Water will be directed away from penetration

Weatherproofing will be in accordance with manufacturer specifications

#### Objective(s):

Prevent entry of weather into building shell

#### **Desired Outcome:**

Heat Recovery Ventilator (HRV) and Energy Recovery Ventilator (ERV) systems installed to specifications

#### Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

## 6.6202.6I - Pest exclusion

#### **Desired Outcome:**

Heat Recovery Ventilator (HRV) and Energy Recovery Ventilator (ERV) systems installed to specifications

#### Specification(s):

Screen material no less than 1/4" and no greater than 1/2" hole size in any direction will be used at any exhaust and intake

#### Objective(s):

Prevent entry of pests into building shell

#### **Desired Outcome:**

Heat Recovery Ventilator (HRV) and Energy Recovery Ventilator (ERV) systems installed to specifications

#### Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

## 6.6202.6m - Duct connections

#### **Desired Outcome:**

Heat Recovery Ventilator (HRV) and Energy Recovery Ventilator (ERV) systems installed to specifications

#### Specification(s):

Ducts will be connected to applicable registers or grilles, collector box, HRV or ERV, intake fitting, and termination fitting

Ducts will be connected and sealed in accordance with duct exhaust and supply duct detail

#### Objective(s):

Achieve the desired air flows to and from the desired locations

Preserve integrity of the duct system and building envelope

#### **Desired Outcome:**

Heat Recovery Ventilator (HRV) and Energy Recovery Ventilator (ERV) systems installed to specifications

#### Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

## 6.6202.6n - Duct layout for attachment to forced air systems

#### **Desired Outcome:**

Heat Recovery Ventilator (HRV) and Energy Recovery Ventilator (ERV) systems installed to specifications

#### Specification(s):

Exhaust air will not be taken from the forced air system

Outdoor air supply ducts attached to the return side of forced air systems will be:

- Attached as close to the heating, ventilation, and air conditioning (HVAC) system's fan as possible, while remaining in compliance with manufacturer specifications
- · Connected to the outdoor air outlet from HRV/ERV system
- Filtration of ventilation air will be provided before reaching the HVAC fan
- Connected and sealed in accordance with the supply duct detail

#### Objective(s):

Achieve the desired air flows to and from the desired locations

Preserve integrity of duct system and building

Ensure occupant health and safety

#### **Desired Outcome:**

Heat Recovery Ventilator (HRV) and Energy Recovery Ventilator (ERV) systems installed to specifications

#### Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

## 6.6202.60 - Duct layout for fully ducted HRV/ERV systems

#### **Desired Outcome:**

Heat Recovery Ventilator (HRV) and Energy Recovery Ventilator (ERV) systems installed to specifications

#### Specification(s):

All ducts will be connected and sealed in accordance with SWS 6.6004.2 Individual Exhaust Fan Serving Multiple Rooms Within a Single Dwelling Unit and SWS 6.6102.7 Ducts for Supply

#### Objective(s):

Achieve the desired air flows to and from the desired locations

Preserve integrity of duct system and building

Ensure occupant health and safety

#### **Desired Outcome:**

Heat Recovery Ventilator (HRV) and Energy Recovery Ventilator (ERV) systems installed to specifications

#### Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

## 6.6202.6p - Insulation

#### **Desired Outcome:**

Heat Recovery Ventilator (HRV) and Energy Recovery Ventilator (ERV) systems installed to specifications

#### Specification(s):

Outdoor air intake duct will be insulated from the outdoor air intake to the HRV/ERV system to a minimum of R-8 or equivalent to local codes

Ducts installed outside of the thermal envelope will be insulated to a minimum of R-8 or equivalent to local codes

#### Objective(s):

Preserve integrity of the duct system by eliminating condensation

#### **Desired Outcome:**

Heat Recovery Ventilator (HRV) and Energy Recovery Ventilator (ERV) systems installed to specifications

#### Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

## 6.6202.6q - Register boot to interior surface seal

#### **Desired Outcome:**

Heat Recovery Ventilator (HRV) and Energy Recovery Ventilator (ERV) systems installed to specifications

#### Specification(s):

Register boot will be sealed to interior surfaces with sealants compatible to their intended surfaces

Sealants will be continuous and meet fire barrier specifications

#### Objective(s):

Prevent air leakage around boot

Ensure a permanent seal to the building air barrier

Prevent a fire hazard

#### **Desired Outcome:**

Heat Recovery Ventilator (HRV) and Energy Recovery Ventilator (ERV) systems installed to specifications

#### Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

## 6.6202.6r - Sealant selection

#### **Desired Outcome:**

Heat Recovery Ventilator (HRV) and Energy Recovery Ventilator (ERV) systems installed to specifications

#### Specification(s):

Sealants will be compatible with their intended surfaces

Sealants will be continuous and meet fire barrier specifications

#### Objective(s):

Ensure a permanent seal

Prevent a fire hazard

#### **Desired Outcome:**

Heat Recovery Ventilator (HRV) and Energy Recovery Ventilator (ERV) systems installed to specifications

#### Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

## 6.6202.6s - Balance and flow

#### **Desired Outcome:**

Heat Recovery Ventilator (HRV) and Energy Recovery Ventilator (ERV) systems installed to specifications

#### Specification(s):

Air flows will be measured in accordance with ANSI/ACCA Standard 5 or ANSI/ASHRAE Standard 111 and adjusted to match to the design specification

#### Objective(s):

Achieve the desired air flows to and from the desired locations
## 6.6202.6 - Heat Recovery Ventilator and Energy Recovery Ventilator Installation in Single Dwelling Unit (All Building Types)

#### **Desired Outcome:**

Heat Recovery Ventilator (HRV) and Energy Recovery Ventilator (ERV) systems installed to specifications

#### Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

### 6.6202.6t - Fire dampers

#### **Desired Outcome:**

Heat Recovery Ventilator (HRV) and Energy Recovery Ventilator (ERV) systems installed to specifications

#### Specification(s):

Fire dampers must be accessible for inspection and/or testing by the local authorities; if fire dampers are not accessible from a grill or register, an access door in the ductwork is required

Sealing activities will not interfere with the operation of fire dampers, balancing dampers, or backdraft dampers

Type B fire dampers will be used as required by fire code

#### Objective(s):

Ensure access to fire dampers for safe operation

Minimize static pressure

Maximize air flow

## 6.6202.6 - Heat Recovery Ventilator and Energy Recovery Ventilator Installation in Single Dwelling Unit (All Building Types)

#### **Desired Outcome:**

Heat Recovery Ventilator (HRV) and Energy Recovery Ventilator (ERV) systems installed to specifications

#### Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

## 6.6202.6u - Occupant/property manager education

#### **Desired Outcome:**

Heat Recovery Ventilator (HRV) and Energy Recovery Ventilator (ERV) systems installed to specifications

#### Specification(s):

Occupant/property manager will be educated on purpose of system, and also how and when to change filter and clean drain pan, if applicable, in accordance with manufacturer specifications

#### Objective(s):

Ensure occupant health and safety

Preserve integrity of system

#### **Desired Outcome:**

Improved fan efficiency and control

Note:

## 6.6202.7a - Evaluate existing fans, motors, and ventilation system

#### **Desired Outcome:**

Improved fan efficiency and control

#### Specification(s):

Motors will be evaluated to determine compatibility with variable frequency drive (VFD)

Load profile and source equipment will be analyzed for use of VFD to provide variable ventilation rates

Control strategy will be determined (e.g., manually adjusted speed or remote sensor control)

#### Objective(s):

Ensure existing motors and ventilation system are compatible with VFD operation

#### **Desired Outcome:**

Improved fan efficiency and control

Note:

## 6.6202.7b - Remove and replace motor, if required

#### **Desired Outcome:**

Improved fan efficiency and control

#### Specification(s):

Power supply will be disconnected; existing motor will be removed and replaced with motor suitable for VFD operation

#### **Objective(s):**

Provide motor suitable for VFD operation

#### **Desired Outcome:**

Improved fan efficiency and control

Note:

## 6.6202.7c - Remove motor starter and replace with VFD

#### **Desired Outcome:**

Improved fan efficiency and control

#### Specification(s):

Power supply will be disconnected; existing starter will be replaced with VFD in accordance with manufacturer specifications

#### Objective(s):

Install and connect VFD

#### **Desired Outcome:**

Improved fan efficiency and control

Note:

## 6.6202.7d - Install required sensors to implement VFD control strategy (for sensor controlled strategies)

#### **Desired Outcome:**

Improved fan efficiency and control

#### Specification(s):

Feedback sensors will be installed in accordance with manufacturer specifications at locations that will optimize chosen control strategy

Feedback sensors will be wired to VFD in accordance with manufacturer specifications

#### Objective(s):

Ensure sensors are installed to optimize VFD operation

#### **Desired Outcome:**

Improved fan efficiency and control

Note:

# 6.6202.7e - Install required manual controls to implement VFD control strategy (for sensor and/or manual controlled strategies)

#### **Desired Outcome:**

Improved fan efficiency and control

#### Specification(s):

Speed controls will be installed in accordance with manufacturer specifications at a location for ease of continued operation

#### Objective(s):

Ensure manual controls are installed to optimize VFD operation, and for ease of installer and continuous operation

#### **Desired Outcome:**

Improved fan efficiency and control

Note:

## 6.6102.7f - Restore power supply to VFD, and verify operation of VFD and fan

**Desired Outcome:** Improved fan efficiency and control

**Specification(s):** Power supply will be restored

VFD will be shown to be capable of operating fan

VFD will be shown to be capable of receiving sensor signals

**Objective(s):** Ensure that VFD is ready for setup

#### **Desired Outcome:**

Improved fan efficiency and control

Note:

## 6.6101.7g - Initial setup of VFD

#### **Desired Outcome:**

Improved fan efficiency and control

#### Specification(s):

VFD parameters will be set up to accept feedback from sensors dependent upon chosen control strategy

System will be optimized to ensure targeted design ventilation rates at the lowest possible speed setting

#### Objective(s):

Achieve targeted design ventilation requirements with reduced electrical energy use

#### **Desired Outcome:**

Energy used for lighting reduced

#### Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

### 7.8003.9a - Assessment

#### Desired Outcome:

Energy used for lighting reduced

#### Specification(s):

Lighting strategy will be provided by lighting professional

Safety and crime prevention will be considered as part of the strategy

#### Objective(s):

Determine appropriate device, settings, and location

Determine existing electrical conditions

Prevent property damage

#### **Desired Outcome:**

Energy used for lighting reduced

#### Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

## 7.8003.9b - Selection

#### Desired Outcome:

Energy used for lighting reduced

#### Specification(s):

Photo sensor will be compatible with existing wiring

Photo sensor will be UL certified

Photo sensor will meet the requirements of the lighting design

Fixture will allow for replacement of photo sensor

#### Objective(s):

Reduce energy use

Ensure device functions appropriately

Ensure product safety

Ensure continued savings

#### **Desired Outcome:**

Energy used for lighting reduced

#### Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

## 7.8003.9c - Installation

#### Desired Outcome:

Energy used for lighting reduced

#### Specification(s):

Work will be performed by licensed electrical professional

Photo sensor will be installed in accordance with ANSI/NFPA 70, ANSI/NFPA 70E, and manufacturer specifications

Photo sensor will be positioned in a secure location and not subject to physical damage

Photo sensor will not be obstructed from natural light

#### Objective(s):

Ensure worker safety

Ensure occupant safety

Ensure continued savings

Prevent tampering

#### **Desired Outcome:**

Energy used for lighting reduced

#### Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

## 7.8003.9d - Settings

**Desired Outcome:** Energy used for lighting reduced

#### Specification(s):

Photo sensor and aperture will be set in accordance with the assessment

**Objective(s):** Ensure sensor performance

#### **Desired Outcome:**

Energy used for lighting reduced

#### Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

## 7.8003.9e - Commissioning

**Desired Outcome:** Energy used for lighting reduced

Specification(s): Settings will be verified and tested to meet lighting design criteria

**Objective(s):** Optimize system performance

Reduce light pollution

#### **Desired Outcome:**

Energy used for lighting reduced

#### Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

## 7.8003.9f - Occupant safety

#### **Desired Outcome:**

Energy used for lighting reduced

#### Specification(s):

Photo sensor will not impact required egress lighting, as required by ANSI/NFPA 101

Photo sensor will not impact required minimum light level, as required by codes or local ordinances

#### Objective(s):

#### **Desired Outcome:**

Energy used for lighting reduced

#### Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

## 7.8003.9g - Staff education

#### **Desired Outcome:**

Energy used for lighting reduced

#### Specification(s):

Building operations staff will be provided with warranty information, operation manuals, and installer contact information

#### Objective(s):

Educate building operations staff about operation and maintenance of equipment

Ensure continued savings

#### **Desired Outcome:**

Energy used for lighting reduced

#### Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

## 7.8003.10a - Assessment

#### Desired Outcome:

Energy used for lighting reduced

#### Specification(s):

Lighting strategy will be provided by lighting professional

Safety and crime prevention will be considered as part of the strategy

#### Objective(s):

Determine appropriate device, settings, and location

Determine existing electrical conditions

Prevent property damage

#### **Desired Outcome:**

Energy used for lighting reduced

#### Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

## 7.8003.10b - Selection

### Desired Outcome:

Energy used for lighting reduced

#### Specification(s):

Switches will be compatible with existing wiring

Switches will meet the appropriate nationally recognized product standard

#### Objective(s):

Reduce energy use

Ensure device functions appropriately

Ensure product safety

Ensure multiple switching strategies can be used

#### **Desired Outcome:**

Energy used for lighting reduced

#### Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

## 7.8003.10c - Installation

#### **Desired Outcome:**

Energy used for lighting reduced

#### Specification(s):

Work will be performed by licensed electrical professional

Switches will be installed in accordance with ANSI/NFPA 70, ANSI/NFPA 70E, and manufacturer specifications

Switches will be positioned in a secure location and not subject to physical damage

Labels will be permanently affixed without the use of adhesives near switch location to indicate light level and fixture control

#### Objective(s):

Ensure worker safety

Ensure occupant safety

Prevent tampering

Ensure continued savings

Optimize system performance

#### **Desired Outcome:**

Energy used for lighting reduced

#### Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

## 7.8003.10d - Commissioning

**Desired Outcome:** Energy used for lighting reduced

Specification(s): Settings will be verified and tested to meet lighting design criteria

**Objective(s):** Optimize system performance

#### **Desired Outcome:**

Energy used for lighting reduced

#### Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

## 7.8003.10e - Occupant safety

#### **Desired Outcome:**

Energy used for lighting reduced

#### Specification(s):

Switches will not compromise egress lighting, as required by ANSI/NFPA 101

Switches will not impact minimum light levels, as required by codes or local ordinances

#### Objective(s):

#### **Desired Outcome:**

Energy used for lighting reduced

#### Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

## 7.8003.10f - Staff education

#### **Desired Outcome:**

Energy used for lighting reduced

#### Specification(s):

Building operations staff will be provided with warranty information, operation manuals, and installer contact information

#### Objective(s):

Educate building operations staff about operation and maintenance of equipment

Ensure continued savings

#### **Desired Outcome:**

Energy used for lighting reduced

#### Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

## 7.8003.10g - Occupant education

#### **Desired Outcome:**

Energy used for lighting reduced

#### Specification(s):

Occupants will be educated of new lighting controls and benefits

Education will be provided by building operations staff

#### Objective(s):

Educate occupants about new controls and benefits

Ensure continued savings

#### **Desired Outcome:**

Energy used for lighting reduced

## 7.8003.11a - Assessment

#### **Desired Outcome:** Energy used for lighting reduced

**Specification(s):** Lighting strategy will be provided by lighting professional

Work order will be evaluated against site circumstances

#### **Objective(s):** Determine and ensure appropriate device and location

#### Desired Outcome:

Energy used for lighting reduced

### 7.8003.11b - Selection

#### **Desired Outcome:** Energy used for lighting reduced

#### Specification(s):

Lamps will be compatible with existing fixtures

Lamps will meet the appropriate nationally recognized product standard (UL 542, UL 1570)

Outdoor lamps will be suitable for local climate conditions and in accordance with ANSI / ULproduct standards

Screw base lamp replacements will be ENERGY STAR® qualified or at least as energy efficient

Compact fluorescent lamps and light emitting diode lamps will be ENERGY STAR qualified or at lease as energy efficient

Linear fluorescent lamps will not be replaced with a T12, and T8 lamps will be minimum standard installed

Vandal-proof pin-based lamps will be used, if appropriate

#### **Objective(s):** Reduce energy use

Ensure device functions properly

Ensure product safety

Ensure occupant satisfaction

#### **Desired Outcome:**

Energy used for lighting reduced

## 7.8003.11c - Installation

**Desired Outcome:** Energy used for lighting reduced

#### Specification(s):

Fixture will be de-energized before beginning work

Worker will follow appropriate lockout procedures in accordance with OSHA 1910 Subpart S and ANSI/NFPA 70E

Lamps will be installed in accordance with manufacturer specifications

If fixture is broken, worker will refer to SWS 7.8003.14 Fixture Replacement

Lens and reflector will be cleaned

**Objective(s):** Ensure worker safety

Ensure occupant safety

Ensure continued savings

Optimize fixture performance

#### **Desired Outcome:**

Energy used for lighting reduced

## 7.8003.11d - Commissioning

#### **Desired Outcome:** Energy used for lighting reduced

#### Specification(s):

Relamping will be tested to meet IESNA protocol for appropriate light levels for certain tasks and emergency levels, as required by the applicable code

Lamps will not impact required egress lighting, as required by ANSI/NFPA 101

#### **Objective(s):** Meet target light levels

Ensure occupant satisfaction

#### **Desired Outcome:**

Energy used for lighting reduced

## 7.8003.11e - Decommissioning

**Desired Outcome:** Energy used for lighting reduced

#### Specification(s):

Lamps will be disposed of in accordance with EPA guidelines, local ordinances, or manufacturer specifications

**Objective(s):** Protect the environment

Prevent the reuse of inefficient components

#### **Desired Outcome:**

Energy used for lighting reduced

## 7.8003.11f - Safety

**Desired Outcome:** Energy used for lighting reduced

#### Specification(s):

Broken lamps containing mercury will be cleaned in accordance with EPA guidelines

#### **Objective(s):** Ensure worker safety

#### **Desired Outcome:**

Energy used for lighting reduced

## 7.8003.11g - Staff education

#### **Desired Outcome:** Energy used for lighting reduced

#### Specification(s):

Building operations staff will be provided with warranty information, product specification, and installer contact information

#### Objective(s):

Educate building operations staff about operation and maintenance of equipment

Ensure continued savings

#### **Desired Outcome:**

Energy used for lighting reduced

## 7.8003.11h - Occupant education

#### Desired Outcome:

Energy used for lighting reduced

#### Specification(s):

Occupants will be educated of new lamp type and benefits

Occupant will be provided with lamp disposal procedure, as determined by building operations staff

If lamps containing mercury are used, occupants will be provided with lamp disposal procedure in accordance with EPA guidelines

Education will be provided by building operations staff

#### **Objective(s):** Educate occupants about new lamps and benefits

Ensure continued savings

Protect the environment

#### **Desired Outcome:**

Energy efficiency of existing lighting controls maximized. (Re- means going through a commissioning process again; retro- means a first-time commissioning on an existing building)

#### Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

## 7.8003.12a - Assessment

#### **Desired Outcome:**

Energy efficiency of existing lighting controls maximized. (Re- means going through a commissioning process again; retro- means a first-time commissioning on an existing building)

#### Specification(s):

Lighting control optimization will be included as part of whole building re- or retro-commissioning

Assessment will occur if lighting controls exist

Lighting strategy will be provided by lighting professional in consultation with a licensed electrical professional

Assessment will follow Lighting Controls Association EE110 and IES procedures (or appropriate section of ASHRAE's whole-building commissioning procedure)

#### Objective(s):

Determine and ensure appropriate control settings

#### **Desired Outcome:**

Energy efficiency of existing lighting controls maximized. (Re- means going through a commissioning process again; retro- means a first-time commissioning on an existing building)

#### Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

## 7.8003.12b - Adjustment

#### **Desired Outcome:**

Energy efficiency of existing lighting controls maximized. (Re- means going through a commissioning process again; retro- means a first-time commissioning on an existing building)

#### Specification(s):

Adjustments will be made in accordance with lighting strategy

#### Objective(s):

Optimize system performance

#### **Desired Outcome:**

Energy efficiency of existing lighting controls maximized. (Re- means going through a commissioning process again; retro- means a first-time commissioning on an existing building)

#### Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

## 7.8003.12c - Safety

#### **Desired Outcome:**

Energy efficiency of existing lighting controls maximized. (Re- means going through a commissioning process again; retro- means a first-time commissioning on an existing building)

#### Specification(s):

Controls will not compromise egress lighting, as required by ANSI/NFPA 101 and IBC

Lighting controls will ensure that required egress light levels are maintained at times when the building is occupied and meet minimum light level requirements by codes or local ordinances

Fixtures will be on when spaces are occupied

**Objective(s):** Ensure occupant safety

#### **Desired Outcome:**

Energy efficiency of existing lighting controls maximized. (Re- means going through a commissioning process again; retro- means a first-time commissioning on an existing building)

#### Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

## 7.8003.12d - Staff education

#### **Desired Outcome:**

Energy efficiency of existing lighting controls maximized. (Re- means going through a commissioning process again; retro- means a first-time commissioning on an existing building)

#### Specification(s):

Lighting professional will provide building operations staff with education on lighting control functions

Lighting professional or installer will provide building operations staff with documentation on lighting control systems

#### Objective(s):

Ensure continued savings

#### **Desired Outcome:**

Energy efficiency of existing lighting controls maximized. (Re- means going through a commissioning process again; retro- means a first-time commissioning on an existing building)

#### Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

## 7.8003.12e - Occupant education

#### **Desired Outcome:**

Energy efficiency of existing lighting controls maximized. (Re- means going through a commissioning process again; retro- means a first-time commissioning on an existing building)

#### Specification(s):

Occupants will be educated of new lighting controls and benefits

Education will be provided by building operations staff

#### **Objective(s):**

Educate occupants about new controls and benefits

Ensure continued savings
### Desired Outcome:

Energy used for lighting reduced

Note:

## 7.8003.13a - Assessment

**Desired Outcome:** Energy used for lighting reduced

#### **Specification(s):** Lighting strategy will be provided by lighting professional

Assessment will identify magnetic ballast location

If the ballast is known to contain polychlorinated biphenyls (PCBs), does not have "No PCBs" on the ballast, or if the manufacturer cannot determine if the ballast contains PCBs, assume the ballast contains PCBs and dispose of ballast in an EPA-approved facility

Work order will be evaluated against site circumstances

### Objective(s):

Determine and ensure appropriate device and location

### **Desired Outcome:**

Energy used for lighting reduced

Note:

## 7.8003.13b - Selection

**Desired Outcome:** Energy used for lighting reduced

#### **Specification(s):** Ballasts will be compatible with new or existing fixture

Ballasts will meet the appropriate nationally recognized product standards (ANSI C82.1, ANSI C82.4, UL 924, UL 1029, NEMA)

Pulse start, high-efficiency electronic ballast will be used

Ballast factor will be a minimum of 0.85

**Objective(s):** Reduce energy use

Ensure device functions appropriately

Ensure product safety

### Desired Outcome:

Energy used for lighting reduced

Note:

## 7.8003.13c - Installation

**Desired Outcome:** Energy used for lighting reduced

#### **Specification(s):** Fixture will be de-energized before work begins

Worker will follow appropriate lockout procedures in accordance with OSHA 1910 Subpart S and ANSI/NFPA 70E

Ballasts will be installed in accordance with manufacturer specifications

If fixture is broken, worker will refer to Fixture Replacement Standard Work Specifications, Section 7.8003.14.

Lens and reflector will be cleaned

### Objective(s):

Ensure worker safety

Ensure occupant safety

Ensure continued savings

Optimize fixture performance

### Desired Outcome:

Energy used for lighting reduced

Note:

# 7.8003.13d - Commissioning

**Desired Outcome:** Energy used for lighting reduced

**Specification(s):** Fixture will be tested to meet IESNA light levels for certain tasks

Fixture will not impact required egress lighting, as required by ANSI/NFPA 101

**Objective(s):** Meet target light levels

Ensure occupant satisfaction

Ensure occupant safety

### **Desired Outcome:**

Energy used for lighting reduced

Note:

## 7.8003.13e - Decommissioning

### Desired Outcome:

Energy used for lighting reduced

### Specification(s):

Ballast manufacture date will be determined, if possible

If the ballast is known to contain PCBs, does not have "No PCBs" on the ballast, or if the manufacturer cannot determine if the ballast contains PCBs, assume the ballast contains PCBs and dispose of ballast in an EPA-approved facility

Ballasts manufactured in 1979 and after will be disposed of in accordance with local ordinances or manufacturer specifications

Disposal manifests will be filed and available to building representatives

#### **Objective(s):** Protect the environment

Prevent the reuse of inefficient components

#### **Desired Outcome:**

Energy used for lighting reduced

Note:

## 7.8003.13f - Staff education

**Desired Outcome:** Energy used for lighting reduced

### Specification(s):

Building operations staff will be provided with warranty information, product specification, and installer contact information

#### **Objective(s):**

Educate building operations staff about operation and maintenance of equipment

Ensure continued savings

#### **Desired Outcome:**

Energy used for lighting reduced

### Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

### 7.8003.14a - Assessment

### Desired Outcome:

Energy used for lighting reduced

### Specification(s):

Lighting strategy will be provided by lighting professional

Work order will be evaluated against site circumstances

### Objective(s):

Determine and ensure appropriate device and location

#### **Desired Outcome:**

Energy used for lighting reduced

#### Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

### 7.8003.14b - Selection

### Desired Outcome:

Energy used for lighting reduced

### Specification(s):

Hard-wired indoor fixtures will be in accordance with ANSI/UL 1598

Plug-in indoor fixtures will be in accordance with ANSI/UL 153

Hard-wired outdoor fixtures will be suitable for local climatic conditions and in accordance with ANSI/UL product standards

Fixture will be capable of being attached to existing wiring

Fixture will carry at least a 1-year warranty

Test existing emergency fixtures and repair or replace if necessary

In-unit replacement fixtures will be ENERGY STAR® qualified

Fixture will comply with selection criteria of SWS 7.8003.11 Lamp Replacement and SWS 7.8003.13 Ballast Replacement

#### Objective(s):

Reduce energy use

Ensure device functions appropriately

Ensure product safety

Ensure occupant safety

#### **Desired Outcome:**

Energy used for lighting reduced

#### Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

### 7.8003.14c - Installation

#### **Desired Outcome:**

Energy used for lighting reduced

### Specification(s):

Work will be performed by licensed electrical professional or a qualified contractor

Fixture will be de-energized before work begins

Appropriate lockout procedures will be followed in accordance with OSHA 1910 Subpart S and ANSI/NFPA 70E

Fixture will be installed in accordance with ANSI/NFPA 70, ANSI/NFPA 70E, and manufacturer specifications

All penetrations will be sealed (ANSI/NFPA/ICC Fire Code)

Egress fixtures will be installed in accordance with applicable codes (NFPA 101)

Lighting fixtures will be installed and secured as specified NECA/IESNA 500

#### Objective(s):

Ensure worker safety

Ensure occupant safety

Preserve integrity of building envelope

Ensure integrity of fire barrier

Ensure quality installation

#### **Desired Outcome:**

Energy used for lighting reduced

#### Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

## 7.8003.14d - Commissioning

### Desired Outcome:

Energy used for lighting reduced

### Specification(s):

Fixtures will be tested to meet IESNA light levels for certain tasks

Fixtures will not impact required egress lighting, as required by ANSI/NFPA 101

### Objective(s):

Meet target light levels

Ensure occupant satisfaction

Ensure occupant safety

#### **Desired Outcome:**

Energy used for lighting reduced

#### Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

## 7.8003.14e - Decommissioning

### **Desired Outcome:**

Energy used for lighting reduced

### Specification(s):

Fixtures, lamps, and ballasts will be disposed of in accordance with local ordinances or manufacturer specifications

Ballast manufacture date will be determined, if possible

If the ballast is known to contain PCBs, does not have "No PCBs" on the ballast, or if the manufacturer cannot determine if the ballast contains PCBs, assume the ballast contains PCBs and dispose of ballast in an EPA-approved facility

Ballasts manufactured in 1979 and after will be disposed of in accordance with local ordinances or manufacturer specifications

#### **Objective(s):** Protect the environment

Prevent the reuse of inefficient components

#### **Desired Outcome:**

Energy used for lighting reduced

#### Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

## 7.8003.14f - Safety

**Desired Outcome:** Energy used for lighting reduced

### Specification(s):

Broken lamps containing mercury will be cleaned in accordance with EPA guidelines

**Objective(s):** Ensure worker safety

Ensure occupant safety

#### **Desired Outcome:**

Energy used for lighting reduced

#### Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

## 7.8003.14g - Staff education

### **Desired Outcome:**

Energy used for lighting reduced

### Specification(s):

Building operations staff will be provided with warranty information, product specification, and installer contact information

#### Objective(s):

Educate building operations staff about operation and maintenance of equipment

Ensure continued savings

#### **Desired Outcome:**

Energy used for lighting reduced

#### Note:

The authority having jurisdiction may require that a licensed professional perform certain tasks outlined in this detail.

### 7.8003.14h - Occupant education

#### **Desired Outcome:**

Energy used for lighting reduced

### Specification(s):

Occupants will be educated on new fixtures and benefits

Occupants will be provided with lamp disposal procedure, as determined by building operations staff

If lamps containing mercury are used, occupants will be provided with lamp disposal procedure in accordance with EPA guidelines

Education will be provided by building operations staff

#### Objective(s):

Educate occupants about new fixtures and benefits

Ensure continued savings

Protect the environment

Ensure occupant safety

#### **Desired Outcome:**

Provide safe and reliable hot water that meets the needs of the occupant/buildingmanagement/ building operations staff at the lowest possible life cycle cost

Note:

### 7.8104.4a - Hazardous material removal

#### **Desired Outcome:**

Provide safe and reliable hot water that meets the needs of the occupant/buildingmanagement/ building operations staff at the lowest possible life cycle cost

#### Specification(s):

Health concerns in the removal and replacement of equipment (e.g., asbestos, other hazardous materials) will be identified

Written notification will be provided to occupants of the discovery of hazardous material, including contact information for regional EPA asbestos coordinator

Occupant will be asked to contract with an EPA-certified asbestos contractor to conduct abatement before decommissioning and replacement (occupant is responsible for abatement or remediation)

#### Objective(s):

Remediate health hazards using EPA-certified contractors

#### **Desired Outcome:**

Provide safe and reliable hot water that meets the needs of the occupant/buildingmanagement/ building operations staff at the lowest possible life cycle cost

Note:

### 7.8104.4b - Removal

#### **Desired Outcome:**

Provide safe and reliable hot water that meets the needs of the occupant/buildingmanagement/ building operations staff at the lowest possible life cycle cost

#### Specification(s):

Old pumps will be hydraulically isolated (valves shut) and drained before removal

Old pumps will be disconnected from electricity before removal

#### Objective(s):

Safely remove the old pump

#### **Desired Outcome:**

Provide safe and reliable hot water that meets the needs of the occupant/buildingmanagement/ building operations staff at the lowest possible life cycle cost

Note:

## 7.8104.4c - Installation and location

#### **Desired Outcome:**

Provide safe and reliable hot water that meets the needs of the occupant/buildingmanagement/ building operations staff at the lowest possible life cycle cost

#### Specification(s):

Pump will be installed and plumbed to allow for inspection, maintenance, and replacement of the pump

#### Objective(s):

Ensure the pump can be easily maintained and replaced

#### **Desired Outcome:**

Provide safe and reliable hot water that meets the needs of the occupant/buildingmanagement/ building operations staff at the lowest possible life cycle cost

Note:

### 7.8104.4d - Insulation

#### **Desired Outcome:**

Provide safe and reliable hot water that meets the needs of the occupant/buildingmanagement/ building operations staff at the lowest possible life cycle cost

**Specification(s):** Pumps will not be insulated

**Objective(s):** Prevent the pump from overheating

#### **Desired Outcome:**

Provide safe and reliable hot water that meets the needs of the occupant/buildingmanagement/ building operations staff at the lowest possible life cycle cost

Note:

### 7.8104.4e - Valves

#### **Desired Outcome:**

Provide safe and reliable hot water that meets the needs of the occupant/buildingmanagement/ building operations staff at the lowest possible life cycle cost

#### Specification(s):

Valves will be installed to isolate pump from water heating system

#### **Objective(s):**

Allow for easy removal and maintenance of the pump

#### **Desired Outcome:**

Provide safe and reliable hot water that meets the needs of the occupant/buildingmanagement/ building operations staff at the lowest possible life cycle cost

Note:

### 7.8104.4f - Controls and sensors

#### **Desired Outcome:**

Provide safe and reliable hot water that meets the needs of the occupant/buildingmanagement/ building operations staff at the lowest possible life cycle cost

#### Specification(s):

Controls and sensors will be installed or reconnected in accordance with design specifications

Installer will understand the control system

When controls are using low voltage, the low voltage and line voltage wiring will be separated

#### **Objective(s):**

Ensure proper function of the water heating system

#### **Desired Outcome:**

Provide safe and reliable hot water that meets the needs of the occupant/buildingmanagement/ building operations staff at the lowest possible life cycle cost

Note:

## 7.8104.4g - Gauges

#### **Desired Outcome:**

Provide safe and reliable hot water that meets the needs of the occupant/buildingmanagement/ building operations staff at the lowest possible life cycle cost

#### Specification(s):

Pressure gauges will be installed to measure suction, discharge, and pressure differential

#### Objective(s):

Verify proper operation of the pump

#### **Desired Outcome:**

Provide safe and reliable hot water that meets the needs of the occupant/buildingmanagement/ building operations staff at the lowest possible life cycle cost

Note:

### 7.8104.4h - Mounting

#### **Desired Outcome:**

Provide safe and reliable hot water that meets the needs of the occupant/buildingmanagement/ building operations staff at the lowest possible life cycle cost

#### Specification(s):

Pumps will be mounted in accordance with manufacturer specifications

#### **Objective(s):**

Prevent the pump from coming loose

Minimize vibration

#### **Desired Outcome:**

Provide safe and reliable hot water that meets the needs of the occupant/buildingmanagement/ building operations staff at the lowest possible life cycle cost

Note:

### 7.8104.4i - Laminar flow

#### **Desired Outcome:**

Provide safe and reliable hot water that meets the needs of the occupant/buildingmanagement/ building operations staff at the lowest possible life cycle cost

#### Specification(s):

Pumps will be installed in accordance with manufacturer specifications with sufficient straight line piping before and after the pump

#### Objective(s):

Minimize pump cavitation

Ensure proper operation of the pump

#### **Desired Outcome:**

Provide safe and reliable hot water that meets the needs of the occupant/buildingmanagement/ building operations staff at the lowest possible life cycle cost

Note:

## 7.8104.4j - Electric

#### **Desired Outcome:**

Provide safe and reliable hot water that meets the needs of the occupant/buildingmanagement/ building operations staff at the lowest possible life cycle cost

#### Specification(s):

Damaged wiring will be replaced

Wiring will be protected from physical damage and water sources

Polarity of pump wiring will be verified before starting the pump

#### **Objective(s):**

Prevent damage to the pump

Ensure pump is properly wired

#### **Desired Outcome:**

Provide safe and reliable hot water that meets the needs of the occupant/buildingmanagement/ building operations staff at the lowest possible life cycle cost

Note:

## 7.8104.4k - Drain/purge valve

#### **Desired Outcome:**

Provide safe and reliable hot water that meets the needs of the occupant/buildingmanagement/ building operations staff at the lowest possible life cycle cost

#### Specification(s):

A drain spigot will be installed in close proximity of the discharge end of the pump

#### Objective(s):

Allow the piping to be purged of air

#### **Desired Outcome:**

Provide safe and reliable hot water that meets the needs of the occupant/buildingmanagement/ building operations staff at the lowest possible life cycle cost

Note:

### 7.8104.4I - Dissimilar metals

#### **Desired Outcome:**

Provide safe and reliable hot water that meets the needs of the occupant/buildingmanagement/ building operations staff at the lowest possible life cycle cost

#### Specification(s):

When connecting nonferrous metal pump to existing ferrous piping, a plastic-lined steel nipple a minimum of 4" long will be installed to connect the two piping systems

#### Objective(s):

Minimize corrosion between dissimilar metals

#### **Desired Outcome:**

Provide safe and reliable hot water that meets the needs of the occupant/buildingmanagement/ building operations staff at the lowest possible life cycle cost

Note:

### 7.8104.4m - Pump materials

#### **Desired Outcome:**

Provide safe and reliable hot water that meets the needs of the occupant/buildingmanagement/ building operations staff at the lowest possible life cycle cost

#### Specification(s):

Pump will be made with metals suitable for potable water, such as bronze or stainless steel

#### Objective(s):

Ensure safe domestic water for building occupants

#### **Desired Outcome:**

Provide safe and reliable hot water that meets the needs of the occupant/buildingmanagement/ building operations staff at the lowest possible life cycle cost

Note:

## 7.8104.4n - Stray voltage protection

#### **Desired Outcome:**

Provide safe and reliable hot water that meets the needs of the occupant/buildingmanagement/ building operations staff at the lowest possible life cycle cost

#### Specification(s):

Motors will be grounded per NEC (NFPA 70)

**Objective(s):** Eliminate stray voltage

#### **Desired Outcome:**

Provide safe and reliable hot water that meets the needs of the occupant/buildingmanagement/ building operations staff at the lowest possible life cycle cost

Note:

## 7.8104.40 - Commissioning

#### **Desired Outcome:**

Provide safe and reliable hot water that meets the needs of the occupant/buildingmanagement/ building operations staff at the lowest possible life cycle cost

#### Specification(s):

The following will be checked before energizing the pump:

- System filled and purged
- Safety controls present
- Valves open
- · Pump and check valve properly oriented
- Shipping bolts removed

The following will be checked once pump is energized:

- System purge complete
- Rotation
- Function of safety controls
- Integration of system controls
- Water leaks
- Operation of pressure gauges

Manufacturer specifications will be met in commissioning

#### **Objective(s):**

Ensure the pump operates as designed