

Northwest Portable Classroom Project

New Construction Procurement Guidelines for the Pacific Northwest

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BUILDING AMERICA EFFICIENT PORTABLE CLASSROOM PROGRAM

NEW CONSTRUCTION PROCUREMENT GUIDELINES FOR THE PACIFIC NORTHWEST

Purpose: To ensure the most energy-efficient operation of new portable classrooms by providing efficient and cost-effective envelope, air sealing and control measures. Implementation of these guidelines will help ensure lowest life cycle costs, maintain acceptable indoor air quality and comfort standards while providing a suitable learning environment.

These guidelines have been developed with support from the US Department of Energy's Building America Program partners and the Oregon Office of Energy, the Idaho Energy Division of the Department of Water Resources and Washington State University Energy Program.

Additional information is available at: <http://www.BAIHP.org>

Technical assistance regarding these guidelines is available from:

- Washington State University Energy Program - Michael McSorley: (360) 956-2008
- Idaho Department of Water Resources, Energy Division – Bob Minter: (208) 327-7970
- Oregon Office of Energy – Betty Merrill/Justin Klure: (503) 373-1581

DESIGN QUALIFICATION AND CERTIFICATION:

Table 1 lists the most efficient and cost-effective measures for new portable classrooms. Details for specific measures are listed below the table.

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Table 1. Recommended Portable Classroom Specifications

<u>Component</u>	<u>Description</u>	<u>Component U-factor</u>	<u>Nominal R-value</u>
Ceilings	Flat	U-0.036	R38
	Sloped	U-0.033	R30
Walls	Above Grade	U-0.065	R19
Floors	Steady State	U-0.041	R30
Glazing		U-0.37 ¹	n/a
Skylights		U-0.5 ¹	n/a
Exterior Doors ^{2,3}		U-0.19	n/a
Building Tightness	Tested to achieve air tightness of less than 8.0 ACH @50PA.		
Ductwork Tightness	Tested to ensure total leakage rate of less than 30 CFM @ 50PA.		
Ductwork Design and Materials	<p>All ductwork shall be located within the pressure envelope.</p> <p>Metal ductwork shall be sealed with water-based mastic.</p> <p>Duct-board shall use water based mastic and/or UL181AP tape.</p> <p>Tapes shall be installed per manufacturer listing instructions.</p>		
Lighting	All interior ceiling lighting shall be rapid start T-8 fluorescents with electronic ballasts with a CRI of 75. The controls shall be an on-off switch for each bank of lights.		
Quality Control	<p>The manufacturer's quality control inspector shall certify that each building meets or exceeds all requirements of these specifications.</p> <p>An authorized state plant inspector shall verify that each building has been inspected at least once during its construction and that the inspected measures meet or exceed the requirements of this specification.</p> <p>School district personnel are also encouraged to inspect these classrooms during site set up.</p>		

¹ NFRC tested U-factor

² Door frame shall be of thermally improved material(s).

³ Up to 1 ft² of security glass is allowed in doors.

THERMAL EFFICIENCY:

General Insulation: All insulating materials shall be installed according to the manufacturer's instructions to achieve proper densities, minimize voids and maintain uniform R-values.

Clearances: Where required by applicable codes, or where specified in the following sections, proper insulation clearances shall be maintained.

Insulation installed around exhaust vents shall comply with manufacturer's recommendations.

All ventilation baffles in attics/roofs shall be moisture-resistant.

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Ceiling Insulation: Ceiling insulation shall be installed to meet the nominal R-values specified in Table 1 or as approved.

Ceilings insulated with fiberglass batt insulation shall use full-width batts which cover the truss members and extend the entire attic length without visible gaps.

Insulation with a vapor barrier shall be installed to minimize compression–face-stapling is preferred over stapling to the side of the joist.

Wall Insulation: Insulation shall be installed to minimize compression and voids as a result of plumbing or wiring wall cavities.

Where structural conditions allow, headers over windows and doors shall be insulated.

Where structural conditions allow, insulation shall fill the cavity between corner studs and other wall structure materials.

Spaces around window and door frames greater than ½ inch shall be filled with an insulating material.

Insulation with a vapor barrier shall be installed to minimize compression–face-stapling is preferred over stapling to the side of the stud.

Floor Insulation: Floor insulation shall fill floor joists to the manufacturer’s insulation density or greater.

Insulation shall be installed to minimize compression and voids as a result of plumbing or wiring in floor cavities.

Set-Up Kit: Manufacturer shall include an approved marriage line sealer, and instructions on how and where to install it.

Door and Glazing u-factors: U-factors for doors and glazing shall be determined certified and labeled in accordance with the National Fenestration Rating Council (NFRC) Product Certification Program (PCP), as authorized by an independent certification and inspection agency licensed by the NFRC.

Glazing: To improve ambient lighting, all portable classrooms built to these specifications shall have operable transom windows installed on one wall. There shall be a minimum of 18 square feet of operable transom windows installed.

In addition to the transom windows two standard vinyl framed windows shall be installed; one window on each side wall. Each window shall have a minimum of 12 square feet of glazing area.

Window frames and sashes shall be constructed of vinyl, wood or other approved materials. Vinyl frames and sashes shall be joined with external and internal welds.

Window Location: Windows shall be located on opposite to ensure passive cross ventilation.

Skylights: Skylights with a maximum of 16 square feet of surface area may be installed in lieu of transom windows

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provided they are double glazed with a minimum U-factor of 0.50. Up to 10ft² of non-NFRC rated solar daylight tube may be installed if it is sealed from the conditioned space, and has a tube wall insulated to at least R-19.

AIR LEAKAGE CONTROL

All buildings shall be sealed using the following standard air-leakage control method and approved sealants. An average air change rate of 0.35 air changes/hour shall be used to calculate thermal losses.

All buildings shall comply with the following prescriptive requirements, or as approved to achieve the tightness levels specified in the prescriptive path.

Windows: Tested air-leakage rates shall not exceed 0.3 cfm/linear foot.

Doors: Tested air-leakage rates shall not exceed 0.2 cfm/linear foot of perimeter.

Caulking and Sealing: All penetrations through the building envelope shall be caulked or otherwise sealed to limit air leakage, including the following:

- *Ceiling* – ceiling and roof insulation shall be installed with a complete air/vapor barrier installed on the warm side of the insulation, with all corners and seams sealed. Sealing can be accomplished using sheetrock tape and texture, or 6 mil plastic sheeting.
- *The floor and wall marriage line* - sealed using gasket and non-porous silicon caulking, foam or closed cell backer rod
- *All window and door frames* - sealed to the building envelope. If the seal is made on exterior grooved siding, then the groove lines shall be sealed at the door or window frame.
- *Exterior-wall sole plates and the structural floor* - caulked using silicon caulking or approved alternate.
- *All receptacles, switches or other electric boxes in exterior walls* - sealed or fitted with outlet plate gaskets.
- *HVAC ducts* - sealed at interior surfaces where ducts penetrate the building envelope.
- *Around openings in the building envelope for HVAC and ventilation ducts, and wiring.*
- *All other penetrations in the building envelope.*

HEATING, VENTILATION AND AIR CONDITIONING (HVAC) SYSTEMS:

Design: Complete operation protocols and maintenance procedures shall be provided for all HVAC equipment. Procedures shall be written to be easily understood and implemented by facilities managers and teachers. Teacher operable controls shall be affixed with a permanent label listing control instructions.

Sizing: Heating systems shall be sized according to standard engineering practice, using an interior design temperature of 70°F and the standard ASHRAE winter design temperature (WDT) for the building location, or as approved. Cooling systems shall be sized according to standard engineering practice using ASHRAE Total Cooling Load calculation procedures (ASHRAE Fundamentals, Chapter 29).

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Heat Pump Systems: Heat pumps shall have a minimum HSPF of 7.5 and air conditioning systems shall have a minimum SEER of 12.0

HVAC Controls: HVAC setback shall occur whenever the classroom is not occupied (at night, weekends, summer vacations and holidays). The ventilation system shall be controlled by an occupancy sensor in conjunction with an on-off switch that can be accessed by occupants. The occupancy sensor will shut off the system off 15 minutes after occupancy. The heating and air conditioning system will be controlled by a 24/7/365 programmable thermostat with a minimum set back of 50 degrees for heating during unoccupied periods. Thermostats are required to ensure correct operation for at least three days in the event of power outages.

Air conditioning: If both air conditioning and electric heat are required, a heat pump shall be used as the primary heating/cooling system.

Economizer: If air conditioning is not provided, economizer cooling is required

Ventilation Rates: Minimum ventilation airflows shall meet the requirements of ASHRAE Standard 62-1989 and state codes: 15 cfm per person.

Heat Recovery Ventilation: Heat recovery ventilation is recommended.

Ventilation Duct Insulation: All ventilation exhaust ducts shall be insulated to at least R-4.

OutsideAir Source: The outside-air source shall be located at least ten feet from exhaust vents to minimize drawing outdoor pollutants and excessive outdoor noise.

HVAC Ducts: To minimize noise and to provide conditioned air evenly to all occupants, ventilation and air conditioning shall be provided through a series of ducts.

Ductwork for HVAC systems shall be installed to comply with the equipment manufacturer's static pressure specifications.

Ductwork shall be sealed using approved sealant as appropriate. Metal ducts shall be sealed with approved mastic. Duct board shall be sealed with mastic or UL181 pressure sensitive tape applied per UL listing.

Moisture Vapor Transfer: A vapor retarder of not more than 1.0 perm dry cup rating shall be installed in exterior walls, exterior ceilings and exterior floors. It shall be installed according to the manufacturer's specifications on the warm side (in winter) of all insulation.

Attic Ventilation: Adequate attic ventilation shall be maintained above all ceiling insulation by providing both high and low vents for roof rafter installed insulation, or gable end vents for insulation installed above a T-bar ceiling.

At least 1 square foot of net-free vent area shall be provided for every 300 ft² of ceiling area with 50 to 60 percent of the vent area located near the roof ridge and 40 to 50 percent located near the eaves. A minimum clearance of one inch shall be maintained between attic insulation and the roof sheathing when soffit vents are used.

Exception: Attic venting is not required when Structural Insulated Panels (SIP) are used to create an un-vented "hot roof," or an unvented attic design is used. In the case of the use of SIPs, all panels shall be effectively sealed

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together.