

**INDOOR  
ENVIRONMENTAL  
QUALITY  
ACCEPTANCE  
CHECKLIST  
FOR  
PORTABLE  
CLASSROOMS/OFFICES**

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The following check list provides a step-by-step guide for inspecting a portable classroom or office and determining its acceptability from an indoor environmental quality perspective (i.e. indoor air quality, noise, and lighting). Because of the diversity in individual perceptions and susceptibilities, acceptable comfort and health may not always be achieved for all individuals at all times when meeting these requirements. This guide does not address structural, fire/life safety, or energy aspects of the building.

This guide is organized into four sections:

**Section 1: HVAC System**

**Section 2: Building Envelope**

**Section 3: Interior Building Materials and Finishes**

**Section 4: Lighting**

## Section 1

### HVAC System – Summary Section Check Off

1-1	Outside Air Inlet	<input type="checkbox"/>
1-2	Air Filtration	<input type="checkbox"/>
1-3	Thermal Comfort Control	<input type="checkbox"/>
1-4	Outside Air Delivery	<input type="checkbox"/>
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#### 1-1 Outside Air Inlet

1-1.1	Rain Protection	
1-1.2	Bird Screens/ Roosting Determent	

The outside air intake and areas around the outside air intake shall be designed for protection from rain entrainment, and bird feces and feathers. Rain entrainment by outside air intakes may be minimized by utilizing one of the following three design controls.

- Installation of louvers or mist-eliminators at the outside air intake to minimize water penetration to 3 mL per m<sup>2</sup> (0.01 oz per ft<sup>2</sup>) of free area when tested in accordance with AMC Standard 500-1994 (15 minute period)

- Installation of rain hoods at the outside air intake sized for no more than 5 m/s (1000 fpm) face velocity and tilted at least 45° downward from the vertical.
- Installation of louvers or mist-eliminators in conjunction with drain pans.

Outdoor air intakes shall be covered by bird screen designed to prevent penetration of a 13 mm (1/2 inch) diameter probe while allowing penetration of a 6 mm (1/4 inch) diameter probe. The screen shall be made of a corrosion resistant material such as galvanized or stainless steel, aluminum or plastic.

## 1-2 Air Filtration

1-2.1	Minimum Filter Efficiencies	
1-2.2	Pressure Measurement Ports	

Ventilation systems shall be designed to operate and have installed a new air filter with a minimum atmospheric dust spot efficiency as determined by ASHRAE Standard 52.1, 1992 of 30%, or a minimum MERV 8 rating as determined by ASHRAE Standard 52.2, Minimum Efficiency Reporting Value (MERV). Note that this is typically a two inch pleated filter but this must be validated with a copy of the ASHRAE 52.1 or 52.2 test report.

Pressure measurement ports shall be installed up and down stream of the filter bank to allow differential pressure

measurements to be made for assisting in establishing the optimal change out frequency of the filters.

### 1-3 Thermal Comfort Control

1-3.1	Provide for Indoor Air Temperatures and Relative Humidities per ASHRAE Standard 55-1992 Recommendations	
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The heating/cooling system shall provide thermal comfort under part and full load conditions as defined in ASHRAE Standard 55, “Thermal Environmental Conditions for Human Occupancy” and an indoor dry bulb temperature of between 70 °F and 74 °F and an indoor relative humidity of between 30% and 60%.

### 1-4 Outside Air Delivery

1-4.1	Outside Air Flowrate	
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Minimum outside air delivery rates shall be set according to California Title 24 requirements. For school classroom spaces or office spaces, Title 24 requires a minimum of 15 cubic feet per minute (cfm) per occupant or 0.15 cfm/ft<sup>2</sup> of floor areas, whichever is greater. Thus, for a 900 ft<sup>2</sup> classroom with a maximum expected occupancy of 32 occupants, a minimum of 480 cfm of outside air is required. For a 900 ft<sup>2</sup> office space with a maximum expected occupancy of 6 occupants, a minimum of 135 cfm of outside air is required.

The required minimum outside air ventilation rate shall be verified prior to use of the space by measuring the flow rate entering the ventilation system outside air inlet with a calibrated airflow hood.

### 1-5 Building Space Pressures

1-5.1	Positive Building Space Pressure	
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Mechanically ventilated buildings shall be provided with a positive building space pressure of between 0.01 and 0.03 inches of water with respect to outdoors to minimize the infiltration of unfiltered and unconditioned outside air but without excessively pressurizing the building.

The required positive building space pressure shall be verified prior to use of the space by measuring the differential pressure between the building and the outside air with the ventilation system providing the recommended minimum outside air flow rate and all exhaust fans operating.

### 1-6 Local Contaminant Space Pressure

1-6.1	Document Local Contaminant Source Spaces	
1-6.2	Document Negative Space Pressure in Spaces with Local Contaminant Sources	

Spaces with a local contaminant sources (e.g., bathrooms, janitor closets, and laboratories) shall be isolated by walls from adjacent occupied spaces and provided with a negative space pressure between 0.01 and 0.03 inches of water with respect to adjacent spaces to minimize the

exfiltration of air contaminants into other areas of the building. These spaces shall not have air returned to the ventilation system for recirculation to the space but shall have air exhausted outdoors.

The required negative space pressure shall be verified prior to use of the space by measuring the differential pressure between the space with a local contaminant source and adjacent spaces with the ventilation system providing the recommended minimum outside air flow rate and with all exhaust fans operating.

## 1-7 HVAC System Access for Maintenance

1-7.1	Adequate Access to HVAC System Equipment for Maintenance/Inspections	
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Access shall be provided around all ventilation system equipment for routine maintenance and inspection. Access shall include easily removable air tight panels or doors for accessibility to the ventilation system component such as, up and downstream of filter banks, up and downstream of cooling or heating coils, condensate pans, outdoor air intake plenum, mixed air plenums, fan box, humidifiers, ...etc).

## 1-8 HVAC System Construction

1-8.1	HVAC System Construction Materials	
1-8.2	HVAC System Duct Leakage	

HVAC system ducting shall be constructed of hard, non-porous materials with surfaces that are easily cleanable.

Sheet metal ducting shall be used wherever possible but flex ducting may be used at terminations of supply and return air ducts. All flex ducting shall have an internal and external vapor barriers.

A minimum of porous materials such as fiberglass sound liner shall be used. Sound liner shall extend no closer than three duct diameters to the cooling coil on the downstream side. All interior duct insulation, exposed to the airstream shall be proved to be durable in accordance with UL 181 or ASTM C 1071 erosion testing. There shall be no tears, or cracks on the airside surface of interior duct insulation. All exposed duct sound insulation edges must be sealed with metal nosings, flashing or sleeves.

All exterior duct insulation must have a continuous vapor barrier with all connections tightly sealed.

Supply and return air duct connections shall be made air tight. Return air plenums in unconditioned spaces such as (wall cavities) shall be lined with sheet metal and made air tight. Air tightness of each system shall be verified by pressurizing the duct system to 25 Pa with a calibrated fan. Acceptable duct leakage is defined as less than 15% of the total system air flowrate at 25 Pa.

## 1-9 HVAC System Fan Controls

1-9.1	Programmable Start/Stop Times (1 hour pre-occupancy start time)	
1-9.2	Continuous Fan Operation	
1-9.3	Posted Operating Instructions	



The ventilation system shall have a programmable thermostat to control the starting and stopping of the system. The thermostat shall be configured to start the system one hour prior to occupancy to remove contaminants and odors that have built when the building ventilation system is turned off and to stop the system at the end of occupancy to save energy.

The thermostat shall not have an “auto” fan switch that allows for the ventilation system fan to automatically cycle on and off according to the thermal needs of the space. The ventilation system fan controls shall be designed to provide continuous operation during all hours of occupancy to provide outside air for occupants.

The thermostat shall come with a laminated 1 page instruction sheet (i.e. no bigger than 8 inches by 11 inches and in typed with a font no smaller than 18) how to program the unit, This instruction sheet shall be securely mounted next to the thermostat. This instruction sheet shall also state the maximum occupancy in 36 font capitals exactly as depicted below:

“MAXIMUM OCCUPANCY = \_\_\_\_\_

THIS VENTILATION SYSTEM IS DESIGNED TO SUPPLY AIR FOR NO MORE THAN THE ABOVE CITED MAXIMUM OCCUPANCY ”

1-10 HVAC System Condensate Pan

1-10.1	Condensate Pan Canted, Drained and Properly Trapped	
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All cooling coils shall be equipped with condensate pans that are properly canted and the drained located to allow for complete drainage. All cooling coils shall be fitted with a drain line equipped with an adequate water trap.

Drainage will be considered acceptable if when the condensate pan is filled with water, the water drains out and results in no standing water either without or with the fan system operating.

The condensate drain line trap will be considered acceptable if when the system is started and stopped there is no breakage of the water seal.

### 1-11 HVAC System Noise

1-11.1	Room Criterion = RC 35(N) or less.	
1-11.2	HVAC Operation less than 2 dB(A) increase	

The background sound level associated with the operation of the ventilation system shall be RC 35(N) or less as described by ASHRAE 1995 HVAC Applications, Chapter 43, Sound and Vibration Control. Measurements shall be made using a calibrated octave band sound pressure meter with the space unoccupied and a low outdoor noise level.

In addition, the difference in the A-weighted sound pressure level with the ventilation system operating shall

be no more than 2 dB(A) higher than without the ventilation system operating.

## Section 2 Building Envelope

2-1	Crawlspace	
2-2	Roof	
2-3	Walls, Windows, and Doors	

### 2-1 Crawlspace

2-1.1	Sufficient Ventilation Openings	
2-1.2	Rodent Screens in Place	
2-1.3	Sufficient Ground Clearance	

The crawlspace (i.e. skirting) shall be provided with not less than 1 ft<sup>2</sup> of openings for each 150 ft<sup>2</sup> of under floor area. Openings shall be distributed on all four sides and shall provide cross ventilation.

Crawlspace ventilation openings shall be covered by rodent screen designed to prevent penetration of a 13 mm (1/2 inch) diameter probe while allowing penetration of a 6 mm (1/4 inch) diameter probe. The screen shall be made of a corrosion resistant material such as galvanized or stainless steel, aluminum or plastic. Outside or at no more than 0.2 m (8 inches) inside of the outside face of the intake grill, louver, or rain hood entry.

There shall be a minimum of 1.5 inches clearance between wood portions of the skirting and the finished grade.

## 2-2 Roof

2-2.1	Water Drainage is Adequate	
2-2.2	No Water Leakage	

The roof shall drain water freely and not allow water to pond. Water shall be removed from the roof through full length gutters and downspouts and directed away from the building.

The roof shall not leak water into the building space or wall or ceiling cavities. Roof systems shall be demonstrated to be watertight according to ASTM E 1646-95.

## 2-3 Walls, Windows, and Doors

2-3.1	No Water Leakage	
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The walls, windows, and doors shall not leak water into the building space or wall or ceiling cavities. The walls, windows, and doors shall be demonstrated to be watertight when tested according to ASTM E 1105-96 with a minimum negative differential air pressure of 0.55 inches of water indoors with respect to outdoors.

### Section 3

## Interior Building Materials and Finishes

3-1	Contaminant Emission Rates of Building Materials and Finishes	
3-2	Floor Materials	
3-3	Stains on Indoor Surfaces	
3-4	Odors	

### 3-1 Contaminant Emission Rates of Building Materials and Finishes

3-1.1	Indoor air contaminant emission rates are at acceptable levels	
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The emission rates of building material shall meet the California Section 01350 architectural specification criteria as described for use in a typical classroom or office space described in the CA Department of Health Services (CDHS) Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers

See:

[http://www.dhs.ca.gov/iaq/vocs/lors/Section01350\\_7\\_15\\_2004\\_FINAL\\_PLUS\\_ADDENDUM-2004-01.pdf](http://www.dhs.ca.gov/iaq/vocs/lors/Section01350_7_15_2004_FINAL_PLUS_ADDENDUM-2004-01.pdf)

A table of products that have been certified by its manufacturer and an independent laboratory to meet these requirements is available at:

[http://www.chps.net/manual/lem\\_table.htm](http://www.chps.net/manual/lem_table.htm)

## 3-2 Floor Materials

3-2.1	Carpeting	
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For classroom spaces, the finished floors shall be constructed of non-porous materials (e.g. vinyl tiles) that are easily cleanable. Wall-to-wall carpeting is unacceptable. Area rugs which are easily removable for cleaning are acceptable. For office spaces carpeting shall meet the CRI Green Label Plus carpet certification program or the California Section 01350 architectural specification cited above.

## 3-3 Stains on Indoor Surfaces

3-3.1	No visible stains on walls, floors, or ceiling surfaces	
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## 3-4 Odors

3-4.1	No perceivable odors	
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The indoor air shall have no perceivable odors in the space as determined during the first 15 seconds of entering the space. This assessment shall be done with the space empty of occupants and furnishings, with all windows and doors closed, and with the ventilation system operating at the minimum recommended outside air delivery rate depicted in Section 1-4 for a minimum of 1 hour.

## Section 4 Lighting

4-1	Lighting	
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### 4-1 Lighting

4-1.1	Illumination Level	
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The illumination level at desk level (i.e. 30 inches above the floor) shall be no less than 50 foot-candles.