APPENDIX -A-

MATERIAL SPECIFICATIONS


DEPARTMENT OF COMMUNITY SERVICES AND DEVELOPMENT
CSD
CALIFORNIA
Serving Low-Income Families Through Community Partners

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AIR CONDITIONER AND HEAT PUMPS—CENTRAL SYSTEM
(WIS Section 31)

Material	*Requirements*
AIR CONDITIONER	- ALL UNITS • All materials shall be in conformance with the California Building Code (CBC) and California Mechanical Code (CMC). – Installed appliances must conform to CEC standards for efficiency, as verified by inclusion in the CEC's database of certified appliances, an equivalent federal directory, or an approved trade association directory. • Replacement air conditioning systems shall be: – In compliance with Title 24 efficiency standards, and – Rated by the Air-Conditioning, Heating, and Refrigeration Institute (AHRI).  *Photo Credit: RHA, Inc.*
AIR FILTER	- CENTRAL AIR CONDITIONING AIR FILTER • Filters shall be selected in accordance with this appendix for "Air Filters".
DUCTS AND SEALANTS	- DUCTS AND SEALANTS • Materials shall be in conformance with this appendix for "Duct System Repair and Sealing".
GAS PIPES AND VALVES	- GAS PIPES AND VALVES • Gas values shall be UL Listed and AGA or CSA certified. • Gas flexible connectors shall be listed epoxy-coated or stainless steel units. • Pilot tubing shall be aluminum (copper not allowed). • Fuel-gas piping: – Shall be selected, sized and installed per 2013 CMC, Chapter 13. – Copper gas lines not allowed.
HEAT PUMP	- HEAT PUMP UNIT • Package Units – Minimum HSPF of 8. – Minimum SEER of 13. • Split Systems (including mini-split systems) – Minimum HSPF of 8.2. – Minimum SEER of 13. – Note: The SEER and HSPF shall be determined by the coil and condenser match as listed in the current AHRI Directory.
PACKAGE UNIT	- PACKAGE UNIT (DUAL PACK) • Furnace: Minimum AFUE rating of 81%. • Air Conditioner: Minimum SEER of 13.
SPLIT SYSTEM	- SPLIT SYSTEM • Furnace: – Furnace unit shall conform with the "Furnace—Central FAU" section of this appendix. – Units installed in a Mobile Home shall be listed for use in a Mobile Home, and inside the living space shall be Closed Combustion. • Air Conditioner: Minimum SEER of 13 with a thermostatic expansion valve (TXV). – The SEER shall be determined by the coil and condenser match as listed in the current AHRI Directory.
THERMOSTATS	- WALL THERMOSTATS • Programmable and manual wall thermostats shall be selected in accordance this appendix for "Thermostats".

Material	*Requirements*
VENT PIPES	- METAL VENT PIPES • All metal vent pipes, vent connectors and components shall be UL listed. • Gas vent pipe shall be Type B. - NON-METALLIC COMBUSTION AIR AND VENT PIPES • Pipes and fittings shall be labeled to conform to ASTM D 1785 and D 2665. • Pipe cement and primer shall be labeled to conform to ASTM D 2564.

AIR CONDITIONER—WALL AND WINDOW
(WIS Section 32)

Materials	*Requirements*
AIR CONDITIONERS	- ALL UNITS • Unit shall be UL listed (or equivalent) and equipped with: – Minimum two-speed fan. – Adjustable thermostat with a minimum of six positions. – Removable filter. – Air directional control, minimum four-way.  *Photo Credit: RHA, Inc.*
UNIT SIZING	- NEW UNIT • Installed appliances must conform to CEC standards for efficiency, as verified by inclusion in the CEC's database of certified appliances, an equivalent federal directory, or an approved trade association directory. • Shall comply with manufacturer's recommendations for sizing and the guidelines in the table in the Field Guide measure-specific policy.
WALL AIR CONDITIONER	- WALL UNITS (CONVENTIONAL HOMES ONLY) • Must be equipped with thru-the-wall chassis (sleeve).

AIR FILTERS
(WIS Section 28)

Materials	*Requirements*
APPROVED MATERIALS	- ALL FILTERS • A MERV 6 filter shall be required for new, replacement appliances. • When a MERV 6 filter is not specifically allowed by the manufacturer's specifications for existing forced air appliances, a washable, "hog hair", foam, or other specialty-type filter (listed below) shall be installed in existing forced air systems (to prevent excessive static pressure that may cause the appliance to fail).
FILTER FOR <u>EXISTING</u> FORCED AIR SYSTEMS	- MERV 6 TYPE • When specifically allowed by manufacturer of the existing system. - "HOG HAIR" TYPE AND OTHER BONDED FILTER • 1" thickness shall be used in central HVAC systems. • 1/2" thickness shall be used in window/wall air conditioners. - FOAM FILTER • 1/4" single layer foam, 20 to 30 pores per inch (ppi). • Foam shall be installed only when bonded fiber is not feasible or prohibited by the appliance manufacturer. - OTHER MATERIALS • "Sock" type foam and other specialty materials shall only be installed where specified by appliance manufacturer.  *Photo Credit: RHA, Inc.*
FILTER FOR <u>NEW</u> FORCED AIR SYSTEMS	- NEW FORCED AIR SYSTEMS • Shall be MERV 6 or better, when installed in a new/replacement forced air unit or filter grille. • Shall be UL listed Class 2 filter material. • Shall conform to AHRI 680 or AHRI 681 (SI), and UL-900. 
SUPPORT RODS AND FILTER SUPPORTS	- FOR UNFRAMED AIR FILTERS • Manufacturer's instructions shall be followed. • When <u>not</u> in conflict with appliance or filter manufacturer's instructions, steel rods (galvanized recommended) shall be internally installed, as needed, to stiffen filters that are 20" or longer in either direction.

ATTIC AND CRAWLSPACE VENTILATION
(WIS Section 21)

Materials	*Requirements*
VENT MATERIALS	- VENTS SHALL BE: • Made of corrosion-resistant material for their specific location (e.g., exterior soffit, gable end, roof, crawlspace, etc.) and material and intended use (e.g., metal vent on metal roof. • Installed with a protective barrier or baffle. - VENT SCREENS • All ventilation will have screens with non-corroding wire mesh with openings of 1/16” to 1/4” to prevent pest entry (e.g., birds, bats, bees, etc.). - POWERED ATTIC VENTS • Are <u>not</u> allowed within the weatherization program.

Photo Credit (upper and lower): RHA, Inc.

CARBON MONOXIDE (CO) ALARMS
(WIS Section 4)

Material	*Description*
ALARM ACCESSIBILITY	- COMPONENT ACCESSIBILITY • Sensor and any field sensitivity adjustment shall <u>not</u> be accessible without removing Alarm from its mounting.
CO ALARM	- ALL <u>STANDARD LEVEL</u> CO ALARMS SHALL BE: • UL tested and Listed to latest ANSI/UL 2034 standard • Manufacturered after August 2009. • Included on the State Fire Marshal's list of approved products. • A single-purpose alarm (CO only) • Alarm shall be battery-powered, and the battery shall be: – Non-rechargeable, long-life lithium type. • Warrantied by alarm manufacturer to power the alarm for a minimum of five years. – Non-removable: • Factory installed behind a door secured with tamper-resistant screw (i.e., battery door cannot be opened with standard screwdriver/wrench), <u>or</u> • Factory sealed with soldered connections. • Sensor shall be electrochemical type. • Alarm shall provide audible <u>and</u> visual warning signals when: – An internal malfunction occurs (i.e., electrical short or failure). – The sensor's life has expired. – The battery power is low (reaches the end of its useful life). - <u>LOW-LEVEL</u> CO ALARM REQUIREMENTS • Alarm shall meet standard level requirements above, and in addition, include a digital readout that, with the single touch of a button, displays the current CO level as low as 10 PPM. - <u>HARD-WIRED</u> CO ALARM REQUIREMENTS • Shall be installed only when interconnection is required to be compatible with the existing hardwired system, or when required by the local jurisdiction (requires a program waiver). • 120 VAC. • Factory preinstalled lithium battery back-up. • Inter-connected, when required by the local jurisdiction.  *Photo Credit for all photos on this page: Defender* 
MOUNTING SYSTEM	- MOUNTING SYSTEM • The mounting system shall be designed so the alarm is secured to the mounting plate or wall with one or more standard screws that extend through the alarm cover/body and into the mounting plate or wall.

CAULKING
(WIS Section 8)

Materials	*Requirements*
SEALANTS	- ALL MATERIALS • Contractor must comply with Proposition 65 requirements. 
	- ACOUSTICAL CAULK/SEALANT • Non-hardening latex compound; ASTM C834.
	- SOLVENT RELEASE SEALANTS • Includes Acrylic, Butyl Rubber and Chlorosulfonated Polyethylene. • Conformance to ASTM C1311.
	- LATEX SEALANTS • Includes Latex, Acrylic Latex, and Siliconized Acrylic. • Conformance to ASTM C834.
	- ELASTOMERIC JOINT SEALANTS • Includes Polysulfide, Polyurethane, and Silicone. • Conformance to ASTM C920 or other ASTM Standards for Elastomeric Sealants (e.g., C603, C734, C1250, and D2202.
	- HIGH TEMPERATURE CAULK • Sealant rated for constant service up to at least 450°F (e.g., RTV red silicone, available for service up to 600°F, such as automotive RTV gasket sealant).
	- FOAM SEALANT • Class A, or Class 1 per ASTM E84. • Minimally expanding. • Fire-resistant foam compliant with ASTM E814 or UL 1479

CEILING FANS
(WIS Section 33)

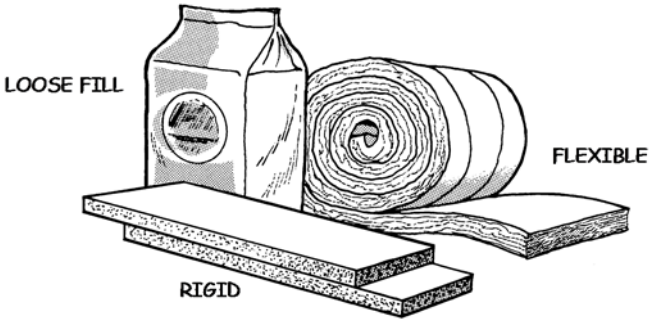
Materials	*Requirements*
ALL CEILING FANS	- GENERAL SPECIFICATIONS • ENERGY STAR qualified, when available. • Ceiling mounted units only. • 110 volt electrical requirements. • Speed control: 3-speed minimum. • Light fixture included when installed in existing light location. • Separate fan and light switch controls on fan. • UL listed motor and/or fan unit. • Fan must comply with UL-507. • Remote control shall be UL Listed and compatible with fan.  *Photo Credit: RHA, Inc.*
CEILING FAN SIZING	- FAN SIZE • Shall be appropriate for room dimensions and by manufacturer specification. • When manufacturer specification is <u>not</u> available, the table below is a Ceiling Fan Sizing Guide from the ENERGY STAR website that shall be followed as closely as is possible and reasonable:
FANS WITH LIGHT KITS	- LIGHT KITS • ENERGY STAR® qualified, for ceiling fans with light fixtures in locations where lighting must be high-efficacy (see 2013 Residential Compliance Manual, Chapter 6, § 6.1.2). • CFLs shall be listed for use in a ceiling fan or other location subject to vibration.
SWAG CHAIN KIT	- SWAG CHAIN KIT • UL Listed (or equivalent) and properly grounded (compliant with local code).

ROOM DIMENSIONS	CEILING FAN DIAMETER
Up to 75 sq. ft.	29" – 36"
76 – 144 sq. ft.	36" – 42"
145 – 225 sq. ft.	44"
226 – 400 sq. ft.	50" – 54"

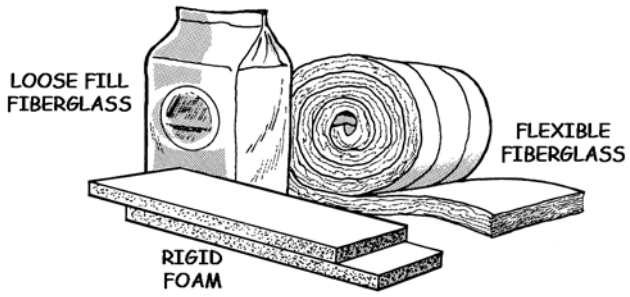
CEILING INSULATION FOR CONVENTIONAL HOMES
(WIS Section 20A)

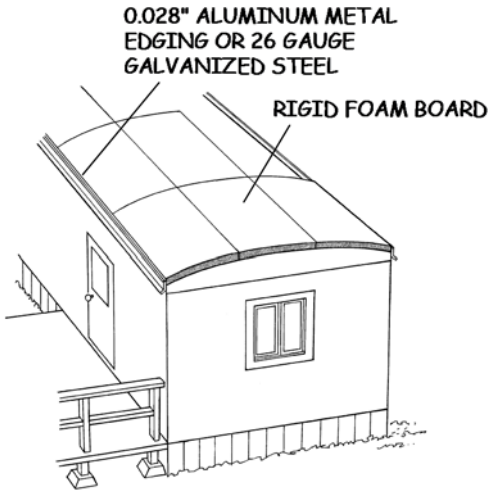
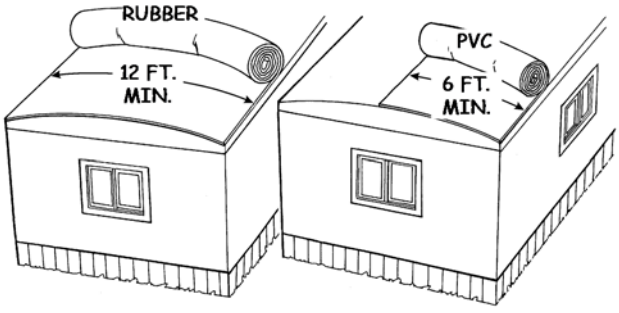
Materials	*Requirements*
APPROVED MATERIALS	- ALL INSULATION • Shall be certified to comply with the CCR, Title 24, Part 12, Chapters 12-13, and "Standards for Insulating Material". • Maximum R-Value for LIHEAP Contract: – Climate Zones 1 & 11 – 16: R-38 – Climate Zones 2 – 10: R-30 • R-Value for DOE Contract shall be determined by: – the DOE Priority List Table; or – Energy Audit result. - MINERAL FIBER • Flexible (Batts): Conformance to ASTM C665. • Loose Fill: Conformance to ASTM C764. - CELLULOSE • Loose Fill – Licensed for sale in California. – Compliance with CPSC 16 CFR, Part 12, Chapter 12-13. – Listed in Department of Consumer Affairs' "Directory of Certified Insulation Materials" - RIGID • Preformed Polyisocyanurate Board Foil Faced on Both Sides – Conformance to FS HH-1-1972. • High Density Fiberglass Board: Conformance to ASTM C726.

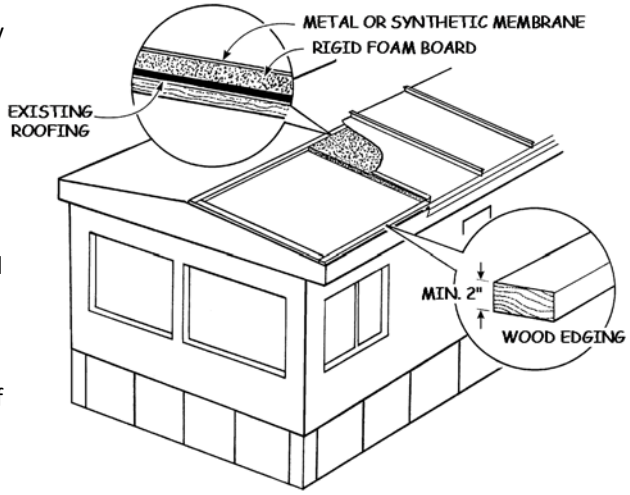
Photo Credit: CAP of San Luis Obispo



CEILING/ROOF INSULATION FOR MOBILE HOMES
(WIS Section 20B)

Materials	*Requirements*
ALL INSULATION	- ALL INSULATION • Actual roof cavity, type of insulation activity, and structural strength may limit R-value that can be installed. • Maximum R-Value for LIHEAP Contract: – R-30 • R-Value for DOE Contract shall be determined by: – the DOE Priority List Table; or – Energy Audit result.  *Photo Credit: WAPTAC.org*
ALL MECHANICAL FASTENERS	- SCREWS AND WASHERS • All screws shall be: – #8 minimum size. – Flathead. – Non-corrosive: cadmium plated or equivalent. – Proper type and size to assure a permanent attachment. • All washers: – Shall be 3" minimum diameter, and – Contain a center recess to place the screw head flush with or below the insulation surface.
ALL MINERAL FIBER	- FLEXIBLE • Conformance to ASTM C665. - ROOF BOARD HIGH DENSITY FIBERGLASS • Conformance to ASTM C726. • Minimum density 3 lbs./cu.ft. - LOOSE FILL FIBERGLASS • Conformance to ASTM C764. - LOOSE FILL ROCK WOOL OR CELLULOSE • Not allowed. 
ALL RIGID FOAM BOARD	- PREFORMED EXPANDED POLYSTYRENE. • Conformance to ASTM C578. • Minimum density 1 lbs./cu.ft. - PREFORMED FOIL FACED POLYISOCYANURATE OR POLYURETHANE • Conformance to FS HH-I-1972.
MOBILE HOME ROOF CAP INSULATION METHOD	
ALUMINUM ROOFING MATERIAL	- MINIMUM THICKNESS: 0.024". • Baked-on enamel or equivalent coating is best practice.
COVER MATERIAL	- COVER MATERIAL SHALL BE: • HUD-approved and listed. • Approved by the manufacturer for mobile home roof cap application.

Materials	*Requirements*
	• Adequately puncture resistant to withstand the environmental hazards of the location in which it will be installed, e.g. dropping pine cones, tree branches, etc. • Light in color.
INSULATION MATERIALS	- RIGID FOAM • Preformed Expanded Polystyrene • Preformed Polyisocyanurate - ROOF BOARD • High Density Fiberglass
OTHER SYSTEM COMPONENTS	- WOOD EDGING AND FURRING • Grade, Type, and Size – #2 or better Douglas Fir acceptable. – Redwood or pressure-treated fir preferred. – Nominal 2" x 2" minimum cross sectional dimensions. • Thickness – Height of wood shall equal height of insulation + 3/8". - ALL METAL COMPONENTS • Shall be manufactured for the application in which they are used. • Shall meet the thickness requirements listed below unless lighter weight material is approved by the HCD State Plan Check Engineer. • Shall be installed, secured, and sealed in conformance with manufacturer's instructions. - METAL EDGING WITHOUT WOODEN PERIMETER • Minimum thickness – Aluminum: .028". – Galvanized steel: 26 gauge. - METAL DRIP RAILS, EDGE TRIM AND FLASHING, END AND RIDGE CAPS • Minimum thickness – Aluminum: .024". – Galvanized steel: 30 gauge. 
SPLICING AND ATTACHMENTS	- PVC MATERIAL • Minimum thickness: 40 mil. • Imbedded rip-stop fiber scrim required. - EPDM AND HYPALON™ RUBBER • Minimum thickness: 45 mil. • Conformance to ASTM D4637. - OTHER MATERIALS • System design shall be submitted to and approved by the CA Department of Housing and Community Development (HCD) prior to any installation activities. 
STEEL ROOFING MATERIAL	• Galvanized steel. • Minimum thickness: 30 gauge. • Baked-on enamel or equivalent coating is best practice. • Shall conform to ASTM A361/361M.
MOBILE HOME GABLE END INSULATION METHOD	
EXTERIOR	- INSULATION

Materials	*Requirements*
SURFACE MOUNT METHOD	• Minimum R-11 rigid insulation covered with a watertight metal enclosure. - ENCLOSURE • Minimum 0.019" aluminum or 30 gauge galvanized steel shall be used for the enclosure. - ATTACHMENTS (SCREWS AND WASHERS) • See above in “All Mechanical Fasteners”. - CAULKING • See Elastomeric sealing, per “Caulking” section of this Appendix. - PUTTY TAPE • Self-sealing adhesive, pliable, long-life-type.
INTERIOR TRUSS MOUNT METHOD	- INSULATION • Flexible or rigid mineral fiber insulation. • Foam <u>not</u> allowed unless ceiling is minimum 5/16" gypsum or equivalent.
MOBILE HOME EXTERIOR ROOF EDGE CAVITY FILL METHOD	
COMPONENT ATTACHMENT	- SCREWS, NAILS, OR STAPLES • All screws, nails, or staples shall be at least 3/4" in length and: – Non-corrosive: cadmium plated or equivalent. • All screws shall be – #8 minimum size. – Flathead. – Proper type and size to assure a permanent attachment.
INSULATING MATERIALS	- APPROVED MATERIALS • Loose fill fiberglass: Conformance to ASTM C764 - MATERIALS <u>NOT</u> ALLOWED: • Cellulose • Rock Wool
SEALING MATERIALS	- SEALANT • Long-life sealant shall be minimum 1/8" putty tape or elastomeric sealant. • Elastomeric sealant shall be applied to exposed seams and screw heads as needed to achieve a permanent, watertight seal. - WASHERS • Exposed screws shall be sealed with a tight-fitting rubberized metal washer, or metal and rubber washer combination. • Washers shall be 3" minimum diameter and shall contain a center recess to place the screw head flush with or below the surface of the insulation. 
MOBILE HOME INTERIOR CEILING BORE CAVITY FILL METHOD	
INSULATING MATERIALS	- APPROVED MATERIALS • Loose Fill Fiberglass: Conformance to ASTM C764. - MATERIAL NOT ALLOWED • Cellulose • Rock Wool
SEALING	- PLUGS

Materials	*Requirements*
MATERIALS	• Custom made plugs matching existing ceiling material is a best practice. • Plastic plugs are acceptable.

COMBUSTION APPLIANCE SAFETY (CAS) INSPECTION EQUIPMENT
(Field Guide Appendix A)

Materials	*Requirements*
CO ANALYZERS	- CARBON MONOXIDE TESTERS • Shall be manufactured under an ISO 9001 quality management system or be ISO 9001 Certified. • Must, at a minimum, measure CO levels from zero ppm to 999 ppm. • New Units: Capable of providing air-free CO readings. • New and Existing Units: On-board or in-line NOx filter and condensate trap. 
CO ANALYZER SAFETY TEST ACCESSORIES	- SAFETY TEST ACCESSORIES • Monoxor Probe Extension materials: – 1/4" OD aluminum tubing (e.g., pilot tubing), cut in 1' & 2' (or longer) lengths (do not buy copper tubing) – 1/4" ID and 5/16" ID plastic tubing – Small stainless worm-drive clamp to fit over 5/16" ID plastic tubing • High-temperature caulk: Non-hardening sealant (e.g., RTV silicone) with a minimum service temperature of 450 °F. • Aluminum foil tape: UL Listed, with minimum service temperature of 265 °F (e.g., 181A-P duct tape). • Liquid gas leak detection compound with spray bottle: can be "neutral" leak detection soap (not dishwashing detergent). • Incense sticks: mildest scent available. • Smoke Sticks, Puffers, Pens to create smoke for diagnostic testing: commercially available. • Match Extender: Alligator clip on telescoping handle.
OTHER TEST EQUIPMENT	- DRAFT GAUGES • Draft gauges must have a range of –0.25 to +0.05 inches of water column (IWC), or –62.5 to +12.5 Pascals (Pa). - THERMOMETERS • Thermometers must have a range from 0 °F to 250 °F. - GAS LEAK DETECTORS • Gas Leak Detectors shall be listed to UL 913.
PLUG BUTTONS	- VENT "PLUG BUTTONS" • Metal and non-corrosive (e.g., nickel plated snap-in hole caps), sized to match drill bit(s) used to drill sampling holes (e.g., 5/16" and 3/8").
SAFETY TEST TOOLS	- SAFETY TEST TOOLS • Battery-powered nut driver, heavy duty, with 1/4" and 5/16" Magnetic Hex Nut Driver Bits. • 5/16" and 3/8" Drill Bits: Metal drills sized to match plug buttons. • Inspection Mirror: Small round or rectangular mirror on telescoping handle. • Propane Lighter: "Gas Match" type trigger-operated, long-nose lighter (flexible nose is best).

COMPACT FLUORESCENT FIXTURES—HARD-WIRED
(WIS Section 35)

<table>
<tr><th>Materials</th><th>Requirements</th></tr>
<tr><td>ADAPTERS</td><td>

- Adaptors which convert a threaded incandescent lamp holder to a high-efficacy luminaire shall not be used to change a fixture to high efficacy.

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<tr><td>ADDITIONAL INSTALLATIONS</td><td>

- Local jurisdiction may require change-out of additional existing lighting to meet Title 24 requirements, but materials will have to be addressed on a case-by-case basis by programmatic waiver.

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<tr><td>ALL FIXTURES</td><td>

- FIXTURE GENERAL REQUIREMENTS
  - Compact fluorescent fixtures, bulbs, and controls shall be high efficacy in accordance with Title 24 Building Energy Efficiency Standards and be ENERGY STAR rated where applicable.
  - All bulbs, fixture(s), and controls shall be UL listed (or equivalent), and must be either ENERGY STAR qualified or Title 24 labeled, and in accordance with local code(s) and NFPA 70 National Electric Code.
  - Pin-based linear or CFFs with electronic ballasts shall meet the following standards:

Photo Credit: WAPTAC.org

Photo Credit: RHA, Inc.

Luminaire (Fixture) Power Rating	Minimum Luminaire Efficacy to Qualify as High Efficacy
• 5 watts or less	• 30 lumens per watt
• over 5 watts to 15 watts	• 45 lumens per watt
• over 15 watts to 40 watts	• 60 lumens per watt
• over 40 watts	• 90 lumens per watt

- TITLE 24 REQUIREMENTS FOR HIGH EFFICACY HARD-WIRED FIXTURES:
  - Socket shall be pin-based.
  - GU-24 sockets shall be rated for compact fluorescent lamps, and not recessed luminaires.
  - Lighting installed in attached and detached garages, laundry rooms, and utility rooms shall be high efficacy luminaires and controlled by vacancy sensors.

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<tr><td>BALLASTS</td><td>

- Ballast must comply with ANSI/UL Standard 935 Class-P.
- Ballasts for fluorescent lamps rated 13 watts or greater shall be electronic and shall have an output frequency no less than 20 kHz.

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<tr><td>COMMON AREA LIGHTING (MULTI-FAMILY)</td><td>

- COMMON AREA LIGHTING
  - In low-rise multi-family buildings with four or more dwelling units where common areas are 20% or less of the building area, lighting for common areas must be high efficacy.
  - Occupancy sensors used in common areas shall be able to turn the lights on automatically.
  - In buildings where common areas are more than 20% of the building area, lighting in those common areas must comply with the Title-24 nonresidential lighting requirements.
  - Lighting in corridors and stairwells of multi-family buildings must be controlled by occupant sensors that reduce the lighting by at least 50%.

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<tr><td>HIGH-RISE MULTI-FAMILY</td><td>

- OUTDOOR LIGHTING (4 STORIES OR MORE) – HIGH-RISE MULTI-FAMILY
  - Outdoor lighting in high-rise multi-family buildings that is controlled from within a dwelling unit shall meet the requirements of single-family residential outdoor lighting.
  - Outdoor lighting in high-rise multi-family that is not controlled from within a dwelling unit shall meet the Title-24 requirements of nonresidential buildings.

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Materials	*Requirements*
LIGHT OUTPUT	- LUMENS • Light output (lumens) level shall be sufficient to maintain pre-existing light level, unless a lower level is acceptable to the client.
LOW-RISE MULTI-FAMILY	- OUTDOOR LIGHTING (3 STORIES OR LESS) – LOW-RISE MULTI-FAMILY • Fixtures shall be high-efficacy lighting.
MULTI-FAMILY LOCATIONS	- ALL CFF LOCATIONS • Replacing incandescent fixtures with CFFs in dwelling units and common areas shall be determined by Energy Audit only in whole-building weatherization projects. • Multi-family whole building project lighting requirements should be confirmed with the local jurisdiction.

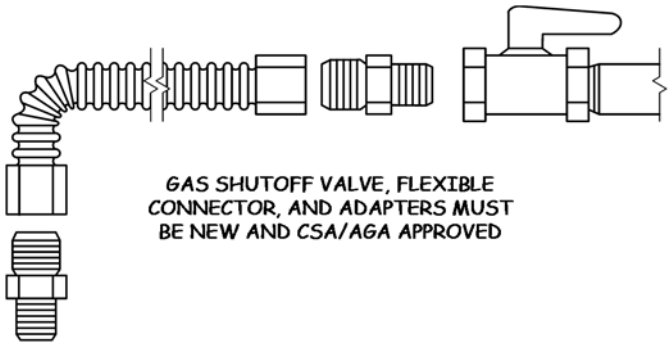
COMPACT FLUORESCENT LAMPS—THREAD-BASED
(WIS Section 34)

Materials	*Requirements*
ALL CFLs	- COMPACT FLUORESCENT LAMPS (CFLS) MUST BE: • ENERGY STAR qualified. • Warrantied for one year from date of installation.  *Photo Credit: WAPTAC.org*

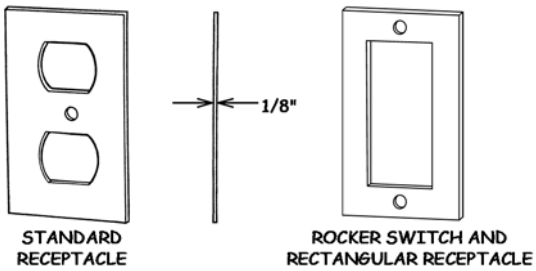
COOK STOVE REPLACEMENT—ELECTRIC
(WIS Section 40)

Materials	*Requirements*
ELECTRICAL COMPONENTS	- ELECTRICAL COMPONENTS • Receptacle shall match the plug on the Range power cord (pigtail) (e.g., NEMA type 14-50R 4-wire or 10-50R 3-wire 120/240 volt receptacle). • Components supplied by the installer shall meet NEMA standards and be UL listed or equivalent (e.g., power supply cord, circuit breaker or fuse, and receptacle).  *Photo Credit: RHA, Inc.*
FREESTANDING ELECTRIC RANGE AND ELECTIC COOKTOP	- REPLACEMENT ELECTRIC RANGE OR COOKTOP • UL-Listed, or equivalent. • In compliance with local code • Sealed or standard design burners, with a standard oven. - RANGE TYPE(S) NOT ALLOWED • Glass-top model • Self-cleaning model

COOK STOVE REPLACEMENT—GAS
(WIS Section 39)

Materials	*Requirements*
FREESTANDING GAS RANGE	- REPLACEMENT GAS RANGE • CSA Certified, UL-Listed, or equivalent. • Compliance with ANSI Z21.1 (Household Cooking Gas Appliances) • Electronic ignition (shall not have standing pilots) • Range shall be compatible with the fuel used: natural gas or liquid petroleum (LP gas). • Sealed or standard design burners. • Unit with a standard oven. - FUEL "SWITCHING" • Conversion kit, when needed and approved in advance in writing by CSD, shall be obtained and specified by the stove manufacturer. - RANGE TYPE(S) NOT ALLOWED • Self-cleaning oven  *Photo Credit: RHA, Inc.*
GAS COOKTOP	- REPLACEMENT GAS COOKTOP • Electronic ignition required, unless it is unfeasible to provide a 110-VAC circuit to the cooktop location.
VALVES AND FLEXIBLE GAS CONNECTORS	- VALVES AND FLEXIBLE GAS CONNECTORS • Gas shutoff valve and adapters shall be new brass and CSA or AGA approved. • Flexible gas connector shall be: – New stainless steel (coated or uncoated) up to 6' in length. – CSA Design Certified (per ANSI Z21.24/CSA 6.10), or AGA approved. 

COVER PLATE GASKETS
(WIS Section 11)

Materials	*Requirements*
GASKET MATERIAL	- ALL GASKETS SHALL BE: • Fire-resistant. • Pre-cut to fit. – Rocker-type switches and rectangular receptacles: Gaskets must have rectangular perforations shaped for those applications (rather than using standard receptacle gaskets with rounded perforations). • Closed cell foam. • 1/8" thick minimum.   *Photo Credit: Public Domain*

DOOR REPAIR/REPLACEMENT
(WIS Section 14)

Materials	*Requirements*
CASING/TRIM	- WOOD • Exterior grade required in all exterior locations. • Paint grade acceptable, unless existing jamb has natural finish. - NAILS • Finishing or casing nails required for interior applications. • Galvanized nails required for exterior applications.
DEADBOLTS	- INTERIOR CONTROL • Knob is required on the interior side (key in lieu of a knob not allowed). • Shall be installed in accordance with the CSD Field Guide.
DOOR (EXTERIOR, HINGED)	- ALL EXTERIOR HINGED DOORS • Shall be in compliance with the fire-resistance requirements of local code (e.g., 2013 CRC Section R327.8). • Shall be equipped with safety glass when required by the local jurisdiction for the specific installation location. • Glass in doors greater than 3" must always be safety glass. • Replacement doors shall be limited to standard solid core slab or panel doors (no ornate design, stained glass, decorative windows, etc., unless required by SHPO and approved by weatherization waiver). • Door "like for like" replacement shall not be allowed unless required by local code. • Hinged doors only, exterior grade. - DOOR COMPOSITION • Exterior replacement doors shall be a minimum 1-3/8" thick solid core wood door; or • Metal door, with a minimum R-6 insulated core; or • Any type of door, with a Fire Resistance Rating of at least 20 minutes, per NFPA 252. – Replacement doors shall be fire-rated in conformance with local code (e.g., for doors transferring from kitchen to garage in homes with attached garage, and in multi-family units). – Doors labeled to have a fire rating of at least 20 minutes shall not be modified or weatherstripped, except as prescribed and allowed by the manufacturer and local code. - NON-METALLIC VENEER FOR WOOD DOORS • Minimum 1/8" thick. • Hardboard veneer acceptable. • Exterior grade glue standard.
DOOR JAMB	- REPLACEMENT MATERIAL • Exterior grade only. • 5/4" thick stock standard; 3/4" minimum.
DOORS WITH GLAZING **(GLASS INSET)**	- DOOR WITH GLAZING • Safety glass is required, except in jalousies, and windows with panes less than 3" in width or height. – Polycarbonate may be used in lieu of glass, if allowed by local code. • Includes doors with glazing that occupies more than 50% of the total area, and sliding glass doors. • U-Factor and Solar Heat Gain Coefficient (SHGC) shall be in compliance with the table on next page. ***Continued on next page.***

<table>
<tr><th>Materials</th><th>Requirements</th></tr>
<tr><td></td><td>
Glazed Door Performance Requirements
<table>
<tr><th>EFFICIENCY FACTOR</th><th>CLIMATE ZONE</th><th>MAXIMUM VALUE</th></tr>
<tr><td>U-Factor</td><td>All CZ</td><td>O.32</td></tr>
<tr><td rowspan="2">Solar Heat Gain Coefficient (SHGC)</td><td>1, 3 & 5</td><td>No Requirement</td></tr>
<tr><td>2 &, 6 – 14</td><td>0.25</td></tr>
</table>
- LABELING
  - Safety glazing shall be permanently labeled and installed per the 2013 CRC, §R308.4.
</td></tr>
<tr><td>DOOR STOP</td><td>
- WOOD JAMBS
  - Stop shall be made of wood.
  - Paint grade acceptable, unless existing jamb has natural finish.
  - 5/16" x 1-1/4" minimum dimensions.
</td></tr>
<tr><td>FINISH/ SEALER, EXTERIOR DOORS</td><td>
- ALL DOORS
  - Doors must be sealed (painted or primed) to prevent moisture intrusion, including those that are cut to fit on-site. Pre-hung doors must be already sealed (primed or painted) to be in compliance.
- WOOD DOOR
  - Acceptable sealers are:
    - Paint, urethane, and varnish.
    - Clear “water seal” products are not allowed.
- METAL DOOR
  - Acceptable sealers are:
    - Oil base or epoxy paint only.
- JAMB AND CASING/TRIM
  - Acceptable sealers are:
    - Paint, urethane, and varnish.
    - Clear “water seal” products not allowed.
    - Exterior grade material shall be used in exterior locations.
</td></tr>
<tr><td>HINGES, EXTERIOR DOORS</td><td>
- HINGE REQUIREMENTS FOR EXTERIOR DOORS
  - Hinges shall:
    - Conform to ANSI/BHMA A156.1.
    - Be constructed of brass or stainless steel, minimum 0.120" thick.
    - Be loose-pin type, unless mounted toward exterior (fixed-pin not required on middle hinge).
- 1-3/8" DOORS
  - Minimum hinge size 3-1/2" x 3-1/2".
- 1-3/4" DOORS
  - Minimum hinge size 4" x 4".
- SCREWS TO ATTACH HINGES
  - Wood and Metal Jambs
    - Brass or stainless steel flathead screws shall be used, or as specified/supplied by manufacturer.
  - Pre-hung Units and Replacement Jambs
    - Screws shall penetrate trimmer stud at least 5/8".
</td></tr>
</table>

Materials	*Requirements*
INTERIOR DOORS WITH HARDWARE	- ALL INTERIOR (ENCLOSURE) DOORS • Interior grade hollow-core and louvered doors are allowed (e.g., for appliance enclosures and communication between rooms for combustion air). • Hinged doors only. - THICKNESS • 1-3/8" or 1-3/4" thick. - VENEER • Minimum 1/8" thick. - HINGES • 2 or 3 hinges (3 hinges for solid wood or solid core). • Hinges shall be constructed of brass or stainless steel. • Conformance with ANSI/BHMA A156.1. • Minimum hinge size: 3-1/2" x 3-1/2" and 0.120" thick. - SCREWS FOR HINGES • Brass or stainless steel flathead screws shall be used.  *Photo Credit: www.pinedohomes.com*
MOBILE HOMES – EXTERIOR DOORS	- MATERIAL REQUIREMENTS FOR ALL SWINGING REPLACEMENT DOORS • Rigid stiles and rails (e.g., channel steel and/or wood). • Permanently-finished skin (e.g., fiberglass or vinyl-clad metal). - MATERIAL REQUIREMENTS FOR OUT-SWINGING REPLACEMENT DOORS • Pre-hung entrance door manufactured for mobile homes. • Flanged metal frame (jambs, header and sill) with integral weather seals (e.g., extruded flap vinyl, bulb seal, etc.).
THRESHOLD SHIMS/ ELEVATORS	- MATERIALS ALLOWED INCLUDE: • Non-wood: Aluminum and Plastic (e.g., Vinyl). • Solid Wood: Redwood, Cedar, Pressure-treated Fir, or Solid Hardwood (i.e., must be degradation-resistant and exterior grade).

DUCT INSULATION
(WIS Section 19)

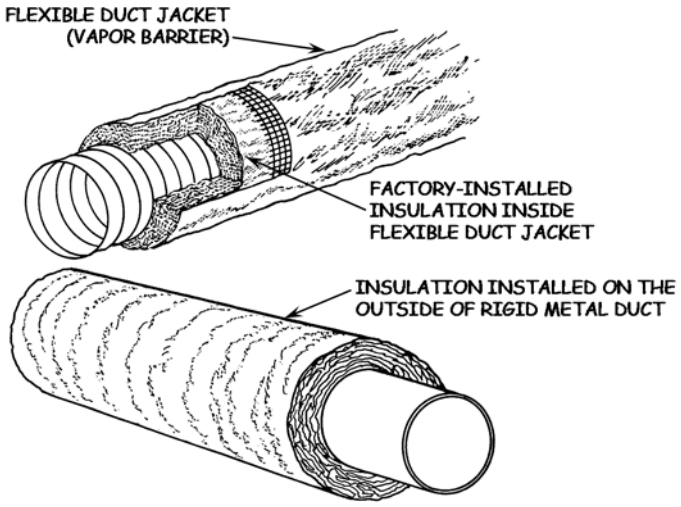
<table>
<tr><th>Materials</th><th>Requirements</th></tr>
<tr><td>DRAWBANDS</td><td>
- DRAWBANDS
  - Weather- and UV-resistant (e.g., black) nylon duct straps/ties rated for outdoor use.
  - Service temperature rating of 165°F minimum.
  - Loop tensile strength rating of 50 pounds minimum.
</td></tr>
<tr><td>INSULATION MATERIAL</td><td>
- ALL MATERIALS
  - Maximum flame-spread index of 25 and smoke-developed index of 50, per ASTM E84, UL 723, OR NFPA 255.
  - Minimum R-value for duct insulation shall be in accordance with Title 24, by heating fuel and CEC Climate Zone, as follows:

<table>
<tr><th>Climate Zone</th><th>Minimum R-value</th></tr>
<tr><td>CZ 1 – 10, 12, 13</td><td>R-6.0</td></tr>
<tr><td>CZ 11, 14 – 16</td><td>R-8.0</td></tr>
</table>

Photo Credit: Public Domain

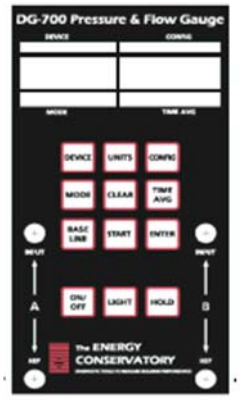
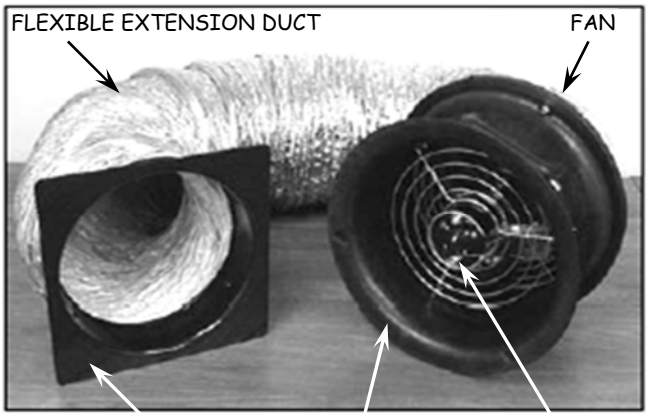
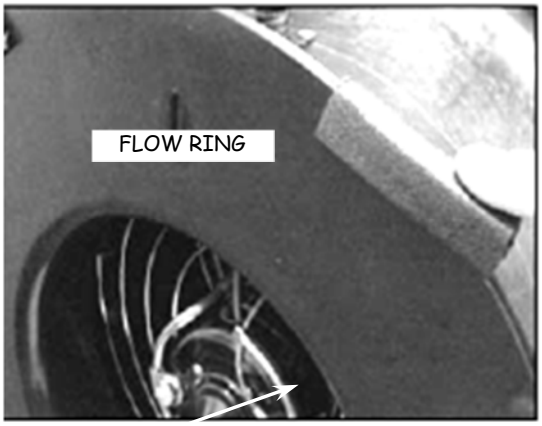

Graphic Credit: RHA, Inc.

- INDOOR INSULATION
  - Flexible or rigid fiberglass.
  - Facing shall be FSK foil or vinyl.
- OUTDOOR INSULATION
  - Shall be Listed for exterior applications.
</td></tr>
<tr><td>TAPE (UL 181) FOR DUCTS</td><td>
- DUCT TAPE
  - Metallic or FSK duct tape only; cloth tape not allowed.
  - For rigid fiberglass:
    - UL labeled “181A-P”
    - Minimum width 2".
</td></tr>
<tr><td>VAPOR BARRIER/ RETARDER</td><td>
- ALL VAPOR RETARDER MATERIAL
  - Vapor barrier/retarder (facing or jacket) shall have a maximum perm rating (permeance) of 0.5.

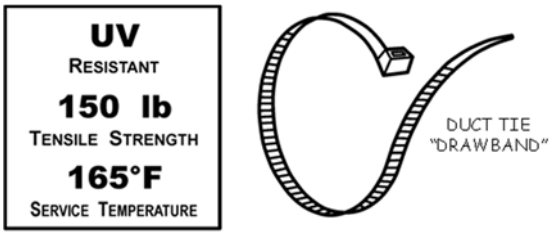


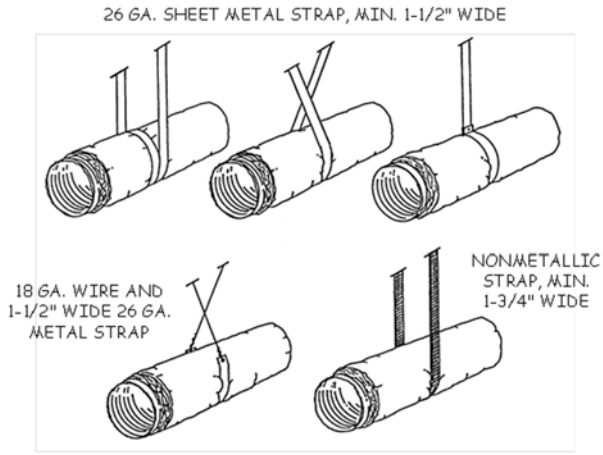
Graphic Credit: RHA, Inc.
</td></tr>
</table>

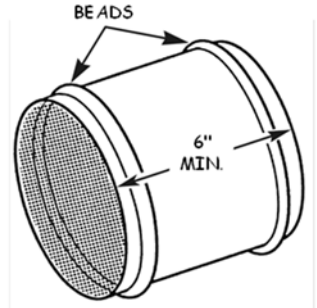
DUCT LEAKAGE TEST EQUIPMENT (DUCT BLASTER)
(CSD Field Guide Appendix B)

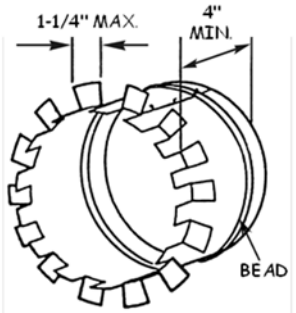
Materials	*Requirements*
DUCT LEAKAGE TESTERS	- EQUIPMENT • Pressure Measurements – Measurement systems shall have an accuracy of ± 0.2 Pa or 1% of reading, whichever is greater, and – Static pressure probes specified by the measurement equipment manufacturer shall be used. - DUCT LEAKAGE MEASUREMENTS • Duct leakage testing shall have an accuracy of ± 7% of measured flow in accordance with Title 24 Building Energy Efficiency Standards, and • Shall utilize digital gauges specified by the measurement equipment manufacturer. - TEST EQUIPMENT • Equipment used to measure duct leakage may include, but is not limited to, a Minneapolis Duct Blaster® or Retrotec Duc-Tester. • Smoke (e.g., from an incense stick, smoke pencil, smoke puffer, etc.) with tactile tests, gauge readings, etc. shall be used as appropriate to determine leak sources.  *Graphic Credit: Energy Conservatory* DUCT BLASTER® COMPONENTS   *Photo Credit: Energy Conservatory*
TESTER CALIBRATION	- CALIBRATION OF EQUIPMENT • Test equipment shall be maintained properly and calibrated regularly in accordance with manufacturer's recommendations. • Records of all calibrations and equipment checks must be kept in an equipment calibration log, as specified by CSD. • Digital gauges must be calibrated annually, by the factory, or by using field calibration procedures.

DUCT SYSTEM REPAIR & SEALING
(WIS Section 6)

Materials	*Requirements*
CONVENTIONAL HOMES	
ALL DUCT REPAIR & SEALING MATERIALS	- GENERAL SPECIFICATIONS • Surface burning characteristics, in accordance with: – UL 723, ASTM E84, NFPA 255, or UL 2043: – Flame spread rating shall not exceed 25. – Smoke developed rating shall not exceed 50. – *Exception*: Wooden building materials inside building cavities. • Only exterior-rated products shall be used on the exterior (outdoors). • UL 181A and 181B listed sealants shall be labeled In accordance with the "Duct Mastic" and "Pressure-Sensitive Tape" sections below.  *Photo Credit: WAPTAC.org*
CAULKING MATERIALS	- ALL MATERIALS • Non-toxic. • See CSD WIS Section 8 (Caulking) material specifications. - LATEX SEALING COMPOUNDS • Conformance with ASTM C834. - BUTYL RUBBER SEALANTS • Conformance with F.S. A-A-272A - ELASTOMERIC JOINT SEALANTS (SILICONE, POLYURETHANE, POLYSULFIDE) • Conformance with ASTM C920 or F.S. A-A-1556A.
CORK TAPE	- GENERAL SPECIFICATIONS • Non-toxic and non-corrosive to copper. • Elongation: 200% minimum. • Hardening: 37% maximum.
DRAWBANDS AND CLAMPS	- ALL DRAWBANDS AND CLAMPS • Drawbands and clamps used to secure flexible non-metallic ducts shall comply with duct manufacturer's installation instructions. - DRAWBANDS • Weather and UV resistant (e.g., black) nylon duct straps/ties rated for outdoor use. • Loop tensile strength: 150 pounds minimum. • Service temperature rating: 165°F minimum. • Tighten with a manufacturer-approved adjustable tensioning tool. - CLAMPS • Stainless steel worm-drive clamps.  *Graphic Credit: RHA, Inc.*

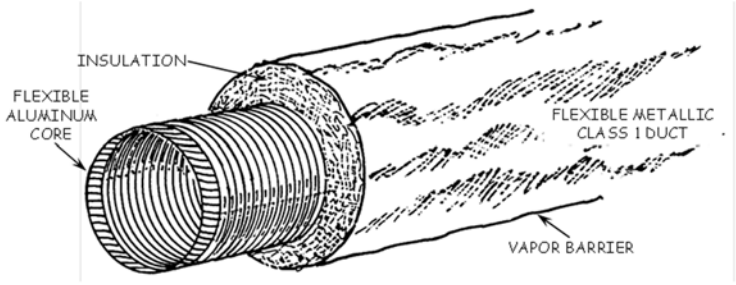
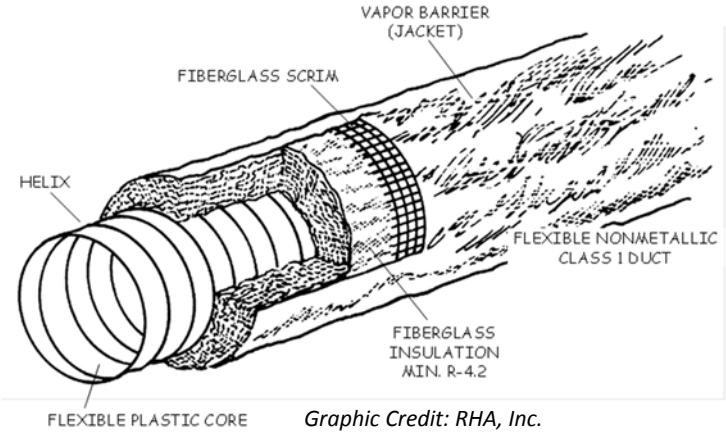
Materials	*Requirements*
DUCT LINER (AKA "DUCT BOARD")	- ALLOWED MATERIALS • High Density Fiberglass Duct Board – Conformance to ASTM C612, or NFPA 90B, or UL Class 1. • Sheet Metal • Plywood - DUCT BOARD & BUILDING BOARDS • Foil-faced Rigid Fiberglass Insulation Board; ASTM C726 • Foil-faced Fiberglass Duct Board; UL 181A - MATERIALS NOT ALLOWED (AS BARRIER MATERIAL OR SEALANT IN THE REPAIR OF BUILDING CAVITIES USED AS DUCTS, PLATFORMS, OR OTHER DUCT SYSTEM COMPONENTS). • Foam Board and Foam Sealant • Drywall  *Graphic Credit: RHA, Inc.*
DUCT MASTIC	- ALL DUCTS • Non-toxic and water resistant. • UL listed and labeled per UL 181A or UL 181B standards by type at right. **DUCT TYPE** / **SEALING MATERIAL** / **UL IDENTIFICATION** **RIGID METAL AND FIBERGLASS DUCTS AND COMPONENTS [UL 181A STANDARD]** — **MASTIC** — **LABELED "181A-M" OR "181A-M/181B-M"** **FLEXIBLE DUCTS [UL 181B STANDARD]** — **MASTIC** — **LABELED "181B-M" OR "181A-M/181B-M"**
DUCT SUPPORTS	- ALL DUCT SUPPORTS • Corrosion resistant • Conform to duct manufacturer's instructions. - FLEXIBLE DUCT SUPPORT STRAPS (HORIZONTAL AND VERTICAL) • Non-Metallic – Only if allowed by the local jurisdiction. – Polypropylene monofilament, woven polyester, polyester scrim reinforced vinyl laminate, or equivalent. • Minimum width: 1-3/4". • Minimum tensile strength: 70 lbs./inch of width. • Sheet Metal Straps and Saddles – Width: 1-1/2" minimum. – Thickness: 26 gage minimum. • Support Saddles – Fit neatly around and cover lower half (180°) of duct. – Shall not constrict inner diameter of duct nor cut the jacket. - HORIZONTAL RIGID ROUND METAL DUCTS • Up to 10" Diameter – Galvanized steel straps, same gage as duct, 1" minimum width, or – 18 gage galvanized steel wire. • 11" to 40" Diameter  *Graphic Credit: RHA, Inc.*

<table>
<tr><th>Materials</th><th>Requirements</th></tr>
<tr><td></td><td>
– Galvanized steel straps, same gage as duct, 1" minimum width, or
– 8 gage galvanized steel wire tied to a galvanized steel band, 1" minimum width, surrounding the duct.
- VERTICAL RIGID ROUND METAL DUCTS
• Up to 10" Diameter
– 18 gage galvanized steel straps, 2" minimum width.
• 11" to 20" Diameter
– 16 gage galvanized steel straps, 2" minimum width.
</td></tr>
<tr><td>FITTINGS (NEW) USED WITH FLEXIBLE <u>NON-METALLIC</u> DUCT</td><td>
- STARTING COLLARS
• 4" installed length (6" recommended).
• 26 gage galvanized steel up to 14" diameter.
- SPLICING SLEEVES
• 6" length (8" recommended).
• 26 gage galvanized steel up to 14" diameter.
- ALL FITTINGS
• Fittings shall be beaded at each core connection (e.g., both ends of a sleeve) when flexible non-metallic ducts are attached.


BEADED SLEEVE MINIMUM 6" LONG FOR FLEXIBLE NONMETALLIC DUCTS


SHEET METAL COLLAR (DOVETAIL) MIN. 4" LONG AND BEADED FOR FLEXIBLE NONMETALLIC DUCTS
Graphic Credit: RHA, Inc.
</td></tr>
<tr><td><u>FLEXIBLE</u> DUCTS FOR CONVENTIONAL HOMES</td><td>
- <u>ALL</u> FLEXIBLE DUCTS FOR CONVENTIONAL HOMES
• Conform to NFPA 90B and UL 181 Class 1.
• Non-metallic insulated ducts with air-permeable core <u>not</u> allowed.
• Have duct insulation minimum insulation and vapor barrier as indicated in the table below, or greater if required by local code.
<table>
<tr><th colspan="3">Additional Requirements for Flexible Ducts</th></tr>
<tr><td></td><td>CLIMATE ZONE</td><td>R-VALUE</td></tr>
<tr><td rowspan="2"><u>DUCT INSULATION</u></td><td>CZ 1 – 10, 12, 13</td><td>R-6.0</td></tr>
<tr><td>CZ 11, 14 – 16</td><td>R-8.0</td></tr>
<tr><td><u>VAPOR BARRIER (JACKET) MATERIAL</u></td><td colspan="2">• Thickness: 2.5 mils minimum.
• Permeance: 1.0 perm maximum.
• Degradation Protection: UV-resistant material (e.g., silver metalized polyester jacket).</td></tr>
</table>

Continued on the next page.
</td></tr>
</table>

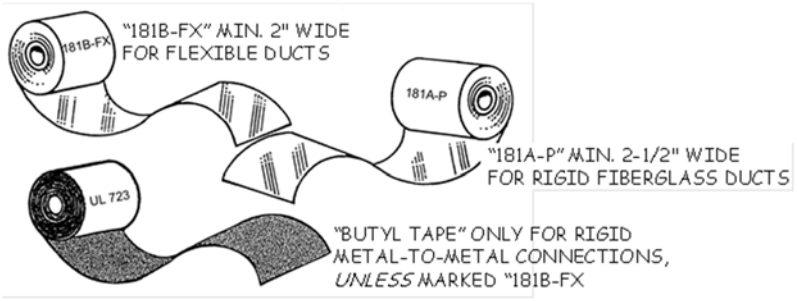
Materials	Requirements
	- FLEXIBLE <u>METALLIC</u> DUCTS FOR CONVENTIONAL HOMES • Rated to withstand designated pressures and velocity of the system, but not less than: – 2 inches of water column (IWC) (500 Pa) positive pressure. – 0.75 IWC (188 Pa) negative pressure, and – 2500 fpm velocity. • Fabricated from minimum 0.0065" thick aluminum material core or equivalent.  *Graphic Credit: RHA, Inc.* - FLEXIBLE <u>NON-METALLIC</u> DUCTS FOR CONVENTIONAL HOMES • Rated to withstand designated pressures and velocity of the system, but not less than: – 2 IWC (500 Pa) positive pressure, – 0.75 IWC (188 Pa) negative pressure, and – 2000 fpm velocity. • Duct Core ("Inner Liner") – Fabricated with a spring steel helix core bonded within a non-porous material (e.g., molded composite or 2-ply lamination of polyester). • Air-permeable core is <u>not</u> allowed.  *Graphic Credit: RHA, Inc.*
MECHANICAL FASTENERS	- FASTENER TYPES BY PURPOSE • Securing and Sealing Ducts – # 8 sheet metal screws and drawbands • Patches in Rodent Barrier – Outward clinch ("stitch") staples or equivalent. – Wooden strips attached and permanently secured by means of screws into floor joists, or wedged above adjacent girders. • To Hold Duct Insulation in Place: – Mechanical fasteners (e.g., wire, drawbands, metal straps, or equivalent that encircle ducts or attach to undercarriage) shall be added as needed to permanently secure insulation
MESH TAPE	- ALL DUCTS • Mesh fabric used to reinforce duct mastic shall comply with mastic manufacturer's instructions, or meet the following specifications: – Fiberglass mesh tape. – Weave per inch: 9 x 9 minimum. – Thickness: 0.006" minimum. - FLEXIBLE DUCTS AND RIGID METAL DUCTS • Mesh tape width: 2" minimum. - RIGID FIBERGLASS DUCTS • Mesh tape width: 3" minimum.

Materials	Requirements
PRESSURE SENSITIVE TAPE	- APPROVED PRESSURE-SENSITIVE TAPES • UL-listed in accordance with the table below.

DUCT TYPE	SEALING MATERIAL	UL IDENTIFICATION
RIGID METAL AND FIBERGLASS DUCTS AND COMPONENTS [UL 181A STANDARD]	PRESSURE SENSITIVE TAPE	MARKED "181A-P" OR "181A-P/181B-FX"
FLEXIBLE DUCTS [UL 181B STANDARD]	PRESSURE SENSITIVE TAPE	MARKED "181B-FX" OR "181A-P/181B-FX"

- Metallic Tape: Aluminum foil backing.
- Plastic Tape: Polypropylene or similar backing.
- "Butyl Tape" (also known as "Foil Mastic"):
  - Aluminum foil tape with minimum 15 mil butyl adhesive.
  - Marked "181B-FX" or "UL 723" (or ASTM E84 or NFPA 255).
  - Butyl tape without "181B-FX" marking shall not be used to seal flexible ducts.

- TAPES NOT ALLOWED: CLOTH-BACK RUBBER-ADHESIVE TAPES.
- SEALING FLEXIBLE NON-METALLIC AND FLEXIBLE METALLIC DUCTS
  - Tapes marked "181B-FX", minimum 2" wide.
  - Cloth-back butyl-adhesive tapes are allowed if CEC-approved for use in California (e.g., indicated by "CA" in the product number).
- TAPES FOR SEALING RIGID METAL DUCTS AND COMPONENTS
  - Metallic tapes marked "181A-P" and/or "181B-FX", minimum 2" wide.
    - *Exception*: "Butyl tape" without "181A-P" or "181B-FX" markings may be used to seal rigid metal-to-metal connections.
- TAPES FOR SEALING RIGID FIBERGLASS DUCTS
  - Metallic tapes marked "181A-P", minimum 2-1/2" wide.



Graphic Credit: RHA, Inc.

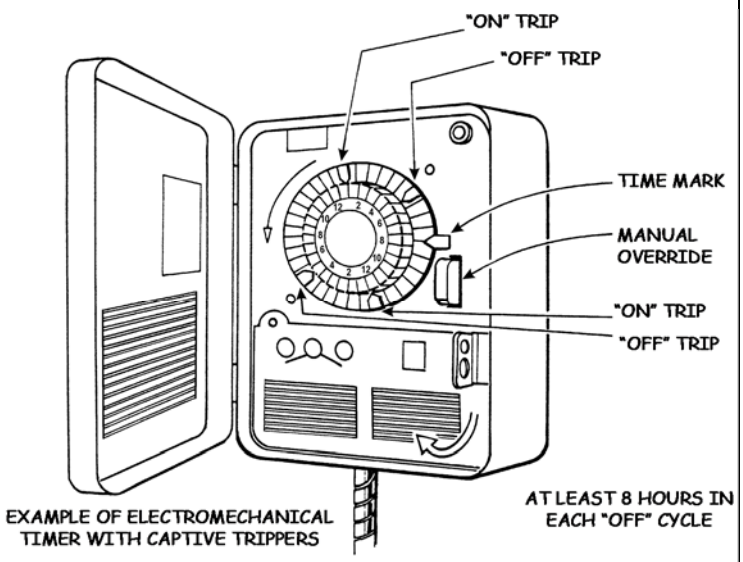
- ACCESS PANELS
  - Metallic tapes with non-butyl (e.g., acrylic) adhesive.
- HIGH-TEMPERATURE APPLICATIONS
  - Metallic tapes with non-butyl (e.g., acrylic) adhesive and service temperature rating of at least 265°F.

RIGID METAL DUCT	- ALL RIGID METAL DUCT: • Conform to NFPA 90B and UL 181 Class 1 or Class 0. • Constructed of non-corrosive material. • Rectangular metal ducts shall conform to CMC requirements. • Round metal ducts shall conform to minimum thickness requirements of the CMC. Examples are in the table on the following page.

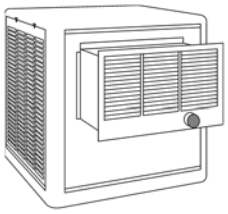
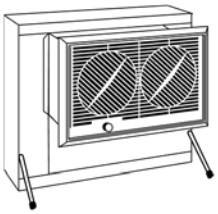
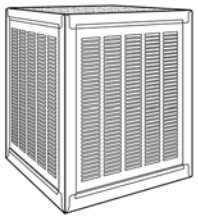
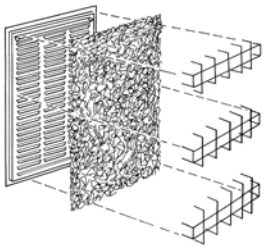
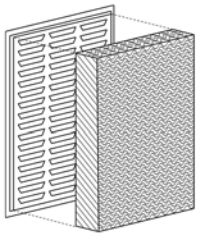
Continued on next page.

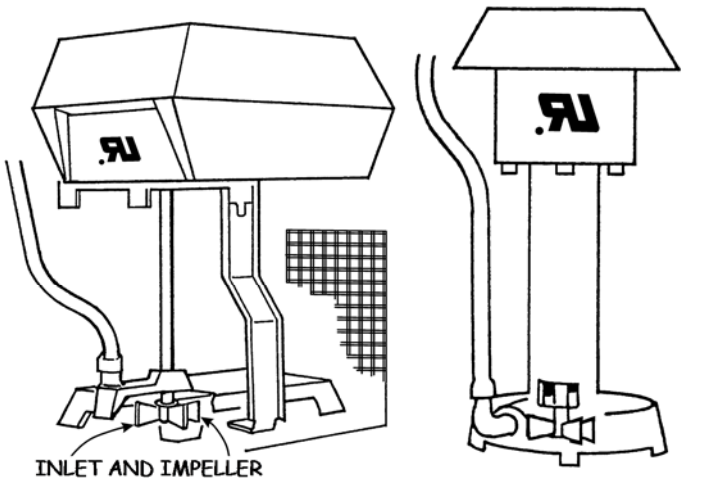
<table>
<tr><th>Materials</th><th>Requirements</th></tr>
<tr><td></td><td>
<table>
<tr><th colspan="3">ROUND METAL DUCTS
AT POSITIVE STATIC PRESSURE UP TO 2 IWG (500 PA)</th></tr>
<tr><th>DIAMETER OF DUCT</th><th>MIN. SHEET GAGE (GALVANIZED STEEL)</th><th>MIN. B. & S. GAGE (ALUMINUM)</th></tr>
<tr><td>Up to 14"</td><td>26</td><td>24</td></tr>
<tr><td>15" to 23"</td><td>24</td><td>22</td></tr>
<tr><td>24" to 37"</td><td>22</td><td>20</td></tr>
<tr><td>38" to 51"</td><td>20</td><td>18</td></tr>
</table>
- ALL RIGID COMPONENTS
  - Constructed of non-corrosive materials.
  - Fittings' (starting collars, splicing sleeves/couplings, adjustable elbows, wyes, etc.) wall thickness (gage) shall be no thinner than specified for attached ducts.
</td></tr>
<tr><td colspan="2">MOBILE HOME-SPECIFIC MATERIALS</td></tr>
<tr><td>ALL DUCT REPAIR & SEALING MATERIALS</td><td>
- WHERE MATERIAL SPECIFICATION IS NOT IDENTIFIED SPECIFICALLY FOR MOBILE HOMES, THE CONVENTIONAL HOME SPECIFICATIONS SHALL APPLY.
- GENERAL SPECIFICATIONS
  - When crawlspace ducts are accessible to animals:
    – Only internally-insulated rigid metal ducts shall be used.
  - When crawlspace ducts are <u>not</u> accessible to animals, flexible ducts may be installed to:
    – Replace damaged or deteriorated ducts (e.g., Crossover Ducts).
    – Install a new ducted return system.
</td></tr>
<tr><td>FLEXIBLE DUCTS FOR MOBILE HOMES</td><td>
- <u>ALL</u> FLEXIBLE DUCTS FOR MOBILE HOMES
  - Conform to NFPA 90B and UL 181 Class 1.
  - Have duct insulation minimum thermal resistance (R-Value) of 4.2 or greater (when required by local code).
  - Shall have vapor barrier material as described below:
    – Be rated for mobile home use (e.g., with HUD markings on the jacket).
    – Have a minimum thickness of 3.5 mils.
    – Have a maximum permeance of 1.0 perm.
- FLEXIBLE <u>NON-METALLIC</u> DUCTS
  - Non-metallic flexible duct core shall be fabricated with a spring steel helix bonded within non-porous material (e.g., molded composite or two-ply lamination of polyester).
- FLEXIBLE <u>METALLIC</u> DUCTS
  - Metallic flexible duct core shall be fabricated from minimum 0.0065" thick aluminum material or equivalent.
</td></tr>
<tr><td>RIGID METAL DUCTS</td><td>
- METAL DUCTS
  - Only galvanized duct or aluminum duct shall be allowed.
  - Gage of any rigid metal duct patch shall equal or exceed gauge of the existing duct.
</td></tr>
</table>

ELECTRIC WATER HEATER TIMERS
(WIS Section 44)

Materials	*Requirements*
ALL WATER HEATER TIMERS	- ELECTRICAL SPECIFICATION • Electrical current specification shall be greater than maximum electrical requirements of water heater.  *Graphic Credit: RHA, Inc.*
MECHANISM	- MECHANISM • UL listed or equivalent • Electromechanical or Digital timing mechanism. – Electromechanical timer should have captive trippers when feasible.
OUTDOOR USE	- OUTDOOR INSTALLATIONS • Timer shall have a weatherproof cover and be labeled for Outdoor use.
PROGRAMMING	- PROGRAMMING • Minimum of two set-back periods per 24-hour day. • Minimum 2 hours between settings. • Manual override switch. • Seven-day programmability.

EVAPORATIVE COOLERS
(WIS Section 29)

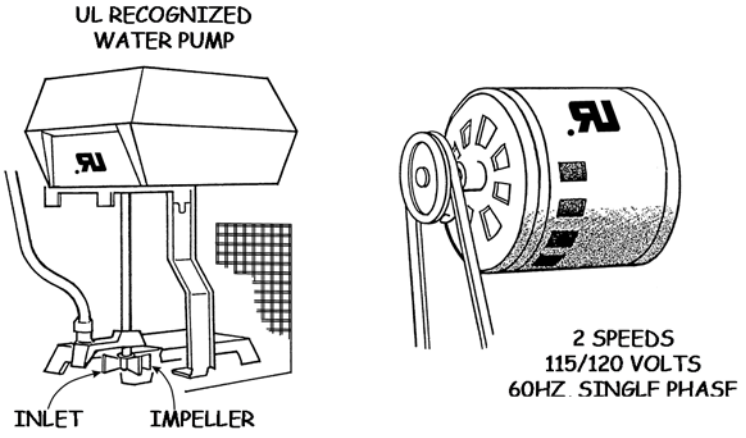
Materials	*Requirements*
EVAPORATIVE COOLERS	- ALL UNITS • Surface burning characteristics shall be per UL 723 and ASTM E-84. • Air movement shall be tested per ANSI/AMCA Standard 210. - WINDOW/WALL UNITS • UL Listed (or equivalent) and compliant with UL 507. - SEALANTS • Sealants used in the unit shall meet the following standards: – Water immersion: ASTM D 870. – Flexibility: ASTM D 756. - CABINET AND PAD FRAMES • Constructed of galvanized steel or polymeric materials conforming to UL 94 and UL 746C. • Pump and grille assembly polymeric materials shall conform to UL94 and UL746A and 746C.  *Photo Credit: RHA, Inc.*  STANDARD WINDOW/WALL COOLER  HIGH-EFFICIENCY WINDOW/WALL COOLER *Graphic Credit: RHA, Inc.*  ROOF-MOUNT COOLER
MEDIA	- STANDARD PADS • Aspen excelsior bound in netting, or type specified by cooler manufacturer. • Minimum thickness 1" (± 1/8”). • Size shall be as specified by cooler manufacturer. - HIGH-EFFICIENCY MEDIA • Only rigid media shall be used. • Size shall be as specified by cooler manufacturer. • Shall be rated to deliver Evaporative Efficiency of 0.85 or better.  STANDARD EXCELSIOR PAD  HIGH-EFFICIENCY RIGID MEDIA *Graphic Credit: RHA, Inc.*

Materials	*Requirements*
MOTOR	- ALL MOTORS SHALL BE: • UL-Listed or a UL-Recognized Component. • In compliance with cooler manufacturer's specifications. • Wired for at least two speeds. • Rated at 115/120 volts, 60 Hz, single phase. - BRACKETS AND PULLEYS • Mounting brackets/supports shall be factory-supplied and adjustable. • Pulley shall be factory-supplied.
REPAIR COMPONENTS	- BLOWER MOTOR • 2-speed, equipped with thermal overload protection. – *Exception*: If existing motor is single speed, replacement may be single speed. • A UL recognized component designed for moist conditions. • Warranted for one year. - BELT • General purpose "A" or "4L" section utility belts. - PADS • High efficiency aspen excelsior pads bound in netting, or • Slit, expanded, and reinforced cellulose fiber pad material, with even density, strengthened for long life, reinforced (e.g., with polyethylene), and with fungus resistance. • All pads must have at least 1" thickness (two thinner pads may be used to achieve 1" thickness). - PUMP • Shall be a grounded UL recognized component with thermal overload protection. - PULLEYS • Single-groove type designed for use with "A" or "4L" section V-belts. • Set screws shall be hollow hex head type. - SHUT-OFF VALVE AND FITTINGS • Brass shut-off valve: – 1/4" x 1/8" needle valve, or as required by local code. – Self-tapping needle valve not allowed. - FITTINGS • Brass fittings only - SUPPLY LINES • Replacement supply lines shall be copper.  UL RECOGNIZED PUMPS WITH THERMAL OVERLOAD PROTECTION *Graphic Credit: RHA, Inc.*
UNIT SIZING REQUIREMENTS	- COOLER CAPACITY (AIRFLOW IN CFM) • Minimum 3.0 CFM per sq. ft. of floor area in average climates: – 22.5 air changes per hour, with 8' ceilings. • Minimum 4.0 CFM per sq. ft. of floor area in hot, dry areas: – 30 air changes per hour, with 8' ceilings. • The following "Cooler Sizing Guidelines" table may be used as a guide.

Materials	Requirements
	- CAPACITY CALCULATION • Cooler capacity required for any size area is calculated by multiplying square footage of the floor area to be cooled by the applicable CFM/sq. ft. (3.0 or 4.0) – (Floor Area Sq. Ft.) X (3.0) for average climates, or – (Floor Area Sq. Ft.) X (4.0) for hot, dry climates.
WATER PUMP	- ALL PUMPS SHALL BE: • UL-Listed or a UL-Recognized Component. • Protected from water damage to motor winding (e.g., by shaft sleeve, skirting, etc.). - MOTOR SHALL: • Be grounded. • Have thermal overload protection. - PUMP SCREEN • Pump shall have a molded screen or other factory-supplied screening device to keep debris out of the impeller.
WATER SUPPLY	- NEW MATERIALS • Supply lines shall be minimum 1/4" OD copper tubing. • Shut-off valve and fittings shall be brass. - MATERIALS NOT ALLOWED • Plastic tubing, fittings, and valves. • Self-tapping needle valve.

COOLER SIZING GUIDELINES

COOLER CAPACITY[1] (AIRFLOW IN CFM) [1]	MAXIMUM SQ. FT. FLOOR AREA[2] AT 3.0 CFM/SQ. FT. –22.5 ACH– (AVERAGE CLIMATE) [2]	MAXIMUM SQ. FT. FLOOR AREA[2] AT 4.0 CFM/SQ. FT. –30 ACH– (HOT, DRY CLIMATE) [3]
3,000	1,000	750
3,500	1,165	875
4,000	1,330	1,000
4,500	1,500	1,125
5,000	1,665	1,250
5,500	1,830	1,375
6,000	2,000	1,500
6,500	2,165	1,625



Graphic Credit: RHA, Inc.

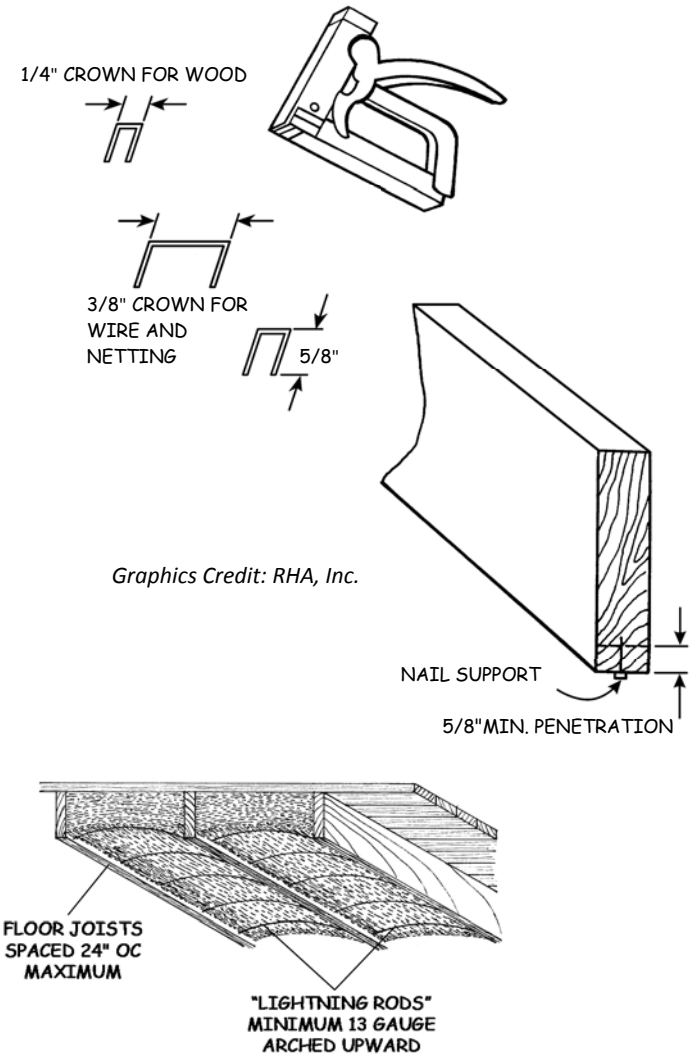
[1] For the applicable climate category (column 2 or 3), a cooler capacity (column 1) is selected which is adequate for the living space (floor area) to be cooled.

[2] When the floor area is between sizes shown in the table, the next larger cooler capacity is selected.

FLOOR INSULATION FOR CONVENTIONAL HOMES
(WIS Section 22A)

Materials	*Requirements*
INSULATION MATERIAL	- ALL FLOOR INSULATION MATERIAL • All insulation shall be certified to comply with the CCR, Title 24, Part 12, Chapters 12-13, "Standards for Insulating Material". - MINERAL FIBER • Flexible (Batts and Blankets) – Conformance to ASTM C665. • High Density Fiberglass Board – Conformance to ASTM C726. - RIGID FOAM • Preformed polyisocyanurate board foil faced on both sides – Conformance to FS HH-I-1972 or ASTM C1289. • Rigid, cellular Polystyrene Thermal Insulation – Conformance to ASTM C578. - INSULATION COVER • For Floor Insulation, where no foundation wall exists: – If <u>not</u> exposed to precipitation, wind, and the elements support with woven wire or minimum 70 perm breathable cover is required.  *Photo Credit: RHA, Inc.*
R-VALUE	- ALL INSULATION MATERIALS • R-value shall be determined in accordance with: – the DOE Priority List Table; or – By Energy Audit; or – By LIHEAP contract guideline, when no existing insulation is present, insulation shall be installed to R-19. - CRAWLSPACE PERIMETER INSULATION—INTERIOR <u>OR</u> EXTERIOR • R-value shall be R-13. - BASEMENT WALL INSULATION • R-value shall be R-13.
SUPPORTS AND ANCHORS	- LIFE EXPECTANCY • All attachment materials shall have a minimum expected service life of 10 years. - STAPLES • Zinc-coated, stainless steel, or similar corrosion-resistant material. • 18 gage minimum diameter. • Minimum 1/4" crown for wood lath. • Minimum 3/8" crown for other insulation support systems. • Minimum 5/8" joist penetration. - NAILS • Galvanized nails. • 5/8" minimum joist penetration - WIRE SUPPORTS • Wire shall be zinc-coated, stainless, or similar corrosion-resistant material.

Materials	Requirements
	• Minimum 20 gage. - NETTING FOR FLEXIBLE INSULATION TYPE • Woven wire shall be galvanized. • Netting shall be propylene or equivalent with a minimum 75 pound breaking strength. - SPRING WIRE SUPPORT RODS ("LIGHTNING RODS") FOR FLEXIBLE INSULATION TYPES • Spring steel wire with chisel points (lightning rods, wirestays). • Minimum 13 gage. • Joists over 24" OC : Spring wire support rods are <u>not</u> allowed.
VAPOR RETARDER	- EXISTING VAPOR RETARDER • Existing undamaged ground cover acceptable if at least 4 mil thick and in good condition after insulation is installed. - NEW VAPOR RETARDER • A <u>new</u> vapor retarder shall be installed in conformance with the Title 24 requirements below. • Vapor Barrier Material for CZ 1 – 16: – A Class I or Class II vapor retarder shall be installed: • Class I – perm rating less than 0.1 (vapor retarder or barrier) • Class II – perm rating between 0.1 and 1.0 (vapor retarder)A ground moisture barrier shall be used that meets tear and puncture resistance standard ASTM D703.



Graphics Credit: RHA, Inc.

FLOOR/UNDERCARRIAGE INSULATION FOR MOBILE HOMES
(WIS Section 22B)

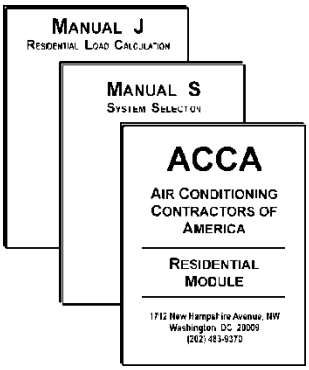
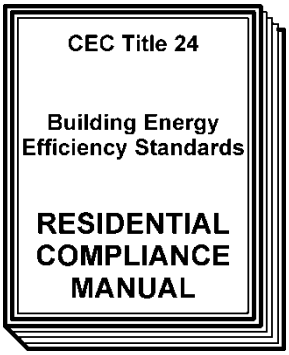
Materials	*Requirements*
INSULATION MATERIALS	- ALL MATERIALS • Selected material will be of minimal water absorbency. • Selected material will be noncorrosive. • Flame Spread – Flame spread index of selected materials shall not exceed 25 with an accompanying smoke-developed index not to exceed 450 when tested in accordance with ASTM E84 or UL 723. – Flame spread index of foam insulation will not exceed 75 and a smoke- developed index of no more than 450 when tested in the maximum thickness intended for use in accordance with ASTM E84 or UL 723.  *Photo Credit: WAPTAC.org* - MINERAL FIBER • Flexible (Batts and Blankets) – Conformance to ASTM C665. • Loose Fill Fiberglass – Conformance to ASTM C764. - FOAM INSULATION • Foam insulation shall be separated from the interior of the building by an approved thermal barrier a (minimum of 1/2" gypsum or a material that is tested in accordance with the acceptance criteria of both the Temperature Transmission Fire Test and the Integrity Fire Test of NFPA 275).
R-VALUE OF ADDED INSULATION	- ALL INSULATION MATERIALS • R-value shall be determined in accordance with: – The DOE Priority List Table; or – By Energy Audit; or – Up to R-19 by LIHEAP contract guideline. - ALL UNDERCARRIAGE INSULATION • Variable R-values from R-11 to R-30 in a single cavity fill allowed. • Replacement for missing insulation shall equal or exceed pre-existing R-value.
SEALING MATERIALS	- CAULKING, SEALANTS, AND TAPES: • Sealing materials shall conform to: – CSD Appendix A (Duct System Repair & Sealing); – CSD Appendix A (Minor Envelope Repair); and – CSD Appendix A (Caulking).
VAPOR RETARDER	- EXISTING VAPOR RETARDER • Existing undamaged ground cover acceptable if at least 4 mil thick and in good condition after insulation is installed. - <u>NEW</u> VAPOR RETARDER SHALL BE INSTALLED IN CONFORMANCE WITH THE REQUIREMENTS BELOW: • Maximum of 0.1 perm moisture barrier material. • Must meet tear and puncture resistance standard ASTM D703.

FLUORESCENT TORCHIERE LAMPS
(WIS Section 36)

Materials	*Requirements*
ALL LAMPS	- FLUORESCENT TORCHIERE- FLOOR LAMP SHALL BE: • UL listed (or equivalent). • ENERGY STAR qualified. • Equipped with a: – Dimmer control or a 3-way switch for three levels of brightness. – Replaceable fluorescent lamp.  *Photo Credit: El Dorado County*

FURNACE —CENTRAL FORCED AIR
(WIS Section 24)

Materials	*Requirements*
AIR FILTERS	- FURNACE FILTERS • MERV 6 filter shall be selected for new FAUs in accordance with manufacturer's specifications and this appendix for "Air Filters".
ALL MATERIALS	• All FAUs shall be in conformance with the CBC and CMC. • HVAC units shall be in compliance with Title 24 efficiency standards.
CONVENTIONAL HOME FURNACE	- ALL UNITS • Units shall be in conformance with the current CBC, CMC, and Title 24 Building Energy Efficiency Standards (Residential Compliance Manual). – Installed appliances must conform to CEC standards for efficiency, as verified by inclusion in the CEC's database of certified appliances, an equivalent federal directory, or an approved trade association directory. • All units and components shall be UL Listed and/or have one of the following certifications: CSA, AGA, or GAMA. • Units installed in a Mobile Home shall be listed for use in a Mobile Home, and inside the living space shall be Closed Combustion.  *Photo Credit: RHA, Inc.*
DUCTS AND SEALANTS	- ALL MATERIALS • Shall be in conformance with Duct Repair and Sealing material specifications provided in this appendix.
GAS PIPES AND VALVES	- GAS PIPES AND VALVES • Risers, flexible connectors, fittings, and valves shall be in conformance with manufacturer's specifications and the managing building authority (HCD or the local jurisdiction). • Components shall be new (re-use of existing materials shall not be allowed). • Gas valves: UL Listed and AGA or CSA certified. • Gas flexible connectors: IAPMO Listed epoxy-coated or stainless steel units. • Pilot tubing shall be aluminum (copper not allowed). • Fuel-gas piping: – Shall be selected, sized and installed per 2013 CMC, Chapter 13. – Copper gas lines not allowed.
MOBILE HOME FURNACE	- MATERIALS INSTALLED WITHIN A MANUFACTURED HOME: • Shall be in compliance with these specifications for conventional homes, HCD regulations, and HUD Mobile Home Code (MHCSS). - MATERIALS INSTALLED OUTSIDE A MANUFACTURED HOME: • Shall be in compliance with HCD regulations or, as applicable, requirements of the local building department.
PACKAGE UNITS	- PACKAGE UNITS (DUAL PACKS): • Furnace: Minimum AFUE rating of 78%. • Air Conditioner: Minimum SEER of 13.
SPLIT SYSTEMS	- SPLIT SYSTEMS • Furnace: – Minimum AFUE rating: • Outdoor units: 81% • Indoor units: 80% ***Continued on next page.***

Materials	Requirements
	• Mobile home unit: 80% – UL Listed and certified by AGA or AHRI. • Air Conditioner, if replaced in conjunction with furnace shall be in accordance with "Air Conditioners and Heat Pumps—Central" section of this Appendix. – Minimum SEER of 13.
SYSTEM DESIGN	- SYSTEM DESIGN AND PERFORMANCE • All Installations – Unit shall be properly sized in accordance with Title 24 or local code, whichever is more stringent. • For heating equipment sizing, reference CEC 2013 Building Energy Efficiency Standards, Subchapter 7, §150(h). – Building heating and cooling loads, which are used for equipment sizing and selection, shall be determined using a method based on one of the following: • ACCA Manual J, or • SMACNA Residential Comfort System Installation Standards Manual, or • ASHRAE Handbook (Equipment, Applications and Fundamentals Volumes). – Heating capacity of the new system shall be sized to meet the minimum requirements but not larger than necessary. – Distribution system shall be in conformance with HVAC manufacturer's specifications and local code.  *Graphic Credit: RHA, Inc.* ⚠ Before installation of any furnace, agency shall confirm that appliance sizing, venting, combustion ventilation air, gas piping, and all feasibility criteria will be met for the replacement unit.
TITLE 24 REQUIREMENTS	- TITLE 24 REQUIREMENTS • The following Title 24 HVAC requirements must be met and verified by a HERS Rater when applicable: – Duct Leakage Verification (all climate zones) – In all climate zones, when a package unit, air handler, A/C condenser, A/C evaporator coil, heating coil, furnace heat exchanger or more than 40' of ducts in unconditioned space are replaced, duct leakage must be verified by a HERS rater by one of the CEC-approved methods. – When new or replacement air conditioner or heat pump is installed, or when the condensor coil or a refrigerant-containing component is installed, correct refrigerant charge must be measured by the installer and verified by a HERS Rater in CEC Climate Zones 2 and 8–15. – In all climate zones, when an entirely new space-conditioning system is installed (all equipment and ducts replaced) or 75% of the duct system is replaced, minimum airflow and maximum fan watt draw must be verified.  *Graphic Credit: RHA, Inc.*
VENT PIPES	- <u>METAL</u> VENT PIPES • All metal vent pipes, vent connectors and components shall be UL listed. • Gas vent pipe shall be Type B or B-vent. - <u>NON-METALLIC</u> COMBUSTION AIR AND VENT PIPES • Pipes and fittings shall conform to ASTM D 1785 and D 2665. • Pipe cement and primer shall conform to ASTM D 2564.
THERMOSTATS	- ALL THERMOSTATS • Programmable and Standard Wall Thermostats shall be selected in accordance with this appendix and CSD WIS Section 27 (Thermostats—Programmable and Manual).

FURNACE—WALL, FLOOR & FREESTANDING UNITS
(WIS Section 25)

Materials	*Requirements*
ALL FURNACES	- ALL FURNACES SHALL BE: • Installed appliances must conform to CEC standards for efficiency, as verified by inclusion in the CEC's database of certified appliances, an equivalent federal directory, or an approved trade association directory. • UL listed and GAMA certified. • The most efficient model feasible to install, but no lower in efficiency than specified in the table below (reference Title 24 2013 Residential Compliance Manual, Section 4.2). • Closed Combustion and listed for use in a Mobile Home, when installed in a Mobile Home.
GAS PIPES AND VALVES	- GAS PIPES AND VALVES • Gas Valves: UL Listed and AGA or CSA certified. • Gas Flexible Connectors: IAPMO Listed epoxy-coated or stainless steel. • Pilot tubing shall be seamless aluminum (copper not allowed). • Fuel-gas piping shall be selected, sized and installed per 2013 CMC Chapter 13.
THERMOSTAT	- ALL THERMOSTATS • Thermostat shall: – Be in conformance with manufacturer's instructions and selected in accordance with this appendix for "Thermostats—Programmable and Manual" and CSD WIS Section 27.
VENT PIPES	- METAL VENT PIPES • All metal vent pipes, vent connectors and components shall be: – UL Listed, and in compliance with furnace manufacturer's specifications. • Gas vent pipe shall be Type B or BW.

Photo Credit: RHA, Inc.

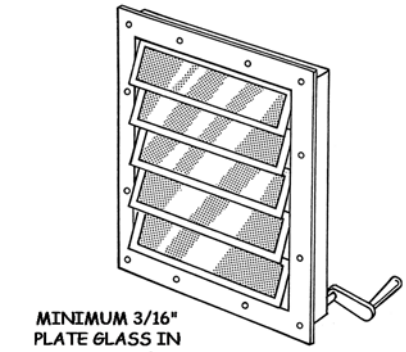
Furnace Type	Btu/hr. Output Capacity	Minimum AFUE (%)
Wall with Fan	• up to 42,000 • over 42,000	• 73% • 74%
Wall without Fan	• 15,001 - 19,000 • 19,001 - 27,000 • 27,001 - 46,000 • over 46,000	• 62% • 63% • 64% • 65%
Floor	• up to 37,000 • over 37,000	• 56% • 57%
Free-standing room heaters	• Up to 20,000 • 20,001 – 27,000 • 27,001 – 46,000 • Over 46,000	• 61% • 66% • 67% • 68%

UL® LISTED

GLASS REPLACEMENT AND WINDOW REPAIR
(WIS Section 12)

Materials	*Requirements*
FULLY TEMPERED GLASS	- ALL PANES • When fully tempered glass is installed, the maximum size also increases. Multiply the "Glass Materials" sizes by 4.
GLASS MATERIALS	- SINGLE STRENGTH (SS) • Maximum pane size: 16 sq. ft. - DOUBLE STRENGTH (DS) • Maximum pane size: 24 sq. ft. - 3/16" PLATE GLASS • Maximum pane size: 45 sq. ft. - 1/4" PLATE GLASS • Maximum pane size: 65 sq. ft.
GLASS MATERIALS FOR MOBILE HOMES	- SINGLE STRENGTH (SS) • Maximum pane size: 11 sq. ft. - DOUBLE STRENGTH (DS) • Maximum pane size: 15 sq. ft. - 3/16" PLATE GLASS • Maximum pane size: 30 sq. ft. - 1/4" PLATE GLASS • Maximum pane size: 43 sq. ft.
GLAZING COMPOUND	- GLAZING COMPOUND REQUIREMENTS • Shall be the type which remains pliable. • Shall conform to ASTM C669 for metal sashes
HEAT STRENGTHENED GLASS	- ALL PANES • When heat-strengthened glass is installed, the maximum size also increases. Multiply the "Glass Materials" sizes by 2.
JALOUSIE WINDOWS	- JALOUSIE WINDOWS • Minimum 3/16" glass shall be installed. • Regular, patterned, frosted, tempered, and heat strengthened glass allowed. • Wired, laminated, and sandblasted glass not allowed.
PLASTIC MATERIALS	- ALL PANES • UV treated polycarbonate, minimum of 1/8" thick • Acrylic sheets and plastic film are not allowed.
SAFETY GLAZING	- GLAZING REQUIREMENTS • Safety glazing shall be permanently marked and meet specifications of ANSI Z97.1, and be permanently labeled per the California Residential Code, §R308.1.

Photo Credit: RHA, Inc.



Graphic Credit: RHA, Inc.

HIGH EFFICIENCY TOILETS
(WIS Section 55)

Materials	*Requirements*
APPROVED ACCESSORIES	- ACCESSORIES • Water Shutoff Valve (Angle Stop) and Supply Line – Water supply line: braided hose with brass fittings – Water shutoff valve: conformance with IAPMO and CPC requirements • Wax Ring with Flange – Good quality thick or reinforced wax, with polyethylene flange. – A flange not required on second ring placed on top for additional thickness. – Compliance with Federal Specification TT-P-1536A • Replacement Toilet Anchor Bolts ("johnny bolts"), Washers, Nuts – Brass bolts: 2-1/4" length by 5/16" diameter minimum – Captive washer included, to secure flange bolt in upright position – Brass open-cap acorn nuts – Corrosion-resistant washers (e.g., stainless steel) • Toilet Bolt Caps: plastic or ceramic, color-matched to toilet • Replacement Plastic Toilet Flanges, and Toilet Flange Extensions and spacers – Compliance with ASME A112.4.3. • Toilet Shims – White plastic or other waterproof material for use with toilets – Snap-off or easy to trim with sharp knife 
APPROVED TOILETS	- ALL TOILETS • Watersense Labeled High-Efficiency Toilet (HET) • Listed MaP Premium Toilet – Listing available at http://www.map-testing.com/content/info/menu/map-premium.html – Some toilets listed may not meet all CSD material standards. • Gallons per Flush (gpf) – Single-flush HET rated 1.06 gpf or less, OR – Dual-flush toilet rated with: • Full flush of 1.28 gpf (gallons per flush) or less, AND • Reduced flush of 0.8 gpf or less. • Other Toilet Requirements – Footprint: 20" x 10" minimum – MaP rating: ≥600 grams – Water spot surface area: 8" x 6" minimum – Trapway: Fully glazed, 2" minimum – Bowl Shape: Elongated or round, per availability, customer preference, and location dimensions and clearances – Bowl Height (excluding seat): • Selected in accordance with client's physical needs and wishes. • 15" minimum for standard toilet • 16" minimum for elevated height (ADA compliant)

Materials	*Requirements*
REPLACEMENT FLOORING MATERIAL	- FLOORING MATERIAL • Minimum 3/4-inch plywood: exterior grade, pressure treated, or marine grade
SEALANT	- CAULK (FOR SEAL BETWEEN TOILET BASE AND FLOOR) • Mold-resistant, acrylic latex or equivalent • Conformance with ASTM C834, C920, or C1311  *Photo Credit: RHA, Inc.*
TOILET SEAT	- TOILET SEAT • Thermoplastic (e.g., polypropylene injection molded plastic), or • Thermoset (e.g., Thermodur or Duroplast).

KITCHEN EXHAUST
(WIS Section 41)

Materials	*Requirements*
APPROVED MATERIALS	- ALL EXHAUST FANS/HOODS • Listed and labeled for kitchen ventilation by a recognized laboratory, such as UL, ETL, or CSA. • 100 CFM minimum, or as required per sizing calculations. • Rated noise level at 3.0 sones or less, unless their maximum rated airflow exceeds 400 cfm, in accordance with ASHRAE 62.2. - RANGE HOODS SHALL: • Be as wide as the cooktop and constructed of metal at least 0.0122 inch thick. • Have a light and multi- or variable-speed fan. - ALL DUCTED UNITS • Wall- and ceiling-mount fans shall be equipped with a removable interior grille. • Exhaust ducts shall be of metal and have smooth interior surfaces. • Vertical ducts shall include a roof flashing system and roof cap which provide a watertight seal. • Exterior wall components and attachment to the siding shall be durable and waterproof. - MOBILE HOME SIDEWALL EXHAUST FANS • Unit shall be designed to fit wall thickness at mounting location. - BACKDRAFT DAMPER • All exhaust systems shall be equipped with a backdraft damper. • Damper shall be located in the fan housing, in the vent duct, or in the wall or roof termination assembly.
KITCHEN EXHAUST REPAIRS	- MOTOR REPAIR AND OTHER COMPONENT REPAIRS • Motor shall be UL Listed or a UL Recognized component. • Motor and components shall be replaced with a manufacturer's replacement motor or, if necessary, a compatible model that fits without altering the motor or fan housing.

Photo Credit: WAPTAC.org

LED BULBS
(WIS Section 53)

Materials	*Requirements*
APPROVED MATERIALS	- ALL LED BULBS SHALL BE: • ENERGY STAR qualified, A-Lamp type bulbs. • In compliance with the requirements of CSD WIS Section 53, manufacturer's instructions and recommendations, and local code. • Warrantied for 3 years by the manufacturer. • Omni-directional (capable of at least 300° light direction) • Dimmable, for those locations on a dimming switch. • Rated for "Damp" or "Wet" installations by the manufacturer when installed in a damp or wet location. • Light Quality (Correlated Color Temperature or CCT) shall be:

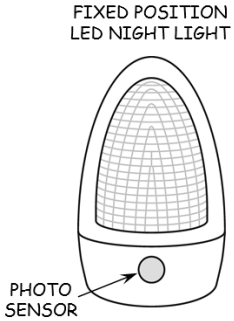
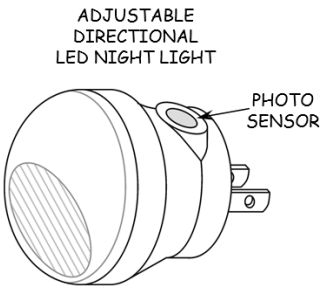
Graphic Credit: RHA, Inc.

Installation Location	Color Correlated Temperature (CCT)	Lighting Characteristic
Indoors	***2700Kelvin (K) to 3699K***	***Warmer, yellowish to natural white (daylight) lighting***
Outdoors	***3700Kelvin (K) to 5000K***	***Natural white (daylight) to bluish lighting***

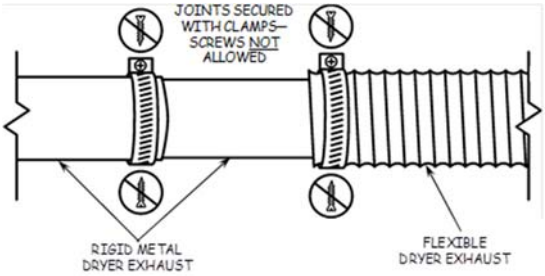
- Color-Rendering Index or CRI: Shall be a minimum of 90.
- Incandescent or Halogen Wattage Equivalencies: LED Bulbs must provide light output (luments) levels sufficient to maintain pre-existing levels, and in accordance with the specifications below, unless prohibited by the fixture manufacturer.

Old Incandescent and Halogen Bulbs (Watts)	ENERGY STAR Brightness (Minimum Lumens)
40	***450***
60	***800***
75	***1,100***
100	***1,600***
150	***2,600***

LED NIGHT LIGHTS
(WIS Section 54)

Materials	*Requirements*
APPROVED MATERIALS	- ALL LED NIGHT LIGHTS SHALL BE: • Maximum wattage 0.5 watts. • UL Listed or equivalent. • Equipped with an integrated photoelectric (auto-on) switch that turns on the night light when the room is dark.    *Photo Credit: RHA, Inc.*

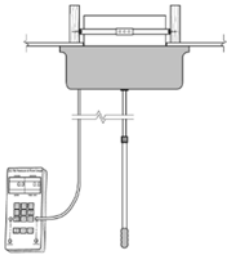
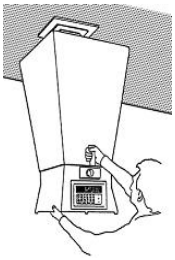
LIMITED HOME REPAIR
(WIS Section 30)

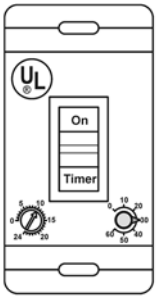
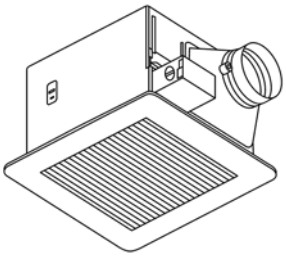
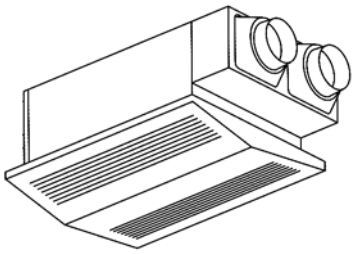
Materials	*Requirements*
COVER PLATES	- SIZE AND SHAPE • Shall be plain (non-decorative) plastic only. – Wood or metal not allowed. • Shall properly fit the application. – Oversize and blank plates allowed where required. • Shall be of standard rectangular shape to fit standard electrical boxes. - COVER PLATE COLOR • Shall be standard color (ivory, white, almond,or black); and • Have color matched screws. • No cover plates shall be allowed with custom colors or decorative design.  CRACKED OR BROKEN COVER PLATE *Graphic Credit: RHA, Inc.*
DOMESTIC CLOTHES DRYER MOISTURE EXHAUST	- ALL DUCTS • A gas or electric clothes dryer moisture exhaust shall be of rigid metal and have a smooth interior surface. • Shall be minimum 4" diameter. • Shall comply with clothes dryer manufacturer's instructions and applicable local code. • Shall be no more than 14 total feet in length, and include no more than two 90-degree elbows. - RIGID DUCT WITH SMOOTH INTERIOR SURFACE • Galvanized Steel: minimum 26 gage. • Aluminum: minimum 24 gage. – *Exception*: UL listed, flexible clothes dryer transition duct not more than six (6) feet in length may be used to connect the dryer to metal exhaust duct. – Flexible transition duct shall not be concealed within construction.  *Photo Credit: WAPTAC.org* - MOISTURE EXHAUST DUCT TERMINATIONS • Termination shall be UL listed aluminum, sheet metal or UV-protected plastic with no mesh/screen. - DAMPERS • A metal or plastic gravity type backdraft damper shall be present in the termination. - CLAMPS AND HANGERS • Duct connectors shall be Listed stainless steel or impact resistant plastic hose clamp style bands to be installed around a duct exterior. • Screws shall not be used to connect duct sections. • Duct hangers shall be rust- and corrosion-resistant.  *Graphic Credit: RHA, Inc.*

Materials	Requirements
EXHAUST FAN VENT EXTENSION	- ALL EXHAUST DUCTS • Shall comply with manufacturer's instructions and applicable local code (e.g., for Flame Spread Rating Index). - RIGID DUCT • Galvanized Steel: minimum 26 gage. • Aluminum: minimum 24 gage. • PVC smooth plastic pipe: minimum schedule 80. - FLEXIBLE DUCT • Semi-Rigid Metallic Aluminum: minimum of .0065" thick and UL listed 181B. - EXHAUST DUCT TERMINATIONS AND DAMPERS • Shall be aluminum, sheet metal, or UV-protected plastic. • A compatible metal or plastic gravity type backdraft damper shall be present in the system.
FLOOR/PLATFORM REPAIR FOR APPLIANCES	- PLYWOOD SHEET • Horizontal surface – Minimum 1" thickness. – C-grade face or better and bonded with exterior glue resin. • Shear surround – Minimum 1/2" thickness. – C-grade face or better and bonded with exterior glue resin. • Primer shall be applied on all new wood used for outdoor applications. - STRUCTURAL WOOD MEMBERS • Pressure-treated or redwood. • 2x4 or larger. - FASTENERS • Shall be: – Minimum #8 size steel screws. – Rust and corrosion-resistant. • Nails not allowed. - DRYWALL FOR INDOOR APPLIANCE PLATFORMS • Minimum 1/2" thickness. • Moisture and mold resistant (e.g., green board). - DRYWALL SCREWS • Shall be sized to penetrate solid wood a minimum 5/8". - METAL WATER HEATER STAND • Shall be UL listed (or equivalent) and compliant with local code. • Constructed of galvanized steel or aluminum. • Appropriately sized to support the entire footprint of the water heater.  *Photo Credit: RHA, Inc.*
MINOR ROOF REPAIR	- GENERAL REQUIREMENTS • Roof repair shall be completed only to protect installed measures from the weather. • Whenever possible, replacement materials shall match existing roofing materials in size, color, and quality. • All materials shall be UL Listed (or equivalent) and compliant with local codes. - REQUIRED SAFETY EQUIPMENT • All roof related work shall be conducted in adherence to all applicable Cal-OSHA regulations (e.g., wearing a safety harness, removal of materials, etc.).

Materials	*Requirements*
MOBILE HOME SKIRTING REPAIR	- ALL JOBS • Actual skirting materials needed for each job shall be identified by the Assessor, but standard materials specifications are provided below. - ALL SKIRTING MATERIALS • Shall be compliant with applicable HCD requirements. • When feasible, materials shall match existing skirting materials including size, color, and quality. - WOOD SKIRTING • All wood within 6" of earth or concrete shall be treated wood or wood of natural resistance to decay (i.e., redwood, cedar, or pressure-treated fir). • Frame structure shall be minimum 2" x2" in size. • Plywood or composite sheeting shall be exterior grade, minimum 3/8" thickness and plies or fibers bonded with exterior glue resin. • Board siding shall be minimum 1/2" thickness - PRIMER • Shall be UV- and stain-resistant, and exterior grade material. • At least one application shall be required on all new wood skirting. - FASTENERS • Shall be rust and corrosion-resistant steel. - VENTILATION SCREEN • Shall be 1/4" corrosion-resistant metal. • Shall match existing screens, when feasible.  *Photo Credit: Pubic Domain*
ROUGH FRAMING TO SUPPORT WINDOW OR DOOR INSTALLATION	- ALL JOBS • Actual materials needed shall be identified by the Installer after the window or door jamb is removed, but standard materials specifications are provided below. - DIMENSIONAL FRAMING LUMBER • Douglas fir of standard grade or better - FURRING STRIP • Douglas fir or redwood, of standard grade or better. - PLYWOOD • APA-rated, exterior grade. - ORIENTED STRAND BOARD (OSB) • APA-rated, exterior grade. - FASTENERS • Shall be consistent with local code requirements.  *Photo Credit: Public Domain*

MECHANICAL VENTILATION
(WIS Section 49)

Materials	*Requirements*
AIRFLOW MEASURING DEVICE	- THE DEVICE SHALL: • Measure airflow in CFM, with a range up to at least 120 CFM. • Have a resolution of at least 1.0 CFM or exhaust fan flow measurement accuracy of ±10%. - ACCEPTABLE DEVICES INCLUDE: • Exhaust Fan Flow Meter™ with Digital Gauge (up to 124 CFM, exhaust only) • Flow Capture Hood • The Energy Conservatory Duct Blaster® as a Powered Capture Hood (Exhaust or Supply; 10 to 300 CFM). • Large Vane Anemometer – Averaging or snapshot capability, with display showing airflow in CFM. – Multiple readings across fan required without funnel/hood; single reading acceptable with funnel/hood.  EXHAUST FAN FLOW METER™  FLOW CAPTURE HOOD  LARGE VANE ANEMOMETER WITH FUNNEL/HOOD ATTACHED *Graphic Credit: RHA, Inc.*
MV SYSTEM COMPONENTS (FANS, CONTROLLERS, & DUCTS)	- GENERAL SPECIFICATIONS • UL listed (or equivalent). • ENERGY STAR qualified and HVI certified (or equivalent when approved through waiver process). – *Exception:* Not required for HRV and ERV units. • Title 24 compliant. • Warrantied for a minimum of one year.  *Photo Credit: Panasonic*
DUCT INSULATION	- ALL MATERIALS • Maximum flame-spread index of 25 and smoke-developed index of 50, per ASTM E84, UL 723, OR NFPA 255. • Shall be Listed for exterior applications. • Minimum R-value for duct insulation shall be in accordance with Title 24, by CEC Climate Zone: Climate Zone: CZ 1 – 10, 12, 13 — Minimum R-value: R-6.0 Climate Zone: CZ 11, 14 – 16 — Minimum R-value: R-8.0
DUCTS	- ALL DUCTS • Shall comply with manufacturer's instructions and local code (e.g., for Flame Spread Rating). - RIGID DUCT • Galvanized Steel: minimum 26 gage. • Aluminum: minimum 24 gage. • PVC smooth plastic pipe: minimum schedule 80. - FLEXIBLE DUCT • Semi-Rigid Metallic Aluminum: minimum of .0065" thick and UL listed 181B.

Materials	Requirements
DUCT TERMINATIONS AND DAMPERS	- ALL SYSTEMS • Terminal shall be constructed of aluminum, sheet metal, or UV-protected plastic, and equipped with maximum 1/2" weave rodent or insect screen. • A compatible metal or plastic damper shall be present in the system. - EXHAUST SYSTEMS • A gravity type backdraft damper shall be located in the termination. - SUPPLY SYSTEMS • A metal spring-loaded butterfly damper shall be located on the inlet side of the fan.
FAN CONTROLLER	- TYPE • An integral part of the fan (inside the fan housing), OR • A separate unit (installed in the wall-mount electrical box). - ADDITIONAL REQUIREMENTS • Shall fit in a single-gang box, if a separate unit. • Shall operate automatically. • Must be rated for amperage that meets or exceeds fan load.  SEPARATE CONTROLLER FOR INTERMITTENT SYSTEM WITH RUNTIME CONTROLS —PLACED INSIDE A WALL-MOUNT ELECTRICAL BOX *Graphic Credit: RHA, Inc.*
FANS	- SHALL BE: • Rated for continuous operation. • Permanently-lubricated motor. • Sone rating, per label and ENERY STAR Certified Products Directory, shall not exceed 1.0. – *Exception* #1: The 1.0 sone requirement must be met to the extent possible. However, if a 1.0 sone product is not available, it is permissible to install up to a 1.2 sone in wall-mount supply fan. – *Exception* #2: Sone requirement does not apply to a fan mounted outside the living space, when there is at least 4' of ductwork between the exhaust or supply grille and the fan unit. • Airflow rating shall be certified at 0.25 iwc (per label or manufacturer's documentation).  CEILING-MOUNT MECHANICAL VENTILATION FAN  CEILING-MOUNT MECHANICAL VENTILATION ERV OR HRV *Graphic Credit: RHA, Inc.*
PASSIVE INLET VENTS	- PASSIVE INLET VENTS SHALL HAVE:: • An indoor fresh-air inlet with: – A replaceable or washable filter for incoming air. – Manual flow control (e.g., shutter or louver) to control incoming air. – Thru-wall sleeve/duct that is adjustable to wall thickness. • Outdoor inlet that: – Protects from wind and precipitation (e.g., with hood and/or louvers). – Shall have a bug/bird screen to keep out insects and birds.  ***Photo Credit: WAPTAC.org***

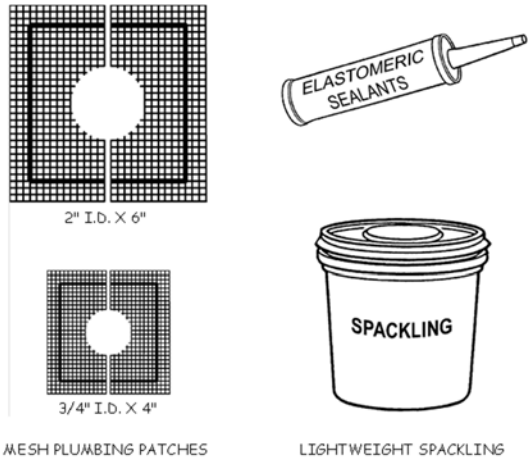
MICROWAVE OVENS
(WIS Section 38)

Materials	*Requirements*
APPROVED MATERIALS	- ALL UNITS • UL listed countertop model • Electronic controls with 10 or more power settings. • Microwave oven capacity and power rating shall be selected in accordance with the following table:

Photo Credit: RHA, Inc.

Number of Occupants	Minimum Size of Unit	Power Rating of Unit
1 – 2 Occupants or when Limited Counter Space Is Available	0.7 cu. ft.	Minimum of 800 watts
2 or more Occupants	1.0 cu. ft.	800 watts to 1100 watts

MINOR ENVELOPE REPAIR
(WIS Section 7)

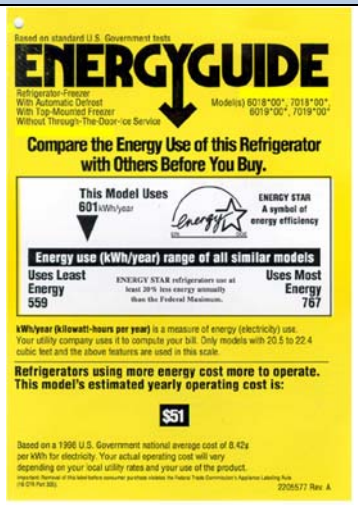
Materials	*Requirements*
MINOR ENVELOPE REPAIR	- GENERAL SPECIFICATIONS: • Where specific measures (line items) already exist, reference that shell sealing line item for material specifications (such as "Caulking" as a shell sealing activity). • Note: Activities such as Duct Sealing, Caulking, Cover Plate Gaskets, Glass and Window Repairs/Replacements, Sliding Glass Door and Standard Door Repair/Replacements, Interior Vent Covers, Kitchen Exhaust Repair/ Replacement, and Weatherstripping have separate specifications that are provided separately in the CSD WIS.  *Photo Credit: RHA, Inc.*
WALL OR SHELL PATCHING	- MESH PLUMBING PATCHES • 28-30 gage non-corrosive metal with self-adhesive backing. – Backing shall be a strong pressure-sensitive adhesive film. – Backing shall be reinforced with fiberglass mesh or equivalent. – Patches shall be cut to fit snugly around pipes (e.g., pre-cut for installation around 2", 1-1/2", 3/4" and 1/2" pipes). - FINISHING COMPOUND • Lightweight, non-shrinking spackling compound, or • Drywall joint compound, or equivalent. - SHEET METAL • Aluminum or galvanized sheet metal; minimum thickness 0.007". - RADIANT BARRIER MATERIAL • Commercially available foil/bubble/foil. • Class A/Class 1; minimum thickness 5/16". - FOAM BOARD • Polyisocyanurate foil clad both sides; ASTM C 1289 or FS HH-I-1972.  *Graphic Credit: RHA, Inc.*
ATTIC ACCESS COVER—HORIZONTAL	- ATTIC ACCESS COVER—HORIZONTAL • Cover Material – Field-fabricated Access Door: Gypsum (drywall), minimum 5/8" thick – Prefabricated access door assembly: Commercially available • Framing Material (Joist Blocking) – Same dimension as joist (e.g., 2"x4" or 2"x6") – No. 2 Hem fir or better • Trim Material – Window/door trim/molding (interior or exterior grade) – Adequate thickness and width to attach to ceiling joists and extend into the opening far enough to support the cover (e.g., 5/8"x3½") – Spackle or wood putty (to cover recessed nails) • Attachments – Minimum 3" nails for blocking

Materials	Requirements
ACCESS COVER—HORIZONTAL (CONT.)	– Finish nails for attaching trim (long enough to penetrate joist at least ½", e.g., 1-5/8" long) • Weatherstripping – Open or closed cell foam tape, in accordance with material specification for Weatherstripping. • Insulation – Flexible or rigid insulation, with an R-value equal to the R-value of insulation on the attic floor.
ATTIC ACCESS COVER--VERTICAL	- ATTIC ACCESS COVER—VERTICAL • Cover Material – Gypsum (drywall), minimum ½" thick; or – Plywood • Minimum 5/8" plywood (interior or exterior grade, CCX or better), for wood-only cover/door. • Minimum ½" plywood (interior or exterior grade, CDX or better), to serve as backing for gypsum-clad cover/door. • Framing Material – Same dimension as studs (e.g., 2"x4") – No. 2 Hem fir or better • Trim Material – Window/door trim/molding (interior or exterior grade), minimum 2" wide – Spackle or wood putty (to cover recessed nails) • Hinges in Firewall Applications – Minimum 3½"x3½" spring-loaded with adjustable tension – Adequate spring tension to make access cover self-closing • Attachments – Minimum 3" nails for blocking – Finish nails for attaching trim (long enough to penetrate joist at least ½", e.g., 1-5/8" long) – Corrosion-resistant screws for hinges • Sized per hinge manufacturers specifications, and • Long enough to penetrate framing at least ½" – Heavy duty construction adhesive (to glue plywood to gypsum) • Weatherstripping – Open or closed cell foam tape, in accordance with material specification for Weatherstripping, or – Entrance door weatherstripping material specification. • Insulation – Flexible or rigid insulation, with an R-value equal to knee walls.
CRAWLSPACE ACCESS COVER--HORIZONTAL	- CRAWLSPACE ACCESS COVER—HORIZONTAL (INDOORS) • Cover Material – Prefabricated access door assembly (commercially available); or – Field-fabricated access door • Substrate of 3/4" plywood, CCX or better • Finish lumber: No. 2 or better • Framing Material (Joist Blocking) – Same dimension as joist (e.g., 2"x4" or 2"x6") – No. 2 Hem fir or better • Attachments – Minimum 3-inch nails for blocking – Corrosion-resistant screws for hinges • Sized in accordance with hinge manufacturers specifications, and • Long enough to penetrate framing at least 5/8". • Weatherstripping – Open or closed cell foam tape, in accordance with material specification for Weatherstripping. • Insulation – Flexible or rigid insulation, with R-value equal to the R-value of insulation on the floor insulation.

Materials	*Requirements*
CRAWLSPACE ACCESS COVER--VERTICAL	- CRAWLSPACE ACCESS COVER—VERTICAL (OUTDOORS) • Cover Material – Metal • Screened metal vent, (commercially available or shop fabricated), or • Solid metal access cover (commercially available or shop fabricated) • Metal: Minimum 20 gage • Screen: ¼" metal mesh or expanded metal, or equivalent – Wood • Minimum ½" exterior grade plywood, CCX or better • Framing Material (Box Frame) – Minimum 1"x2" redwood or pressure-treated fir, no. 2 or better • Hinges – Cabinet hinges or better – Corrosion-resistant • Latches – Cabinet latches or better – Corrosion-resistant • Attachments – Box Frame and Metal Frame • Concrete nails or corrosion-resistant screws and anchors • Sized for ½" penetration into concrete – Corrosion-resistant screws for hinges • Sized in accordance with hinge manufacturers specifications, and • Long enough to penetrate framing at least 5/8".
FIREPLACE CHIMNEY DAMPER	- FACTORY-BUILT (ZERO CLEARANCE) FIREPLACES • Repair or replacement parts shall be specified by the fireplace manufacturer. - MASONRY FIREPLACES • Commercially available top-sealing (chimney top) dampers. • Sized to fit the chimney termination. • Controllable from indoors (e.g., with a control cable inside the fireplace).
FIREPLACE GLASS DOORS	- ALL GLASS DOORS • Shall fit smallest dimensions of the fireplace opening. • Shall seal against the fireplace surface (e.g., with gasket or strips of fiberglass insulation). • Shall meet the requirements listed below, based on Fireplace Type. - FACTORY-BUILT (ZERO CLEARANCE) FIREPLACES • Commercially available glass doors. • Designed for use with zero clearance fireplaces. • Sized and shaped to fit against and seal off the fireplace opening. - MASONRY FIREPLACES • Commercially available glass doors. • Designed for use with masonry fireplaces. • Sized and shaped to fit against and seal off the fireplace opening.

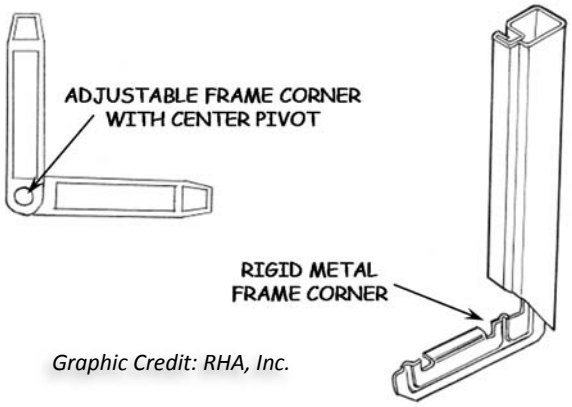
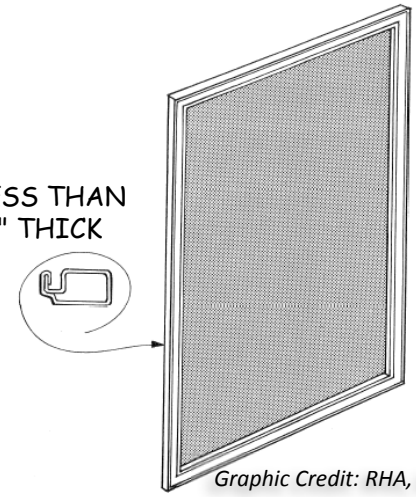
REFRIGERATOR REPLACEMENT
(WIS Section 37)

Materials	*Requirements*
REPLACEMENT REFRIGERATOR	- ALL UNITS SHALL BE: • UL-Listed. • ENERGY STAR qualified. – A non-ENERGY STAR refrigerator may be installed, provided: (a) it meets CEC energy efficiency standards, and (b) SIR for that model is verified to be higher than the SIR for a comparable ENERGY STAR model. • Frost free, but no extra specialty features. • Maximum capacity of 23 cu. ft. (per Sizing Guide in CSD Field Guide). • White in color. Client-requested color is allowed if available at no cost increase. • Freezer normally on top, but side-by-side is allowed in larger sizes, when top freezer is not available or bottom freezer costs more. - REFRIGERATOR TYPE(S) NOT ALLOWED • Unit equipped with ice maker or water dispenser.



ENERGY GUIDE LABEL WITH ENERGY STAR® LOGO

SHADE SCREENS
(WIS Section 46)

Materials	*Requirements*
FRAME CORNERS	- SQUARE CORNERS • Rigid metal internal frame corners shall be used; adjustable and plastic corners <u>not</u> allowed. - ANGLED CORNERS (RAKE WINDOWS) • Adjustable internal frame corners are allowed. – Shall be durable, solid plastic (two legs riveted in the center), when adjustable metal frame corners are not available.  *Graphic Credit: RHA, Inc.*
FRAME MATERIAL	- WOOD • Not allowed. - RIGID VINYL • Not allowed. - STEEL • Zinc or cadmium plated. - ALL ALUMINUM • A minimum of .025" thickness, 7/16" x 1" dimension for windows up to 25 square feet. • A minimum of .032" thickness, 7/16" x 1" dimension for windows over 25 square feet.  *Graphic Credit: RHA, Inc.*
SCREEN MATERIAL	- VINYL OR FIBERGLASS • Lead-free • Flame-resistant (e.g., NFPA 101 Class B; CS-191 53; CFR Part 1610.61; IBC 903.1, Class A). - METAL LOUVERS • Not allowed.  *Photo Credit: Project Go, Inc.*
SCREEN SHADING PERFORMANCE	- ALL SHADE SCREENS • Must have shading coefficient of 0.36 or less at 75-degree profile angle on clear single-pane glass, or be rated to block/absorb/dissipate at least 70% of the sun's heat and glare..
SPLINE	- ALL SHADE SCREENS: • Sized to fit properly in frame channel.
TURN CLIPS	- CLIPS SHALL BE: • Corrosion-resistant metal (not plastic) • Compatible with screen frame and sized so barrel rests on the mounting surface.

SHELL LEAKAGE TEST EQUIPMENT (BLOWER DOOR)
(CSD Field Guide Appendix C)

Materials	*Requirements*
SHELL LEAKAGE TESTING EQUIPMENT	- STANDARD TESTING EQUIPMENT • Shell leakage testing shall be performed with standard blower door and in accordance with manufacturer's instructions, except as noted in "Alternative Testing Equipment" below. • Equipment shall comply with the following requirements: – Commercially-produced equipment shall be used. – Analog (magnehelic) gauges or a digital Manometer (pressure gauge) shall be used. – House Pressure gauge shall display pascals with a range from 0 to 60 Pa, and an accuracy of ±10%. – Fan Flow gauge shall display Pascals and CFM with a range of 500 to 6000 CFM, and an accuracy of ±10%. – Gauges may be calibrated in Inches of Water Column if the range is between 0 and 0.25 IWC with an accuracy of ±5%. • Smoke generators may include incense sticks, smoke pencils, smoke puffers, etc. to accomplish effective shell sealing.  *Photo Credit: CAP of San Luis Obispo*
ALTERNATIVE TESTING EQUIPMENT FOR MULTI-FAMILY UNITS ONLY	- ALTERNATIVE TESTING EQUIPMENT • Shell Leakage Testing with a Minneapolis Duct Blaster® and DG-700 Digital Gauge is allowed only under the following condition: – A Minneapolis Duct Blaster fan may be used in lieu of a blower door fan *only when* the fan control can produce at least 30 Pa of house pressure (MUD units only).  *Photo Credit: WAPTAC.org*
CALIBRATION OF TESTING EQUIPMENT	- CALIBRATION OF EQUIPMENT • Records of all calibrations and equipment checks must be kept in an equipment calibration log. • Digital gauges must be calibrated annually, by the factory, or by using field calibration procedures. – For Minneapolis, using the available field calibration plate. – For Retrotec, using items and instructions supplied with the gauge. – Note: When Infiltration Credit will be claimed and the RESNET 800 Procedures used, additional calibration requirements must meet those stated in Section 6.9 of CSD Field Guide Appendix C. - BLOWER DOOR FANS MUST BE FIELD-CHECKED USING MANUFACTURER'S RECOMMENDED PROCEDURES: • Annually, or whenever a fan has been dropped or damage is suspected. • All equipment must be checked by the factory after damage has occurred or field checks reveal deviations that require factory service—in accordance with factory recommendations. • Equipment manufacturer's assistance shall be used as needed to properly maintain test equipment. – For Energy Conservatory (Minneapolis) Blower Doors, find calibration information and instructions at: http://www.energyconservatory.com/support/support7.htm – For Retrotec Blower Doors, find equipment information at: http://www.retrotec.com

SHOWERHEADS AND FAUCET AERATORS
(WIS Section 45)

Materials	*Requirements*
AERATORS AND SHOWERHEADS	- GENERAL SPECIFICATIONS • Conformance to ANSI/ASME A112.18.1. - AERATORS • Shall be metal (e.g., chrome-plated brass). - SHOWERHEADS • WaterSense labeled. • Features will be selected that meet any special needs of the occupant (e.g., shut off, swivel, handheld showers) in compliance with the CSD Field Guide. • All showerheads must be pressure-compensating type for consistent performance (i.e., maintain constant temperature under varying pressures). - REQUIRED FLOW RATES • Showerhead – Maximum flow rate: 2.0 gpm at 80 psi. – Minimum flow rate: 1.2 gpm at 60 psi. • Faucet Aerators – Maximum flow rate: 1.5 gpm at 60 psi. – Minimum flow rate: 0.8 gpm at 20 psi  *Photo Credit: CAP of San Luis Obispo*  *Photo Credit: RHA, Inc.*
SHOWER CONTROL VALVE	- SHOWER CONTROL VALVE ("TRICKLE VALVE") • Chrome-plated brass. • Designed to fit standard 1/2" showerheads and arms. • Flow rate from 2.5 gpm to a trickle. • May be separate or built into the showerhead.
SHOWERARM ADAPTER	- SHOWERARM ADAPTERS • Adapter shall be metal (e.g., chrome-plated brass). • Minimum 5/8" long male pipe threads with a minimum taper of 3% on showerhead end.
SHOWERHEADS, HAND-HELD	- HAND-HELD SHOWERHEADS • Hose: – Minimum 48" length, capable of swiveling at both ends. – Flexible vinyl or PVC, reinforced (e.g., with nylon). • Mounting bracket: – Heavy-duty thermoplastic (e.g., ABS) or equivalent, with all-metal swivel ball (e.g., chrome-plated brass). – Designed to attach to showerarm (not the wall). • Attachment: must fit standard-thread showerarms and standard adapters.
SHOWERHEADS, WALL-MOUNT	- WALL-MOUNT SHOWERHEADS • "Self-cleaning" type or cleanable without being unscrewed from the showerarm. • Non-aerating type. • Ball joint shall be metal (e.g., chrome-plated brass).

SHUTTERS
(WIS Section 48)

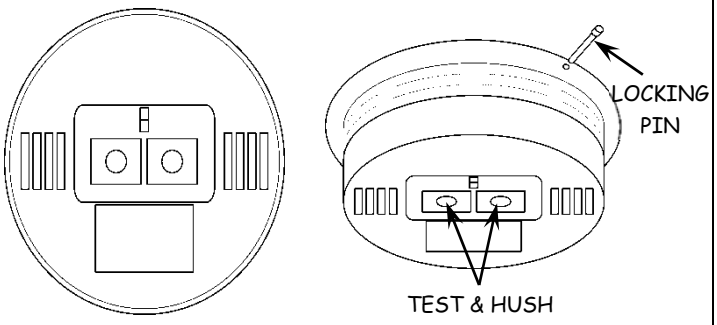
Materials	*Requirements*
APPROVED SHUTTERS	- PLYWOOD • Minimum 5/8" thick. • Exterior type only. • Minimum grade APA PSI - DIMENSIONAL LUMBER • Must be treated and sealed on all edges. - OVERLAY • Must comply with U.S. Product Standard PS 1. - HINGES, LATCH, AND SCREWS • Must be stainless steel, brass, or other non-corrosive material. • Screws and hinges must be made of the same material.

Photo Credit: Public Domain

SMOKE ALARMS
(WIS Section 5)

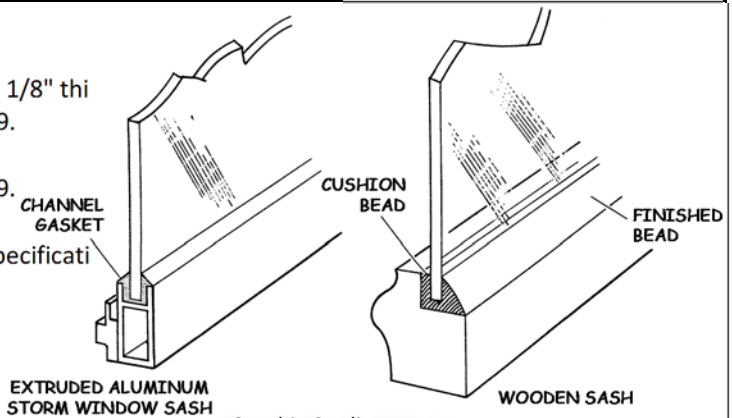
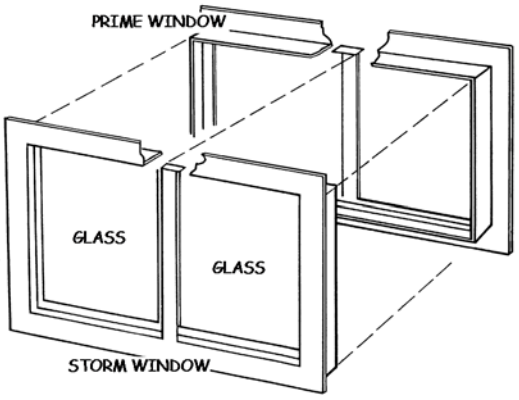
Materials	*Requirements*
INTERCONNECTED ALARMS	- INTERCONNECTED ALARMS • If more than one hard-wired alarm is installed, they shall be interconnected, if required by code. • If multiple hard-wired smoke alarms are present and interconnected, and at least one within the group will be replaced: – The replacement alarm shall be compatible with the existing interconnection system, or – All of the interconnected smoke alarms shall be replaced, when required by the local jurisdiction (condition shall be documented in the permanent file).
MOUNTING SYSTEM	- MOUNTING SYSTEM • Alarm shall: – Have tamper-resistant mounting, such as a locking pin or tamper-resistant tabs, and – Be secured to the mounting surface by at least two standard screws.
SMOKE ALARM	- ALL ALARMS • Listed to UL 217. • Single-purpose alarm (smoke only). • Photoelectric or Ionization-type. – Note: When the required 20' minimum horizontal distance from an open combustion appliance cannot be met, installation of a *photoelectric-type* alarm shall reduce the minimum distance to as little as 10'. • On the California State Fire Marshal's list of approved smoke alarms, and have these features: – Date of manufacture on the alarm label. – Test and hush buttons to check alarm electronics and temporarily silence unwanted nuisance alarms. – End-of-life feature that indicates the alarm must be replaced. - BATTERY-POWERED • Battery(ies) shall be non-replaceable, non-removable, and capable of powering the alarm for a minimum of 10 years. - HARD-WIRED • 120 VAC. • Factory preinstalled lithium battery backup. • Inter-connectable, when required as described below in "Interconnected Alarms".

Photo Credit: Public Domain

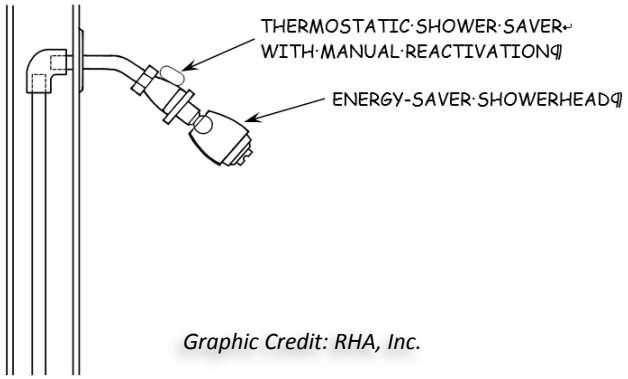


Graphic Credit: RHA, Inc.

STORM WINDOWS
(WIS Section 15)

Materials	*Requirements*
HARDWARE AND FASTENERS	- HARDWARE AND FASTENERS • Aluminum, stainless steel, or other non-corrosive material compatible with frame. - ANGLED CORNERS (RAKE WINDOWS) • Adjustable internal frame corners are allowed. – Shall be durable, solid plastic (two legs riveted in the center), when adjustable metal frame corners are not available.  *Photo Credit: RHA, Inc.*
SEALANTS	- ALL SEALANTS • Glazing Tape – Closed-cell foam, minimum 1/8" thi – Conformance to ASTM C509. • Pre-formed Gaskets – Conformance to ASTM C509. • Caulk – Conformance to material specificati  *Graphic Credit: RHA, Inc.*
STORM WINDOW FRAME	- ALUMINUM FRAME WINDOWS • Conformance to ANSI/AAMA 1002.10. - WOOD FRAME WINDOWS • Conformance to Section 3 of ANSI/NWWDS I.S.2. - RIGID-VINYL FRAME WINDOWS • UV-resistant. • Conformance to ASTM D4099.  *Graphic Credit: RHA, Inc.*
STORM WINDOW MATERIAL	- GLASS • Conformance to AAMA 1701.2. - POLISHED WIRE GLASS • Conformance to ANSI Z97.1. - SAFETY GLASS • Conformance to ANSI Z97.1 and permanently labeled. - PLASTIC GLAZING • UV- and scratch-resistant polycarbonate, minimum 1/8". • Conformance to ANSI Z97.1. - WINDOW GLAZING • Glass recommended; plastic glazing is acceptable. • Safety glass or polycarbonate, where glazing is required and required by the local jurisdiction.

THERMOSTATIC SHOWER VALVES AND THERMOSTATIC SHOWERHEADS
(WIS Section 51)

Materials	*Requirements*
THERMOSTATIC SHOWER VALVES & SHOWERHEADS	- ALL UNITS SHALL BE COMPLIANT WITH: • IAPMO IGC 244 (latest adopted version). - ALL UNITS SHALL BE: • Designed to automatically reset after the valve cools down following completion of showering. • Easily reactivated with manual control. • Threaded with a female 1/2" NPT to fit standard showerarms threaded with a male 1/2" NPT, in accordance with ANSI/ASME B1.20.1. **Note**: When a thermostatic shower valve is installed in conjunction with an energy-saver showerhead, the showerhead (and adapter if used) shall be in compliance with CSD WIS Section 45 (Showerheads and Faucet Aerators).  *Photo Credit: Evolve Technologies LLC*  *Graphic Credit: RHA, Inc.*
TEMPERATURE ACTUATION	- ALL UNITS • The thermostatic shower valve shall automatically reduce flow to a trickle, in response to incoming water temperatures exceeding a preset actuation temperature.

THERMOSTATS—PROGRAMMABLE AND MANUAL
(WIS Section 27)

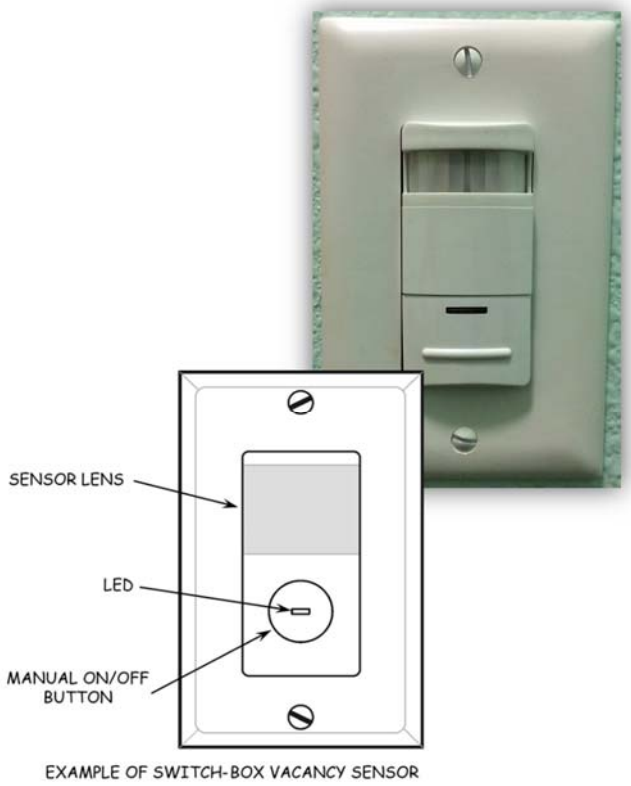
Materials	*Requirements*
MANUAL WALL THERMOSTAT	- MANUAL REQUIREMENTS • Alternative when client refuses programmable thermostat. • Digital with built in anti-short-cycle feature. • Conforms with HVAC manufacturer's instructions. • Compatible with HVAC equipment it will control. • Includes a positive on/off switch.  *Photo Credit: WAPTAC.org*
PROGRAMMABLE WALL THERMOSTAT	- PROGRAMMABLE REQUIREMENTS • ENERGY STAR qualified. • System powered, not battery powered, on 24 volt systems. • Digital with anti-short-cycle feature. • Minimum setback capability of at least 10°F. • At least two setback periods per 24 hour day, with change cycle increments being no greater than 30 minutes. • Programmable for both weekdays and weekends. • Manual override and standard alkaline battery backup or other program-saving backup system. – Long-life lithium battery, when compatible. • Positive on/off switch that is easily accessible. • Compatible with the HVAC equipment it will control.  *Photo Credit: RHA, Inc.*

TIER 2 AUDIO-VISUAL ADVANCED POWER STRIPS
(WIS Section 52)

Material	*Requirements*
ADVANCED POWER STRIPS	- TIER 2 AUDIO-VISUAL ADVANCED POWER STRIPS (T2 AV APS) SHALL BE: • Underwriters Laboratories Tested and Listed – ALL APS UL listed to latest UL1449 standard – Corded APS also UL listed to latest UL1363 standard • Infrared (IR) controlled, with an IR remote sensor that detects control signals (e.g., volume or channel changes) from the television IR remote control. • Rated for 120 volts and 15 amps. • Three-pronged right-angle corded connector, or three-prong direct wall plug-in. • Resettable circuit breaker.  *Photo Credit: Embertec* - ALL T2 AV APS SHALL BE EQUIPPED WITH: • Minimum 1,000 joules of surge protection for all outlets. • "Smart" power-saving function that automatically turns off power to all switched devices within 5 minutes after the TV is turned off with its IR remote control. • Adequate sensitivity for any TV connected to it, including LED and Plasma TVs. The APS: – Shall detect when the TV is turned off—thus activating the function that turns off all switched outlets. – Shall not turn off any switched outlets when very low power consumption occurs in an LED TV (e.g., due to a dark scene on the screen). • Adjustable Timer (Delay Period) – Factory preset to automatically turn off TV and switched outlets after a delay period of approximately 1 hour, when no IR activity is detected by the APS IR remote sensor. – Can be manually programmed to automatically turn off TV and switched outlets after a longer delay period without detectable IR activity. – Produces a warning signal that alerts the user before power to the TV and peripheral devices is turned off. • Switched and Unswitched Outlets: – Corded T2 AV APS shall have at least four switched (power-saving) outlets, one of which may be specified for the TV, and at least two unswitched (always-on) outlets. – Direct wall plug-in T2 AV APS shall have a least one switched (power-saving) outlet and at least two unswitched (always-on) outlets. – Visual indicator which verifies the unit is active and functioning.  *Photo Credit: Tricklestar*

VACANCY SENSORS
(WIS Section 50)

Materials	*Requirements*
VACANCY SENSOR	- ALL VACANCY SENSORS SHALL BE: • UL-Listed. • Title 24 compliant and listed in the CEC's Appliance Efficiency Database • Adjustable time delay, with maximum 30-minute delay - IN ADDITION, SENSORS MUST BE SELECTED IN ACCORDANCE WITH CIRCUIT TYPE: • <u>For light-only circuits</u>: "Manual-On/Automatic-Off" vacancy sensor switches with "Manual-Off" capability • <u>For bathroom light and exhaust fan control</u>: "Dual-relay Manual-On/Off" occupancy switches • <u>For 3-way and 4-way lighting circuits</u>: "Multi-way, Manual-On/Off" occupancy switches - SENSOR TYPE MAY BE: • Passive Infrared (PIR), or • Ultra Sound (US), or • Combination of both sensor types - OCCUPANCY SENSOR USE • An occupancy sensor with a daylight control is acceptable in lieu of a vacancy sensor, as long as it meets the minimum requirements listed above.



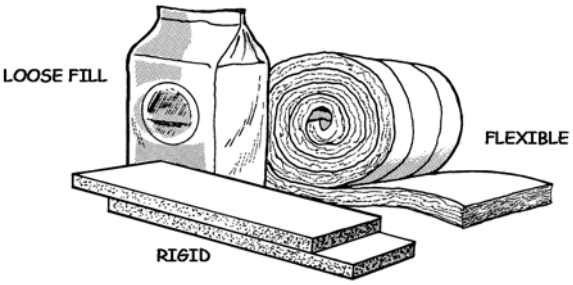
EXAMPLE OF SWITCH-BOX VACANCY SENSOR

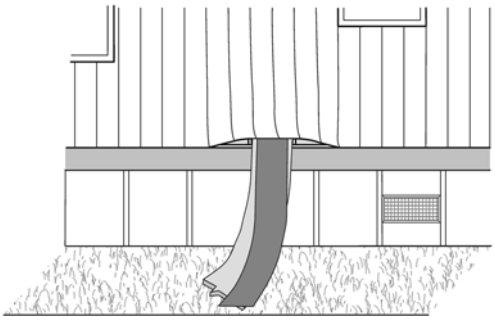
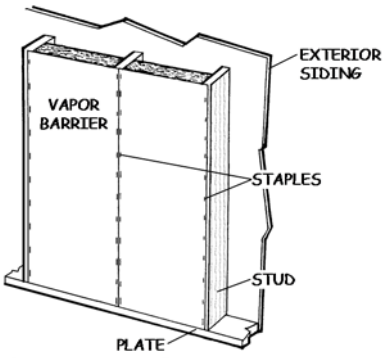
Photo and Graphic Credit: RHA, Inc.

VENT COVERS - INTERIOR
(WIS Section 10)

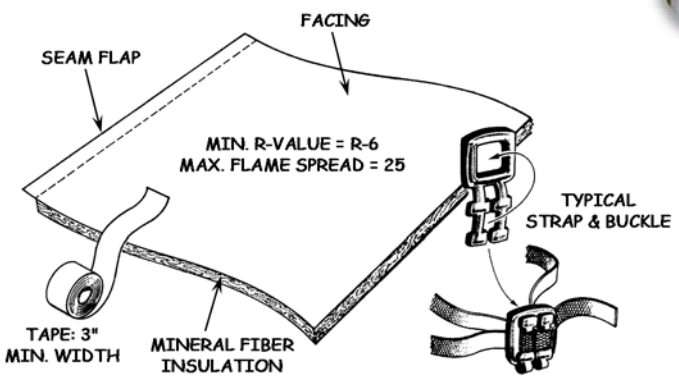
Materials	*Requirements*
ALL VENT COVERS	- ALL COVERS • Covers shall be for interior vents for Evaporative Coolers and Window/Wall Air Conditioner vents only. • Maximum perm rating shall be 1.0.  *Photo Credit: Public Domain*
EXTERIOR COVERS	- WINDOW/WALL AC OUTDOOR COVERS • Installed by programmatic waiver only when an existing unit is missing or does not have a damper. • Shall be a heavy duty, commercial grade, water-repellant canvas with secure attachment (e.g., integral rope tie in the open end hem) to create a tight fit around the AC unit. • Vinyl covers shall not be allowed.
MAGNETIC SHEETING VENT COVERS	- MAGNETIC SHEETING • Minimum 30 mil flexible magnetic sheeting with vinyl face (white, or colored to blend with surrounding material).
METAL VENT COVERS	- METAL COVERS • Shall be aluminum, galvanized, or painted metal only.
PLASTIC FILM AS A VENT COVER	- PLASTIC FILM • Minimum 12-mil film. • Film shall be framed with aluminum, rigid plastic or finished hardwood.
PLASTIC VENT COVER	- RIGID PLASTIC COVER • Shall be one-piece or multi-piece adjustable. • Adjustable cover must consist of pieces that bond together to form the equivalent of a one-piece cover.
WOOD COVERS	- WINDOW/WALL AC WOOD COVERS • Installed by programmatic waiver only when an existing unit is missing or does not have a damper. • Shall be finished wood only. • Bare wood shall be sealed/finished with paint, urethane, varnish, or stain. • May be installed only when other types are not feasible.

WALL INSULATION
(WIS Section 23)

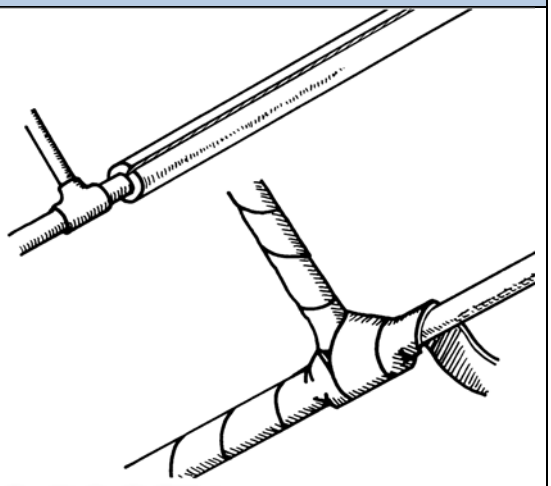
Materials	*Requirements*
ALL WALL INSULATION	- FLEXIBLE AND RIGID INSULATION MATERIALS • All insulation shall be certified to comply with the CCR, Title 24, Part 12, Chapter 12-13, "Standards for Insulating Material". • Facing shall meet applicable code requirements. • A non-absorbent, fire-rated insulation will be used with a minimum life expectancy of 10 years. - MINERAL FIBER • Flexible – Conformance to ASTM C665. • High Density Fiberglass Board – Conformance to ASTM C726. • Loose Fill – Conformance to ASTM C764. - CELLULOSE • Loose Fill – Shall be licensed for sale in California. – Listed in the Department of Consumer Affairs "Directory of Certified Insulation Materials". - RIGID FOAM • Preformed Foil Faced Polyisocyanurate Board that conforms to FS HH-I-1972/1. • Facing shall be a code-approved fire rated material (confirm allowed material with local jurisdiction).  *Photo Credit: WAPTAC.org*  *Graphic Credit: RHA, Inc.*
DENSE PACK INSULATION	- INSTALLATION DENSITY • Blown fiberglass, mineral fiber, or rock and slag wool used in an enclosed cavity will be installed at or above the manufacturer recommended density to limit air flow that corresponds to an air permeance value of 3.5 cfm/sq. ft. at 50 pascals, as measured using BPI- 102 "Standard for Air Resistance of Thermal Insulation Used in Retrofit Cavity Applications – Material Specification" or ASTM C 522, E 283, or E 2178. • The number of bags installed will be confirmed and will match the number required on the coverage chart.
INSULATION R-VALUE	- ALL FLEXIBLE AND RIGID MINERAL FIBER AND RIGID FOAM INSULATION MATERIALS • R-value shall be determined in accordance with: – DOE Priority List Table; or – By Energy Audit; or – As prescribed by insulation manufacturer and the LIHEAP guidelines below <u>when existing R-value is less than R-11</u>: • In 2-by-6 walls: R-19 • In 2-by-4 walls: R-13 for cellulose/R-13 for fiberglass material.

Materials	Requirements
MOBILE HOME INSTALLATIONS	- FIBERGLASS INSULATION MATERIALS • Flexible: – High-density R-13 fiberglass blankets or minimum 8-foot-long batt). – Width for 16″ OC stud spacing (or actual stud spacing, if different). – Unfaced, plastic-jacketed, or kraft faced. • Loose-fill: Fiberglass blowing wool. - OTHER MATERIALS • Vapor Retarder: 6-mil plastic sheeting cut into strips: – Slightly wider than the blankets/batts (to wrap around edges of the stuffing tool), and – Slightly longer than the insulation length (to serve as a vapor retarder. • Screws: Aluminum hex-head screws (to replace old screws when re-installing mobile home siding). – Same diameter as, or larger than, the existing screws. – At least 1/8″ to 1/4″ longer than the existing screws. - SPECIALIZED TOOLS • Long, straight pry bar. • Stuffing tool made with a strip of sturdy, flexible polycarbonate (e.g., Lexan) or galvanized metal (used to push the fiberglass insulation into an enclosed wall cavity). • Stuffing Tool Construction: – Dimensions: • 1 foot wide by 8 feet long for full-length cavities • 1 foot wide by 4 feet long for shorter cavities (under windows, etc.) – Thickness: 5/16″ plastic, or 20 gauge metal – Bend (5-15° angle), 10-12" from one end, to help clear obstructions inside the wall cavity. – For plastic, apply indirect heat at bend location to achieve the angle.  METAL SIDING PULLED AWAY FROM FRAME, AND STUFFING TOOL USED TO PUSH FIBFRGLASS *Graphic Credit: RHA, Inc.*
VAPOR RETARDER, ALL DWELLING TYPES	- TO BE INSTALLED WITH FLEXIBLE AND RIGID INSULATION MATERIALS WHEN REQUIRED BY THE LOCAL JURISDICTION. • Shall have a maximum perm rating of one.  *Graphic Credit: RHA, Inc.*

WATER HEATER INSULATION
(WIS Sections 16 and 17)

Materials	*Requirements*
INSULATION/ BLANKET	- BLANKET MATERIAL • Applies to standard and multi-family central water heaters. • Maximum flame-spread index of 25 and maximum smoke-developed index of 50, per ASTM E84, or UL 723, or NFPA 255. • Mineral fiber only, with vinyl or fiber-reinforced foil facing. • R-6 minimum R-value.  *Photo Credit: WAPTAC.org*  *Graphic Credit: RHA, Inc.*
STRAPS AND BUCKLES	- STRAPS AND BUCKLES • Maximum flame-spread index of 25 and maximum smoke-developed index of 50, per ASTM E84, or UL 723, or NFPA 255. • Polypropylene blanket straps and compatible buckles or other mechanical strap locks; tying of straps is not allowed.
TAPE	- TAPE • Maximum flame-spread index of 25 and maximum smoke-developed index of 50, per ASTM E84, or UL 723, or NFPA 255. • Vinyl or fiber-reinforced foil compatible with, or the same material as, facing. • Minimum width 3". • Duct tape not allowed.

WATER HEATER PIPE INSULATION
(WIS Section 18)

<table>
<tr><th>Materials</th><th>Requirements</th></tr>
<tr><td>GLUE</td><td>- GLUE
Maximum flame-spread index of 25 and maximum smoke-developed index of 450, per ASTM E84, or UL 723, or UBC Standard 8-1.
Compatible with insulation material and manufacturer’s instructions. 
Graphic Credit: RHA, Inc.</td></tr>
<tr><td>PIPE INSULATION MATERIAL</td><td>- PIPE INSULATION
Maximum flame-spread index of 25 and maximum smoke-developed index of 450, per ASTM E84, or UL 723, or UBC Standard 8-1.
Preformed foam (e.g. closed cell polyethylene) conforming to ASTM C534.
Inside diameter of preformed material shall be appropriate for the size pipe being insulated.
Rated for temperatures up to 180°F.
R- Value in conformance with the following table:
PIPE INSULATION MINIMUM R-VALUE<table><tr><th>Condition</th><th>Required R-value</th></tr><tr><td>No new tank or water pipes installed</td><td>R-4</td></tr><tr><td>New tank or water pipes installed during weatherization work (pipe ≤1" and temperature ≤140°F)</td><td>Minimum 1" insulation thickness</td></tr></table>- PIPE INSULATION TYPES NOT ALLOWED
Sheet or semi-molded insulation
Heat tape or strap insulation</td></tr>
<tr><td>TAPE</td><td>- TAPE
Maximum flame-spread index of 25 and maximum smoke-developed index of 450, per ASTM E84, or UL 723, or UBC Standard 8-1.
Tape specified by insulation manufacturer, or
Minimum 2" wide pressure-sensitive metallic tape labeled UL 181A-P or UL 181B-FX.
Cloth duct tape and electrical tape are not allowed.</td></tr>
<tr><td>TIES</td><td>- TIES
Maximum flame-spread index of 25 and maximum smoke-developed index of 450, per ASTM E84, or UL 723, or UBC Standard 8-1.
Plastic cable ties.
Corrosion-resistant wire and metal sleeves</td></tr>
</table>

WATER HEATER—STORAGE ELECTRIC
(WIS Section 43)

<table>
<tr><th>Materials</th><th>Requirements</th></tr>
<tr><td>ELECTRIC WATER HEATERS</td><td>
- ALL STORAGE WATER HEATERS

Comply with ASHRAE 90.1b and UL 174.
Minimum Energy Factor (EF) shall be in compliance with Title 24 energy efficiency requirements, per the table below.

MINIMUM EF FOR STORAGE ELECTRIC WATER HEATERS*
<table>
<tr><th>Tank Volume (Gallons)</th><th>Minimum Energy Factor (EF)</th></tr>
<tr><td>30</td><td>0.96</td></tr>
<tr><td>40</td><td>0.95</td></tr>
<tr><td>50</td><td>0.95</td></tr>
<tr><td colspan="2">*Based on Table F-3 in the CEC Appliance Efficiency Regulations.

Note: Tanks with lower energy factors would have to be externally wrapped with a minimum R-12 insulation.</td></tr>
</table>

Photo Credit: Public Domain

Installed appliances must conform to CEC standards for efficiency, as verified by inclusion in the CEC's database of certified appliances.
Minimum of R-16 internal insulation.
Listed and labeled in conformance with local code.

</td></tr>
<tr><td>MOBILE HOME WATER HEATER INSTALLATION</td><td>
- ALL MOBILE HOME STORAGE WATER HEATERS

Must be in compliance with requirements of the California Department of Housing and Community Development (HCD).
Water heater is not required to be listed/labeled for installation in a mobile home, unless required by HCD.

</td></tr>
<tr><td>TEMPERATURE & PRESSURE (T&P) VALVE</td><td>
- T&P VALVE

Shall be listed and manufactured to ANSI Z21.22.
Meets sizing/pressure requirements of the Water Heater listing.

</td></tr>
<tr><td>WATER PIPING</td><td>
- ALL STORAGE WATER HEATERS

Installed water lines and valves shall be lead-free.

</td></tr>
</table>

WATER HEATER—STORAGE GAS
(WIS Section 42)

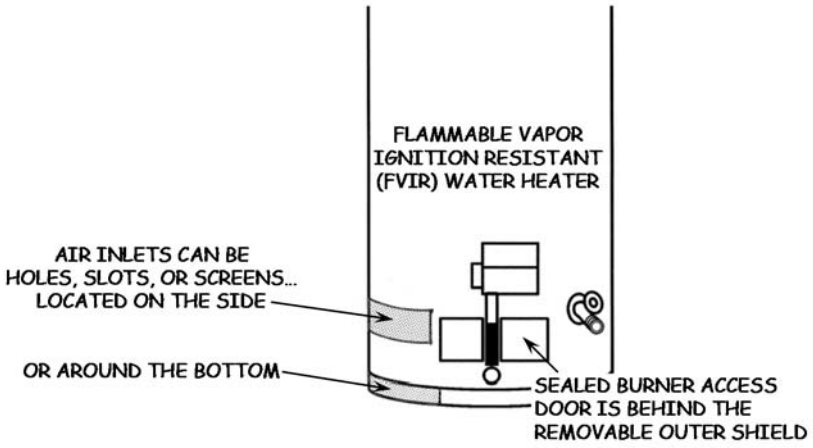
Materials	*Requirements*
GAS PIPING AND VALVES	- GAS PIPES • All valves and flexible connectors shall be new. • Gas valves shall be listed (UL or equivalent) and AGA or CSA certified. • Flexible connectors shall be listed (e.g., by IAPMO) epoxy-coated or stainless steel units. • Fuel-gas gas piping shall comply with 2013 CMC. • Copper gas lines and butt-soldered joints not allowed.
GAS WATER HEATERS	- ALL STORAGE WATER HEATERS • Natural or LP gas-fueled storage type. – Replacement water heater will be direct vented or power vented and Energy Star qualified. • Open Combustion – Flammable Vapor Ignition Resistant (FVIR) combustion chamber – Low NOx burner system, when required by local code. • Minimum Energy Factor (EF) shall be in compliance with Title 24 energy effici the table below.

Photo Credit: RHA, Inc.

MINIMUM EF FOR STORAGE GAS WATER HEATERS*

Tank Volume (Gallons)	Minimum Energy Factor (EF)
30	0.64
40	0.62
50	0.61
*Based on Table F-3 in the CEC Appliance Efficiency Regulations. Note: Tanks with lower energy factors would have to be externally wrapped with a minimum R-12 insulation.	

- Installed appliances must conform to CEC standards for efficiency, as verified by inclusion in the CEC's database of certified appliances.
- Listed and labeled in conformance with local code.
- Manufactured to ANSI Z21.10.1.
- Minimum of R-12 internal insulation.
- Equipment will be functional at high efficiency under all load conditions.



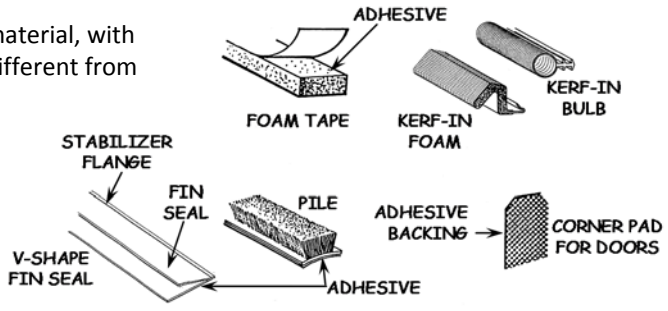
Graphic Credit: RHA, Inc.

Materials	*Requirements*
MOBILE HOME WATER HEATER INSTALLATION	- ALL MOBILE HOME STORAGE WATER HEATERS • Must be in compliance with requirements of the California Department of Housing and Community Development (HCD). • Water heater is not required to be listed/labeled for installation in a mobile home, unless required by HCD.
TEMPERATURE & PRESSURE (T&P) VALVE	- ALL T&P VALVES • Listed and manufactured to ANSI Z21.22. • Meets sizing/pressure requirements of the water heater listing.
VENT SYSTEMS	- VENTS • Shall be UL listed vent connectors, components, and Type B vent pipes. • Non-metallic systems shall conform to ASTM D 1785 and D 2665.
WATER PIPING	- WATER PIPES • Installed water lines and valves shall be lead-free.

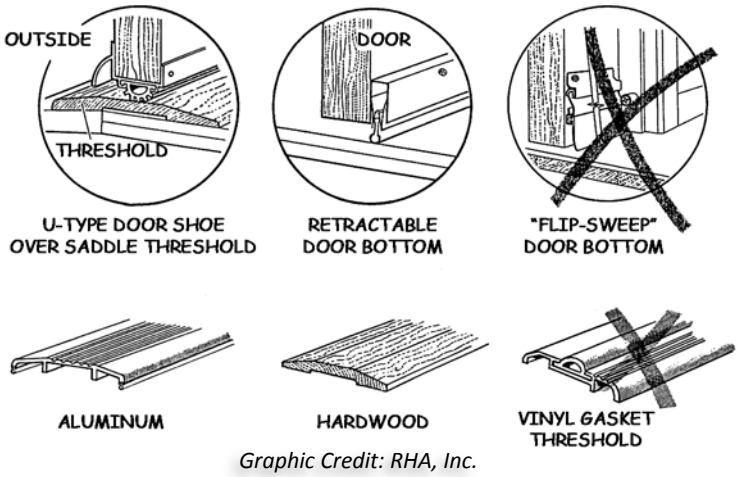
WEATHERSTRIPPING
(WIS Section 9)

Materials	*Requirements*
WEATHER-STRIPPING MATERIALS	- RIGID GASKET JAMB MATERIALS (ALUMINUM CARRIER) • Solid extruded aluminum carrier 0.05" minimum nominal thickness. • Pliable gasket of vinyl, thermoplastic elastomer (TPE), silicone, or equivalent. • Carrier shall have elongated mounting holes, 9" OC maximum. • Secondary seal between carrier and mounting surface shall be a minimum of 1/8" wide and extend the full length of the carrier. - SPRING AND CUSHION METAL • Brass, bronze, or stainless steel only; aluminum not allowed. - CUSHION SYNTHETIC PRESSURE SENSITIVE DOOR GASKETING • Polypropylene, TPE, silicone, or equivalent. • L-shaped stabilizer with self-adhesive backing. - FLANGED BULB (COMPRESSION BULB) • Pliable gasket of TPE or silicone (e.g., teardrop-shaped Seal). • Minimum 3/8" wide with self-adhesive stabilizer flange. - ROUND TUBE • Pliable gasket of TPE, silicone, or equivalent. - FOAM TAPE • Color shall be compatible with surrounding materials (i.e., light color foam for light color surfaces). • Closed Cell Foam Tape – Shall be UV-resistant with self-adhesive backing. • Open Cell Foam Tape – Shall have self-adhesive backing. - V-SHAPE FIN SEAL • Durable V-seal of silicone or equivalent material, with stabilizer flange and adhesive backing, (different from "Vinyl V-Strip"). - REPLACEMENT KERF-IN BULB AND FOAM • Properly sized for retaining channel. - REPLACEMENT PILE • Fin seal type, whenever feasible. • Properly sized for retaining channel. - CORNER PADS • Pile pad with self-adhesive backing. - MECHANICAL ATTACHMENTS • All screws, nails, staples, and other fasteners shall be: – Metal and non-corrosive. – Properly sized for each application. - PRESSURE-SENSITIVE ADHESIVE • Minimum adhesion strength of 65 oz./in. on all self-adhesive products. • Required on all self-adhesive products.

Photo Credit: CAP of San Luis Obispo



Graphic Credit: RHA, Inc.

Materials	*Requirements*
SHOES, DOOR BOTTOMS, AND SWEEPS	- DOOR SHOE, AUTOMATIC DOOR BOTTOM, STATIONARY SWEEP, METAL SADDLE THRESHOLD, AND BUMPER THRESHOLD • Solid aluminum extrusions. • Gaskets shall be pliable vinyl, TPE, silicone, or equivalent. • Solid aluminum carrier 0.05" nominal thickness minimum, with elongated mounting holes 9" OC maximum. – *Exception* for shoes: plastic carrier allowed per CSD Field Guide measure-specific policy.  *Graphic Credit: RHA, Inc.* • Shoes: – Shall have rain drip in exposed outdoor locations. – Tall (e.g. 3" high) U-Shoe may be used when door bottom is cut too short or is too worn/weak to accept a standard (1-1/2" high) U-Shoe. • Stationary sweeps shall have pliable gasket of vinyl or silicone. - AUTOMATIC DOOR BOTTOM • Retractable type only; flip sweep not allowed. - METAL SADDLE THRESHOLD • Solid aluminum only; "gasket saddle" with vinyl top gasket not allowed. • Shall have floor-sealer gasket of vinyl, TPE, silicone, or equivalent. - WOODEN SADDLE THRESHOLD • Hardwood only; "gasket saddle" with vinyl top gasket not allowed.

WINDOWS AND SLIDING GLASS DOORS
(WIS Section 13)

<table>
<tr><th>Materials</th><th>Requirements</th></tr>
<tr><td>WINDOW AND SLIDING GLASS DOOR MATERIALS</td><td>
- ALL REPLACEMENT WINDOWS SHALL BE:

ENERGY STAR-compliant.
Compliant with local code and bear an NFRC temporary label.
Compliant with Warranty Requirements in CSD WIS Appendix B.
In compliance with Title 24 energy efficiency standards (CEC-400-2013-CMF, Section 8.3, “Building Envelope” as listed below:

<table>
<tr><th>EFFICIENCY FACTOR</th><th>CEC CLIMATE ZONE</th><th>MAXIMUM VALUE</th></tr>
<tr><td>Maximum U-Factor</td><td>All CZ</td><td>0.32</td></tr>
<tr><td rowspan="2">Maximum Solar Heat Gain Coefficient (SHGC)</td><td>1, 3, 5</td><td>No Requirement</td></tr>
<tr><td>2, 4, 6 – 16</td><td>0.25</td></tr>
</table>

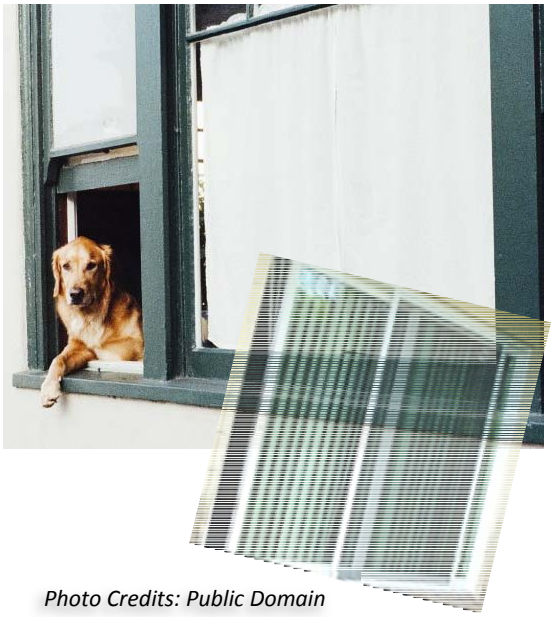



Photo Credits: Public Domain
- REPLACEMENT WINDOW TYPE

Replacement windows shall be selected by type in accordance with Table below.

<table>
<tr><th>EXISTING WINDOW TYPE</th><th>REPLACEMENT WINDOW TYPE</th></tr>
<tr><td>Horizontal Slider</td><td>Horizontal Slider</td></tr>
<tr><td>Vertical Slider</td><td>Vertical or Horizontal Slider</td></tr>
<tr><td>Picture Window</td><td>Picture or Sliding Window</td></tr>
<tr><td>Jalousie Window</td><td>Vertical or Horizontal Slider</td></tr>
</table>
- WINDOW EGRESS REQUIREMENTS

Egress requirements apply to all rooms used for sleeping.
When a sleeping room has no operable exterior door, at least one window shall meet the egress requirements of:

– Local code, or
– 2013 CRC §R310.1

</td></tr>
<tr><td>INSECT SCREENS</td><td>
- OPENABLE WINDOWS

All openable windows shall be equipped with insect screens.

</td></tr>
<tr><td>SEALANTS</td><td>
- CAULKING MATERIALS

Shall comply with the “Caulking” section of this Appendix.
Caulking shall be non-toxic and paintable.
Caulking shall be clear when dry, or color coordinated with surrounding color.

- FOAM

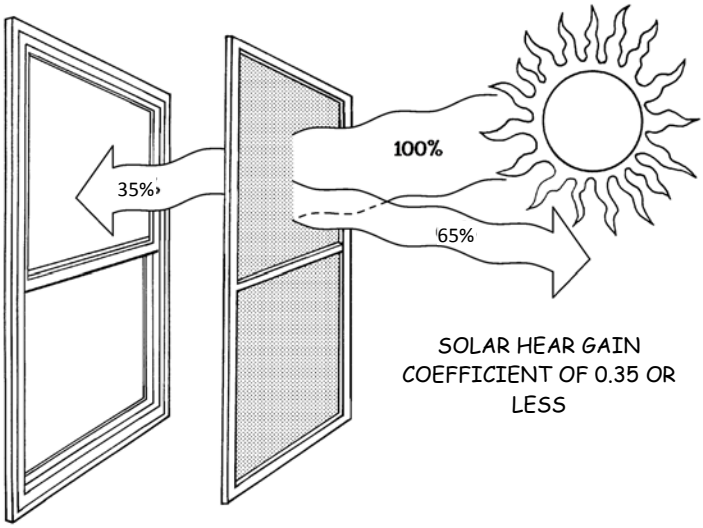
Injected foam appropriate for sealing gaps and cracks.
Shall only be minimally-expanding type.
Injected foam is allowed only if intended for that purpose and installed strictly in conformance with manufacturer instructions. Overfilling the cavity in a manner that warps the SGD or window frame shall not be allowed.

</td></tr>
</table>

WINDOW FILM
(WIS Section 47)

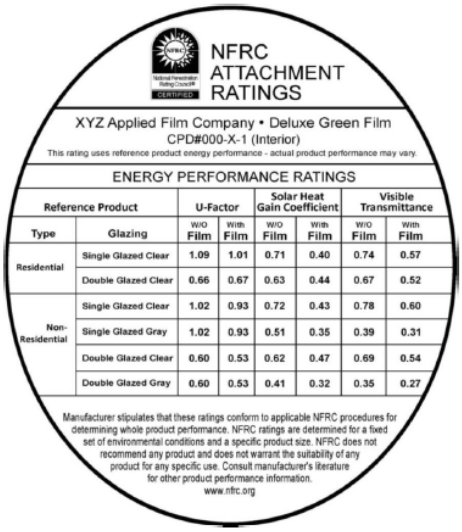
Materials	*Requirements*
APPROVED MATERIALS	- ALL TYPES • Shall be selected to reduce heat and light energy transmission through windows. – Solar Heat Gain Coefficient of 0.35. – A U-factor of 0.40. – Shall be UV treated. – Shall be self-adhering. • Separate adhesives not allowed. - POLYESTER • Minimum thickness: 0.0010 inches (1 mil).

Photo Credit: MasterWindowFilms.com



SOLAR HEAR GAIN COEFFICIENT OF 0.35 OR LESS

Graphic Credit: RHA, Inc.



NFRC ATTACHMENT RATINGS

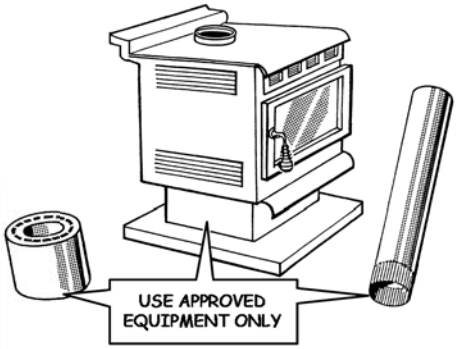
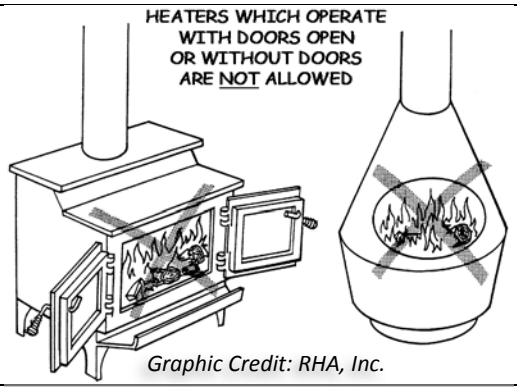
XYZ Applied Film Company • Deluxe Green Film
CPD#000-X-1 (Interior)
This rating uses reference product energy performance - actual product performance may vary.

ENERGY PERFORMANCE RATINGS

Reference Product		U-Factor		Solar Heat Gain Coefficient		Visible Transmittance	
Type	Glazing	W/O Film	With Film	W/O Film	With Film	W/O Film	With Film
Residential	Single Glazed Clear	1.09	1.01	0.71	0.40	0.74	0.57
	Double Glazed Clear	0.66	0.67	0.63	0.44	0.67	0.52
Non-Residential	Single Glazed Clear	1.02	0.93	0.72	0.43	0.78	0.60
	Single Glazed Gray	1.02	0.93	0.51	0.35	0.39	0.31
	Double Glazed Clear	0.60	0.53	0.62	0.47	0.69	0.54
	Double Glazed Gray	0.60	0.53	0.41	0.32	0.35	0.27

Manufacturer stipulates that these ratings conform to applicable NFRC procedures for determining whole product performance. NFRC ratings are determined for a fixed set of environmental conditions and a specific product size. NFRC does not recommend any product and does not warrant the suitability of any product for any specific use. Consult manufacturer's literature for other product performance information.
www.nfrc.org

WOOD BURNING SPACE HEATERS
(WIS Section 26)

Materials	*Requirements*
CHIMNEY AND COMPONENTS	- LISTED COMPONENTS • Only factory built UL-Listed heaters, chimneys, connectors, and other associated hardware/components specified by the heater manufacturer shall be installed, including: – Ceiling support package when vent connector is used. – Insulation shield when penetrating an attic. – Chimney cap and spark arrestor. – Electrical components shall be UL labeled.  *Photo Credit: commons.wikimedia.org*  *Graphic Credit: RHA, Inc.*
CONNECTOR TYPES	- CONNECTORS AND RELATED COMPONENTS SHALL BE: • Those specified by the heater manufacturer. • Factory built. • Laboratory Listed.
EMISSION STANDARDS	- ALL HEATERS SHALL: • Meet EPA emission standards. • Comply with federal, state, and local codes.
HEATER TYPES	- REQUIRED TYPES • Freestanding Heaters – Designed to operate only with fire chamber door closed. – Wood burning units. – Radiant or convective type. - NOT ALLOWED • Units designed to operate with fire chamber door open. • Units without doors.  *Graphic Credit: RHA, Inc.*
LABELS	- TEMPORARY LABEL • When purchased by agency or contractor, unit shall bear temporary label(s) certifying conformance to EPA emission standards. - PERMANENT LABEL • All heaters shall bear permanently affixed label stating “For use with solid fuel only.” • Heater shall have permanent factory label(s) in conformance with EPA regulations stating: – Required clearance to combustibles, including walls, ceiling and floor. – Proper fuel. – Connector and chimney size and type. – Operation and safety information. – Floor protection requirements. – Wall/ceiling protection requirements.