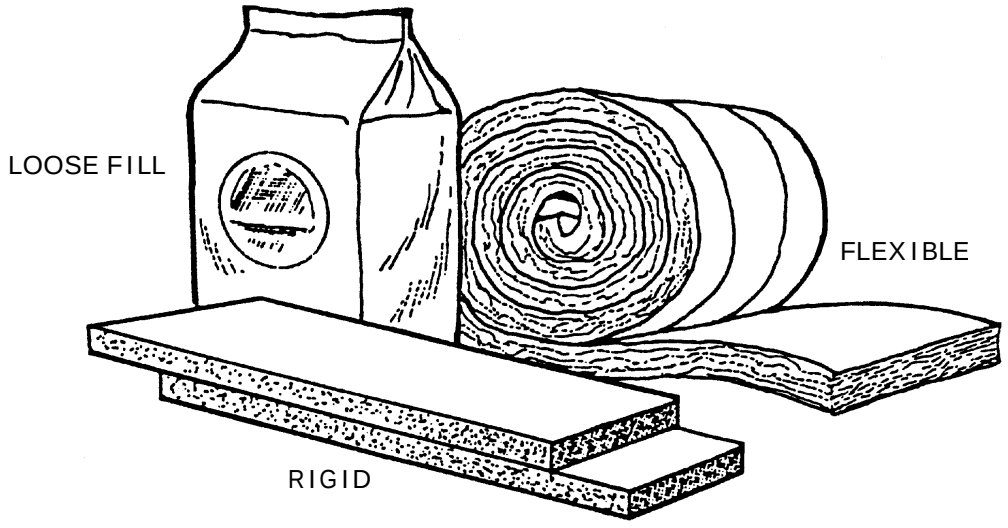
CEILING INSULATION STANDARDS

1. APPROVED MATERIALS

- **All insulation shall be certified to comply with the CCR, Title 24, Part 12, Chapter 12-13*, Standards for Insulating Material*.**
- **Mineral Fiber**
  - Flexible (Batts): Conformance to ASTM C665.
  - Loose Fill: Conformance to ASTM C764.
- **Mineral Cellular**
  - Vermiculite: Conformance to ASTM C516.
  - Perlite: Conformance to ASTM C549.
- **Cellulose**
  - Loose Fill
    - Licensed for sale in California.
    - Compliance with CPSC 16 CFR, Parts 1209 and 1404, and ASTM C739.
- **Rigid**
  - Preformed Polyisocyanurate Board Foil Faced on Both Sides
    - Conformance to FS HH-1-1972/1.
  - High Density Fiberglass Board: Conformance to ASTM C726.



2. R-VALUES

- **Attic Floor**
  - Areas with less than 5,000 heating degree days (HDD): R-30 total (existing plus added insulation).
  - Areas with 5,000 HDD or more: R-38 total.
- **Knee Walls and Skylight Wells**
  - R-13 in walls with 2x4 framing.
  - R-19 in walls with 2x6 framing.
- **Attic Access**
  - Horizontal: same R-value as attic floor.
  - Vertical: same R-value as knee walls and skylight wells.

3. LOCATION

- **All Insulation**
  - Insulation shall be installed only between conditioned and unconditioned areas.

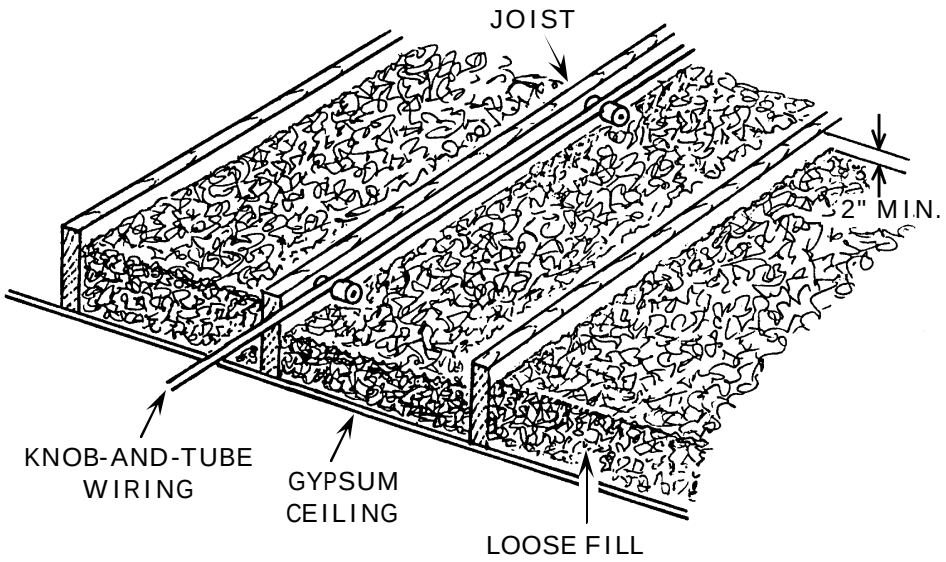
TABLE 3-1: R-VALUE REQUIREMENTS

LOCATION	CRITERIA	TOTAL R-VALUE
Attic Floor	~~Less than 5,000 HDD~~*Climate Zones 2 – 15*	R-30*
	~~5,000 HDD or more~~*Climate Zones 1 & 16*	R-38*
Knee Walls & Skylight Wells	2x4 Framing	R-13
	2x6 Framing	R-19
Horizontal Access	Same R-value as Attic Floor	
Vertical Access	Same R-value as Knee Walls & Skylight Wells	

***R-value of existing insulation plus R-value of installed insulation.**

31. KNOB-AND-TUBE WIRING

- **Insulation which encapsulates knob and tube wiring shall <u>not</u> be installed when prohibited by local code.**
- **All Insulation**
  - Attic with knob-and-tube wiring shall <u>not</u> be insulated unless the wiring has been surveyed by an electrical contractor and certified to be:
    - Live and acceptable for encapsulation, or
    - Abandoned and disconnected.
  - All provisions of this section and Article 324, Section 324-4 of the 1998 *(or currently adopted)* California Electrical Code shall be met.
- **Certification of Wiring by Electrical Contractor**
  - Certification shall be provided by a C-10 electrical contractor licensed by the State of California.
  - The electrical contractor shall survey all knob-and-tube wiring located in all areas to be insulated and shall complete a "Notice of Survey by Electrical Contractor" (example on page 3-35) prior to installation of ceiling insulation.
  - A copy of the "Notice of Survey by Electrical Contractor" shall be provided to the local jurisdiction and the property owner when insulation is installed.



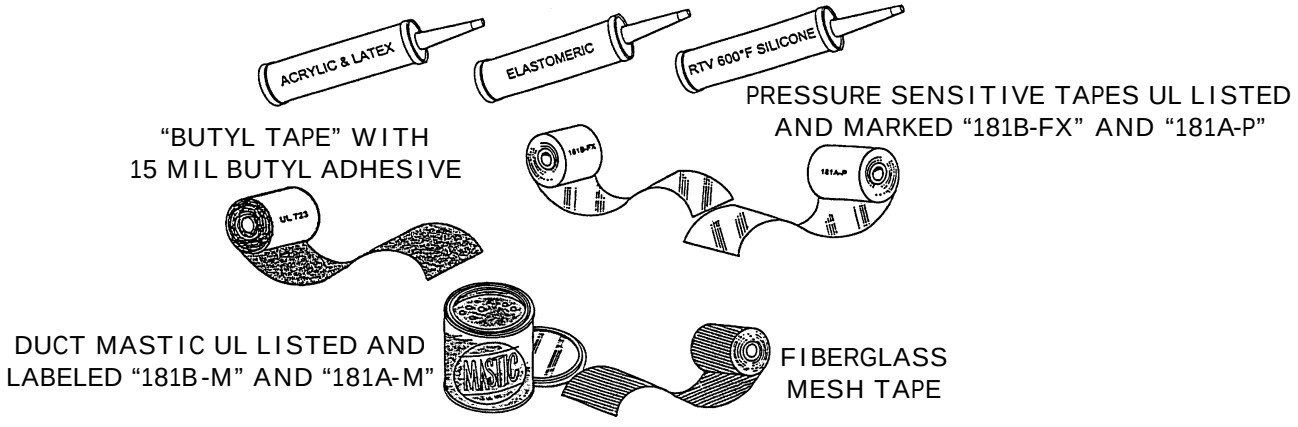
33. MATERIALS FOR DUCT REPAIR AND SEALING (continued)

- **Caulks and Sealants**
  - Caulk/sealant material and installation criteria prescribed in Section 1, Caulking Standards, shall be followed.
  - Foam sealants are not allowed for duct repair/sealing.
- **Sealants for Seal Flexible Ducts**
  - Tapes: "181B-FX" shall appear on the tape.
  - Mastics: "181B-M" shall appear on the label.
- **Drawbands for Flexible Nonmetallic Ducts**
  - Drawbands shall comply with duct manufacturer's installation instructions and the following specifications:
    - Weather- and UV-resistant *(e.g., black)* duct *straps/*ties *rated for outdoor use*.
    - Loop tensile strength of 150 pounds minimum.
    - Service temperature rating of 165°F minimum.
  - Drawbands shall be tightened with an adjustable tensioning tool in accordance with duct manufacturer's instructions.
- **Sheet Metal**
  - Galvanized sheet steel, or sheet aluminum, at least 0.007" thick.

~~**-New Fittings (Collars, Sleeves, etc.)**~~

- ~~All installed fittings shall be minimum 26 gage.~~
- ~~New fittings installed for Flexible Nonmetallic ducts:~~
  - ~~All fittings shall be beaded.~~
  - ~~Starting collars: minimum 4" length.~~
  - ~~Sleeve/couplings: minimum 6" length.~~

- **Foam Board and Foam Sealant**
  - Not allowed as a barrier material or sealant in duct systems.

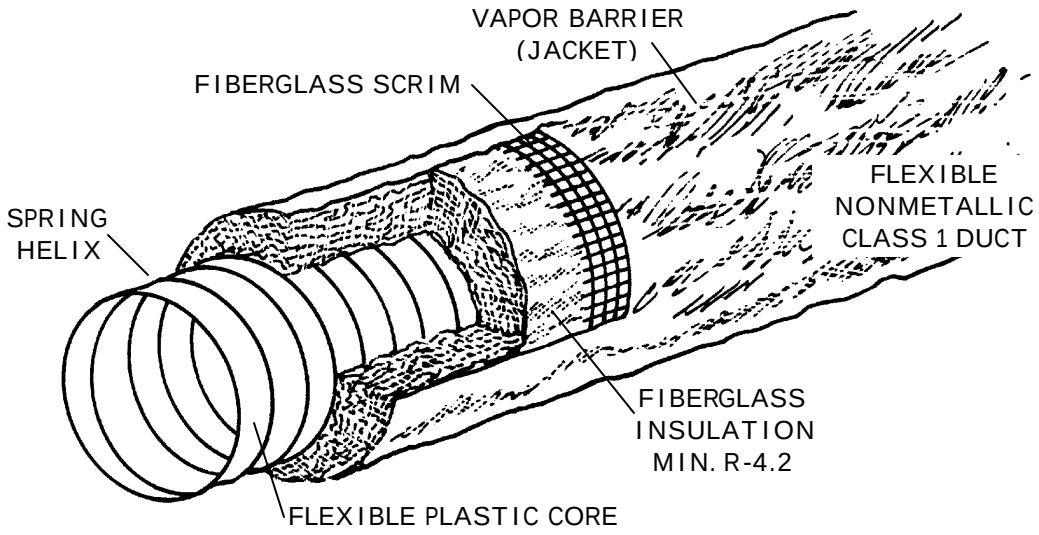


33. MATERIALS FOR DUCT REPAIR AND SEALING (continued)

- **New Fittings (Collars, Sleeves, etc.)**
  - All installed fittings shall be minimum 26 gage.
  - New fittings installed for Flexible Nonmetallic ducts:
    - All fittings shall be beaded.
    - Starting collars: minimum 4" length.
    - Sleeve/couplings: minimum 6" length.

- ***Flexible Ducts***
  - *Ducts shall conform to NFPA 90B and UL 181 Class 1.*
  - *Nonmetallic insulated ducts with air-permeable core not allowed.*
  - *Vapor barrier (Jacket):*
    - *Thickness: 2.5 mils minimum.*
    - *Permeance: 1.0 perm maximum.*
    - *Degradation Protection: UV degradation-resistant material (e.g., silver metalized polyester jacket). recommended.*

- ***Insulation shall have minimum thermal resistance as indicated below, or greater if required by local code.***
  - *Natural Gas Heat*
    - *R-4.2 in CEC climate zones (CZ) 6 – 8.*
    - *R-6 in CZ 1 – 5 and 9 – 13.*
    - *R-8 in CZ 14 – 16.*
  - *Electric Heat*
    - *R-8 in all CZ.*



34. DUCT CLOSURE SYSTEMS

- ***All Closure Systems***
  - *Sealants shall be applied per manufacturer's instructions.*
  - *A complete, durable seal shall be achieved.*
  - *Pressure sensitive tapes shall be marked, and mastic containers shall be labeled, in conformance with:*
    - *UL 181B for flexible metallic and nonmetallic ducts.*
    - *UL 181A or 181B for rigid metal ducts and components.*
      - *Exception: Butyl tape without UL 181 markings may be used to seal rigid metal-to-metal connections, per Item 4.*
- ***Gap Size and Sealing Materials***
  - *Sealing materials shall be selected in conformance with Table 3-3.*
  - *Flexible duct connections with gaps wider than 1/4" shall be replaced with properly-sized duct and/or fitting.*
  - *For rigid metal ducts, gaps 1" or wider shall be repaired with a sheet metal patch (Item 37) or sleeve.*
  - *For rigid fiberglass ducts, repairs shall be:*
    - *Made with duct board or sheet metal and screws, and*
    - *Sealed with mastic or metallic tape.*

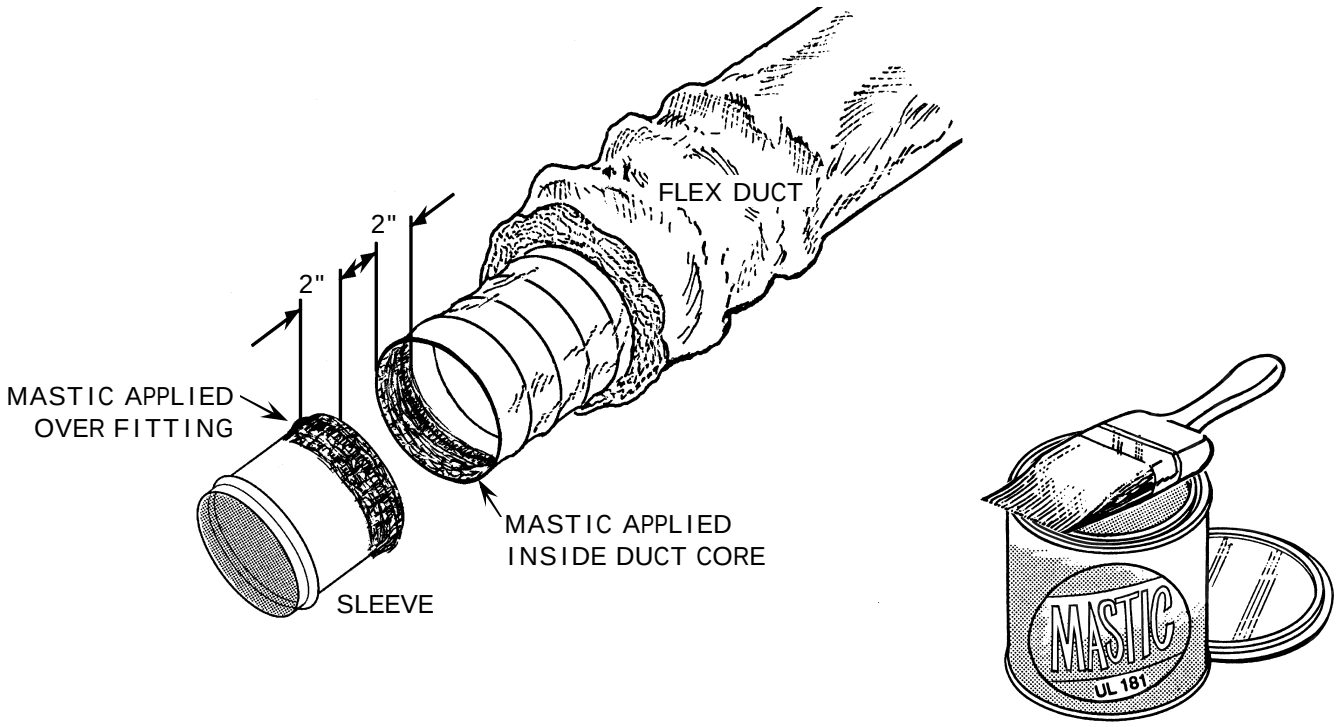
TABLE 3-3: GAP SIZE AND APPROVED SEALING MATERIALS

GAP SIZE	FLEXIBLE METALLIC & NONMETALLIC DUCTS		RIGID METAL DUCT	
	Sealing with MASTIC	Sealing with TAPE	Sealing with MASTIC	Sealing with TAPE
£ 1/4"	Mastic	Tape	Mastic	Tape
> 1/4" - £ 1"	Repair Required*	Repair Required*	Mastic & Mesh	Mastic over Tape
1" or more	Repair Required*	Repair Required*	Metal Patch or Sleeve & Mastic	Metal Patch or Sleeve & Tape

***Duct and/or fitting must be replaced with proper size.**

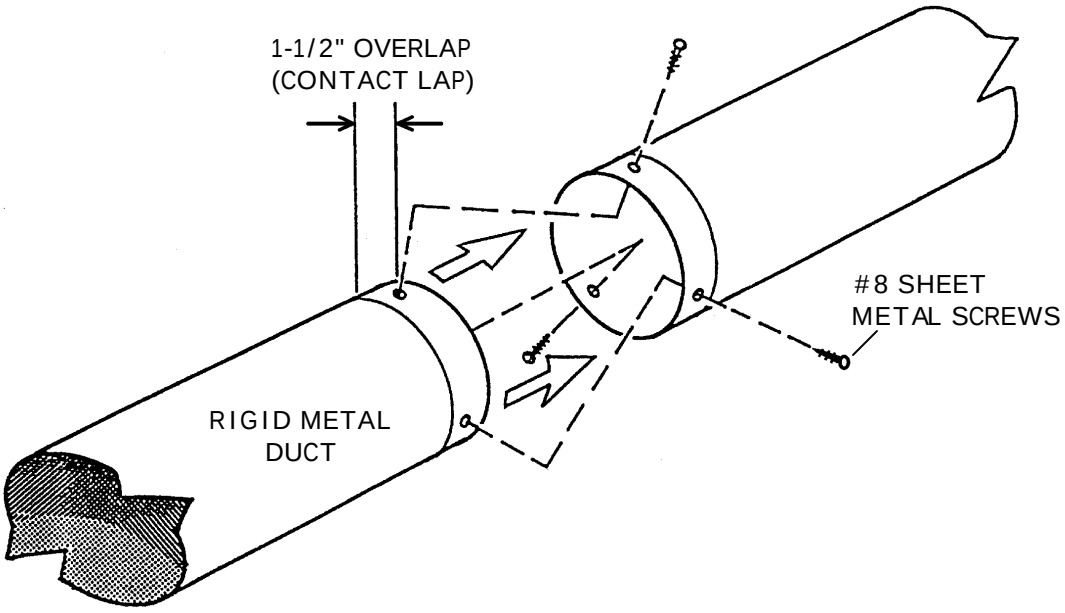
34. DUCT CLOSURE SYSTEMS (continued)

- ***Externally-Applied Closure Systems***
  - *Sealing materials shall:*
    - *Be centered over the joint or gap, and*
    - *Extend at least 1" onto each of the two joined/sealed surfaces.*
- ***Internally-Placed Mastic Sealant (Core-to-Fitting Joints)***
  - *Mastic may be applied either:*
    - *Inside the duct core, or*
    - *Onto the rigid component over which the core is attached.*
  - *Mastic coating shall be at least 1/8" thick and 2" wide.*
- ***Sealing with Mastic and with Pressure Sensitive Tape***
  - *Mastic and Fiberglass Mesh Tape*
    - *Mastic and mesh shall be installed as prescribed in Item 38.*
  - *Pressure Sensitive Tapes*
    - *Tape shall be installed as prescribed in Item 39.*



~~35.~~*36.* REPAIRING AND SEALING RIGID METAL DUCTS

- **Attachment of Metal Sections**
  - When two rigid components are joined (e.g., duct and starting collar, or two pieces of duct), they shall overlap at least 1-1/2".
- **Mechanical Fasteners**
  - Connections shall be secured with #8 or larger sheet metal screws equally spaced, or an equivalent fastening method.
  - Round Ducts
    - At least 3 screws for duct diameters up to ~~12~~*14*", *4 screws for diameters 15" to 19",* and 5 screws for diameters *20" to 24",*.
  - Rectangular Ducts
    - At least 1 screw per side.
  - Lapped Seams (e.g., field fabricated metal plenums, etc.)
    - Overlapped surfaces shall:
      - Be in substantial contact with each other along the entire seam.
      - Be securely fastened together (e.g., with 1/2" #8 or larger sheet metal screws at intervals of 12" or less).

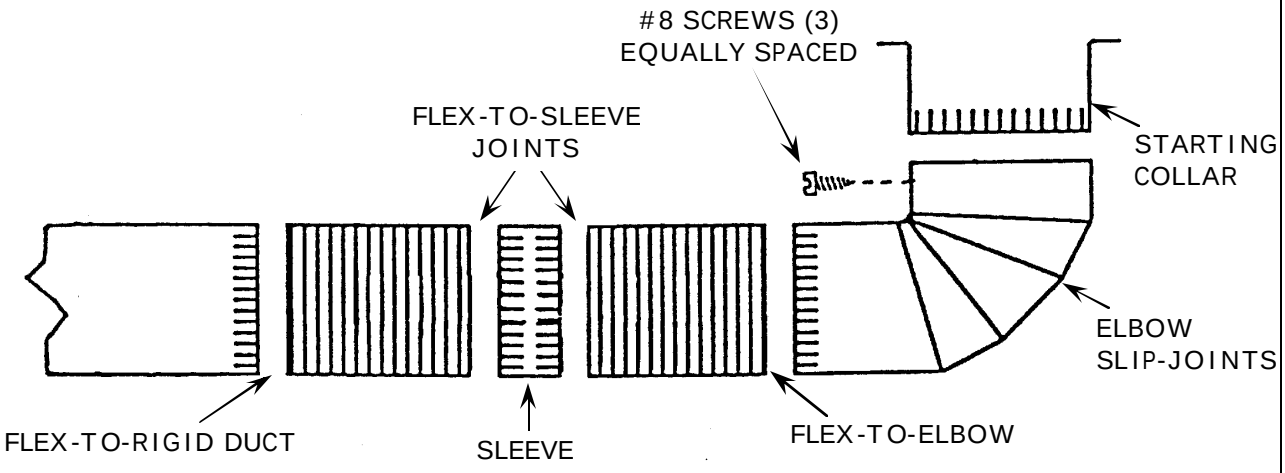


~~35.~~*36.* REPAIRING AND SEALING RIGID METAL DUCTS (continued)

- **Gaps ~~1/8~~*1/4*" or smaller may be sealed with:**
  - Duct mastic, or
  - *Metallic* pressure sensitive tape.
  - ~~Aerosol-applied sealant.~~
- **Gaps ~~larger than~~*over* ~~1/8~~*1/4*" *up to 1" wide* shall be sealed with:**
  - Duct mastic *with* embedded ~~with~~ fiberglass mesh, or
  - *Metallic* pressure sensitive tape ~~(shall be applied in combination with mastic for gaps greater than 1/4"), or~~*covered with mastic.*
  - ~~Aerosol-applied sealant (gaps up to 1/4" wide maximum).~~
- ***Gaps over 1" wide shall be repaired with a sleeve or a sheet metal patch (per Item 28) and sealed with mastic or tape.***

~~**-Sealing Methods**~~

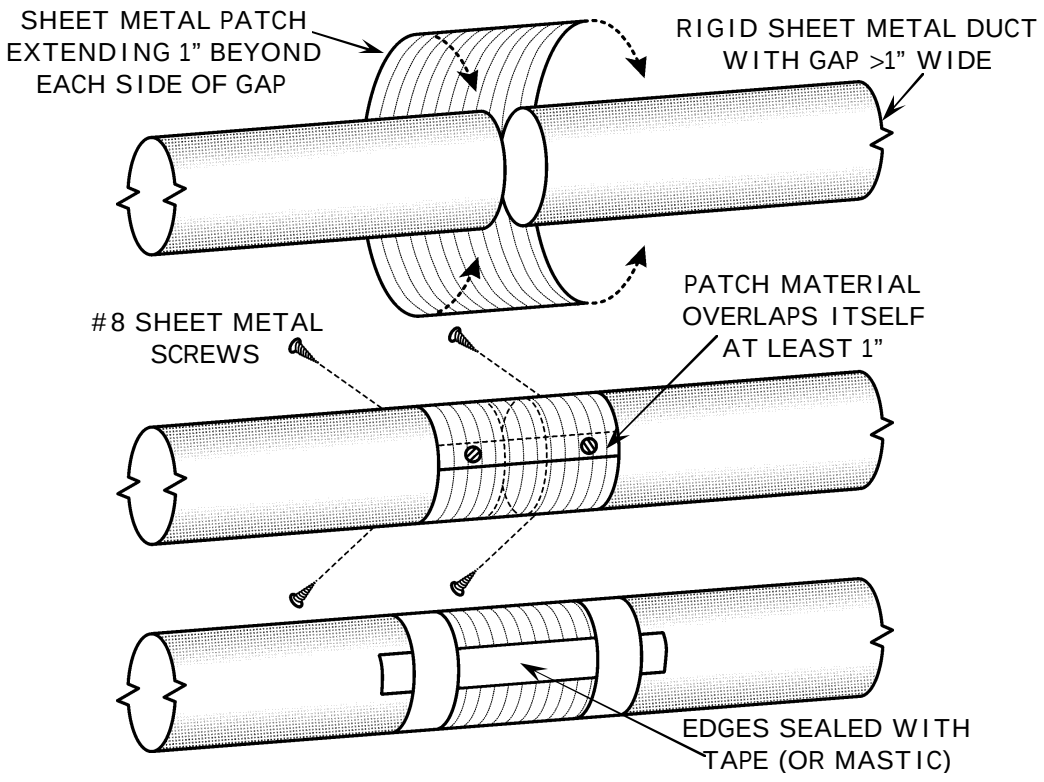
- ~~Mastic and Fiberglass Mesh Tape~~
  - ~~Mastic and mesh shall be installed as prescribed in Item 36.~~
- ~~Pressure Sensitive Tapes~~
  - ~~Tape shall be installed in compliance with Item 37.~~
- **All Connections**
  - Mastic and fiberglass mesh shall be installed per Item 38.
  - Metallic pressure sensitive tapes shall be installed per Item 39.



- TAPE OR MASTIC ON GAPS UP TO 1/4"
- MASTIC & MESH, OR METALLIC TAPE COVERED BY MASTIC, ON GAPS OVER 1/4"

37. SHEET METAL PATCHES FOR RIGID METAL DUCTS

- ***Material***
  - *Patch material shall match the existing duct material (i.e., galvanized patch for galvanized duct, or aluminum patch for aluminum duct).*
  - *Gauge of the patch shall equal or exceed gauge of the existing duct.*
- ***Installation***
  - *Patch material shall:*
    - *Extend at least 1" beyond each edge of the gap, and*
    - *Overlap itself by at least 1".*
  - *The patch shall be wrapped tightly around the duct and secured with #8 sheet metal screws.*
    - *Where the patch overlaps itself, at least 1 screw shall be installed on each side of the gap.*
    - *At least 2 more screws shall be evenly-spaced around the duct on each side of the gap.*
- ***Sealing***
  - *All patch edges/gaps shall be sealed per Item 34.*



36. DUCT MASTIC SEALING PROCEDURE

-Rigid Metal Ducts and Components

- Mastic by itself may be used to seal gaps up to 1/8" (e.g., on adjustable elbow joints, seams in wyes, metal duct seams, etc.).
- Mastic shall be reinforced with fiberglass mesh tape when used to seal gaps larger than 1/8".
- When sealing longitudinal seams in new rigid metal ducts, mastic is required on S-and-drive, snap lock, and government lock seams.

-Flexible Metallic and Nonmetallic Ducts

- Mastic used to seal core-to-fitting connections may be:

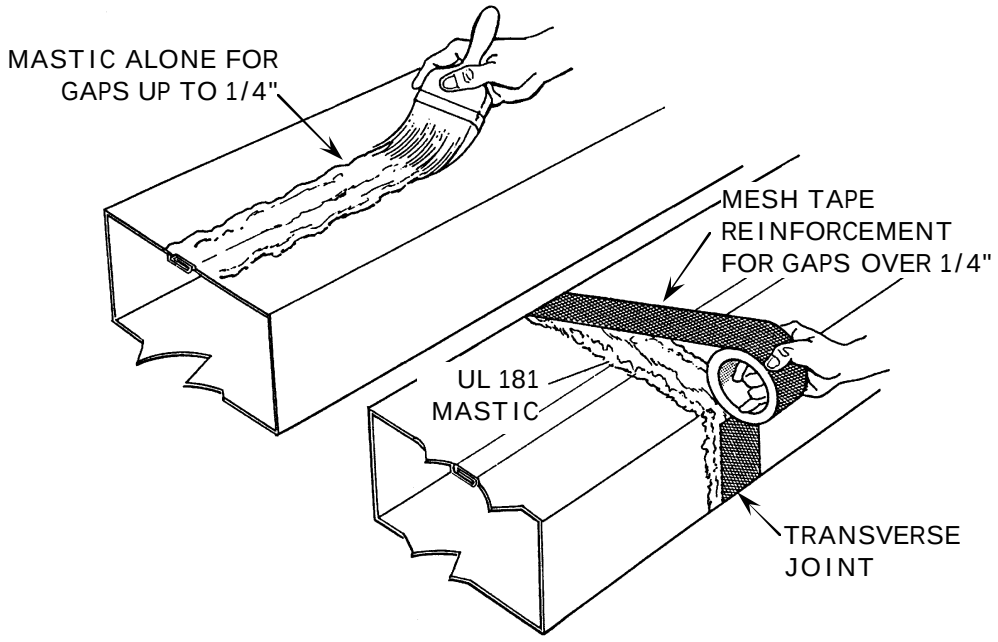
  -Externally applied over the duct core and rigid fitting, or

  -Internally placed between the core and the fitting.
- Externally-Applied Mastic

  -Mastic shall be reinforced with fiberglass mesh tape when:
  - A gap greater than 1/8" exists between the duct core and the fitting (starting collar, coupling, elbow, wye, etc.).
  - Mastic is used to seal the outer vapor barrier (jacket).

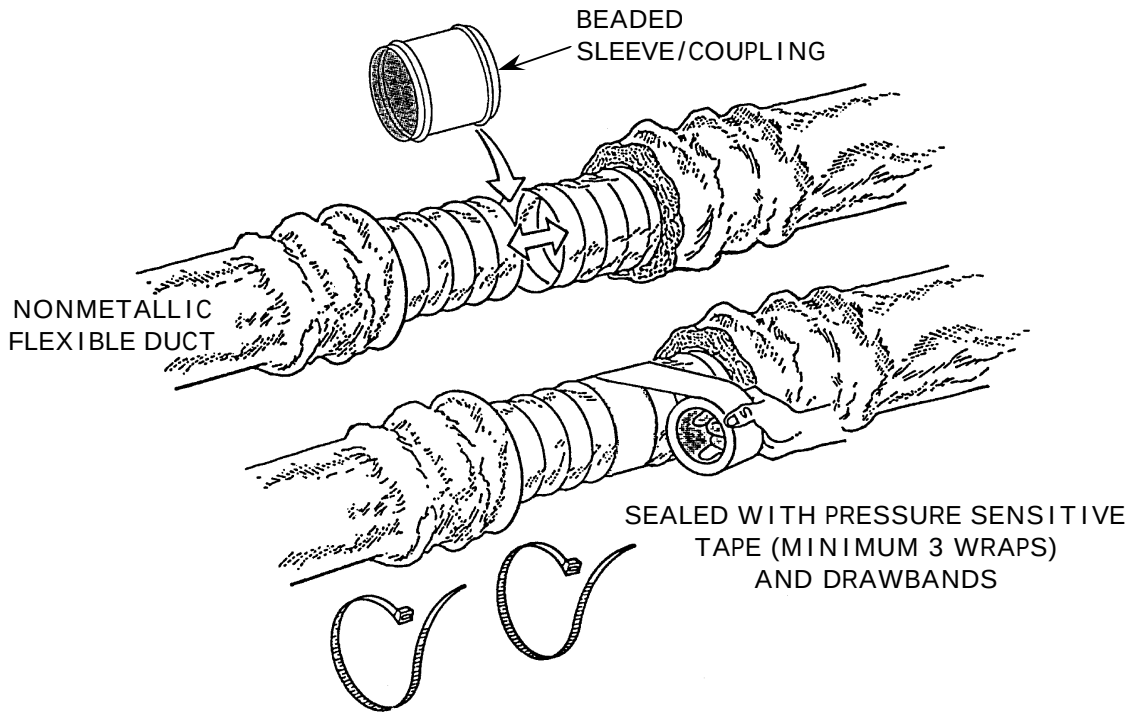
38. SEALING WITH MASTIC

- ***Mastic shall be applied as prescribed by manufacturer, including:***
  - *Surface preparation/cleaning.*
  - *Temperature and moisture limitations.*
  - *Thickness and set-up time.*
- ***Rigid Metal Ducts and Components***
  - *Mastic by itself may be used to seal gaps up to 1/4".*
  - *Mastic shall be reinforced with fiberglass mesh tape when used to seal gaps larger than 1/4".*
  - *Gaps larger than 1" wide shall be repaired and sealed:*
    - *Metal ducts per Item 37.*
    - *Fiberglass ducts repaired with fiberglass duct board or sheet metal and screws, and sealed with mastic or metallic tape.*
    - ~~*Repaired with sheet metal and #8 screws, and*~~
    - ~~*Properly sealed (see Item 34).*~~
- ***Flexible Metallic and Nonmetallic Ducts***
  - *Mastic used to seal core-to-fitting connections may be:*
    - *Externally applied over the duct core and rigid fitting, or*
    - *Internally placed between the core and the fitting.*
  - *Externally-Applied Mastic*
    - *Mastic shall be reinforced with fiberglass mesh tape when:*
      - *A gap greater than 1/4" up to 1/2" exists between the duct core and the fitting (starting collar, coupling, elbow, wye, etc.).*
      - *Mastic is used to seal the jacket (vapor barrier).*



~~37.~~*39.* SEALING WITH TAPE

- **Pressure Sensitive Tapes**
  - Tapes shall be installed as prescribed by manufacturer.
  - Successive wraps of tape shall be staggered and should overlap by 50 to 75% of the tape width.
  - At least three wraps of tape shall be applied when sealing:
    - Transverse joints in round or rectangular metal ducts (the joint formed when two pieces of duct are spliced together).
    - Flexible duct core-to-fitting attachments (with a drawband also installed to secure the core).
    - Vapor barrier (jacket) splices on flexible ducts.
  - *When* gaps ~~wider than~~*between* 1/4" *and 1" are* sealed with tape:
    - *Tape shall be applied as prescribed above and then covered with duct mastic.*
    - ~~Duct~~ *The* mastic shall be applied at least 1/8" thick over the installed tape to provide additional strength and durability.
    - Mastic shall extend beyond the width of the tape.
  - *Metallic pressure sensitive tape shall be used to seal rigid metal connections.*



WATER HEATER PIPE INSULATION STANDARDS

1. APPROVED MATERIALS

- **All Materials**
  - Maximum flame-spread index of 25 and maximum smoke-developed index of 450, per ASTM E84, or UBC Standard 8-1.
- **Insulation**
  - 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.
  - Minimum thermal performance rating of 180°F.
- **Tape**
  - Tape specified by insulation manufacturer, or
  - Minimum 2" wide pressure-sensitive metallic tape meeting or exceeding strength and adhesive requirements of UL 181A-P or UL 181B-FX.
  - Cloth duct tape and electrical tape are not allowed.
- ***Ties***
  - ~~*UV-resistant (e.g., black) cable ties*~~ *Plastic cable ties*.

PREFORMED FOAM PIPE INSULATION

2. R-VALUE *OF PIPE INSULATION*

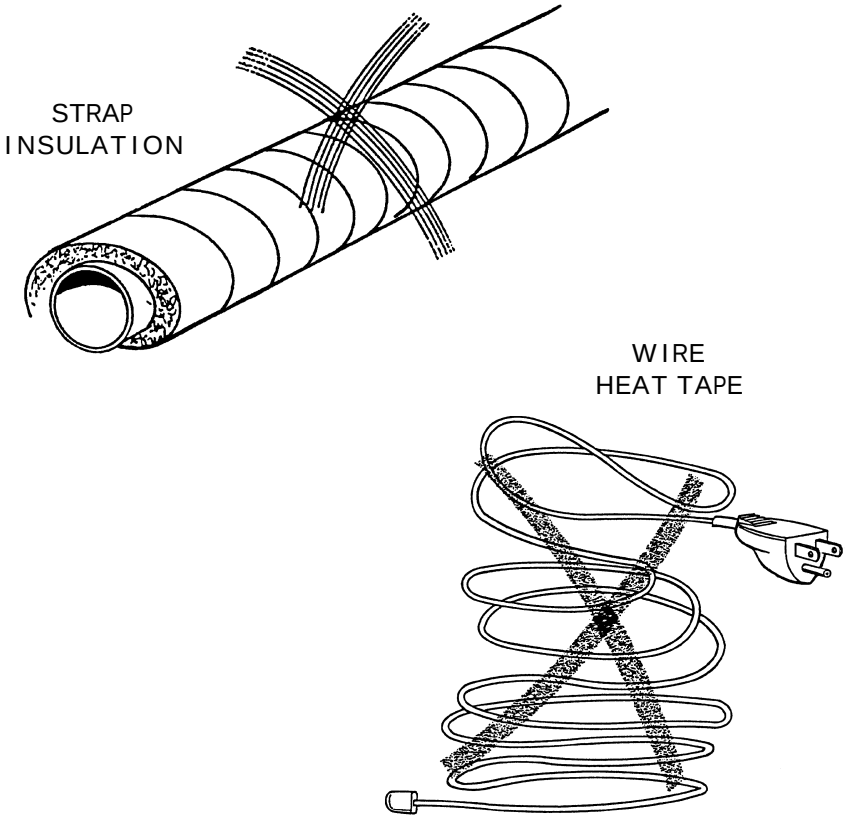
- **R-4 minimum for pipes less than or equal to 2" in diameter.**
  - *Minimum 1" insulation wall thickness.*
  - *Exception: 3/4" wall thickness acceptable if R-value requirement is met.*
- **R-6 minimum for pipes greater than 2" in diameter.**
  - *Minimum* 1.5" ~~or greater~~ *insulation* wall thickness.

3. SHEET OR SEMI-MOLDED INSULATION

- **All Units**
  - Not allowed.

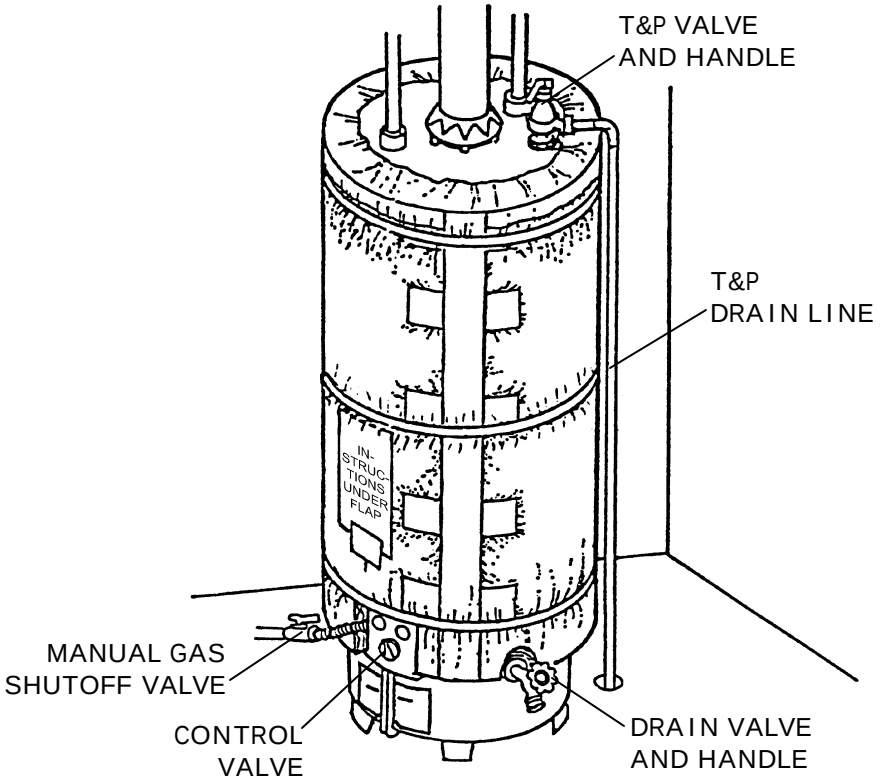
4. HEAT TAPE OR STRAP INSULATION

- **All Units**
  - Not allowed.



7. COVERAGE RESTRICTIONS

- **All Units**
  - Materials shall not cover:
    - Temperature and pressure (T&P) relief *(or gas shutoff)* valve.
    - Valve handles.
    - Control and safety devices.
    - T&P drain line.
    - Leaking pipes.
- **Gas Units**
  - Minimum 6" clearance required from combustible insulation materials to single-wall gas vent pipe.
  - Minimum 3" clearance, or as specified by listing, from listed Type B gas vent piping connectors.
  - Minimum 3" clearance from draft hood opening.
  - No part of the draft hood opening shall be obstructed.



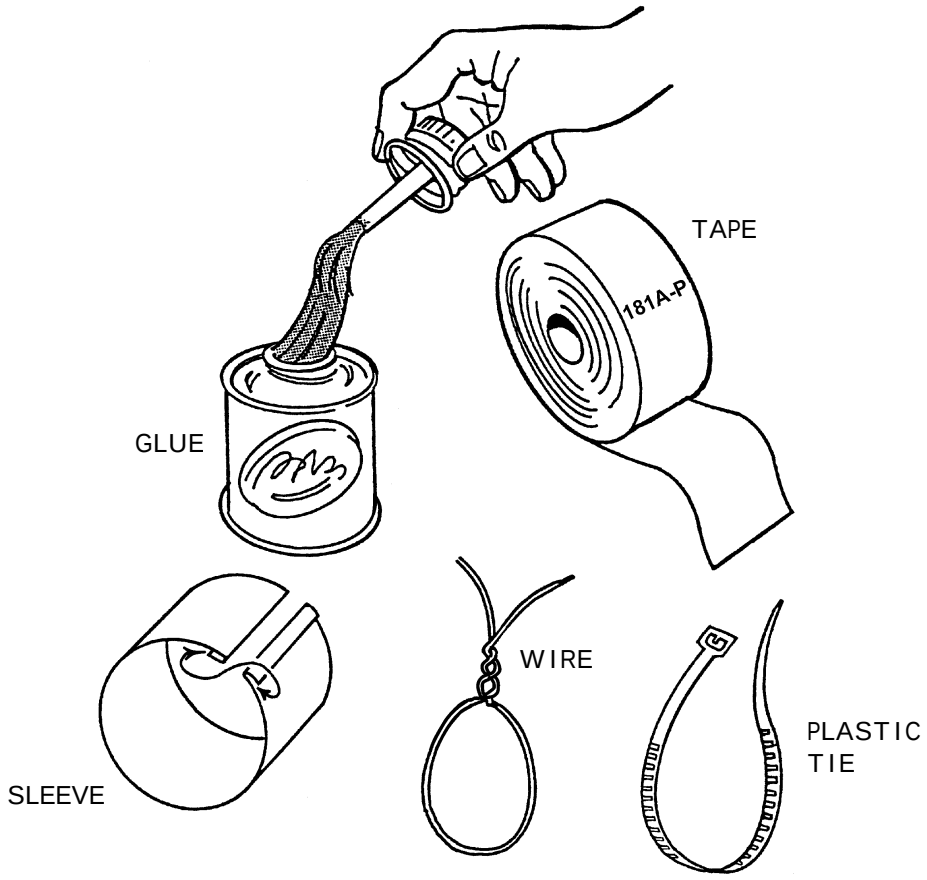
ITEMS NOT TO BE COVERED

10. GENERAL ATTACHMENT REQUIREMENTS

- **Insulation shall be firmly secured with *~~UV-resistant~~* plastic ties~~(e.g., UV-resistant cable ties)~~, tape, wire, or sleeves.**
- **All slits and joints shall be glued or taped to achieve complete closure.**
- **All material shall be corrosion-resistant.**
- **Tape shall be used on bends, 90º elbows, and joints.**

11. GLUE FOR ATTACHMENT

- **Glue shall be compatible with insulation and manufacturer's instructions.**



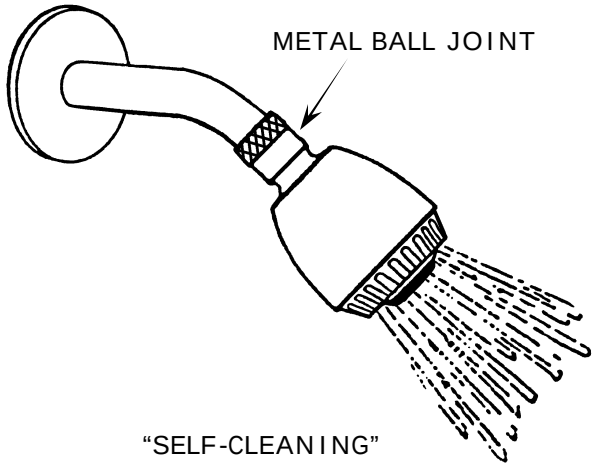
ENERGY-SAVER SHOWERHEAD AND FAUCET AERATOR STANDARDS

1. APPROVED MATERIALS

- **Showerheads and Aerators**
  - Conformance to ~~ANSI/~~ASME A112.18.1-*2003*~~M~~.
  - Compliance with CEC (Title 24) Residential Manual ~~Part 2.6.1~~*Section .2.5*.
- **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).
  - Ball joint shall be made of the same material as showerarm.
- **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.
- **Aerators**
  - Shall be metal (e.g., chrome-plated brass).

2. WARRANTY

- **Showerheads and Aerators**
  - Minimum three-year warranty.



"SELF-CLEANING"
2.5 GPM SHOWERHEAD

3. FLOW RATE

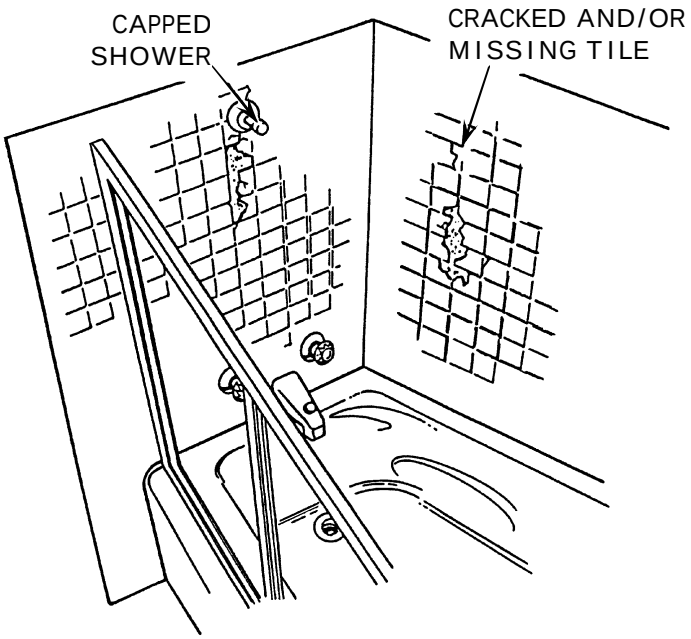
- **Showerheads**
  - Maximum flow rate: 2.50 gpm at 80 psi.
  - Minimum flow rate: 2.0 gpm at 40 psi.
- **Faucet Aerators**
  - Maximum flow rate: ~~2.50~~ *2.2* gpm at ~~80~~ *60* psi.

4. SHOWERHEAD FLOW CONTROL

- **Flow-restricting devices shall be factory-installed and mechanically-retained (e.g., with a retaining ring or expansion seat), requiring 8 lbs. or more of pulling force to remove.**
- **Removable flow restrictors are not allowed.**

5. INSTALLATION

- **Functional Showers**
  - Energy-saver showerheads shall be installed on all functional showers that have flow rates greater than 3.0 gpm.
- **Nonfunctional Showers**
  - Energy-saver showerheads shall not be installed on showers which are not functional due to plumbing or physical defects.



NONFUNCTIONAL SHOWER

WINDOW REPLACEMENT STANDARDS

1. APPROVED MATERIALS

- **Windows shall:**
  - Be in conformance with one or more of the following:
    - NWWDA I.S. 2-93, 3-95, or 8-95; or ANSI/AAMA 101-93.
    - AAMA/NWWDA 101/I.S.2-97.
  - Comply with local code *and Title 24 energy efficiency requirements, as shown in Table 12-1*.
  - *Bear an NFRC temporary label.*
- **Permanent Label**
  - Each unit shall bear a permanent label which:
    - Lists both (a) the energy performance with rating procedure, and (b) minimum Design Pressure rating, or
    - References the original certification information on file with the Independent Certification and Inspection Agency (IA).
- **Insect Screens**
  - All openable windows shall be equipped with insect screens.

~~**-Complete House Retrofit**~~

- ~~Units must also bear an NFRC temporary label.~~
- ~~U-Value shall be 0.70 or lower when all windows are replaced.~~

2. REPLACEMENT SELECTION

- **Horizontal sliders shall be replaced with horizontal sliders.**
- **Vertical sliders shall be replaced with vertical or horizontal sliders.**
- **Picture windows shall be replaced with picture windows or sliding windows.**
- **Jalousies shall be replaced with vertical or horizontal sliders.**

TABLE 12-1: REPLACEMENT WINDOW MINIMUM REQUIREMENTS

EFFICIENCY FACTOR	CLIMATE ZONE	MAXIMUM VALUE
Solar Heat Gain Coefficient (SHGC)	2, 4, & 7 – 15	0.40
	1, 3, 5, 6, 16	No Requirement
U-Factor	16	0.55
	1, 2, 10 – 16	0.57
	3 - 9	0.67

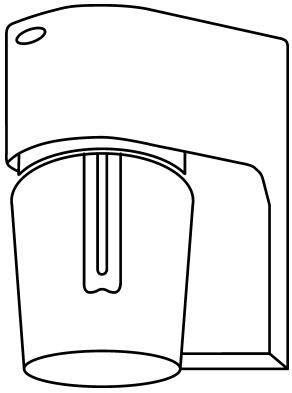
HARD-WIRED COMPACT FLUORESCENT FIXTURE STANDARDS

1. MATERIALS

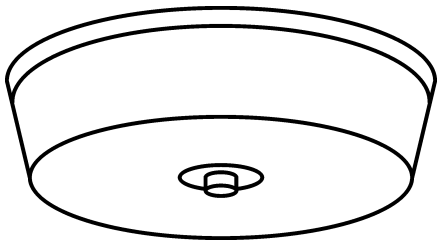
- **Fixture *ballast* must be UL listed *(UL 935)* ~~and meet ANSI/UL Standard 935~~ Class-P.**
- **CFLs must be ENERGY STAR® ~~compliant~~*qualified*.**
- **Compact fluorescent lamp (CFL) tube glass and other housing materials must be UV resistant and heat stable.**
- **Hardwired fixtures and lamps must be fully warranted for one year from date of purchase.**
- **Fixture must allow for lamp replacement.**

2. INSTALLATION

- **All fixtures shall be installed:**
  - In accordance with the current NEC and local codes.
  - In a manner which prevents water from entering or accumulating in wiring compartment, lamp holder or electrical parts.
- **All wiring, conduit, accessories, fasteners, and controls used in exterior locations shall be designed for exterior use.**



WALL-MOUNT
FLUORESCENT FIXTURE
WITH PHOTO CELL CONTROL



CEILING-MOUNT
COMPACT FLUORESCENT
REPLACEMENT FIXTURE

NATURAL GAS CENTRAL FORCED AIR HEATING SYSTEMS REPAIR AND REPLACEMENT STANDARDS

PART 1: MATERIALS

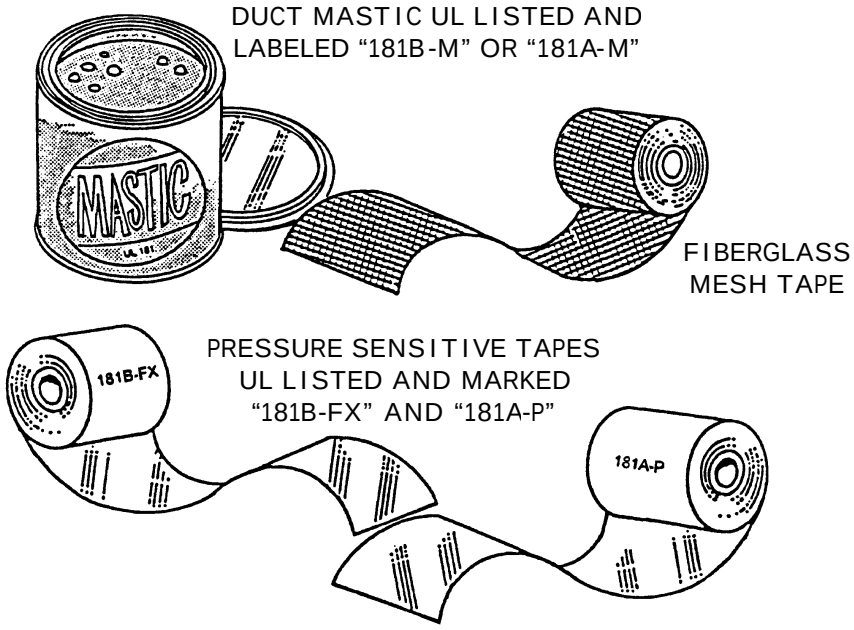
1. APPROVED MATERIALS

- **All materials shall be in conformance with the CBC and CMC.**
- **Furnaces**
  - All units and components shall be UL listed and AGA certified.
  - All units shall be ~~Energy Star~~ *ENERGY STAR®* ~~labeled~~*qualified*.
- **Split Systems**
  - Furnace: Minimum AFUE rating of 90%.
  - Air Conditioner*, if replaced in conjunction with furnace*:
    - Minimum EER of 11.~~5~~*5*0 and SEER of 13.0, with a Thermostatic Expansion Valve (TXV).
    - EER shall be determined by the coil match as listed in the current ARI Directory.
- **Package Units (Dual Packs):**
  - Furnace: Minimum AFUE rating of 80%.
  - Air Conditioner: Minimum EER of ~~10~~*11*.5 and SEER of ~~12~~*13*.0.

LISTED

1. APPROVED MATERIALS (continued)

- **Metal Flue and Vent Pipes**
  - All metal flue and vent pipes, vent connectors and components shall be UL listed.
  - Gas flue and vent pipe shall be Type B or BW.
- **Nonmetallic 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.
- **Gas Pipes and Valves**
  - Gas values shall be listed and AGA 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 ~~1998~~ *2001* CMC Chapter 13.
    - Copper gas lines not allowed.
- **Ducts and Sealants**
  - Materials shall be in conformance with the "Catastrophic Duct Leaks and Disconnections" component of WIS Section 3.



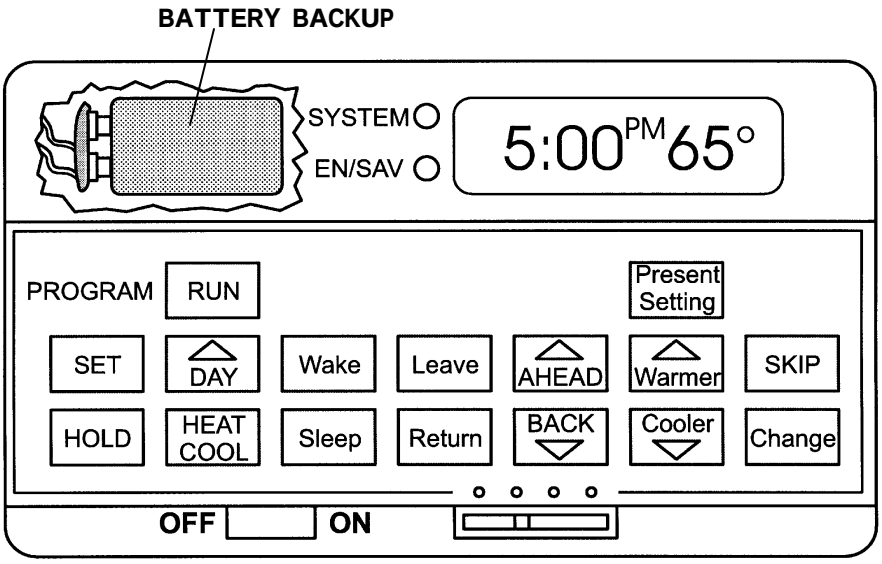
1. APPROVED MATERIALS (continued)

Programmable Wall Thermostat

- *ENERGY STAR® qualified.*
- System powered, not battery powered, on 24 volt systems.
- Digital with anti-short-cycle feature.
- Minimum setback capability of 10°F.
- At least two setback periods per 24 hour day, with change cycle increments being no greater than 30 minutes.
- Manual override and standard alkaline battery backup or other program saving backup system.
- Positive on/off switch that is easily accessible.
- Compatible with the HVAC equipment.

Standard Wall Thermostat

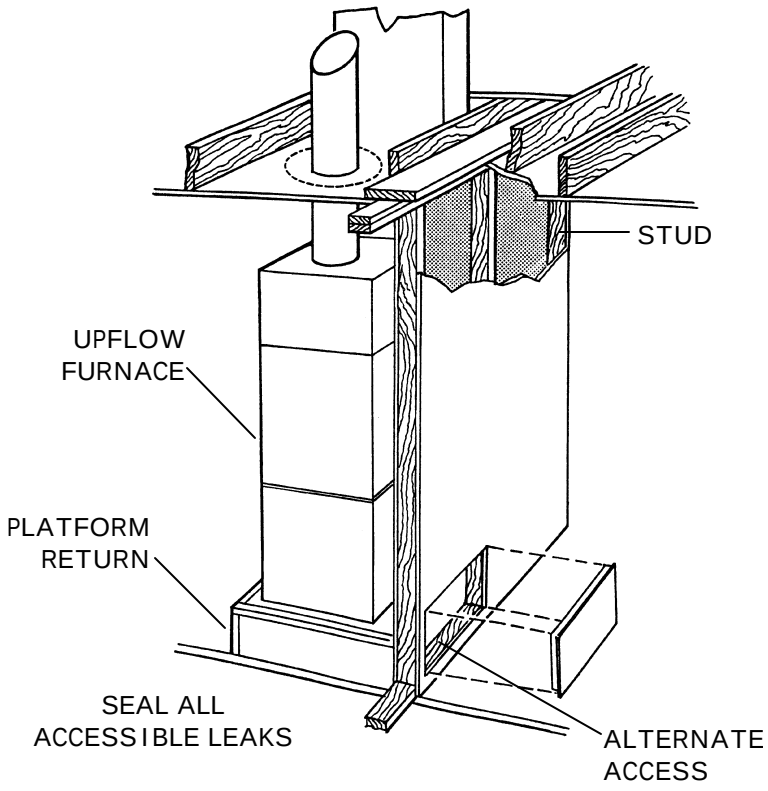
- Alternative when customer refuses programmable thermostat.
- Digital with built in anti-short-cycle feature.
- Conforms with manufacturer's instructions.
- Compatible with the HVAC equipment.
- Includes a positive on/off switch.



DIGITAL PROGRAMMABLE THERMOSTAT WITH ON/OFF SWITCH

8. FAU, PLENUMS, AND DUCTS

- **Return Air Plenum**
  - Plenum shall be free of leaks which:
    - Affect combustion air.
    - Draw in outside air (except economizer units).
- **Platform Returns**
  - Platform cavity shall be sealed to prevent infiltration from unconditioned space and furnace enclosure.
  - Platform bypasses shall be blocked/sealed with a liner of fiberglass duct board~~,~~ *or* sheet metal ~~or drywall~~.
  - *Uninsulated* platform*s* shall be insulated ~~externally *internally* with flexible insulation, or lined*/sealed* with fiberglass duct board.~~*by:*
    - *Filling stud cavities inside the plenum with flexible insulation, when lining/sealing with sheet metal, or*
    - *Installing fiberglass duct board to both line/seal and insulate the plenum.*
  - Platform return accessed by swinging appliance enclosure door:
    - Door-mounted grille shall not interfere with proper closure of the door.
    - Return shall be isolated from furnace enclosure (e.g., with weatherstripping).
- **Cabinet and Plenum**
  - Components shall be mechanically attached and sealed around the perimeter (e.g., cabinet-to-platform, cabinet-to-plenum).
  - Wiring and plumbing penetrations into the return air chamber shall be sealed with cork tape.



8. FAU, PLENUMS, AND DUCTS (continued)

- **Ducts and Sealants**
  - *Duct* repairs and sealing ~~of disconnections and catastrophic leaks~~ shall be made in accordance with ~~the "Catastrophic Duct Leaks and Disconnections" component of~~ WIS Section ~~3~~*20, Duct Sealing Standards*.

9. FLUE AND VENT SYSTEMS

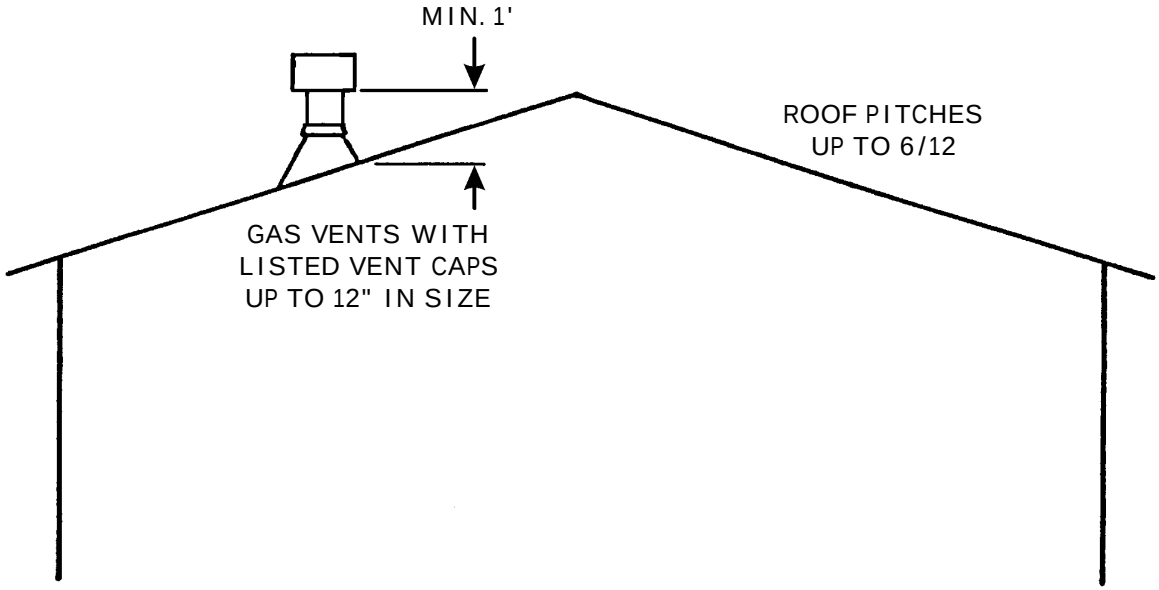
- **All Furnaces**
  - New vent/flue system shall be installed and secured in conformance with manufacturer's instructions and local code.
  - Reference Standard: CMC Chapter 8.

10. ELECTRICAL WIRING

- **All wiring shall be in conformance with local code.**
- **Air conditioning equipment shall be installed as prescribed in Part 5.**

11. WALL THERMOSTATS

- **When required ~~by the Program Policy and Procedures~~, a programmable thermostat shall be installed as prescribed in Part 6.**

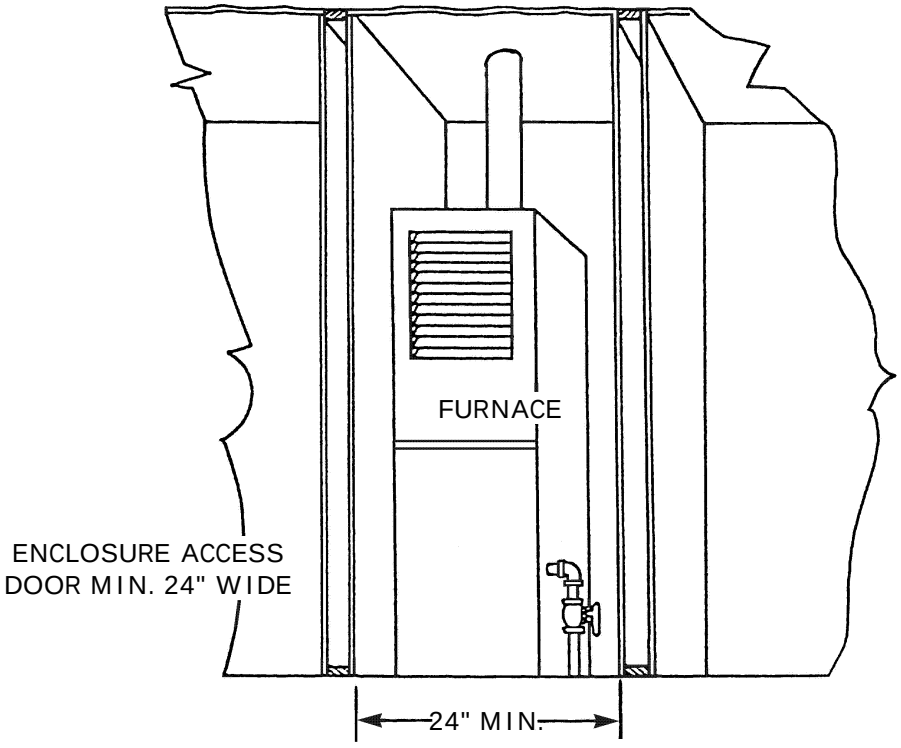


13. ACCESS AND SERVICE SPACE

- **All installations**
  - Access and service space shall be provided in accordance with local code (reference standard: ~~1998~~ *2001* CMC, Section ~~307~~*305*).
- **Equipment in Enclosures**
  - Access door shall be:
    - At least 24" wide if installed.
    - Wide enough to remove the appliance.
    - High enough to accommodate removal of the appliance.
- **Equipment Under Floors *and on Roofs***
  - ~~.~~Access shall be provided in accordance with local code. ~~(reference standard: 1998 CMC Article 307.4).~~

~~**Equipment On Roofs**~~

- ~~Access shall be provided in accordance with local code (reference standard: 1998 CMC, Article 307.5).~~



16. ~~CATASTROPHIC~~ DUCT *TESTING AND SEALING* ~~LEAKS~~

~~-~~Duct system shall be *examined* ~~checked~~ for ~~catastrophic~~ leaks and disconnections *and brought into conformance with Title 24 requirements, in accordance with the program Policy and Procedures*.

~~-~~Testing shall be performed in accordance with WIS Section 10, Duct Testing Standards, and **repairs *and sealing* shall be made in accordance with ~~the "Catastrophic Duct Leaks and Disconnections" component of~~ WIS Section ~~3~~*20, Duct Sealing Standards*.**

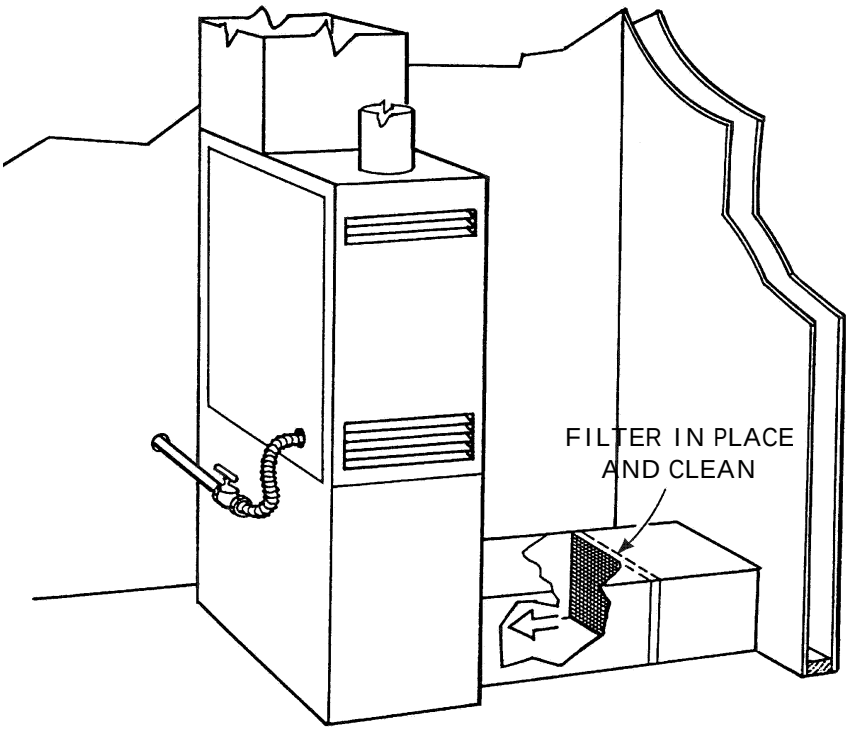
~~-Closures shall be in compliance with CEC Title 24 standards.~~

~~· Pressure sensitive tapes shall be UL 181A and 181B listed and marked.~~

~~· Duct mastic shall be UL 181A and 181B listed and labeled.~~

17. FURNACE FILTERS

- **All filters shall be properly installed and clean.**
- **Unframed filters shall be properly supported to prevent being drawn toward the air handler, as prescribed in Part 7.**



31. BURNERS

- **The furnace shall be checked for evidence of combustion problems, such as the following, and necessary corrections shall be made.**

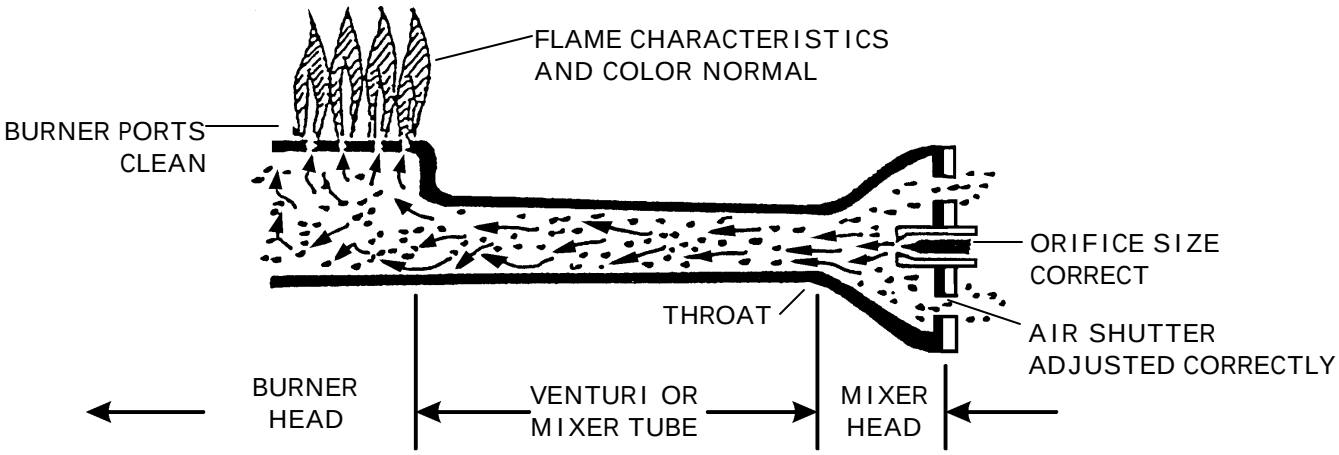
Burner Performance

- *When the burner(s) ignite, checks shall be made for:*
  Delayed ignition.
  Excessive roll-out.
- *Burner(s) shall be examined for flame abnormalities, including:*
  Large yellow flame (more than 50% yellow).
  Soft lazy flame or smothering flame.

- ***Carbon and Rust***
  - *The top of the burner(s), the heat exchanger, draft hood and flue/vent pipe shall be examined for excessive amounts of carbon or rust.*

~~· Presence of excessive soot or rust.~~
~~· Abnormal flame impingement and/or odor of aldehydes.~~
~~· Large yellow flame, soft lazy flame, or other abnormality.~~
~~· Delayed ignition, or rollout ignition.~~

- **Burners and Venturies**
  - Shall be clean, and ports shall be unobstructed.
  - Burners shall be correctly aligned/positioned.
- **Burner Operation**
  - Air shutters shall be clean and adjusted for correct air/gas mixture.
  - Gas pressure shall comply with manufacturer's specifications.
  - Burner shall not be under- or over-fired.
- **Carbon Monoxide**
  - CO in flue gas shall be within limits specified by:
    - Manufacturer's instructions, and
    - ~~The~~ LIEE ~~Policies & Procedures~~*WIS Section 29, NGAT*.



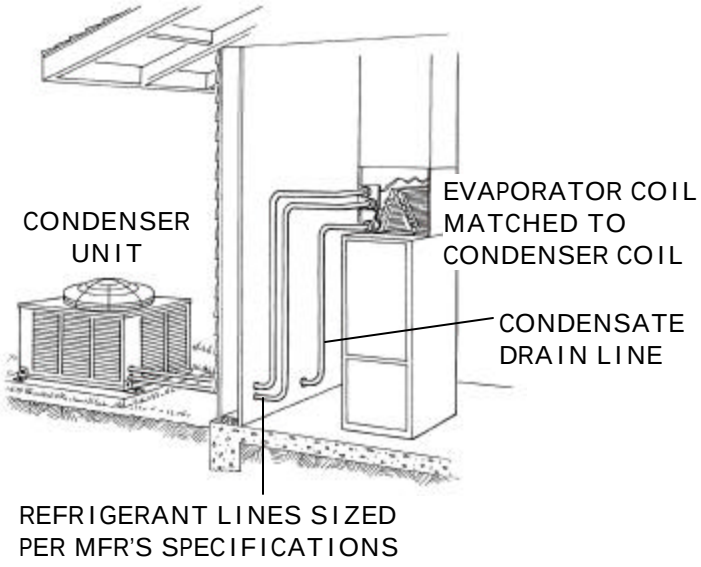
PART 5: NEW AIR CONDITIONER INSTALLATION WHEN COMBINED HEATING AND AIR CONDITIONING SYSTEM IS REPLACED

32. SIZING CRITERIA

- **System Size**
  - Unit shall be ~~properly~~ sized ~~by the Contractor in accordance with ACCA Manual J and Manual S procedures~~*~~to the duct system (must have adequate airflow)~~ in accordance with Title 24 or local code, whichever is more stringent*.
  - ~~*Exception:*~~ The tonnage of the new system should ~~never~~ be *equal to or smaller* ~~larger~~ than the existing system.
- **Refrigerant Lines**
  - Shall be properly sized per manufacturer's specifications.
  - Shall provide the rated EER for the combination condenser and evaporator coil match.

33. EVAPORATOR (INDOOR) COIL AND CONDENSER (OUTDOOR) COIL

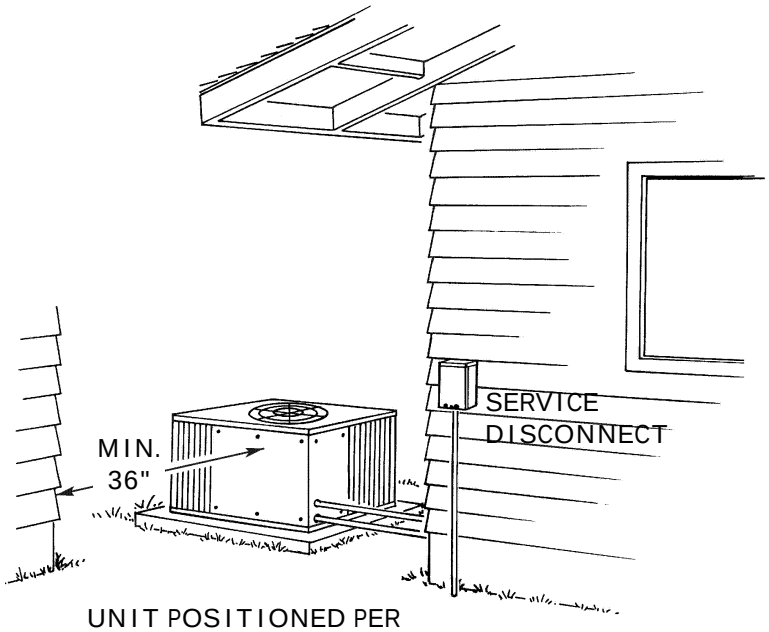
- **Split Systems**
  - An evaporator coil shall be installed which is verified to be a rated match with the condenser unit, as listed in current ARI Directory.
  - The coil label shall be visible.
  - Condenser coil and evaporator coil shall be verified to function properly.
  - An access panel shall be provided for cleaning.
- **Evaporator Coil Replacement**
  - Prior to charging, vacuum shall be drawn on the refrigerant lines to test for leaks and remove water vapor.
  - Depth of vacuum and length of time shall be as specified by the manufacturer.



35. ELECTRICAL ACCESSIBILITY AND GROUNDING

- **All Equipment Installations**
  - Access and working space shall be provided in conformance with CEC Section 110-16 and local code.
- **Open Space for Panels and Equipment**
  - An open space shall be provided around electrical panels and equipment requiring servicing, which shall be minimum 30" wide by 36" deep or as specified by local jurisdiction.
- **Accessibility for Equipment**
  - The air-conditioning equipment shall be accessible for inspection, service, repair and replacement without removing permanent construction (per CMC Section 1106.3).
  - Minimum clearance between air-conditioning equipment and the adjacent structure/wall/obstruction shall be:
    - 36" on side(s) containing service access panels, and
    - 12" on all other sides, or
    - As specified by manufacturer and local jurisdiction.

    Exception: Other clearances allowed when variance is granted by building department.



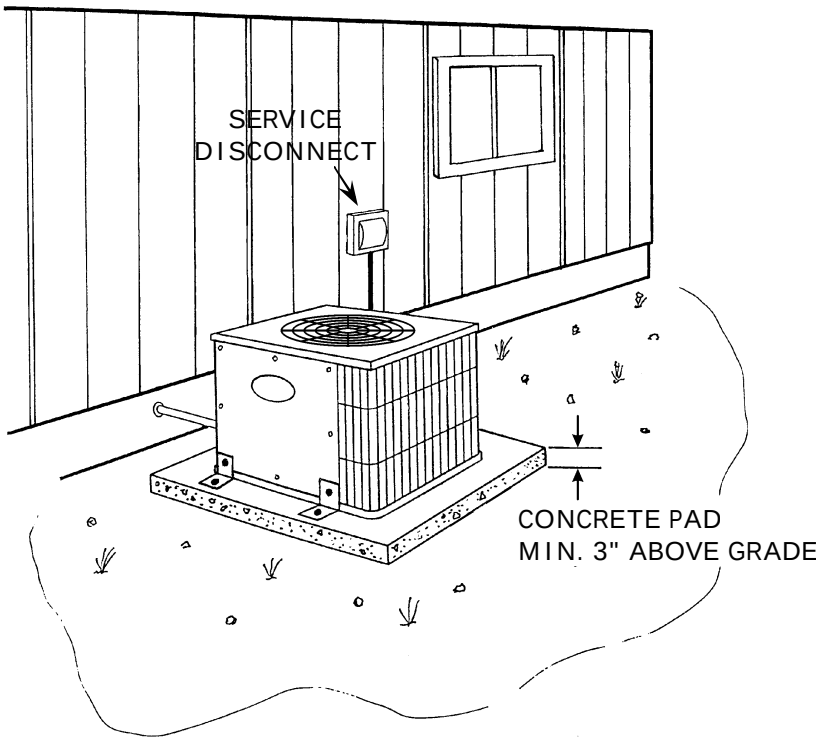
UNIT POSITIONED PER
MFR'S INSTRUCTIONS & LOCAL CODE

39. MOUNTING OF EQUIPMENT (continued)

- **Ground Mount**
  - Air-conditioning equipment shall be installed in conformance with CMC Section 1504.
  - The unit shall rest on concrete or other approved base extending at least 3" above the adjoining ground level.
- **Protection**
  - Units subject to mechanical damage shall be protected in conformance with CMC Section 508.
  - Unit shall be attached to base with seismic straps*, when required by local code*.
- **Overhead Clearance**
  - Overhead clearance shall be provided in conformance with manufacturer's specifications and local code.

40. PACKAGE UNIT FUEL-GAS PIPING

- **Gas lines, fittings, and valves shall be in conformance with Item 12.**



NATURAL GAS WALL AND FLOOR FURNACE REPAIR AND REPLACEMENT STANDARDS

NEW INSTALLATION

1. MATERIALS

- **All Furnaces shall:**
  - Be UL listed and GAMA certified.
  - Be the most efficient model feasible to install, but no lower in efficiency than specified below.
- **Wall Furnaces**
  - Minimum Efficiencies for Fan Type Wall Furnaces
    - 73% AFUE for ~~inputs~~ *output capacities* up to 42,000 Btu/hr.
    - 74% AFUE for ~~inputs~~ *output capacities* over 42,000 Btu/hr.
  - Minimum Efficiencies for Gravity Type Wall Furnaces
    - 62% AFUE for ~~inputs~~ *output capacities* 15,001 - 19,000 Btu/hr.
    - 63% AFUE for ~~inputs~~ *output capacities* 19,001 - 27,000 Btu/hr.
    - 64% AFUE for ~~inputs~~ *output capacities* 27,001 - 46,000 Btu/hr.
    - 65% AFUE for ~~inputs~~ *output capacities* over 46,000 Btu/hr.
- **Floor Furnaces**
  - Minimum Efficiencies for Floor Furnaces
    - 56% AFUE for ~~inputs~~ *output capacities* up to 37,000 Btu/hr.
    - 57% AFUE for ~~inputs~~ *output capacities* over 37,000 Btu/hr.

TABLE 19-1: MINIMUM EFFICIENCIES OF REPLACEMENT FURNACES

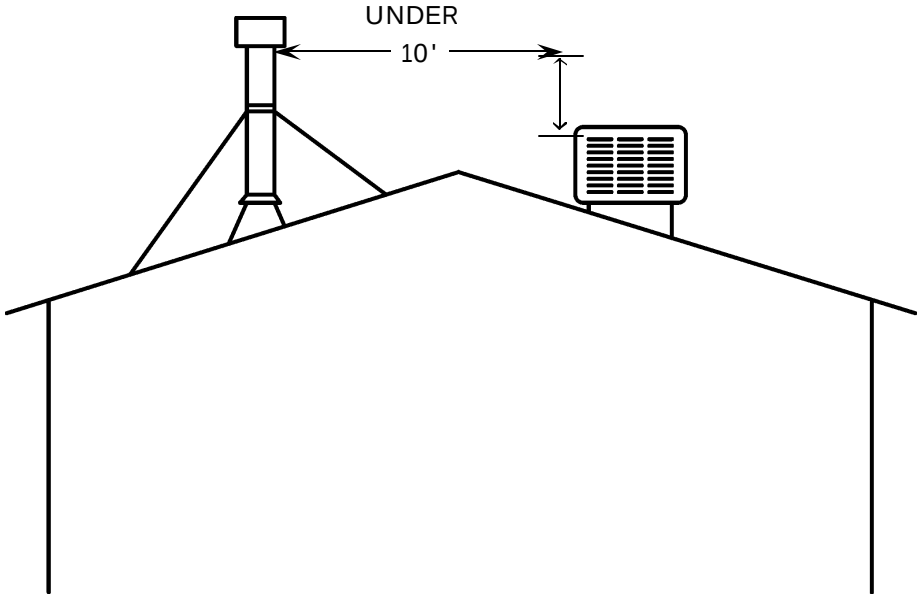
FURNACE TYPE	BTU/HR. ~~INPUT~~ *OUTPUT* ~~RATING~~ CAPACITY	MINIMUM ~~EFFICIENCY~~ AFUE (%)
WALL WITH FAN	• up to 42,000 • over 42,000	• 73% • 74%
WALL WITHOUT FAN	• 15,001 - 19,000 • 19,001 - 27,000 • 27,001 - 46,000 • over 46,000	• 62% • 63% • 64% • 65%
FLOOR	• up to 37,000 • over 37,000	• 56% • 57%

11. FLUE AND VENT SYSTEMS

- **Installation**
  - New flue/vent system shall be installed and secured in conformance with the manufacturer's instructions and local code.
- **Termination**
  - New flue/vent system termination shall be in conformance with the manufacturer's instructions and local code.
  - Flue/vent pipes within 10' of an evaporative cooler shall terminate at least 3' above the cooler.
  - Reference standards:
    - CMC Chapter 8, Section 806.0.
    - *LIEE WIS, Section 29, NGAT.*

12. ACCESS AND SERVICE SPACE

- **All Installations**
  - Access and service space shall be provided in accordance with CMC Section 305.
- **Floor Furnace**
  - Control valve operation must be accessible from inside the residence.
  - Pilot light must be accessible for lighting from inside the residence.



24. BURNERS

- **The furnace shall be checked for evidence of combustion problems, such as the following, and necessary corrections shall be made.**
  - Presence of excessive soot or rust.
  - Abnormal flame impingement and/or odor of aldehydes.
  - Large yellow flame, soft lazy flame, or other abnormality.
  - Delayed ignition, or rollout ignition.
- ***Burner Performance***
  - *When the burner(s) ignite, checks shall be made for:*
    Delayed ignition.
    Excessive roll-out.
  - *Burner(s) shall be examined for flame abnormalities, including:*
    Large yellow flame (more than 50% yellow).
    Soft lazy flame or smothering flame.
- ***Carbon and Rust***
  - *The top of the burner(s), the heat exchanger, draft hood and flue/vent pipe shall be examined for excessive amounts of carbon or rust.*
  - *Presence of excessive soot or rust.*
  - *Abnormal flame impingement and/or odor of aldehydes.*
  - *Large yellow flame, soft lazy flame, or other abnormality.*
  - *Delayed ignition, or rollout ignition.*
- **Burners and ~~venturis~~*ventures* shall be clean, and ports shall be unobstructed.**
- **Burners shall be correctly aligned/positioned.**
- **Burner Operation**
  - Air shutters shall be clean and adjusted for correct air/gas mixture.
  - Gas pressure shall comply with manufacturer's specifications.
  - Burner shall not be under- or over-fired.
- **Carbon Monoxide**
  - CO in flue gas shall be within limits specified by:
    - Manufacturer's instructions, and
    - *LIEE WIS Section 29, NGAT.*
    - ~~The LIEE Policies & Procedures, Table 5: "Recommended Minimum Standard for Gas Appliance Testing~~*Section 10.*

25. APPLIANCE DRAFT

- *Open Combustion Natural Draft Furnaces*
  - *Drafting shall be checked and verified to be acceptable, utilizing a Visual/Smoke Draft Test in accordance with WIS Section 29, NGAT.*

~~25. DRAFT AND SPILLAGE TESTS~~

~~- Drafting Evaluation on *Open* Combustion Furnaces~~

- ~~Draft shall be evaluated using at least one of the following methods:~~
  - ~~A Mechanized Draft Test, using a draft gauge, manometer, or other pressure-sensing instrument to measure pressure inside the vent connector.~~
  - ~~A Visual Draft Test, using smoke applied along the entire top edge of the draft hood opening.~~
- ~~Mechanized Draft Test~~
  - ~~Applies to floor furnaces with single-wall metal vent connector or vent pipe.~~
  - ~~Negative pressure inside the vent connector/pipe shall be within furnace manufacturer's specification.~~
  - ~~When manufacturer's instructions are not available, minimum pressures shown in the table below shall apply.~~
- ~~Visual Draft Test~~
  - ~~Draft is adequate *only if* smoke is drawn inward along the entire draft hood opening.~~

~~- Tactile Spillage Test~~

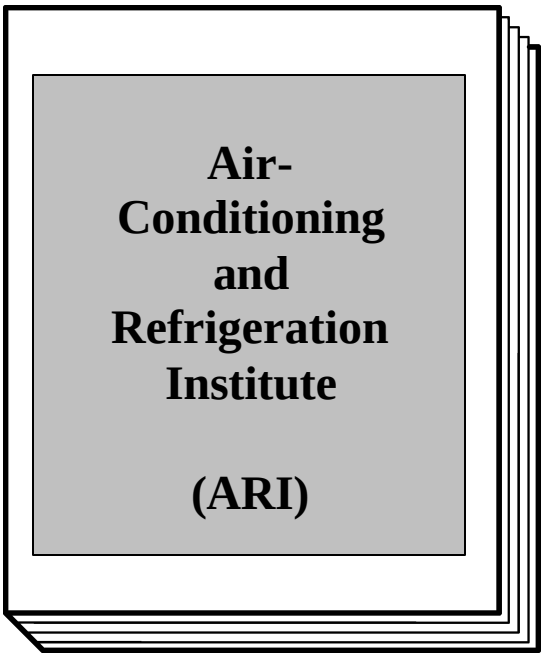
- ~~A check for spillage shall be performed along the entire draft hood opening of Natural Draft units.~~
- ~~Hazardous spillage shall not be present.~~

~~OPEN COMBUSTION APPLIANCES~~ ~~DRAFT IS ADEQUATE WHEN NEGATIVE PRESSURE INSIDE THE VENT CONNECTOR/FLUE EQUALS OR EXCEEDS THE VALUES BELOW.~~		
~~OUTDOOR TEMPERATURE~~	~~PA MINIMUM DRAFT~~	~~IWC MINIMUM DRAFT~~
~~Below 30 °F~~	~~-5.0 Pa~~	~~-0.02 IWC~~
~~30 °F to 80 °F~~	~~-2.5 Pa~~	~~-0.01 IWC~~
~~Above 80 F°~~	~~-1.25 Pa~~	~~-0.005 IWC~~

CENTRAL HIGH EFFICIENCY AIR CONDITIONER REPLACEMENT STANDARDS

1. APPROVED MATERIALS

- **All Units**
  - All materials shall be in conformance with the CBC and CMC.
  - Replacement air conditioning systems shall be rated by the Air-Conditioning and Refrigeration Institute (ARI).
  - Programmable thermostat shall be selected and installed as prescribed in Section 23.
- **Package Units (Dual Packs)**
  - Minimum SEER of 13 ~~or~~ *and* EER of 11.5.
- **Split Systems**
  - Minimum SEER of 13 ~~or~~ *and* EER of 11.5 with a Thermostatic Expansion Valve (TXV).
  - The EER shall be determined by the coil match as listed in the current ARI Directory.



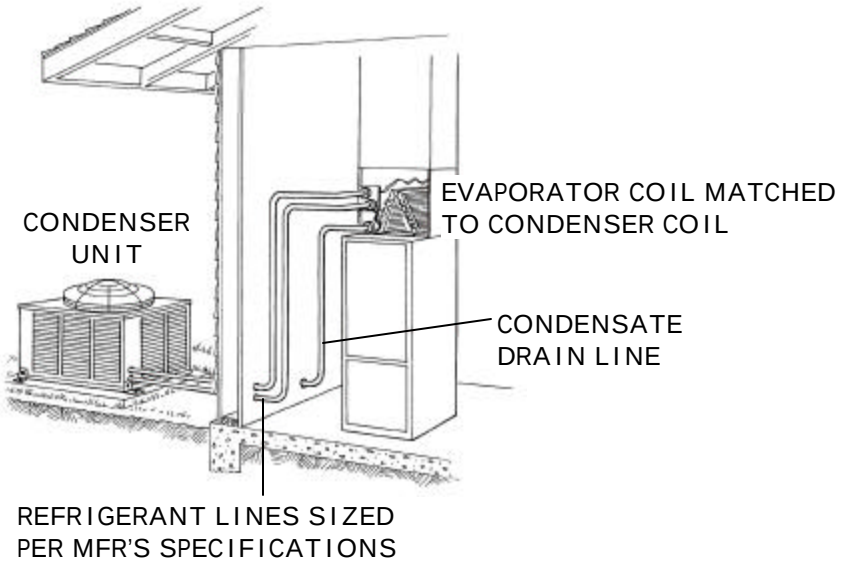
4. SIZING CRITERIA

- **System Size**
  - Unit shall be ~~properly~~ sized ~~to duct system (must have adequate airflow)~~ *in accordance with Title 24 or local code, whichever is more stringent*.
  - The tonnage of the new system should be equal to or smaller than the existing system.
- **Refrigerant Lines**
  - Shall be properly sized per manufacturer's specifications.
  - Shall provide the rated EER for the combination condenser and evaporator coil match.

~~•Replacement of refrigerant line set is beyond the scope of this program.~~

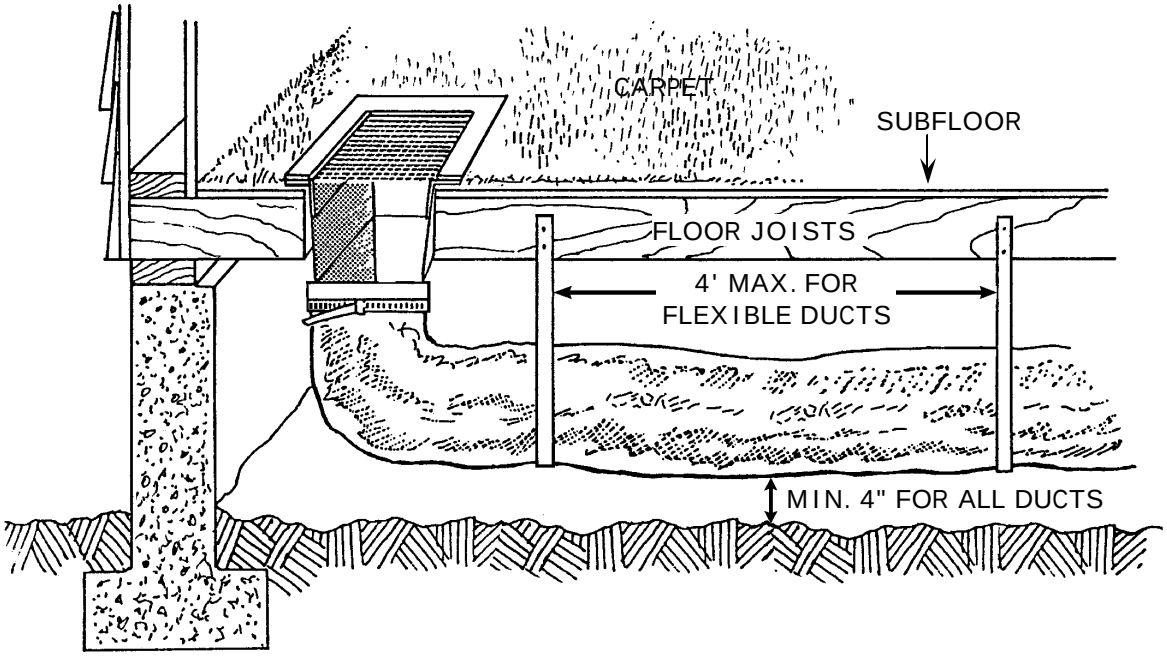
5. EVAPORATOR (INDOOR) COIL AND CONDENSER (OUTDOOR) COIL

- **Split Systems**
  - An evaporator coil shall be installed which is verified to be a rated match with the condenser unit, as listed in current ARI Directory.
  - The coil label shall be visible.
  - Condenser coil and evaporator coil shall be verified to function properly.
  - An access panel shall be provided for cleaning.
- **Evaporator Coil Replacement**
  - Prior to charging, vacuum shall be drawn on the refrigerant lines to test for leaks and remove water vapor.
  - Depth of vacuum and length of time shall be as specified by the manufacturer.



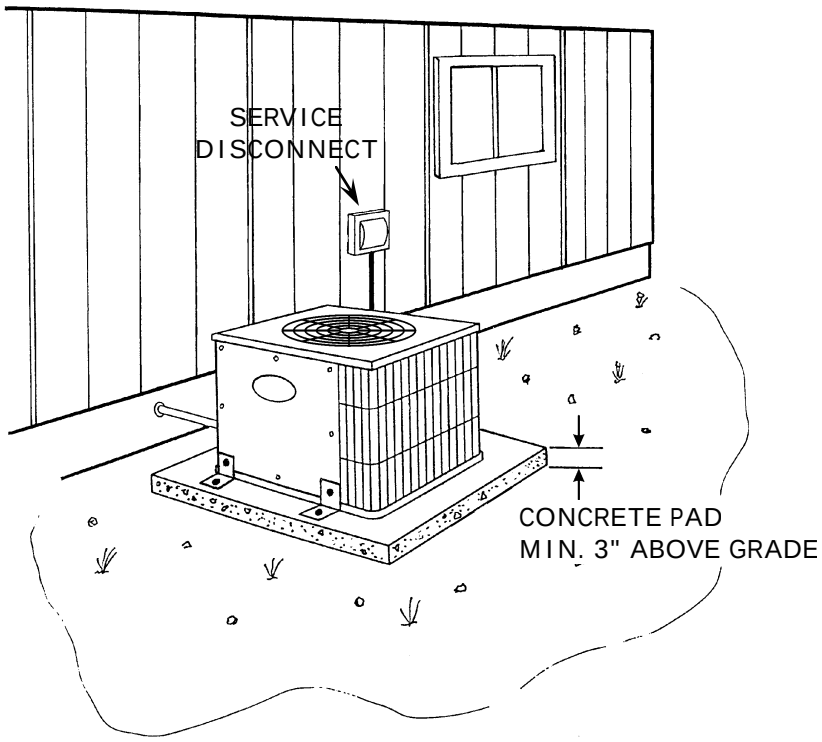
7. AIR DISTRIBUTION SYSTEM

- **All Units**
  - Distribution system shall be in conformance with HVAC manufacturer's specifications.
- **Retrofit Units Utilizing Existing Duct System**
  - Duct system shall be examined for ~~catastrophic~~ leaks ~~(e.g., partial~~ and ~~complete~~ disconnections~~)~~ *and brought into conformance with Title 24 requirements, in accordance with the program Policy and Procedures*.
  - *Testing shall be performed in accordance with WIS Section 10, Duct Testing Standards, and repairs and sealing shall be made in accordance with WIS Section 20, Duct Sealing Standards.*
  - The supply and return plenums shall be securely attached to the air handler.
  - The supply and return ductwork shall be securely attached to the respective plenums.
- **New Ductwork**
  - The new duct system shall be installed in conformance with manufacturer's instructions.



12. MOUNTING OF EQUIPMENT (continued)

- **Ground Mount**
  - Air-conditioning equipment shall be installed in conformance with CMC Section 1106.0.
  - The unit shall rest on concrete or other approved base extending at least 3" above the adjoining ground level~~, per CMC Section 1106.2~~.
- **Protection**
  - Units subject to mechanical damage shall be protected in conformance with CMC Section 308.
  - Unit shall be attached to base with seismic straps, when required by local code.
- **Overhead Clearance**
  - Overhead clearance shall be provided in conformance with manufacturer's specifications and local code.



NATURAL GAS WATER HEATER REPLACEMENT STANDARDS

1. MATERIALS

- **Water Heaters**
  - Natural gas-fueled storage *or instantaneous (tankless)* type.
  - Minimum Energy Factor (EF) ~~of 0.60, and~~*shall be in* compliance with Title 24 energy efficiency requirements*, per Table 25-1*.
  - Listed and labeled in conformance with local code.
  - Manufactured to ANSI Z21.10.1 or ANSI Z21.10.3.
- **Vent Systems**
  - UL listed vent connectors, components, and Type B vent pipes.
  - Nonmetallic systems shall conform to ASTM D 1785 and D 2665.
- **Gas Piping and Valves**
  - Gas valves shall be listed (e.g., by UL) 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 ~~1998~~ *2001* CMC Chapter 13.
  - Copper gas lines and butt-soldered joints not allowed.

2. WARRANTY

- **Minimum five (5) year written manufacturer's warranty.**
- **Minimum one (1) year written labor and parts warranty.**

TABLE 25-1: MINIMUM ENERGY FACTOR

WATER HEATER TYPE	*VOLUME (GALLONS)*	*MINIMUM EF*
Gas Storage	*30*	*0.61*
	40	*0.59*
	50	*0.58*
Gas Instantaneous	*—*	*0.62*

3. GENERAL REQUIREMENTS

- **A permit for the installation shall be obtained from and finalized by the local authority having jurisdiction.**
- **Installation shall be in conformance with:**
  - Product listing.
  - Manufacturer's instructions and specifications.
  - The California Electrical Code (CEC), the California Plumbing Code (CPC), and Local code.
- **Orifice shall be verified to be sized for natural gas.**

4. WATER HEATER SIZING

- **Replacement water heater capacity, the First Hour Rating, shall comply with the greater of:**
  - Manufacturer's sizing recommendations, or
  - Local code requirements, and
  - *Storage units s*hall be no less than the 2000 Uniform Plumbing Code (UPC) minimum guidelines, as shown in the table below.

5. LOCATION

- **All Units**
  - Clearances shall be in compliance with listing requirements, manufacturer's instructions, the UPC, and local code.
- **Units in Enclosures**
  - Access door shall be at least 24" wide, and high enough to accommodate removal of the appliance.

MINIMUM CAPACITY FOR WATER HEATERS
FIRST HOUR RATING TABLE
BASED ON THE
2000 UNIFORM PLUMBING CODE (UPC) TABLE 5-1

Number of Bathrooms	1 to 1.5			2 to 2.5				3 to 3.5			
Number of Bedrooms	1	2	3	2	3	4	5	3	4	5	6
First Hour Rating*	42	54	54	54	67	67	80	67	80	80	80

***First Hour Rating, the water heating capacity expressed in gallons, is the amount of hot water the heater can supply per hour (starting with a tank full of hot water). The First Hour Rating is shown on the yellow EnergyGuide label.**

7. PLUMBING

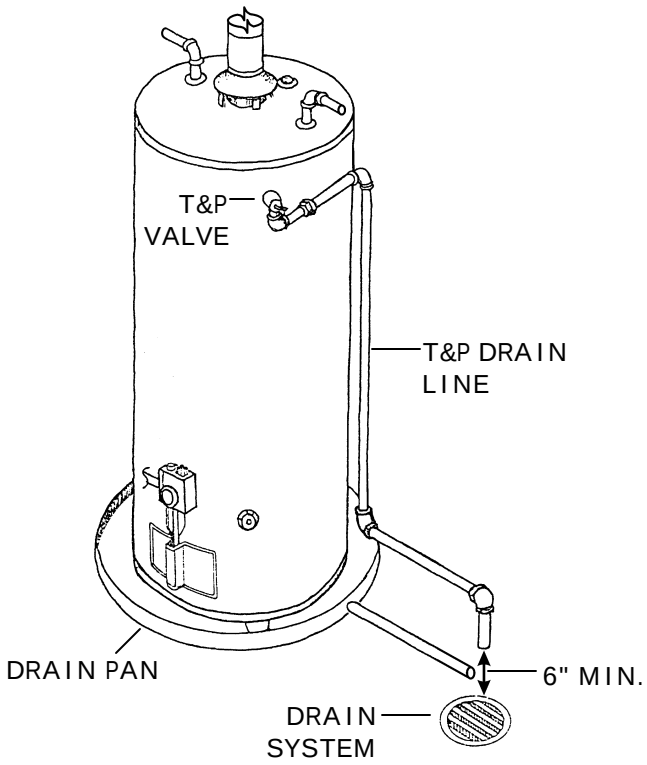
- All Units

- Only new parts shall be installed.
- Threaded fittings shall be sealed with Teflon® tape or nontoxic pipe joint compound.
- A cold water supply shutoff valve shall be installed if not present.
- Flexible connectors shall be used to connect the tank to the rigid hot and cold water lines.
- Dielectric insulators shall be installed on water piping connections to the tank when required by local code.

8. DRAIN PAN

- Storage Units

- A watertight pan of corrosion resistant material shall be installed when the water heater is located in:
  - An attic or on a floor-ceiling assembly, or
  - Other location for which a pan is required by local code.
- A minimum 3/4" diameter drain line from the pan shall be installed with a continuous downward slope to the exterior, or to a drain system, in accordance with local code.
- Drain pan shall <u>not</u> inhibit proper combustion air flow.



9. TEMPERATURE AND PRESSURE ~~(T&P)~~ RELIEF ~~VALVE~~

- **A *Temperature and pressure (*T&P*)* relief valve*, or a gas shutoff valve ~~(e.g., a "Watts 210" valve)~~ and pressure-relief valve,* shall be installed ~~in the tank~~ in conformance with the water heater manufacturer's instructions *and local code*.**
- **The T&P relief *and gas shutoff* valve shall:**

  Be listed and manufactured to ANSI Z21.22.

  Meet the sizing/pressure requirements of the water heater listing.
- **T&P Relief Valve Drain Line**

  Line shall be galvanized steel, hard drawn copper, or CVPC.

  Internal diameter of the line and fittings shall equal or exceed diameter of the relief valve outlet.

  The line shall drain fully by gravity and shall not be trapped.

  Drain line shall terminate outside the building, or in an approved drain system, with the terminal end:
  - No more than 24", nor less than 6", above the surface, and
  - Unthreaded and pointing downward.

10. SEISMIC BRACING

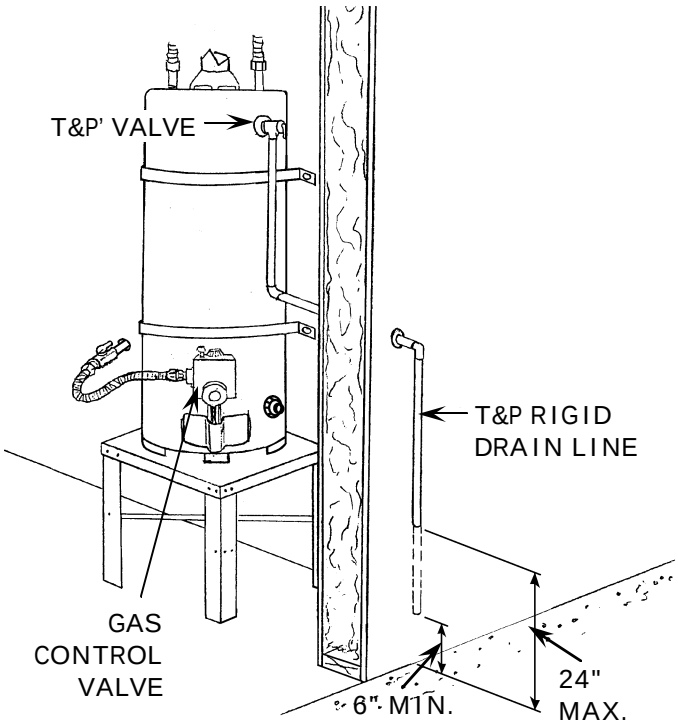
- **The tank shall be braced (strapped or anchored) to resist horizontal movement during an earth-quake.**
- **Bracing shall be:**

  Installed per manufacturer's instructions and local code.

  Securely attached to structural framing or ledger board.
- **Strap Locations**

  Two straps shall be installed: one within the upper third of the tank, and one within the lower third of the tank.

  The lower strap shall be at least 4" above the gas control valve.



11. GAS LINES, FITTINGS AND VALVES

- All Units

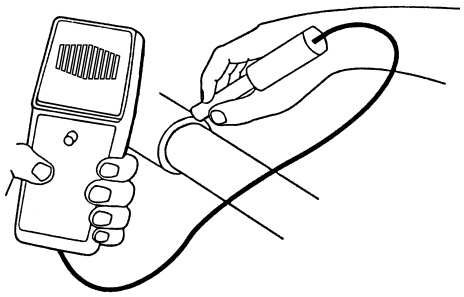
- All gas lines, flexible gas connectors, fittings and valves shall be installed per manufacturer's instructions and local code.
- Manual gas shutoff valve shall be within 6' of the appliance and in the same room where the appliance is located.
- A flexible gas connector shall be located between the gas control valve and shutoff valve.
- Readily-accessible sediment trap (drip leg) shall be located just ahead of flexible gas connector when required by local code.
- All new and affected gas lines, flexible gas connectors, fittings, and valves shall be checked for gas leaks using a method approved by the local jurisdiction.

12. COMBUSTION AIR

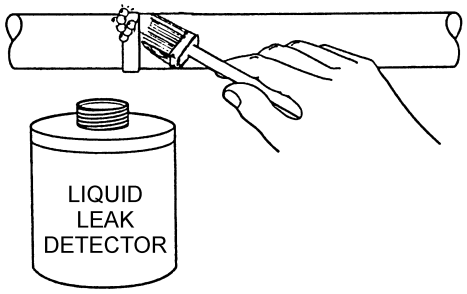
- All Units

- Combustion air shall be supplied in conformance with manufacturer's instructions and local code.
- Obstructions in existing combustion air vents (e.g., overblown insulation) shall be cleared as needed to provide required NFVA.

ELECTRONIC LEAK DETECTOR



LIQUID LEAK DETECTION METHOD



GAS LINE FITTINGS, VALVES, AND
CONNECTORS CHECKED FOR GAS LEAKS

13. VENT SYSTEM

- **All Systems**
  - Appliance venting shall be in conformance with manufacturer's instructions, ~~1998~~ *2001* CMC Chapter 8, and local code.
  - Vent dampers shall not be used.
  - Horizontal vent connectors shall slope upward a minimum of 1/4" per foot of horizontal length (CMC Article ~~816.5~~*815.3.2.4*).
- **Type B and BW Gas Vents (CMC Article 806.4)**
  - Vents with Listed Vent Caps 12" in Size or Smaller
    - The vent shall terminate above a roof per CMC Table ~~8-A~~ *8-1.* (minimum 1' above for slopes up to 6/12), provided the vent is located at least 8' from a vertical wall or similar obstruction.
    - Vents within 8' of a vertical wall or obstacle must terminate at least 2' above the wall/obstacle.
- **Vent Terminals (CMC Article 806.6 and 806.7)**
  - Vent systems shall terminate the following minimum distances from doors, operable windows and gravity inlets into a building:
    - 1' above, or 4' below, or
    - 4' horizontally from the door/window/inlet.
  - Vent terminations located within 10' of outside-air, makeup-air, and forced-air inlets shall terminate at least 3' above such inlets.