CALIFORNIA CONVENTIONAL HOME WEATHERIZATION INSTALLATION STANDARDS

for use in

California's Low Income Energy Efficiency Programs

administered by

San Diego Gas and Electric Company
Southern California Edison
Southern California Gas Company
Pacific Gas and Electric Company

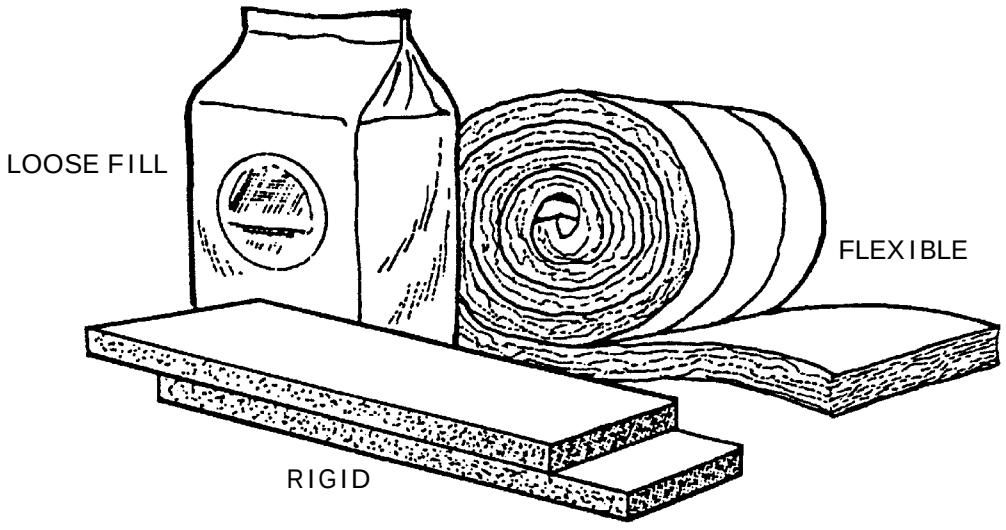
PART 2

SEPTEMBER 15, 2005 –*REVISIONS*– *(WITH EDITS)*

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	

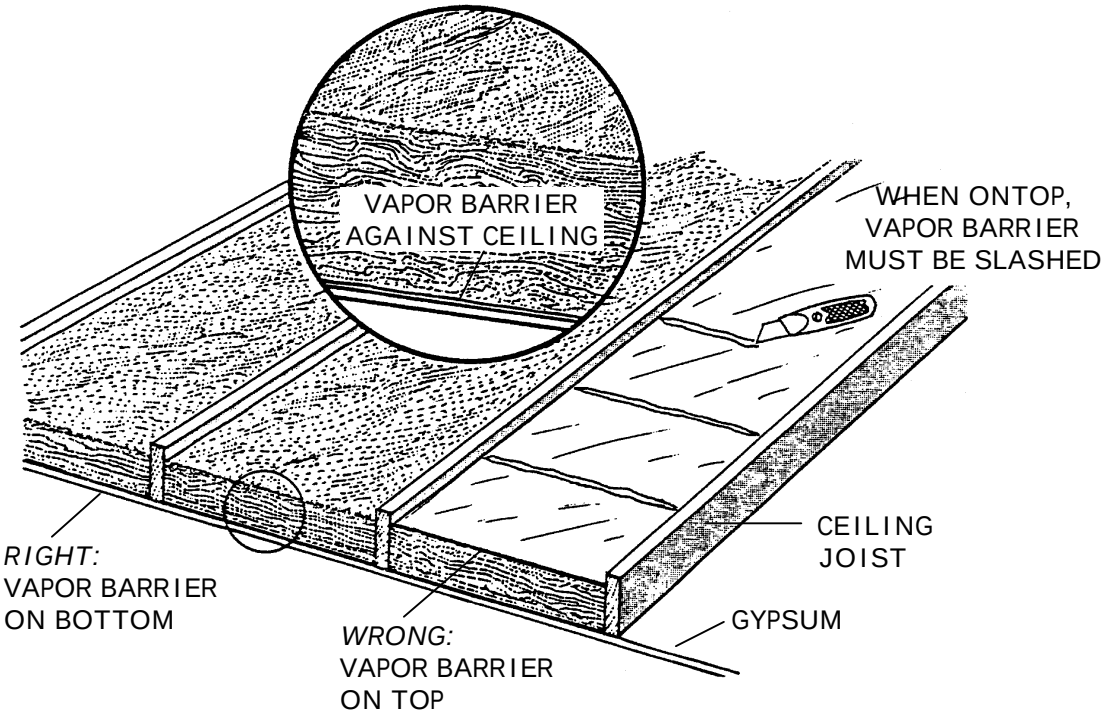
***R-value of existing insulation plus R-value of installed insulation.**

4. STRUCTURAL REQUIREMENTS

- **All Insulation**
  - Ceiling shall be structurally adequate to support weight of installer and installed insulation.
  - Ceiling insulation shall not be installed when roof leaks are present.

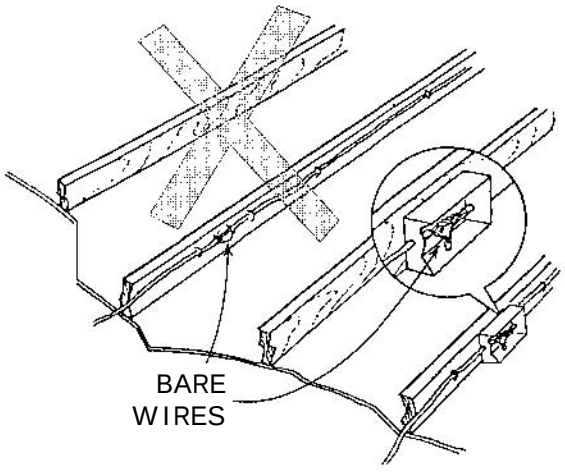
5. VAPOR BARRIER

- **All Insulation**
  - Vapor barrier is required only on flexible mineral fiber.
  - Vapor barrier shall not be installed over existing insulation.
  - When installed, vapor barrier shall be:
    - Placed toward winter warm side (e.g., directly on attic floor).
    - Rated no higher than 1 perm.
  - When existing batts are incorrectly installed with vapor barrier on top (upward):
    - Vapor barrier shall be removed from attic, or
    - Batts shall be turned over to place facing against attic floor, or
    - Vapor barrier shall be slashed entire length of batt or across the width of the batt at 12" intervals.



6. ELECTRICAL WIRING

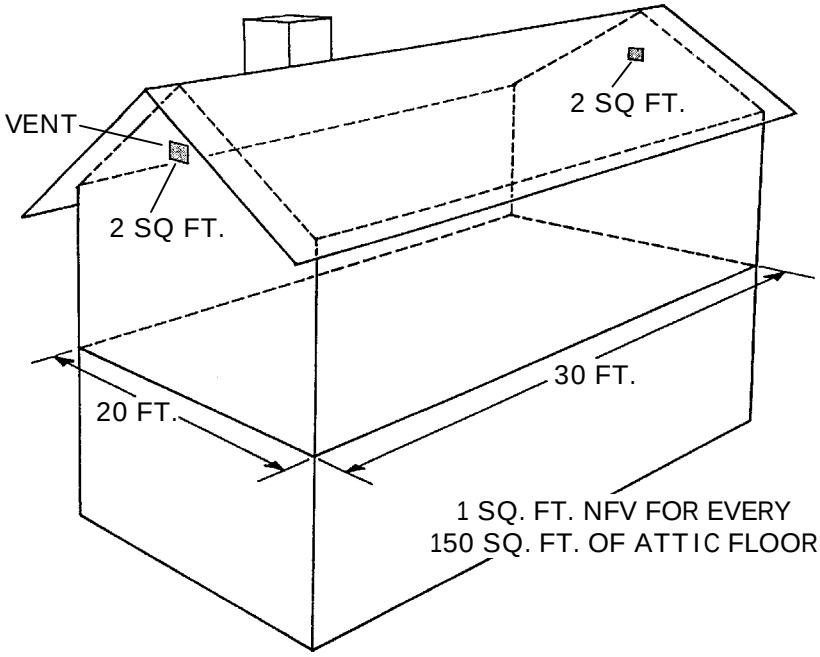
- **All Insulating Materials**
  - Insulation shall not be installed over energized bare wires or wires with frayed or decayed insulation.
- **Loose Fill**
  - Open Junction Boxes
    - Loose fill material shall not cover open junction boxes.
    - Boxes shall be protected with either of the following:
      - Standard cover plates.
      - A minimum 14-1/2" x 12" piece of unfaced batt that covers the box and equals or exceeds height of installed loose fill.
  - Wire Connections Protruding from Junction box
    - Loose fill material shall not cover the wires.
    - Connections shall be protected with either of the following:
      - Box extension and standard cover plate.
      - Mineral fiber blocking which exceeds height of loose fill by 4" and extends away at least 14-1/2" in all directions.
  - Wire Connections Without Junction Box (Spider Web)
    - Wire connections shall not be covered by loose fill material .
    - Connections shall be protected with mineral fiber blocking which exceeds height of loose fill by 4" and extends away at least 14-1/2" in all directions.
  - Knob and Tube Wiring
    - Insulation shall be installed as prescribed in Item 31.



DO NOT INSULATE

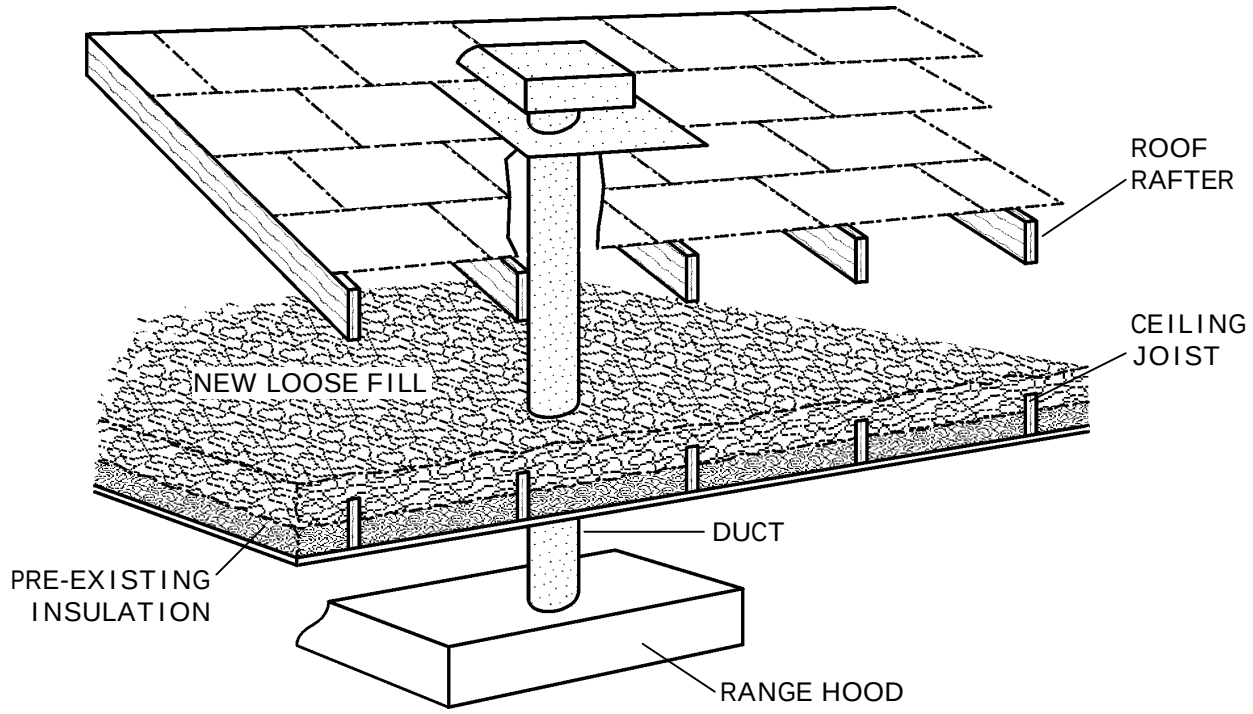
7. VENTING

- **All Insulation**
  - For ceiling insulation to be installed, venting shall comply with program policy or the following criteria.
  - Cross ventilation for each separate space is required.
- **Venting Criteria for Altitudes <u>Up to 3000</u> Feet**
  - 1 sq. ft. of Net Free Venting Area (NFVA) required per 300 sq. ft. of ceiling area.
  - 1 sq. ft. to 600 sq. ft. ratio is acceptable if:
    - Vapor barrier placed toward the winter warm side is present, or
    - 50% of the venting is upper venting (±25%), with upper vents located at least 3' higher than low vents, and low vents are eave or soffit venting.
- **Venting Criteria for Altitudes <u>Over 3000</u> Feet**
  - 1 sq. ft. of Net Free Venting Area (NFVA) required per 150 sq. ft. of ceiling area.
  - 1 sq. ft. to 300 sq. ft. ratio is acceptable if:
    - Vapor barrier placed toward the winter warm side is present, or
    - 50% of the venting is upper venting (±25%), with upper vents located at least 3' higher than low vents, and low vents are eave or soffit venting.



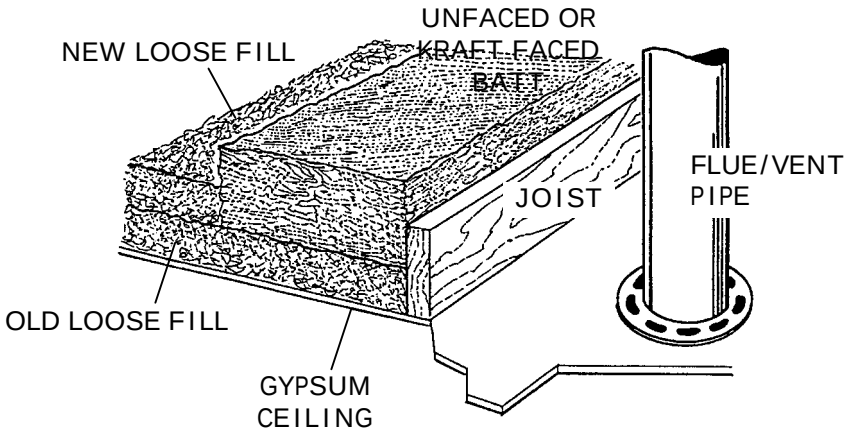
8. KITCHEN AND BATH TYPE EXHAUST SYSTEMS

- **Range hood and bath type exhaust fans shall be blocked per Item 15.**
- **Vent Hose/Duct.**
  - May be covered by loose fill.
  - Shall be unobstructed at its termination (open end).
- **Screened openings shall be blocked per Item 20.**
- **Exhaust Termination**
  - Exhaust systems which terminate in the attic shall be extended to the exterior.
  - The vent pipe shall:
    - Be connected to a roof or wall termination.
    - Have an upward slope (flat run not allowed).
    - Conform to local codes.



9. PERMANENT BLOCKING

- **Blocking Materials**
  - Batts
    - Flexible mineral fiber, kraft faced or unfaced.
  - Metal
    - Corrosion-resistant metal, minimum 0.007" thick.
    - Blocking shall be mechanically attached to ceiling and/or framing (e.g., with staples, nails, or screws).
  - Eave Vent Chutes and Baffles
    - Commercially available plastic chutes and cardboard baffles, or 0.007" metal.
    - Eave chutes and baffles shall not be used to block HPDs.
    - Maximum flame-spread index of 25 and smoke-developed index of 50, per ASTM E84, UL 723, or NFPA 255.
  - Structural Wood
    - Framing members and attached sheathing (e.g., plywood).
- **Blocking for Loose Fill Insulation**
  - A barrier (blocking and/or structural wood) shall extend from the attic floor to the prescribed height above installed loose fill.
  - Blocking height may be achieved with a combination of structural wood and permanent blocking material.
  - Unfaced and kraft faced flexible blocking may rest on top of other insulation, with vapor barrier facing either up or down.
- **Flexible Insulation**
  - No blocking required where loose fill is not present.
  - When flexible is being installed over loose fill, blocking/barrier shall prevent loose fill from entering clearance zone.



9. PERMANENT BLOCKING (continued)

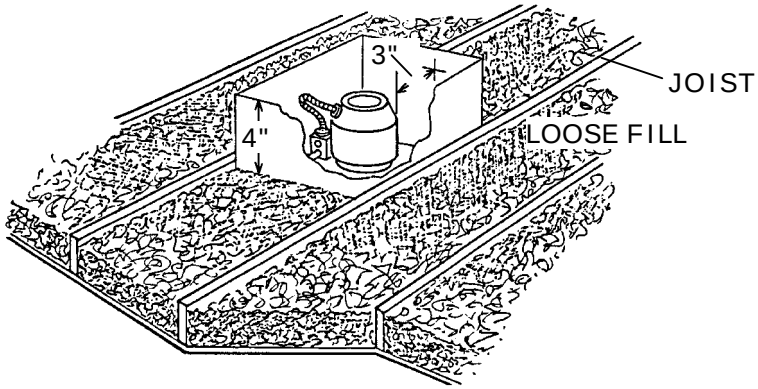
- **Clearance Zone**
  - Clearance zone shall provide a cleared space free of insulation which surrounds a heat producing device, vent, etc.
  - Clearance from blocking to protected item shall be a minimum of 3" but no greater than necessary to provide proper blocking.
  - After insulation has been installed, the clearance zone shall be free of loose fill material.

10. TEMPORARY BLOCKING COVER

- **Loose Fill**
  - A temporary cover may be placed over permanent blocking to prevent accidental "overblow" of loose fill into clearance zone. The cover shall be removed after insulating.

11. RECESSED LIGHTING FIXTURES

- **Loose Fill**
  - 3" clearance zone required around fixture.
  - Noncombustible blocking required.
  - Blocking in conformance with Item 9 shall rest on attic floor and exceed height of loose fill by 4".
  - Metal blocking material must be at least .007" thick.
  - Metal blocking must be permanently attached to ceiling joist: stapled, nailed, or screwed.
  - Flexible mineral fiber blocking shall extend at least 14-1/2" away from the clearance zone in all directions.
  - If covered, 24" minimum top clearance required.
  - Gypsum enclosures which house recessed fluorescent light fixtures do not require protection from loose fill.
  - Existing wood framing members acceptable as barriers if they exceed the height of the insulation by 4".
- **Flexible**
  - 3" clearance from fixture required on all sides.

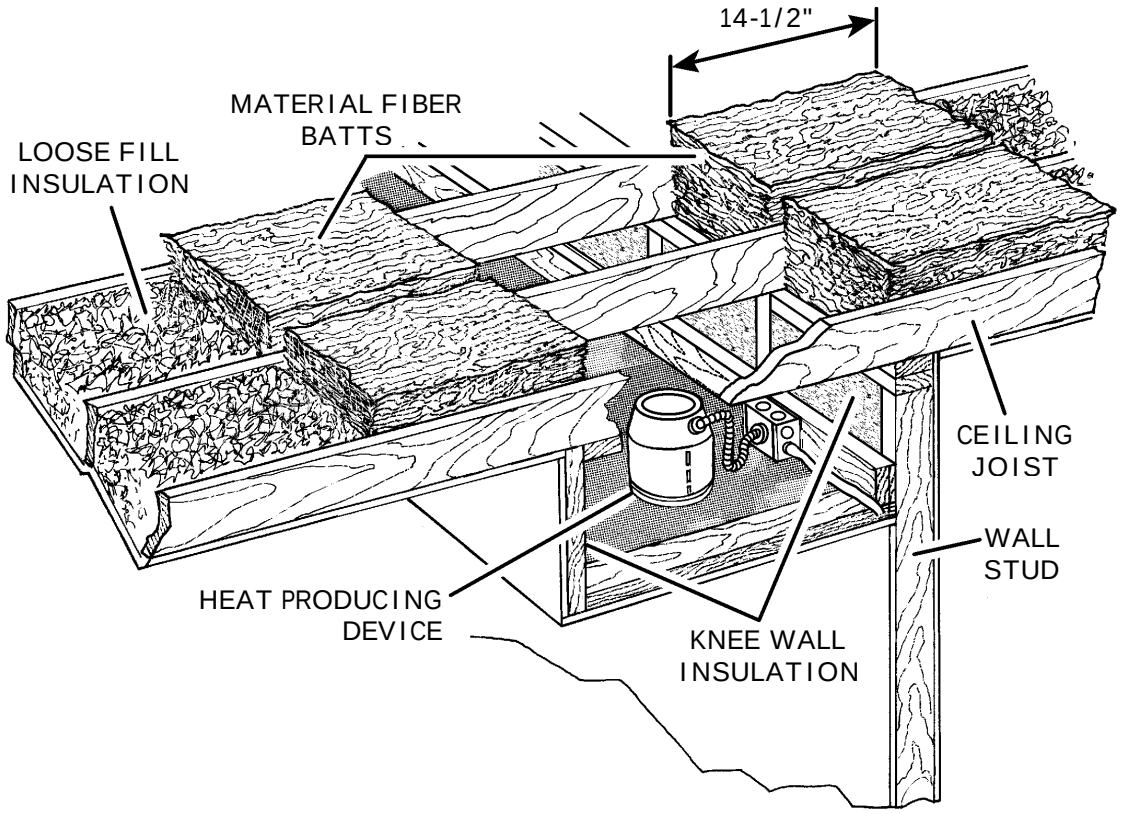


12. TYPE IC (INSULATION COVERED) RECESSED LIGHTING FIXTURES

- **Must meet same clearance as all other recessed lighting fixture.**

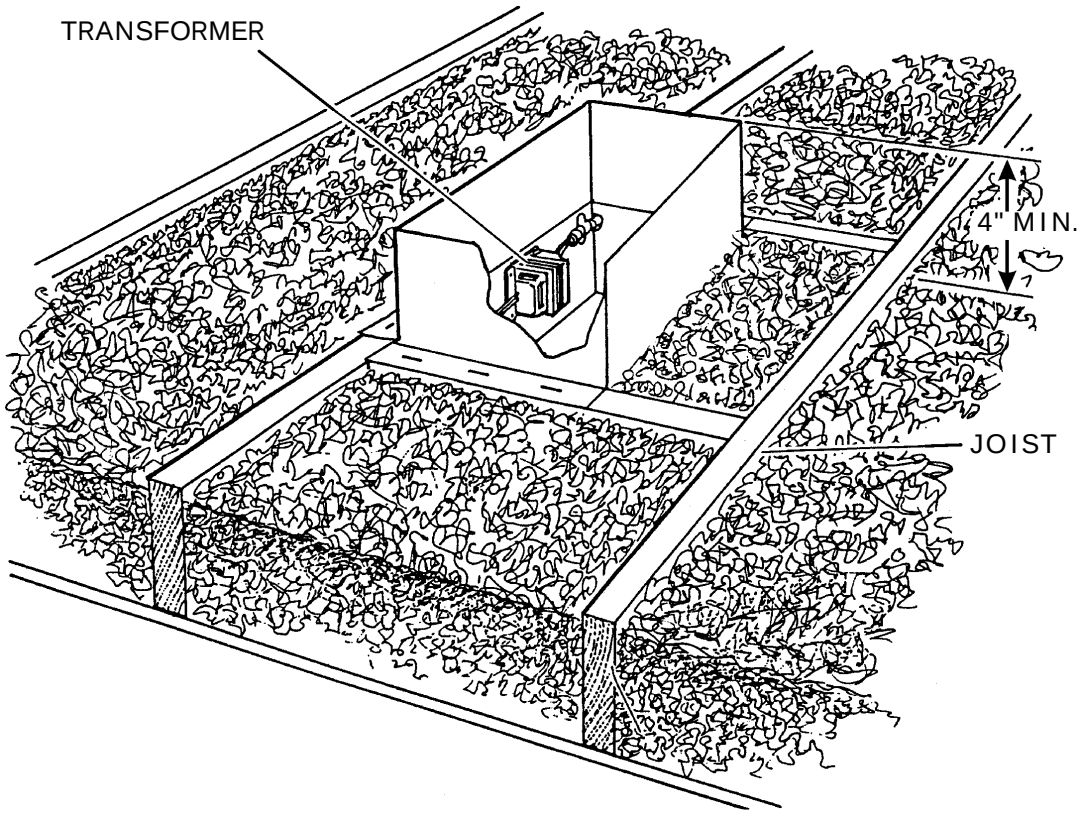
13. RECESSED INTERIOR SOFFITS CONTAINING HPDS

- **Loose Fill**
  - Soffits shall be blocked to protect recessed lights and other heat producing devices.
    - Blocking in conformance with Item 9 shall:
      - Extend from the attic floor to 4" above the loose fill.
      - Extend at least 14-1/2" back from the soffit opening when mineral fiber blocking is used.
      - Blocking inside soffit shall be installed in conformance with Items 11 and 12 of this section.
  - Accessible knee walls (12" or higher) shall be insulated in conformance with Item 30 of this section.



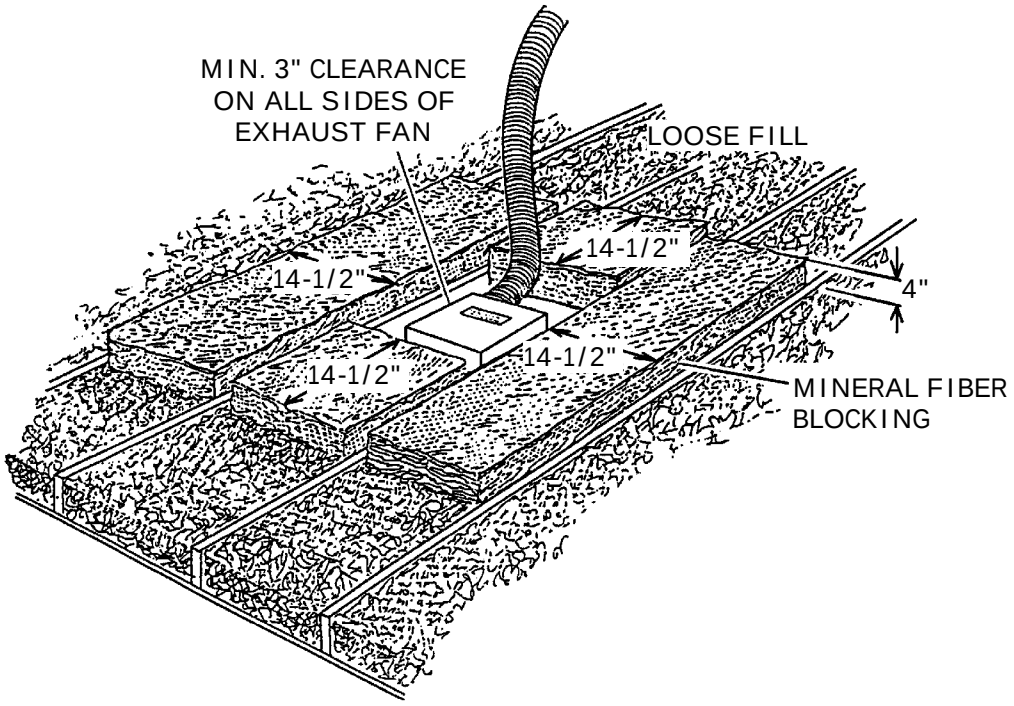
14. DOORBELL TRANSFORMER

- **Loose Fill**
  - 3" clearance zone required around transformer.
  - Noncombustible blocking required.
  - Blocking shall conform to Item 9, rest on attic floor and exceed height of loose fill by 4".
  - Metal blocking must be permanently attached to ceiling joist: stapled, nailed, or screwed.
  - Flexible mineral fiber blocking shall extend at least 14-1/2" away from clearance zone in all directions.
  - If covered, 24" minimum top clearance required.
  - Blocking not required if transformer is mounted above top of insulation.
- **Flexible**
  - 3" clearance from transformer required on all sides.



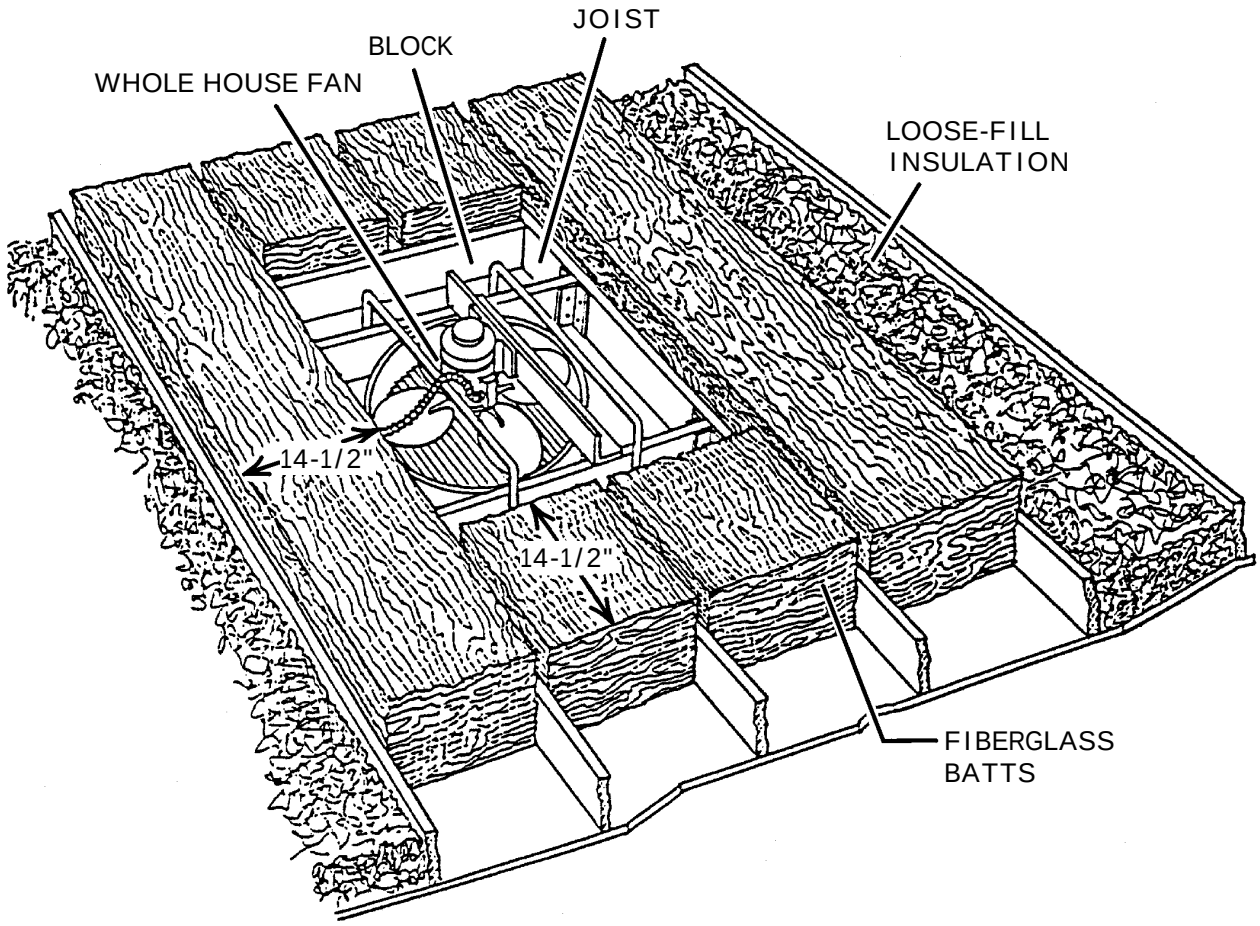
15. FAN MOTORS & MISC. HPDs, INCLUDING EXPOSED FLUORESCENT FIXTURES

- **HPDs include, but not limited to, the following:**
  - Recessed light fixtures.
  - Doorbell transformers.
  - Fan motors.
  - Metal flues.
  - Masonry chimneys.
  - Other heat producing devices.
- **Abandoned vent pipes must be blocked or removed.**
- **Loose Fill**
  - 3" clearance zone required around HPD.
  - Noncombustible blocking required.
  - Blocking in conformance with Item 9 shall exceed height of loose fill by 4".
  - Flexible mineral fiber blocking shall extend at least 14-1/2" away from clearance zone in all directions (as illustrated in Item 17).
  - When cover/insulation is placed above an HPD, cover/insulation shall be at least 24" above the HPD.
- **Flexible**
  - 3" clearance from HPD required on all sides.



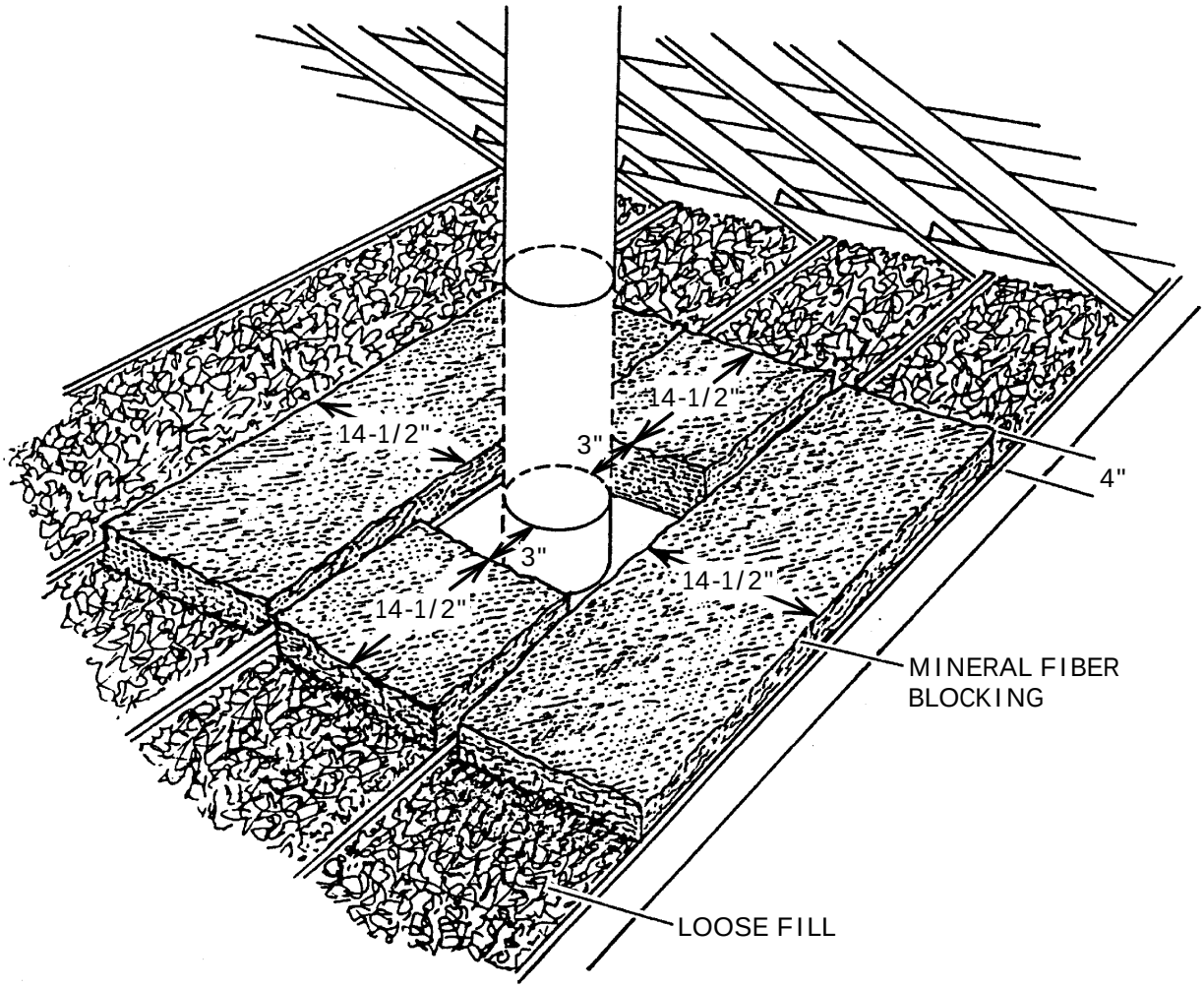
16. WHOLE-HOUSE FANS

- **Loose Fill**
  - Blocking required, even when a shroud is present on the fan.
  - 3" clearance zone required for fan motor.
  - Blocking in conformance with Item 9 shall rest on attic floor and exceed height of insulation by 4".
  - Flexible mineral fiber blocking shall extend at least 14-1/2" away from clearance zone in all directions.
- **Flexible**
  - 3" clearance required for fan motor.



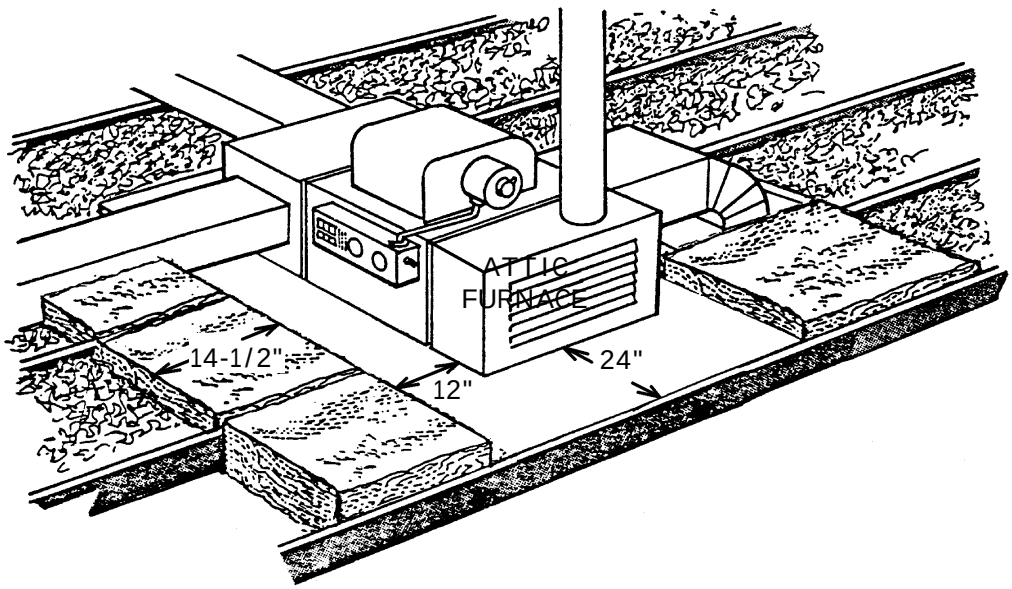
17. GAS AND SOLID FUEL VENT AND FLUE PIPES AND MASONRY CHIMNEYS

- **Loose Fill**
  - 3" clearance zone required around HPD.
  - Noncombustible blocking required.
  - Blocking in conformance with Item 9 shall rest on attic floor and exceed height of insulation by 4".
  - Flexible mineral fiber blocking shall extend at least 14-1/2" away from clearance zone in all directions.
- **Flexible**
  - 3" clearance from HPD required on all sides.
- **Abandoned pipes shall be blocked or removed.**



18. FURNACES AND HEAT PUMPS LOCATED IN ATTICS

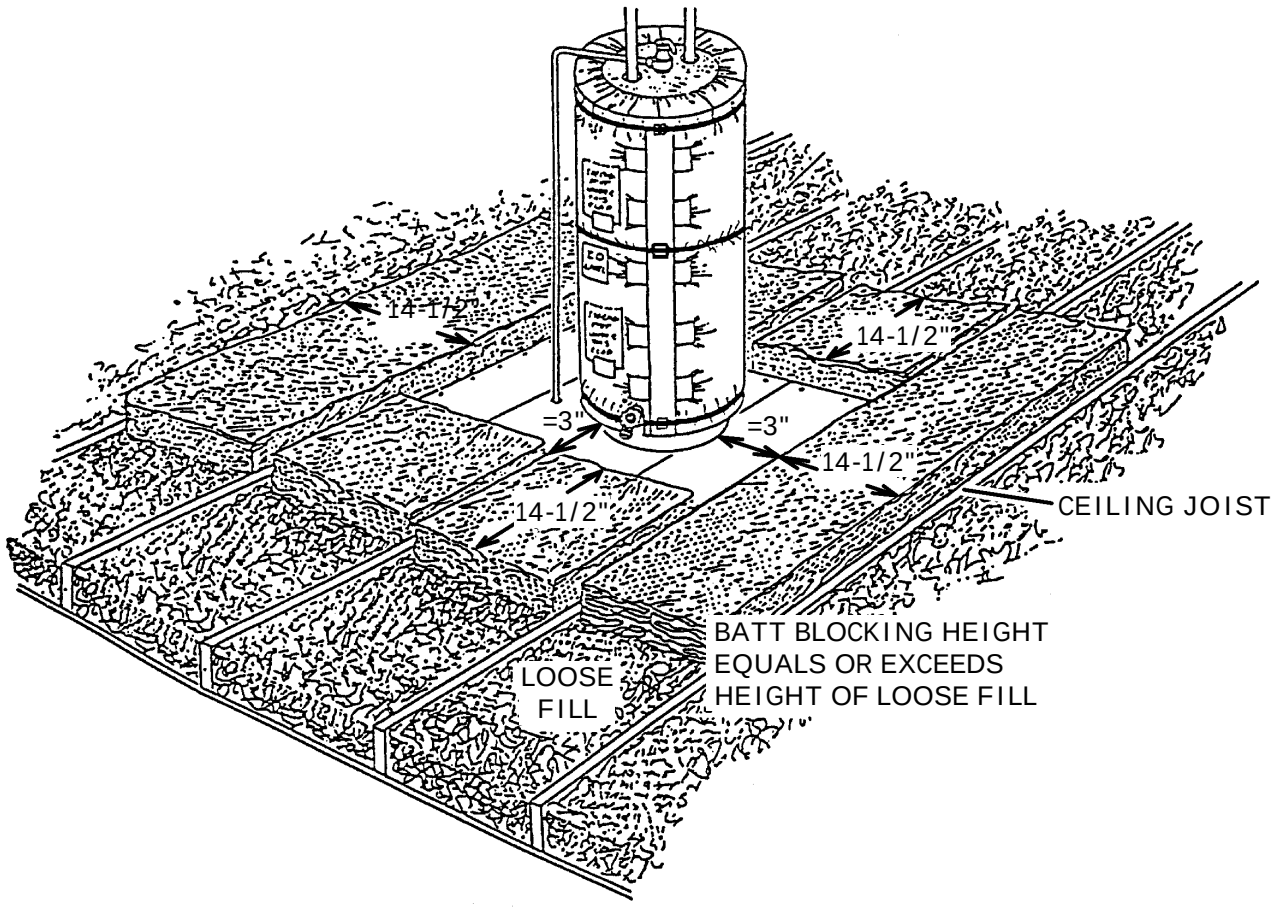
- **Loose Fill**
  - A clearance zone is required around all units.
    - 12" clearance around back, sides, and top.
    - 24" clearance in front.
    - 3" clearance for flues pipes.
  - Blocking in conformance with item 9 required unless bottom of unit is more than 4" above loose fill.
  - Blocking shall rest on the attic floor and exceed height of loose fill by 4".
  - Flexible mineral fiber blocking shall extend at least 14-1/2" away from clearance zone in all directions.
  - "Overblow" shall be cleared from unit and clearance zone.
  - If unit is suspended or draws combustion air from the bottom:
    - 12" clearance shall be provided below unit, or
    - Flexible insulation shall be installed below which extends 12" beyond unit on all sides (no exposed loose fill beneath unit).
- **Flexible**
  - 12" clearance required on all sides; 3" clearance for flue pipes.
  - 6" clearance below units drawing combustion air from bottom.
- **Platforms and Catwalks**
  - Insulation shall be installed underneath both when accessible.
  - Insulation shall <u>not</u> be installed on top of platforms.



19. WATER HEATER LOCATED IN ATTIC

ELECTRIC UNITS

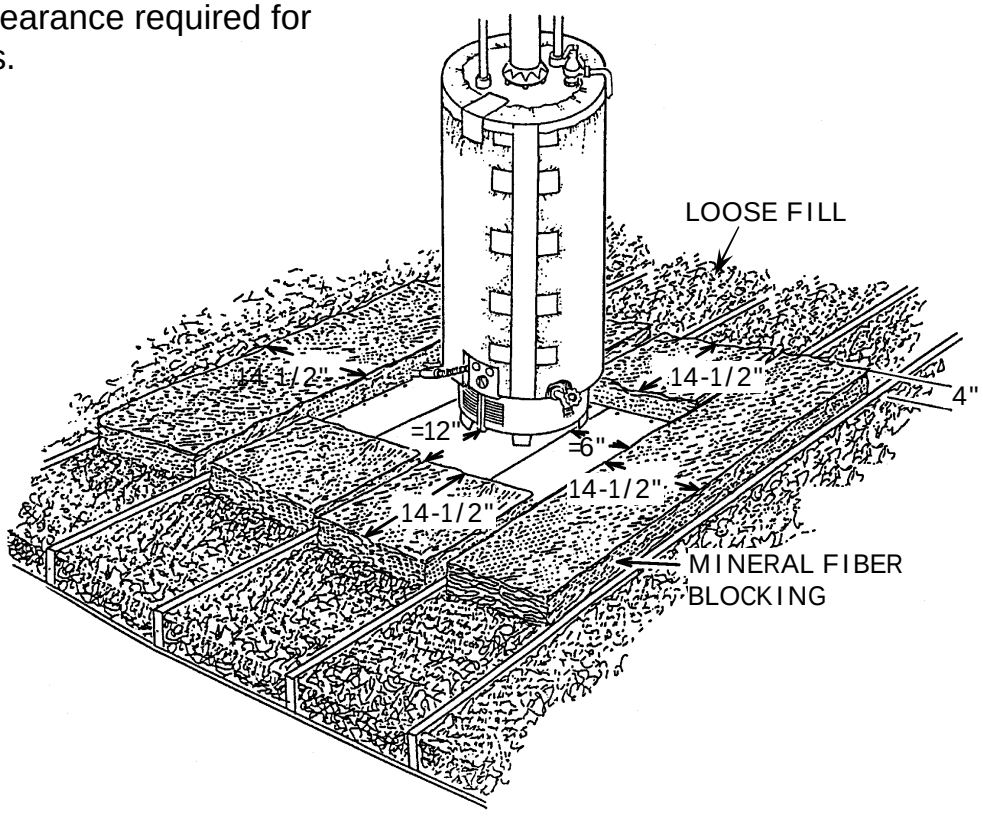
- **Loose Fill**
  - 3" clearance zone required around unit.
  - Blocking in conformance with item 9 required if bottom of unit is below top of installed loose fill.
  - Blocking shall be noncombustible, conform to Item 9, and equal or exceed height of insulation.
  - Flexible mineral fiber blocking shall extend at least 14-1/2" away from clearance zone in all directions.
  - Insulation "overblow" shall be cleared from unit, clearance zone, and platform.
- **Flexible**
  - 3" clearance from unit required on all sides.



19. WATER HEATER LOCATED IN ATTIC (continued)

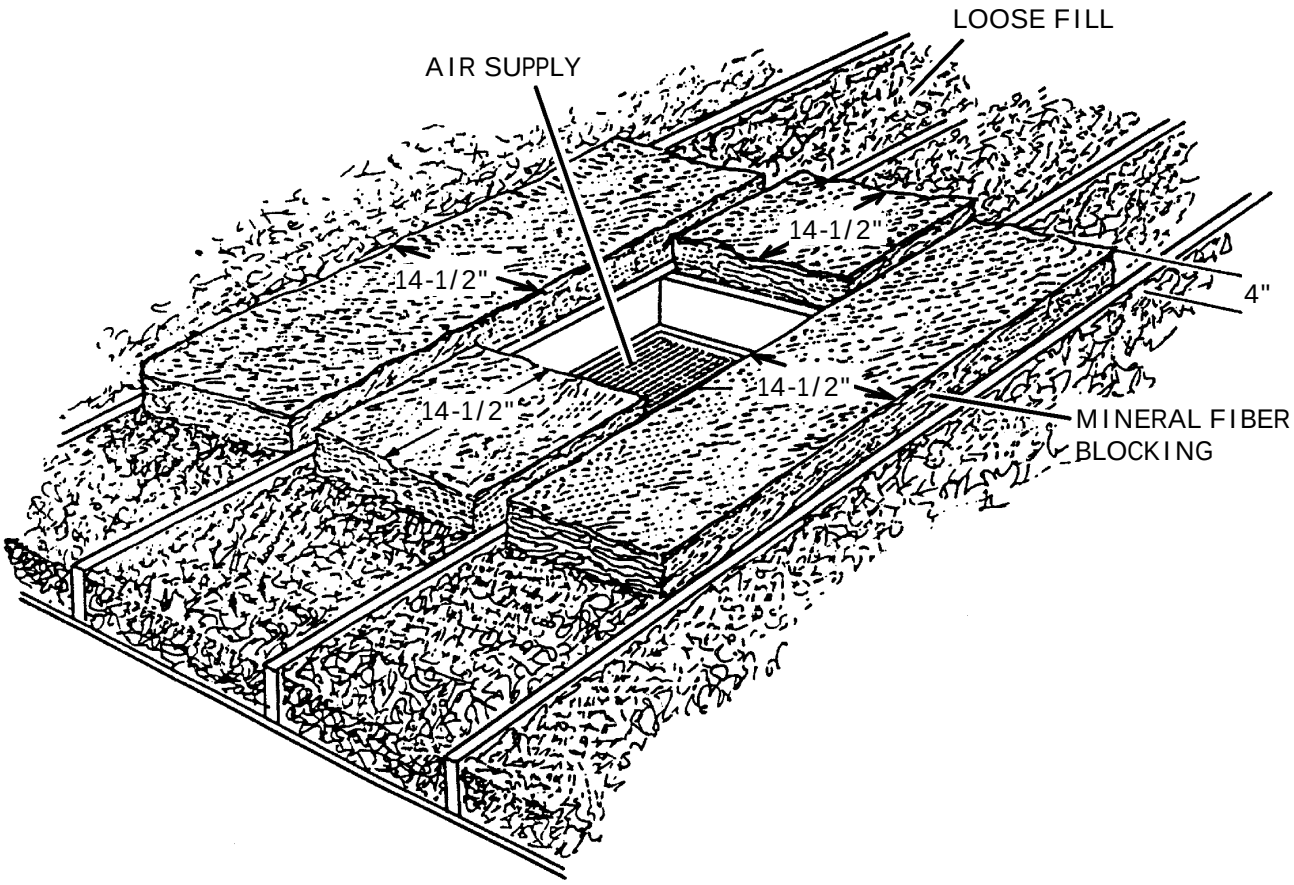
GAS UNITS

- **Loose Fill**
  - A clearance zone is required around the unit.
    - 6" clearance around sides and back.
    - 12" clearance in front.
    - 3" clearance for flues.
  - Blocking in conformance with item 9 required if bottom of unit is not at least 4" above installed loose fill.
  - Blocking material shall be noncombustible and exceed height of loose fill by 4".
  - Flexible mineral fiber blocking shall extend at least 14-1/2" away from clearance zone in all directions.
  - Insulation "overblow" shall be cleared from unit, clearance zone, and platform.
- **Flexible**
  - 6" clearance from unit required on all sides.
  - 3" clearance required for flues.



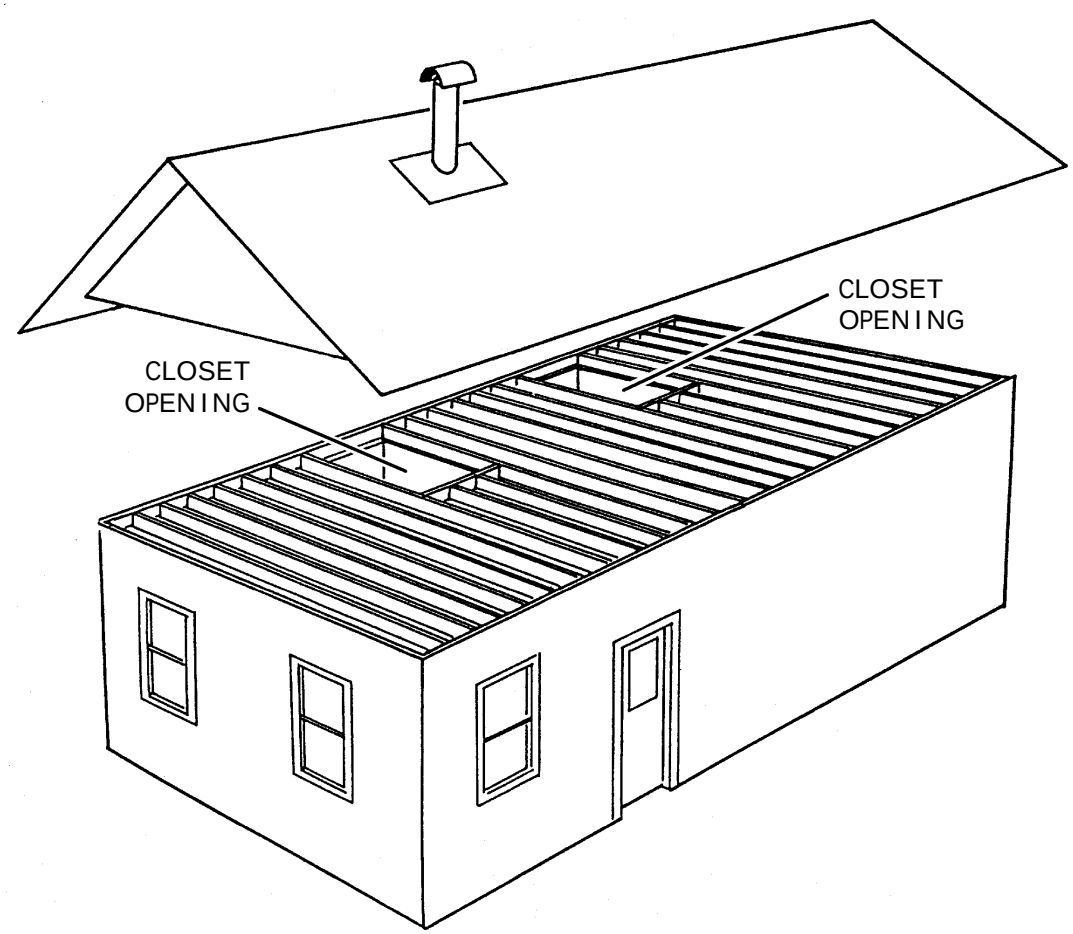
20. COMBUSTION AIR SUPPLY

- **Loose Fill**
  - Blocking required.
  - Must not obstruct air supply.
  - Blocking shall conform to Item 9, rest on the attic floor, and exceed height of loose fill by 4".
  - Flexible mineral fiber blocking shall extend at least 14-1/2" away from vent opening in all directions.
  - Any insulation which blocks the screen shall be removed.
  - Blocking may be either flexible fiberglass batts or metal barriers.
- **Flexible**
  - Must not obstruct air supply.



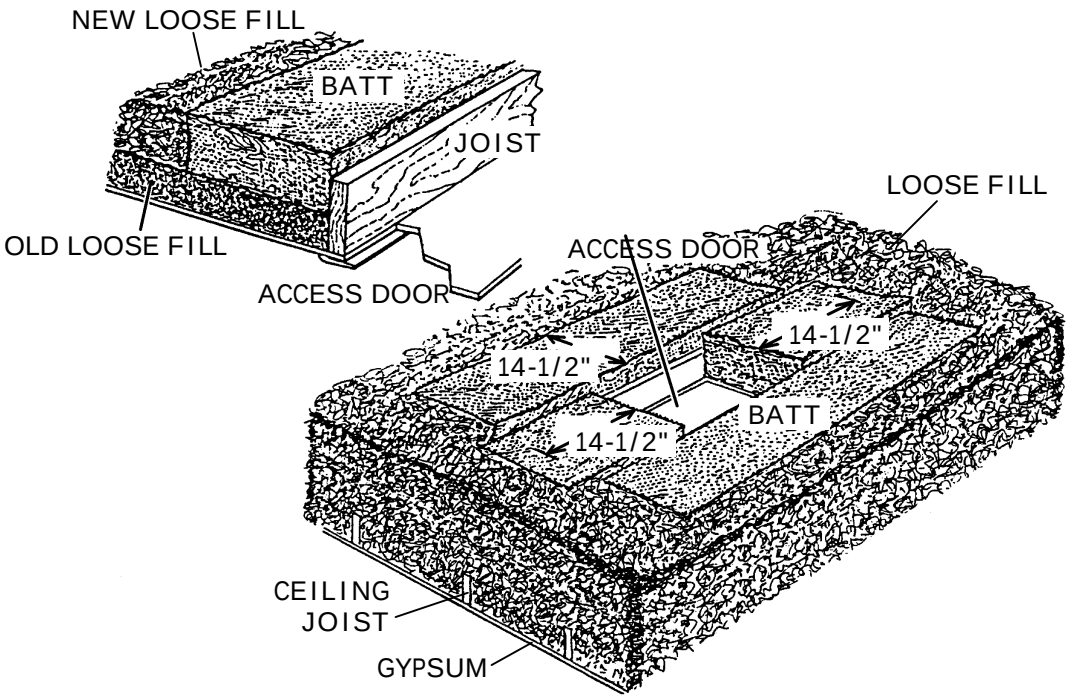
21. CLOSET OPENINGS

- **All Insulation**
  - Combustion Air Supply
    - When closet opening is used for combustion air supply, it shall be blocked per item 20.
  - Ceiling Vents Not Used for Combustion Air
    - The opening shall be sealed and covered with insulation.
    - Vents shall be sealed with minimum 1/2" gypsum or plywood or minimum 0.007" metal.
    - Vents shall not be sealed with mineral fiber batts or foam board.



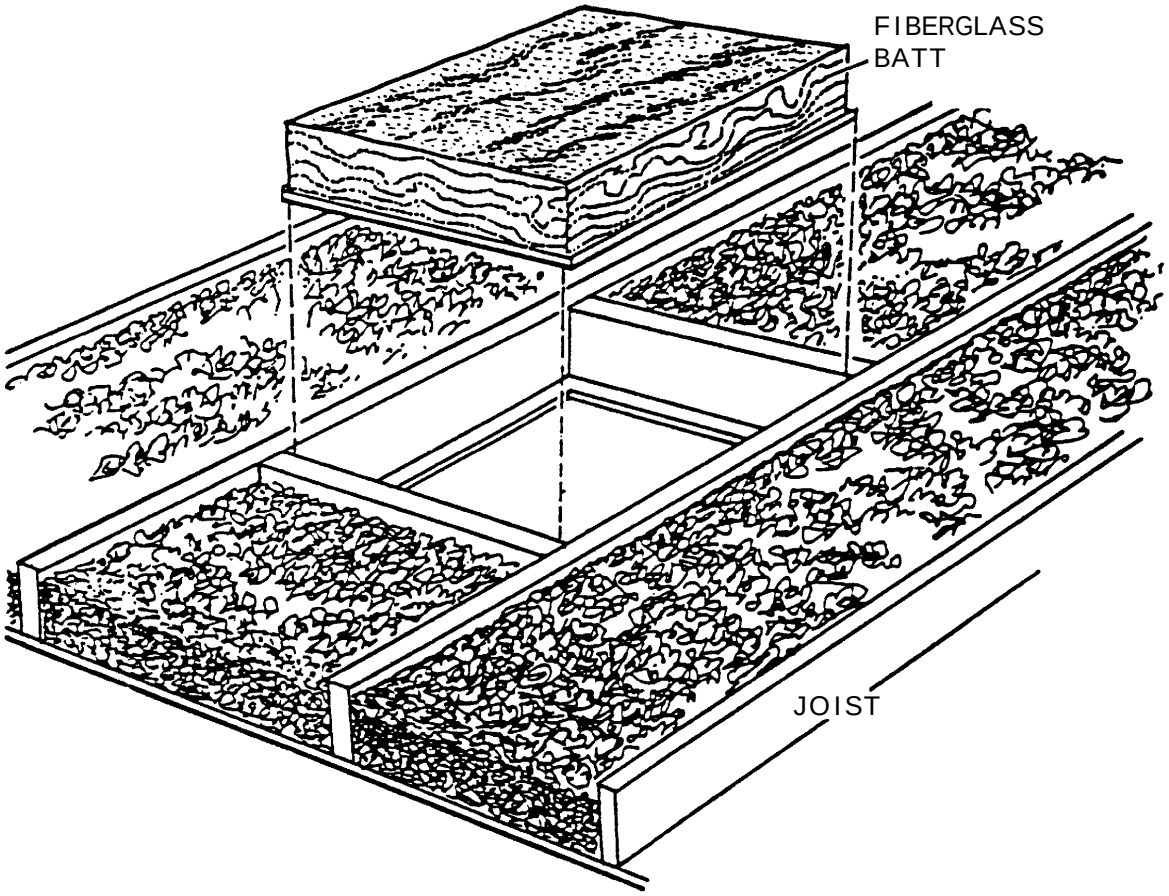
22. ATTIC ACCESS DOOR BLOCKING

- **Loose Fill**
  - Each access must be blocked.
  - Blocking shall conform to Item 9, and extend from the attic floor to the top of the installed loose fill.
    - Flexible mineral fiber batts shall extend at least 14-1/2" away from access opening in all directions.
    - Metal barrier material shall not be installed.
  - 2-by joists and other wood members:
    - Where wood extends from attic floor to top of installed loose fill, additional blocking is not required.
    - Where wood extends from attic floor but does not equal height of installed loose fill, blocking shall be added.
      - Mineral fiber batt may be used in combination with wood members to achieve required height.
      - Unfaced batt may be placed on top of existing loose fill.
    - Where wood is not present, flexible mineral fiber blocking shall rest on the attic floor.
- **Flexible**
  - Blocking is required only where unblocked loose fill is present at the access opening.



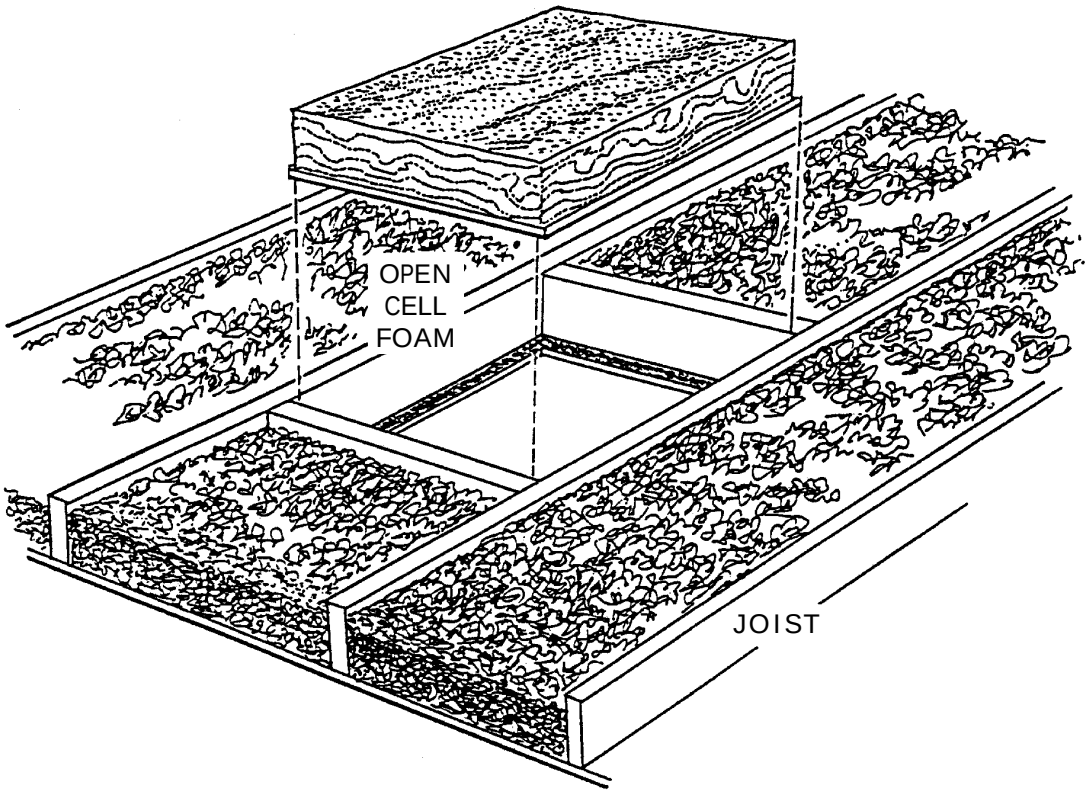
23. ATTIC ACCESS DOOR INSULATION

- **All Insulation**
  - All attic entry doors accessed from conditioned space shall be insulated:
    - ~~Minimum R-19 shall be installed on horizontal doors~~*Horizontal: same R-value as attic floor*.
    - ~~Minimum R-11 shall be installed on vertical doors~~*Vertical: same R-value as knee walls and skylight wells*.
    - Rigid or flexible insulation shall be used.
    - Insulation shall be permanently attached.
  - Multiple Accesses
    - All applicable attic entry doors shall be insulated.



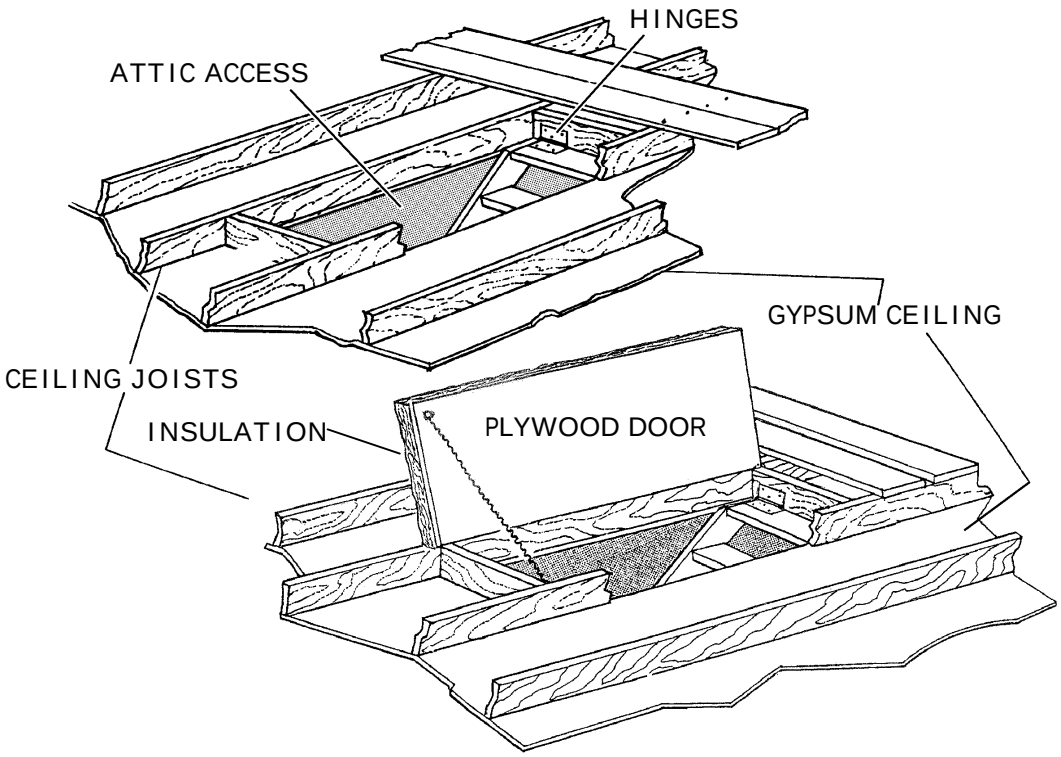
24. ATTIC ACCESS DOOR WEATHERSTRIPPING

- **All Insulation**
  - Only attic entry doors accessed from conditioned space shall be weatherstripped.
  - Horizontal doors
    - Open cell foam is standard.
    - Closed cell foam acceptable if thickness does not create more than 3/16" gap between door and retaining surface.
    - Mounting Surface
      - Weatherstripping shall be installed on surface providing best adhesion (i.e., smooth wood trim rather than textured drywall door).
      - Mounting surface shall be free of dust, dirt and debris.
  - Vertical Doors
    - Materials approved for entry doors shall be used (see Section 2).



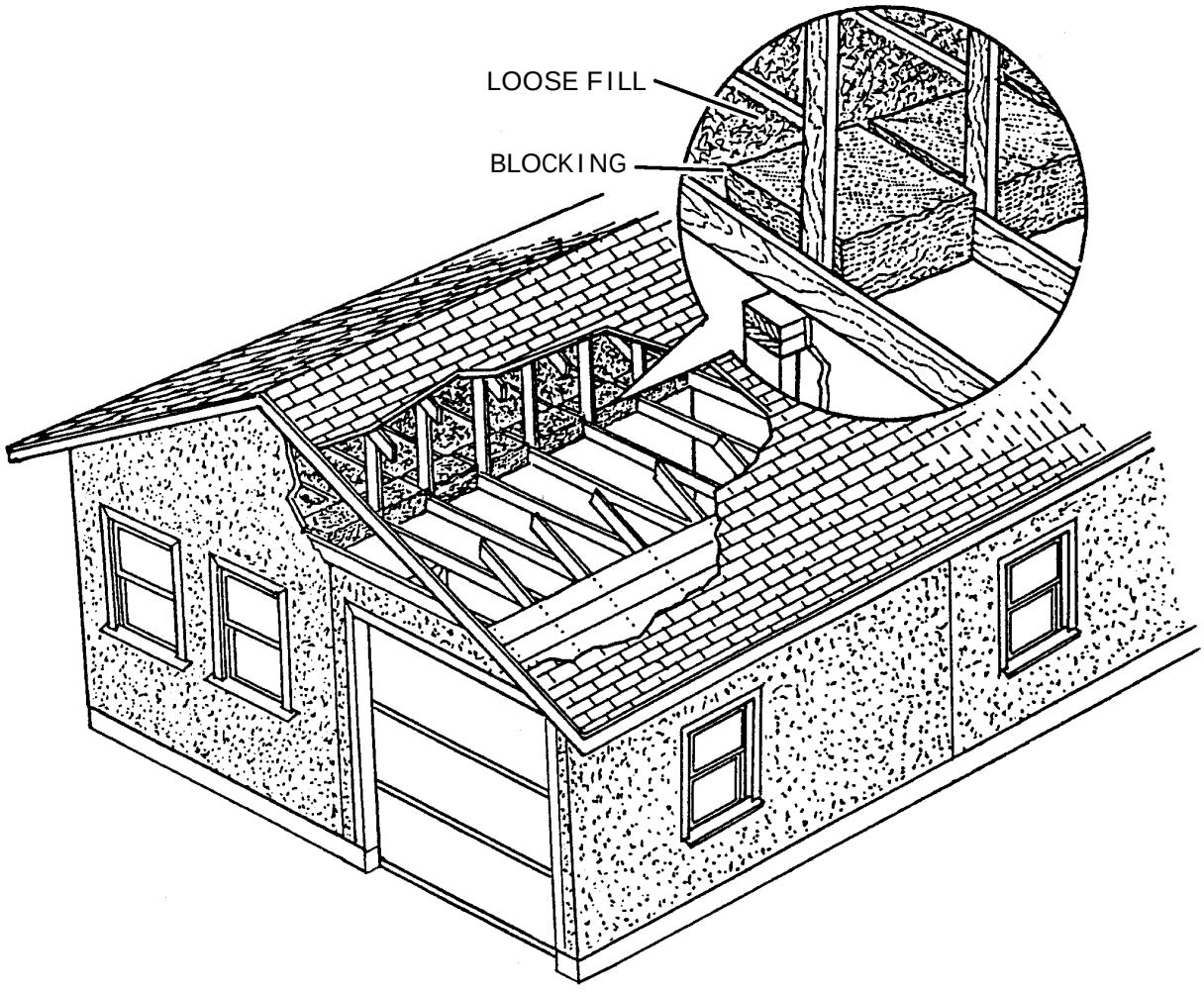
25. DISAPPEARING STAIRS

- **All Insulation**
  - Lid shall be weatherstripped.
  - Lid shall be insulated in accordance with item 2.
  - Hinged lid shall be installed if not already present.
  - Insulation shall be permanently attached to lid.
- **Loose Fill**
  - Blocking shall conform to Item 9 and be installed as prescribed in Item 22.
  - Bottom door shall be weatherstripped as prescribed in Item 24.
- **Flexible**
  - Bottom door shall be weatherstripped.
- **Stairs with Top Lids**
  - Top lid shall be insulated as prescribed in Item 23.
  - Blocking shall be installed as prescribed in Item 22.
  - Top lid shall be weatherstripped as prescribed in Item 24.



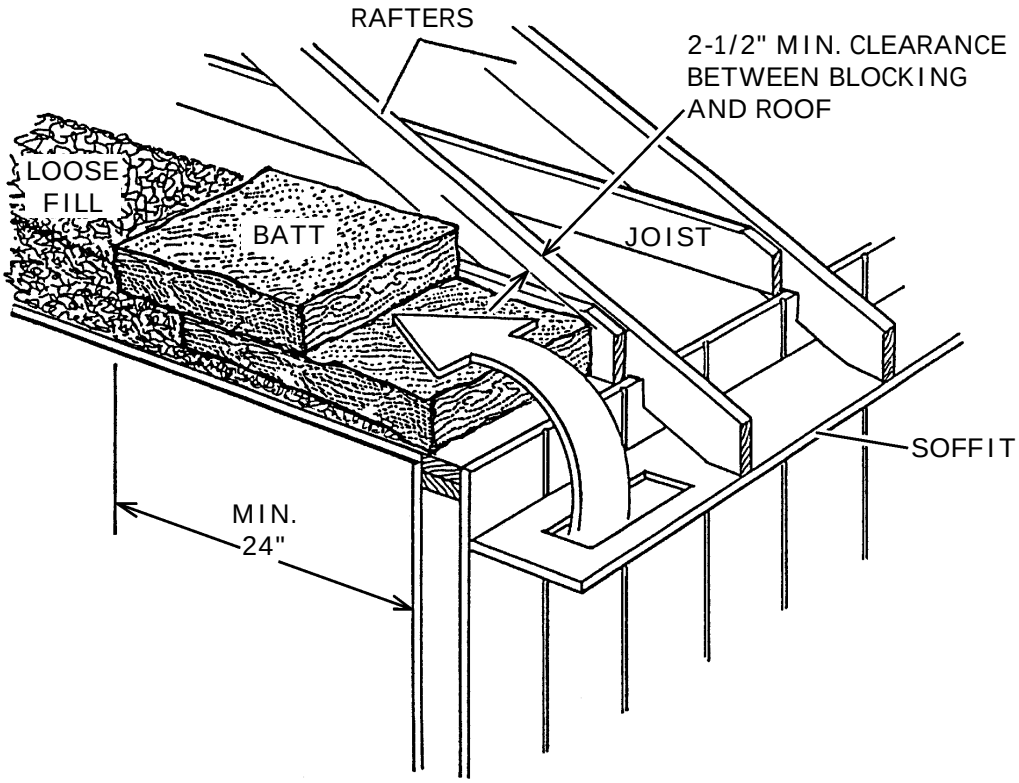
26. OPEN END CAVITIES

- **Loose Fill**
  - Blocking shall be installed to prevent loose fill from spilling out the open end of the joist cavity.
  - Blocking shall confirm to Item 9 and rest on the top plate and exceed the height of loose fill by 4".
  - Metal, noncombustible cardboard chute/barrier material or flexible insulation may be used.
  - Flexible insulation shall extend at least 14-1/2" back from the open end of the cavity.



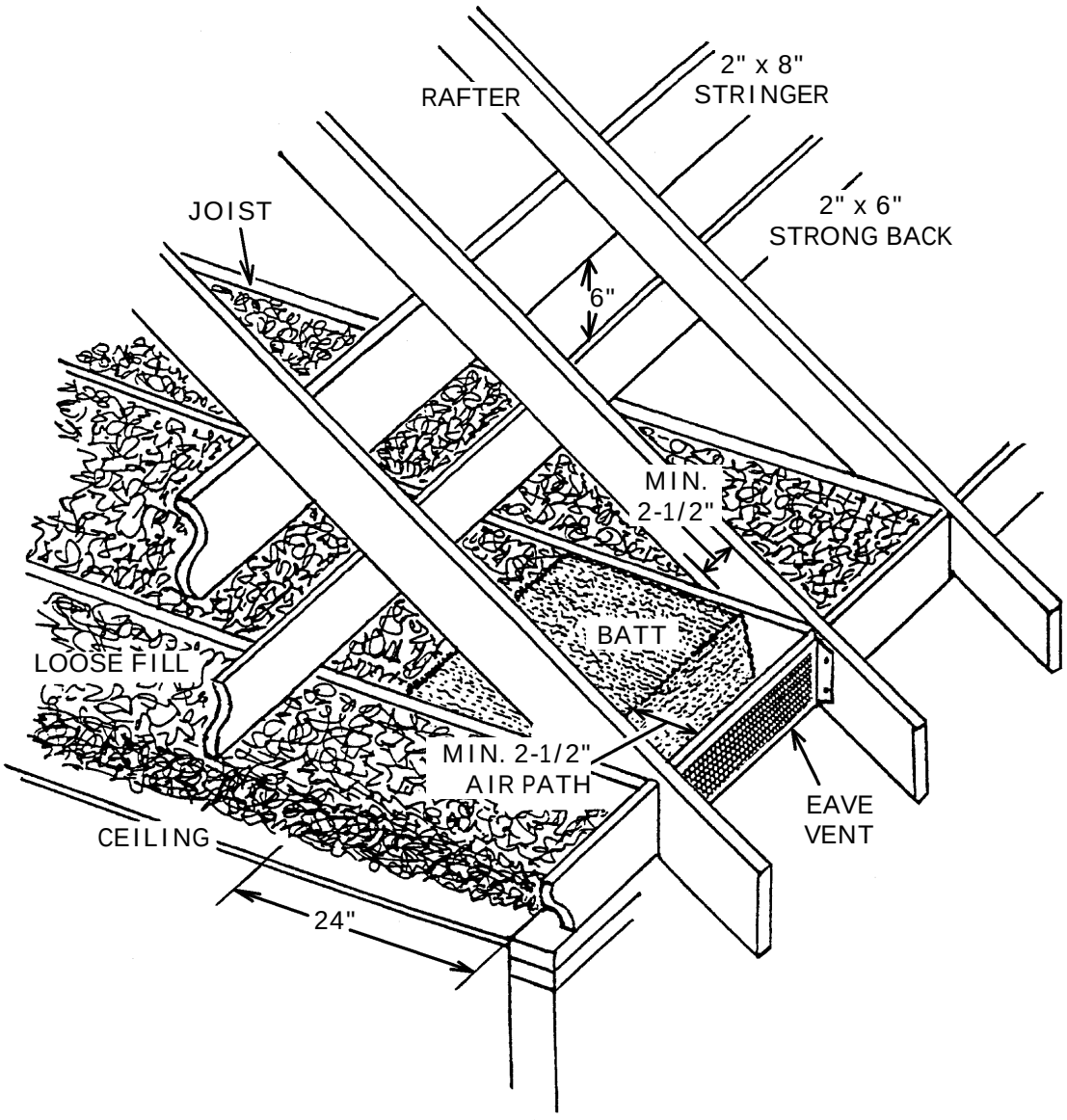
27. EAVE AND SOFFIT VENTS

- **Flexible**
  - Minimum 2-1/2" clearance required between roof sheathing and insulation.
- **Loose Fill**
  - Blocking shall be installed which extends to the top plate (i.e., batt, chute, baffle, etc.).
  - Minimum 2-1/2" clearance required between roof sheathing and blocking.
  - Vent screens shall be free of loose fill.
- **Horizontal Mineral Fiber Blocking**
  - May rest on existing loose fill provided no loose fill is exposed at the top plate.
  - Blocking which extends inward 14-1/2" shall exceed height of the loose fill by 4".
  - Blocking which extends inward 24" shall equal or exceed height of the loose fill.



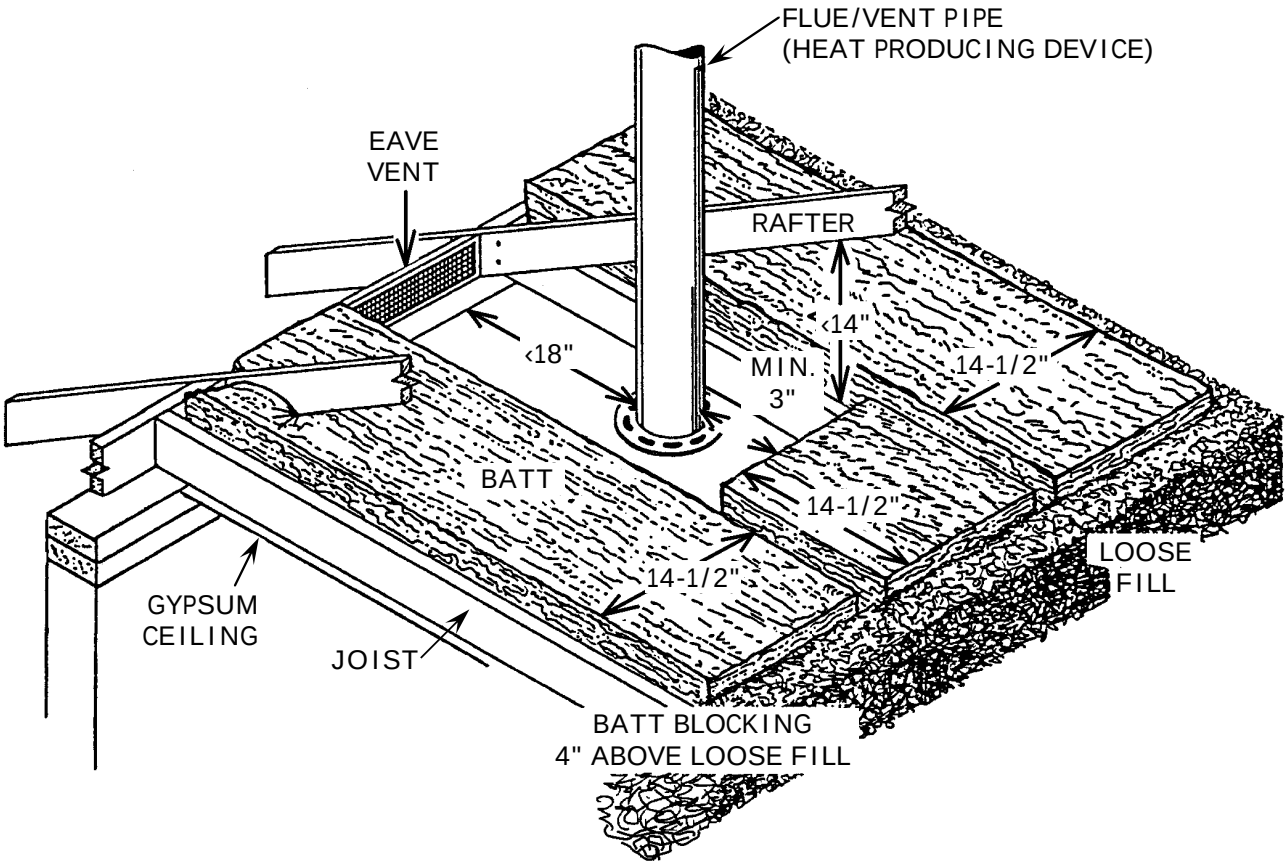
27. EAVE AND SOFFIT VENTS (continued)

- **Restricted Access**
  - Flexible mineral fiber blocking shall be installed.
  - Minimum 2-1/2" clearance between blocking and roof sheathing.
  - Minimum 2-1/2" air path between vent and blocking.
  - Blocking
    - May be placed over existing loose fill if unfaced batt is used and loose fill is not blocking vent.
    - Shall exceed height of loose fill or extend inward at least 24".



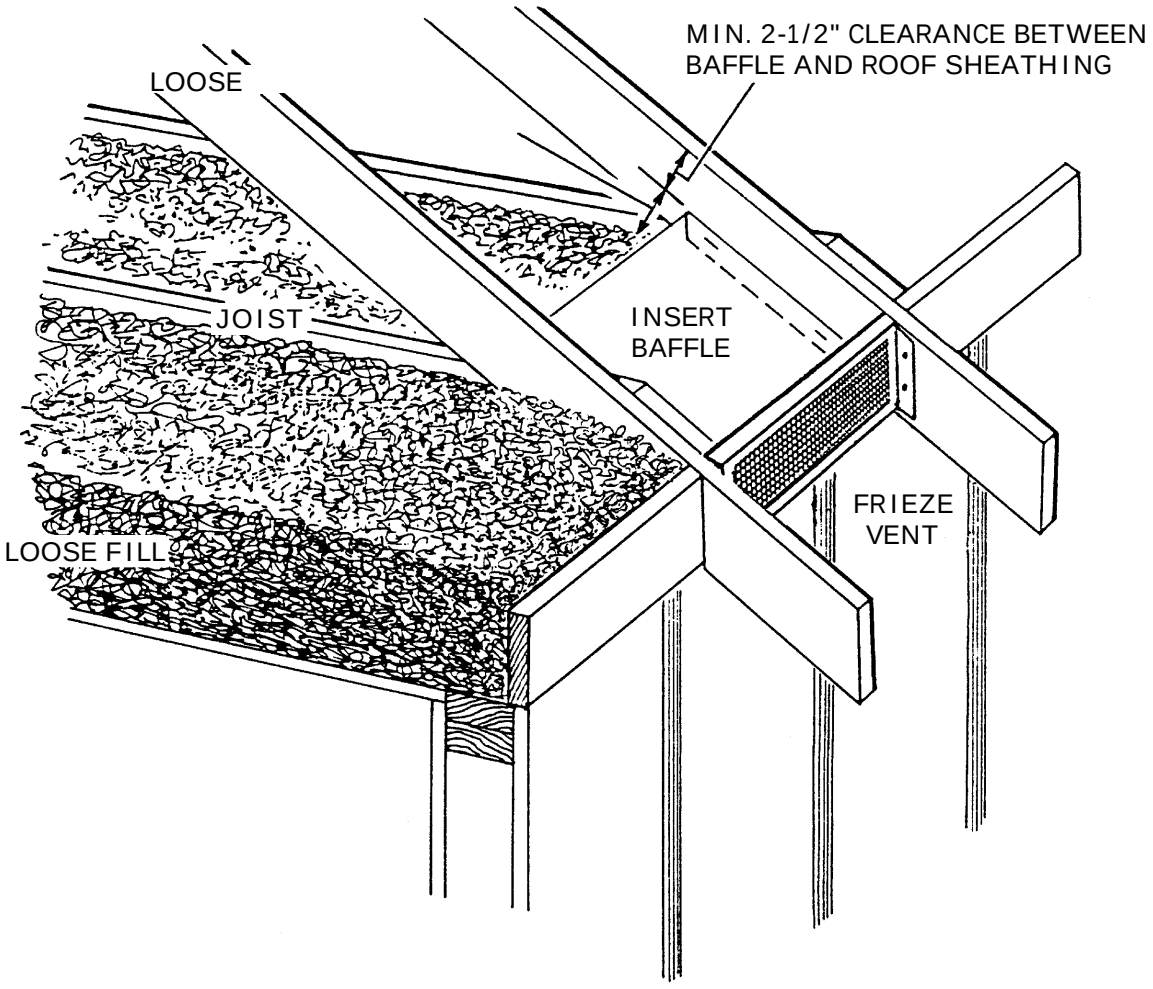
27. EAVE AND SOFFIT VENTS (continued)

- **Restricted Access (HPD Present)**
  - Applies when HPD is less than 18" from an eave/soffit vent and clearance between floor joists and rafters is less than 14" at edge of clearance zone (as illustrated below).
    - Clearance zone shall be free of loose fill.
    - Minimum 3" clearance required between HPD and blocking.
    - Between joists adjacent to the HPD, flexible mineral fiber blocking shall be installed which rests on the attic floor, extends inward at least 14-1/2", and or exceeds height of the installed loose fill by 4".
    - Along the outside of each joist adjacent to the HPD, flexible mineral fiber blocking shall be installed (may rest on existing loose fill) which extends away from the clearance zone at least 14-1/2" and or exceeds height of installed loose fill by 4".



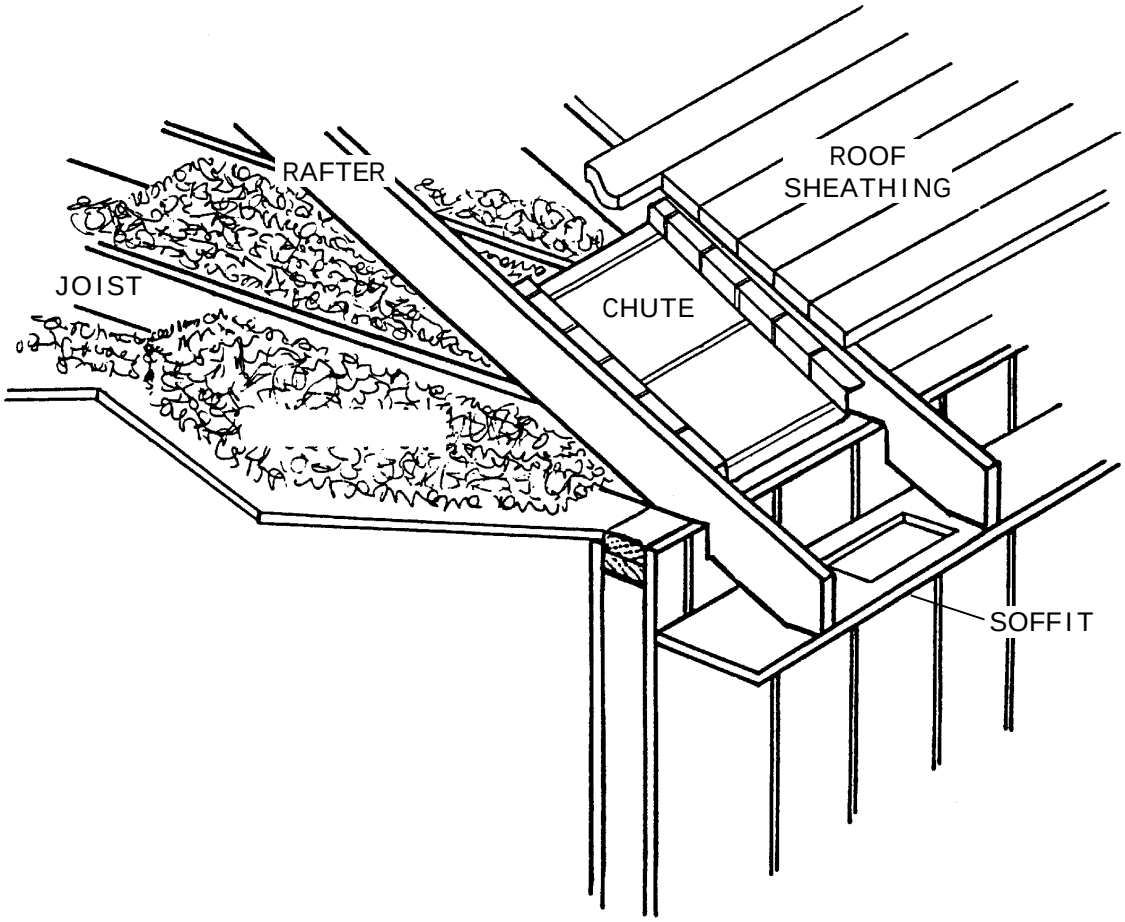
27. EAVE AND SOFFIT VENTS (continued)

- **Baffles and chutes attached to rafters shall:**
  - Rest on the top plate and extend above the loose fill by a minimum of 4" and a maximum of 12".
  - Be permanently attached with a minimum of two mechanical fasteners per rafter.
- **Baffles and chutes may be made of:**
  - Preformed plastic, commercially available.
  - Precut cardboard, commercially available.
  - Minimum .007" metal.
  - Plywood or gypsum.



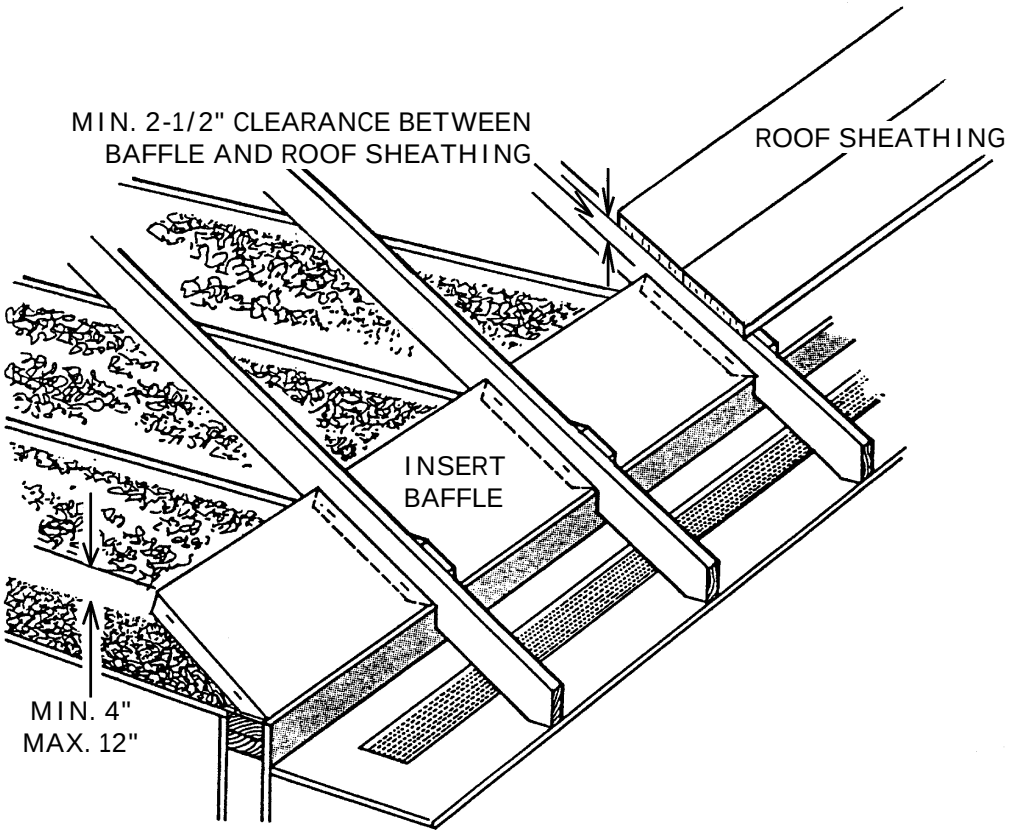
27. EAVE AND SOFFIT VENTS (continued)

- **Preformed Ventilation Chutes**
  - Molded rigid plastic.
  - Minimum air path:
    - 2" x 12" for 16" OC rafters.
    - 2" X 18" for 24" OC rafters.
- **Chutes shall:**
  - Rest on top plate and extend above the loose fill by a minimum of 4" and a maximum of 12".
  - Be permanently attached at the top with at least one mechanical fastener on each side.
  - Be installed in a manner which prevents new loose fill from blowing around the bottom and edges.



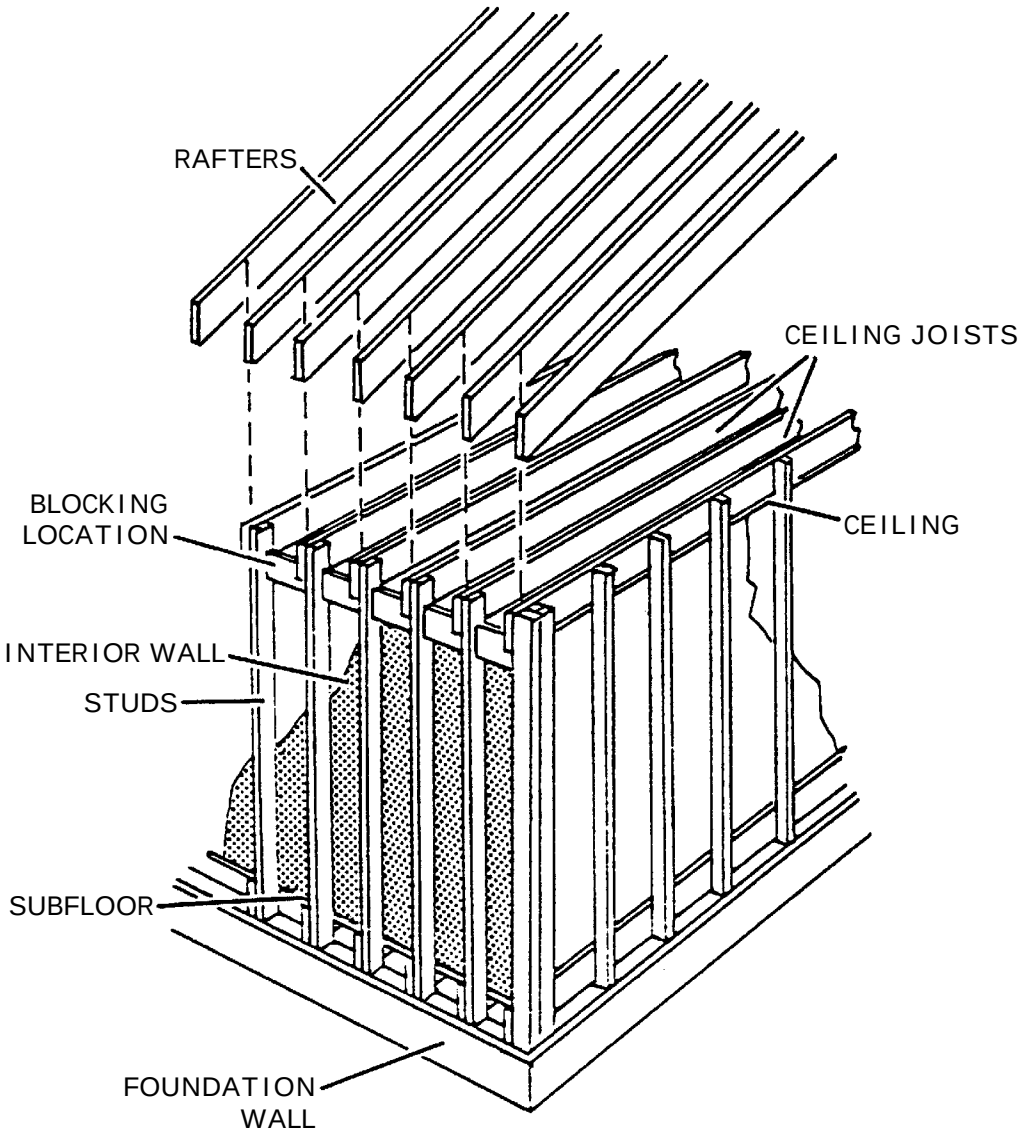
28. CONTINUOUS SOFFIT VENTS

- **All Loose Fill**
  - Blocking in accordance with Item 9 must be installed.
  - Mineral fiber blocking must rest on the attic floor and extend 14-1/2" from the top plate.
  - Minimum 3" clearance between blocking and roof sheathing.
  - Vent chutes must be non-combustible.
  - Vent chutes must extend above the installed loose fill.
  - All nonmetal chutes must be kept 12" away from heat producing devices.
- **Flexible**
  - Minimum 3" clearance required between roof sheathing and insulation.
  - Must rest on attic floor.
- **All Types**
  - Loose fill that falls on the vent screen must be removed.



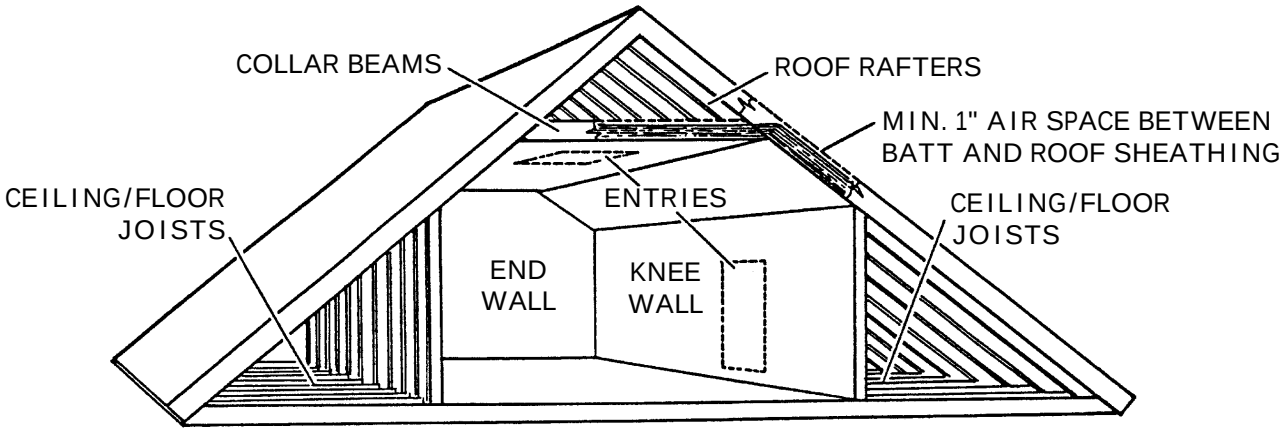
29. BALLOON FRAMING

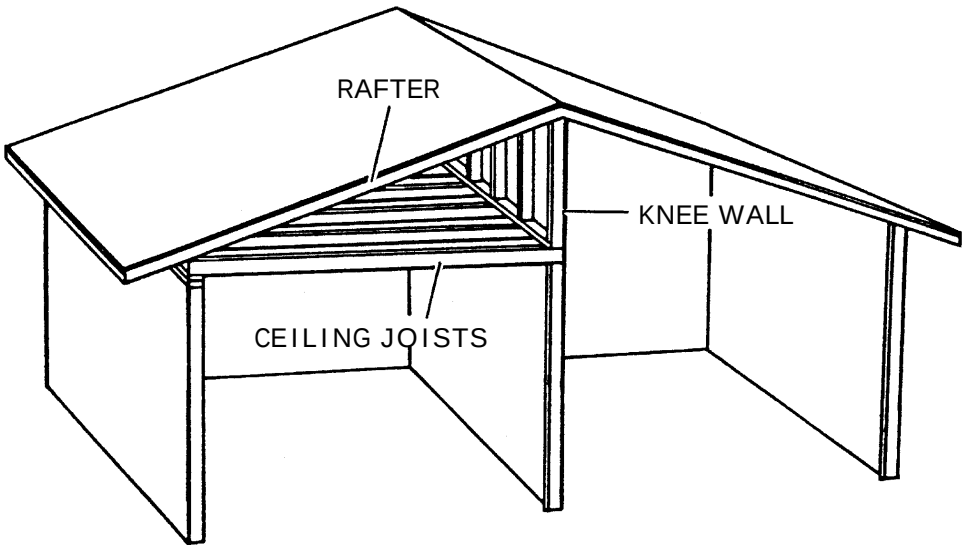
- **Loose Fill**
  - Blocking in accordance with Item 9 shall be installed to prevent loose fill from falling down into open wall cavities and crawl space or basement.



30. KNEE WALLS AND PARTIAL CATHEDRAL CEILING COMBINATIONS

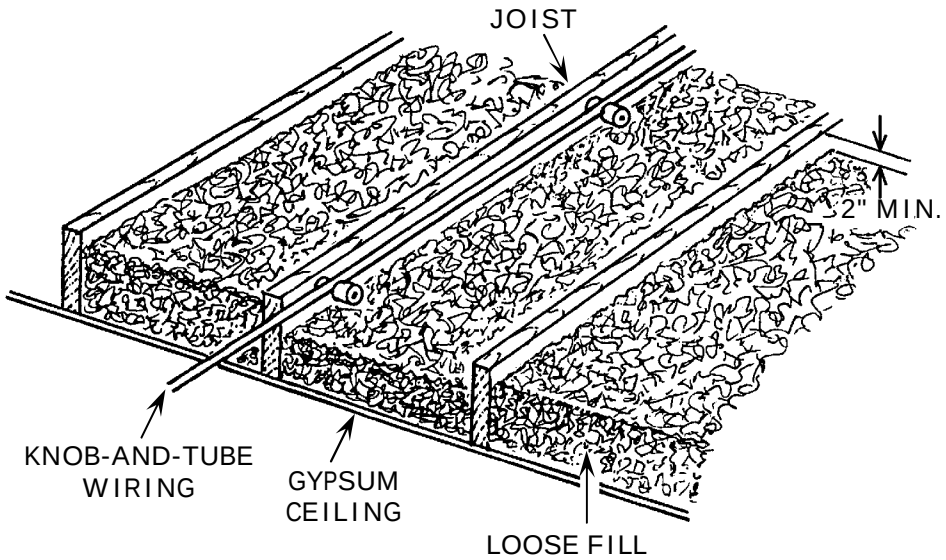
- **Knee Walls & Skylight Wells**
  - Uninsulated knee wall areas over 12" in height after new insulation is installed, and uninsulated skylight wells, shall be insulated to the R-value specified in item 2.
- **Partial Cathedral Ceiling and Knee Wall Combinations**
  - Mineral fiber batt may be installed in partial vaulted ceiling cavities.
  - Minimum 1" air space required between batt and roof sheathing.
  - Loose fill not allowed.





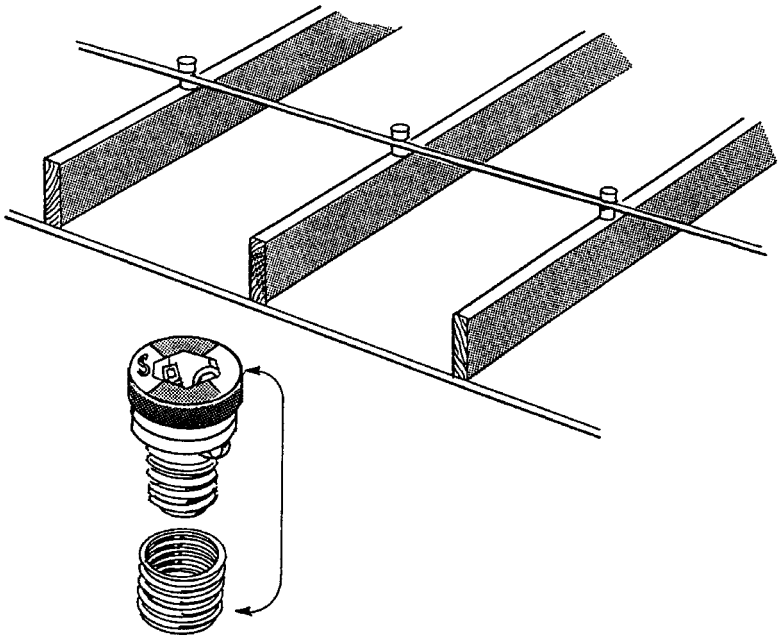
31. KNOB-AND-TUBE WIRING

- **Insulation which encapsulates knob and tube wiring shall not be installed when prohibited by local code.**
- **All Insulation**
  - Attic with knob-and-tube wiring shall not 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.



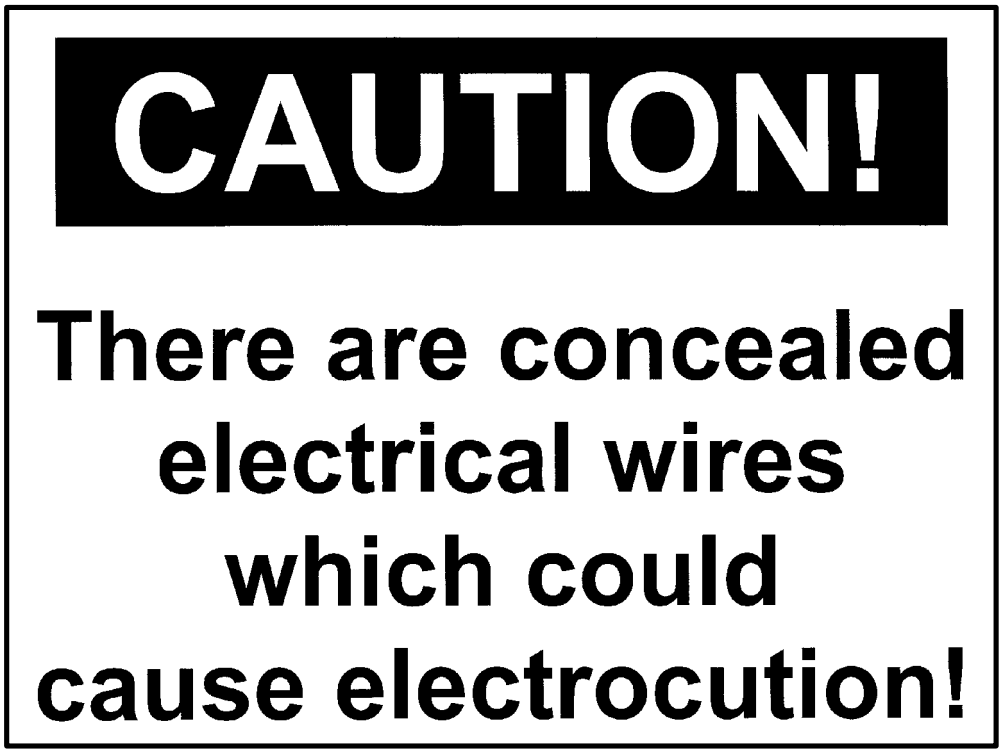
31. KNOB-AND-TUBE WIRING (continued)

- **Live Knob-and-Tube Wiring**
  - Attics with knob-and-tube wiring may be insulated if:
    - The knob-and-tube wiring is certified to be acceptable for encapsulation, i.e., in good condition with no evidence of deterioration or improper overcurrent protection and no improper connections or splices.
    - The knob-and-tube wiring, initially found to be in poor condition, has been upgraded to be acceptable for encapsulation.
  - Insulation which encapsulates live knob-and-tube wiring shall not be installed when the wiring was found to be in poor condition and will not be upgraded to be acceptable for encapsulation.
  - Installation of New Overcurrent Protection
    - The devices shall be a tamperproof type (e.g., Type “S” fuses or circuit breakers).
    - Prior to installation of such devices, the occupant must sign a statement in the “Notice of Survey by Electrical Contractor” acknowledging that he/she understands that existing usage of electrical appliances may cause nuisance tripping of the new overcurrent protection devices.



31. KNOB-AND-TUBE WIRING (continued)

- **Live Knob-and-Tube Wiring (continued)**
  - The following requirements apply to all attics insulated:
    - Insulation shall be noncombustible in accordance with Section 324-4 of the 1998 California Building Code.
    - Barriers and supports shall be noncombustible and shall not contain any electrical conductive material.
    - A "Warning Placard", stating that caution is required when entering insulated areas because of covered electrical wiring, shall be posted inside the attic near each openable entrance in a location where it will be observed by persons entering the attic.
    - A copy of the completed "Notice of Survey by Electrical Contractor" shall be posted near the "Warning Placard" at the primary entrance.



31. KNOB-AND-TUBE WIRING (continued)

- **Abandoned and Disconnected Knob-and-Tube Wiring**
  - Prior to installation of ceiling insulation that encapsulates knob-and-tube wiring, the wiring shall be surveyed by an electrical contractor.
  - The "Notice of Survey by Electrical Contractor" shall specify that all knob-and-tube wiring located in all areas to be insulated is not live and has been abandoned and disconnected.
  - The electrical contractor, by severing wires in the attic or by other means, shall ensure that all abandoned and disconnected wiring cannot be energized by reconnecting abandoned feeder conductors to a service panel or other power source.

Notice of Survey by Electrical Contractor

This is a verification that the existing knob-and-tube wiring was surveyed at this address:

Number _____ Street _____ City _____ Zip _____

The existing wiring was found to be:

(A) ☐ In good condition with:
- ☐ No evidence of deterioration
- ☐ No improper connections or splices
- ☐ No evidence of improper overcurrent protection

OR

☐ In poor condition and was brought up to acceptable standards by:
- ☐ Installing tamperproof overcurrent protection with fuses
- ☐ Installing new service panel with breakers
- ☐ Other: _____

Therefore, the attic has been approved for the installation of ceiling insulation.

(B) ☐ In poor condition and not suitable to be brought up to acceptable standards because of:
- ☐ Evidence of deterioration
- ☐ Evidence of improper connections or splices
- ☐ Evidence of improper overcurrent protection
- ☐ Other: _____

☐ A copy of this certification will be filed with the local code-enforcement authority if so required.

☐ Prior to installation of new overcurrent devices, their effect on useage habits was explained to the occupant(s) and permission to install them was obtained.

Date _____ X _____ Contractor Signature

License Number _____ Firm Name _____

NOTICE TO CUSTOMER: This electrical survey is required before your ceiling can be insulated by the Program.

You are advised that if tamperproof overcurrent protection devices are installed to protect the wiring system, your electrical usage habits may require modification to avoid nuisance tripping of the fuses. Prior to installing overcurrent protection, the electrical contractor performing this survey is required to explain the difficulties you may experience after the devices are installed.

I CERTIFY THAT I HAVE READ AND UNDERSTAND THIS NOTICE:

Date _____ X _____ Customer Signature

K&T-97EP.XLS (4/1/97)

CATASTROPHIC DUCT LEAKS AND DISCONNECTIONS

32. GENERAL INSTALLATION CRITERIA

- **All catastrophic duct leaks shall be sealed, and all disconnections reconnected.**
- **All duct reconnections and repairs shall comply with these standards and the manufacturer's instructions and local codes, with the more stringent requirements taking precedence.**

33. MATERIALS FOR DUCT REPAIR AND SEALING

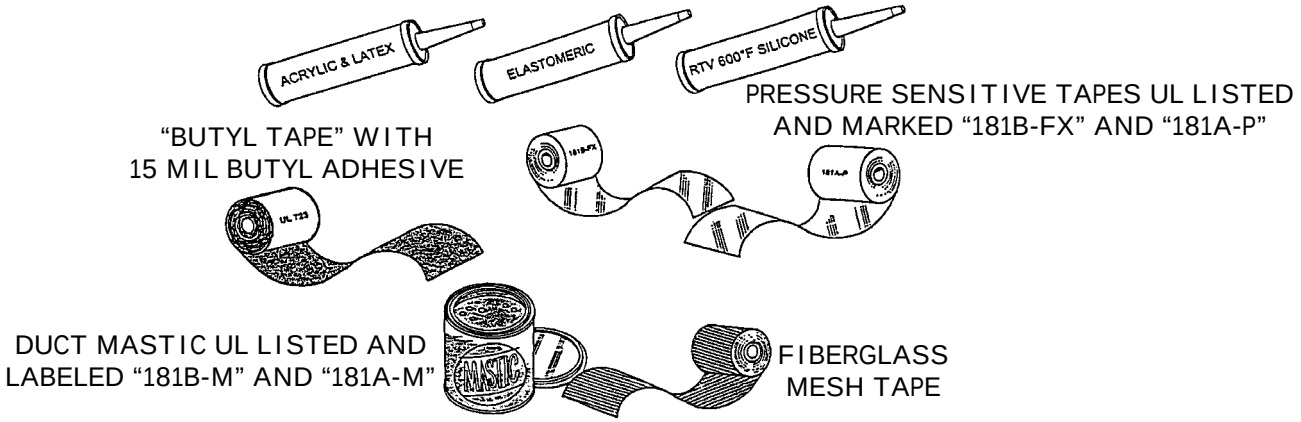
- **All Materials**
  - Maximum flame spread index of 25 and maximum smoke developed index of 50, per ASTM E-84, UL 723 or NFPA 255.
- **Duct Mastic and Mesh Tape**
  - Nontoxic, water-resistant mastic listed per UL 181A or 181B standards and labeled “181A-M” or “181B-M”.
  - Fiberglass mesh tape, minimum 2" wide and 9x9 weave per inch.
- **Metallic Pressure-Sensitive Tape**
  - Aluminum foil tape listed per UL 181A or 181B standards and marked “181A-P” or “181B-FX”.
- **Pressure-Sensitive “Butyl Tape”**
  - Aluminum foil tape with minimum 15 mil butyl adhesive, used to seal metal-to-metal connections.
  - Marked “UL 723” or “181B-FX”.
  - Butyl tape without “181B-FX” marking shall not be used to seal flexible ducts.
- **Cloth-Backed Duct Tapes**
  - Not allowed.

TABLE 3-2: REQUIRED UL 181 IDENTIFICATION

UL STANDARD	SEALING MATERIAL	REQUIRED UL IDENTIFICATION
UL 181A APPLIES TO SEALANTS USED ON RIGID FIBERGLASS DUCT BOARD	PRESSURE SENSITIVE TAPE	MARKED “181A-P”
	HEAT ACTIVATED TAPE	MARKED “181A-H”
	MASTIC	LABELED “181A-M”
UL 181B APPLIES TO SEALANTS USED ON FLEXIBLE DUCTS	PRESSURE SENSITIVE TAPE	MARKED “181B-FX”
	MASTIC	LABELED “181B-M”

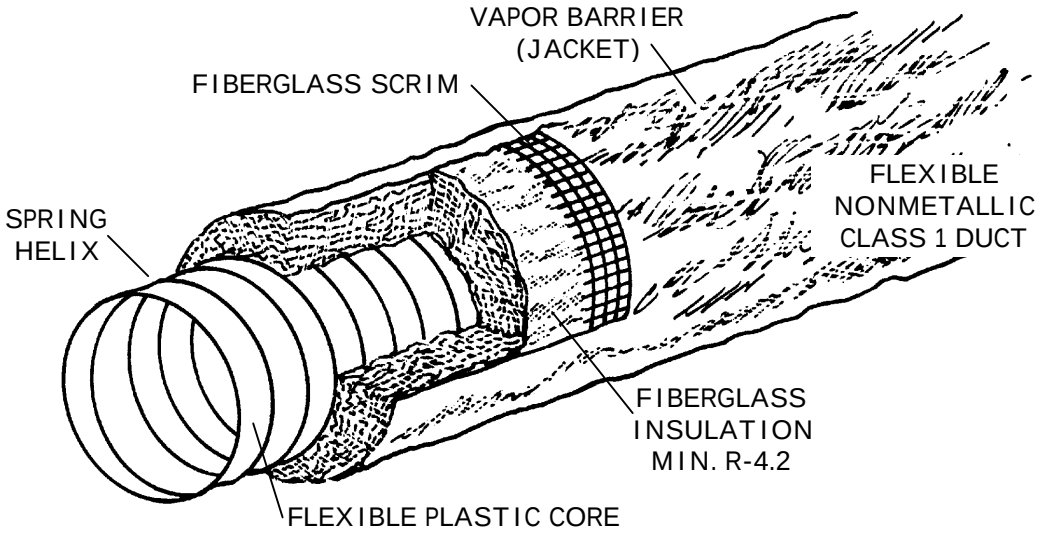
33. MATERIALS FOR DUCT REPAIR AND SEALING (continued)

- ***Insulation***
  - *Replacement ducts exceeding 40 linear feet in unconditioned space shall be insulated with an R-value meeting the following guidelines:*
    - *Minimum R-4.2 in CEC Climate Zones 6-8.*
    - *Minimum R-6 in CEC Climate Zones 1-5 and 8-13.*
    - *Minimum R-8 in CEC Climate Zones 14-16.*
- **Caulks and Sealants**
  - Caulk/sealant material and installation criteria prescribed in Section 1, Caulking Standards, shall be followed.
- **Foam Board and Foam Sealant**
  - Not allowed as a barrier material or sealant in duct systems.
- **Duct Sealants for 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 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.



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.*

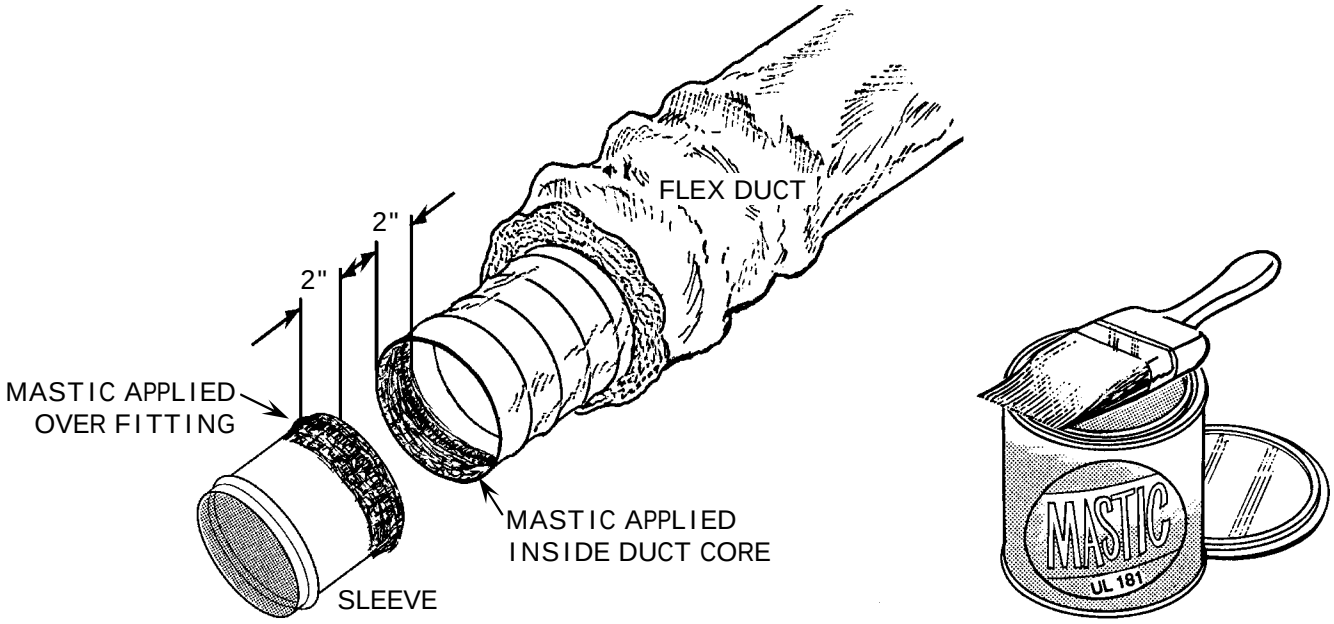
TABLE 3-3: GAP SIZE AND APPROVED SEALING MATERIALS

GAP SIZE	FLEXIBLE METALLIC & NONMETALLIC DUCTS		RIGID METAL *&* *FIBERGLASS* DUCT*S*	
	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.**

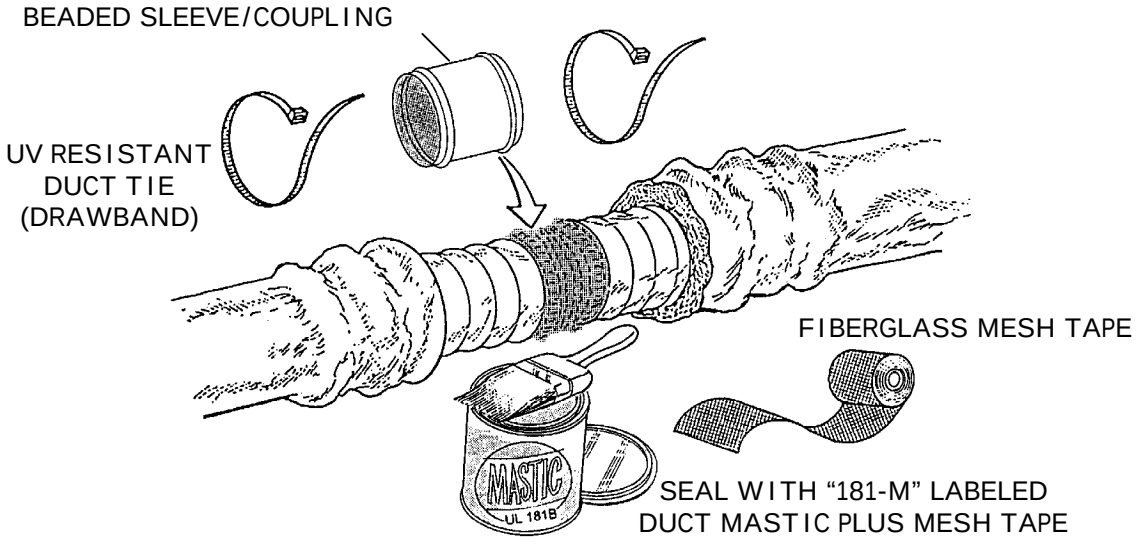
34. DUCT CLOSURE SYSTEMS (continued)

- **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.



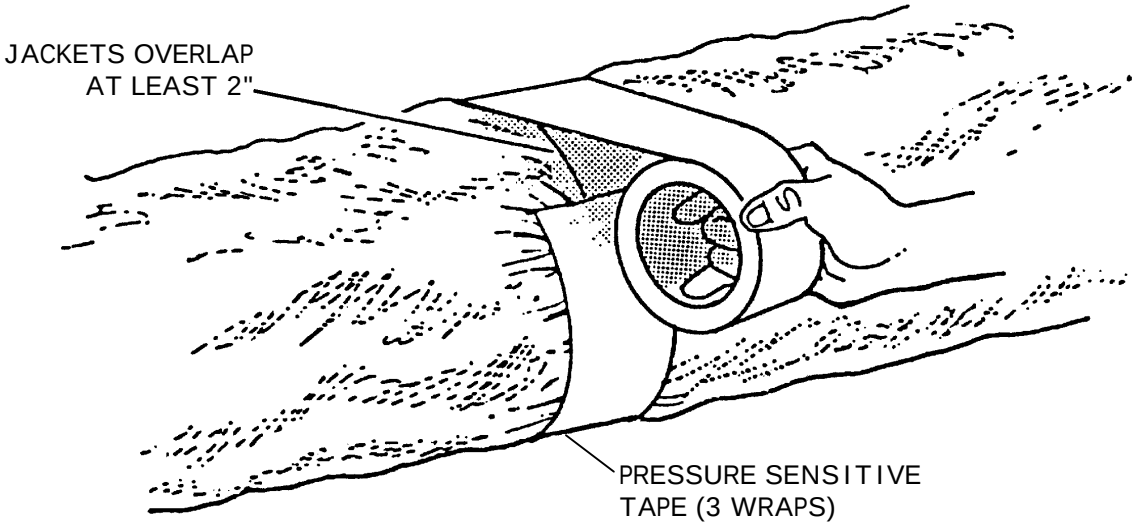
35. REPAIRING AND SEALING FLEXIBLE NONMETALLIC DUCTS

- **Attachment of Duct Core to Fitting**
  - At least 2" of duct core shall be pulled onto the fitting, with at least 1" extending past the bead.
  - Fitting must provide additional 1" wide area beyond duct core for application of tape or externally-applied mastic.
  - A drawband (duct tie or metal clamp) shall be:
    - Placed behind the bead to secure the core onto the fitting.
  - When a preexisting fitting is not beaded:
    - Duct core shall be secured to the fitting with internally-placed mastic and a drawband, or
    - The core's wire coil shall be secured to the fitting with evenly-spaced #8 sheet metal screws plus mastic or tape.
      - Each screw shall penetrate a 2" x 2" or larger strip of metallic "181B-FX" tape externally applied to the duct core.
      - 3 screws for fittings under 12", 5 screws for 12" or larger.
- **Sealing Methods**
  - 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.



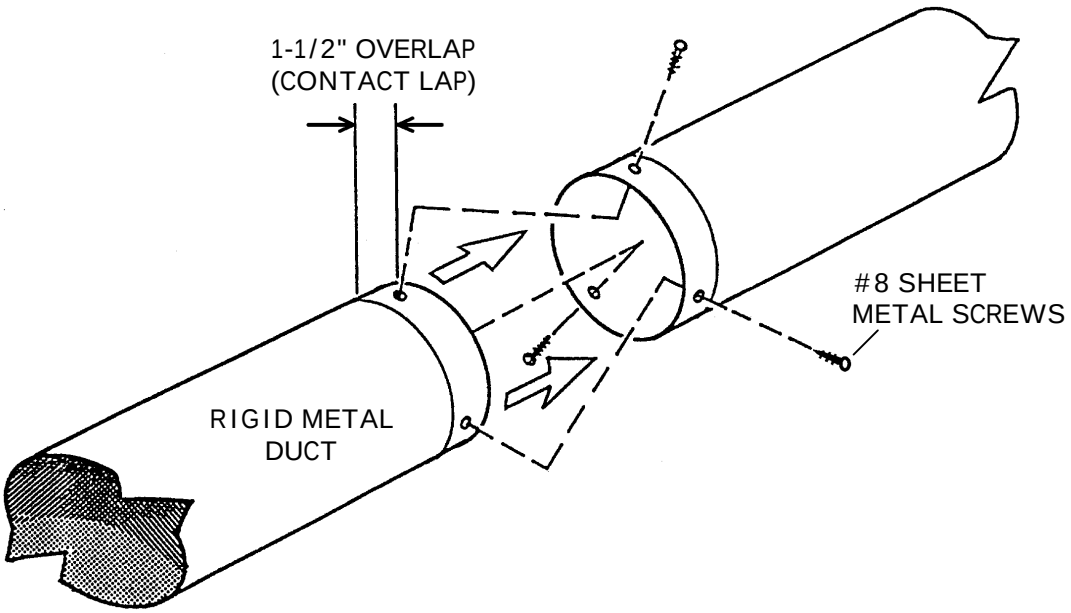
35. REPAIR AND SEALING FLEXIBLE NONMETALLIC DUCTS (continued)

- **Insulation and Vapor Barrier**
  - Insulation shall completely cover the duct core and fitting.
  - The vapor barrier (jacket) shall be pulled back over the insulation.
    - Where two pieces of duct are joined (splices), the two jackets shall overlap at least 2".
    - Vapor barrier shall be secured/sealed with a drawband and/or three staggered wraps of pressure sensitive tape (see Item 39).



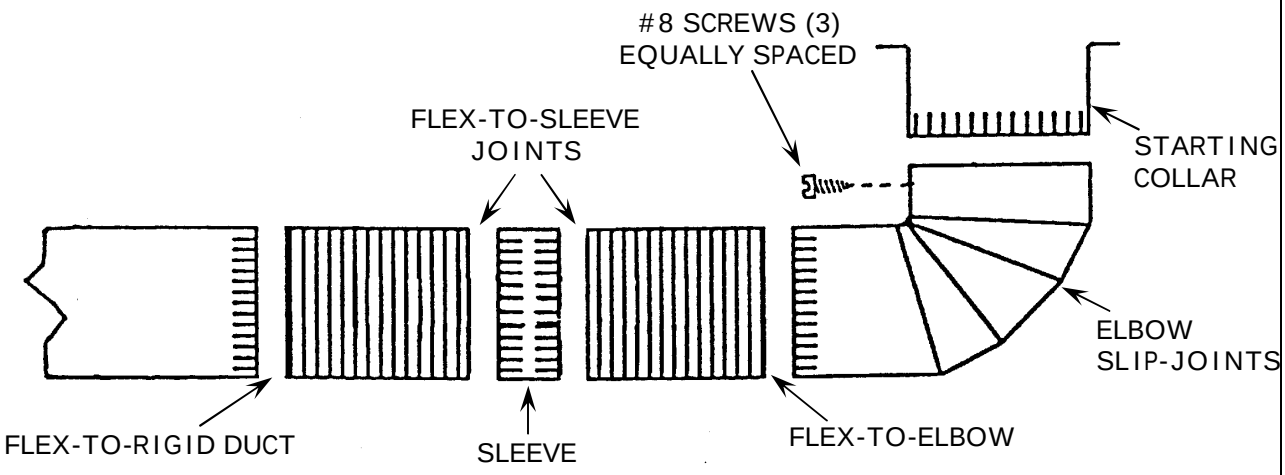
36. REPAIRING AND SEALING RIGID METAL DUCTS

- **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).



36. REPAIRING AND SEALING RIGID METAL DUCTS (continued)

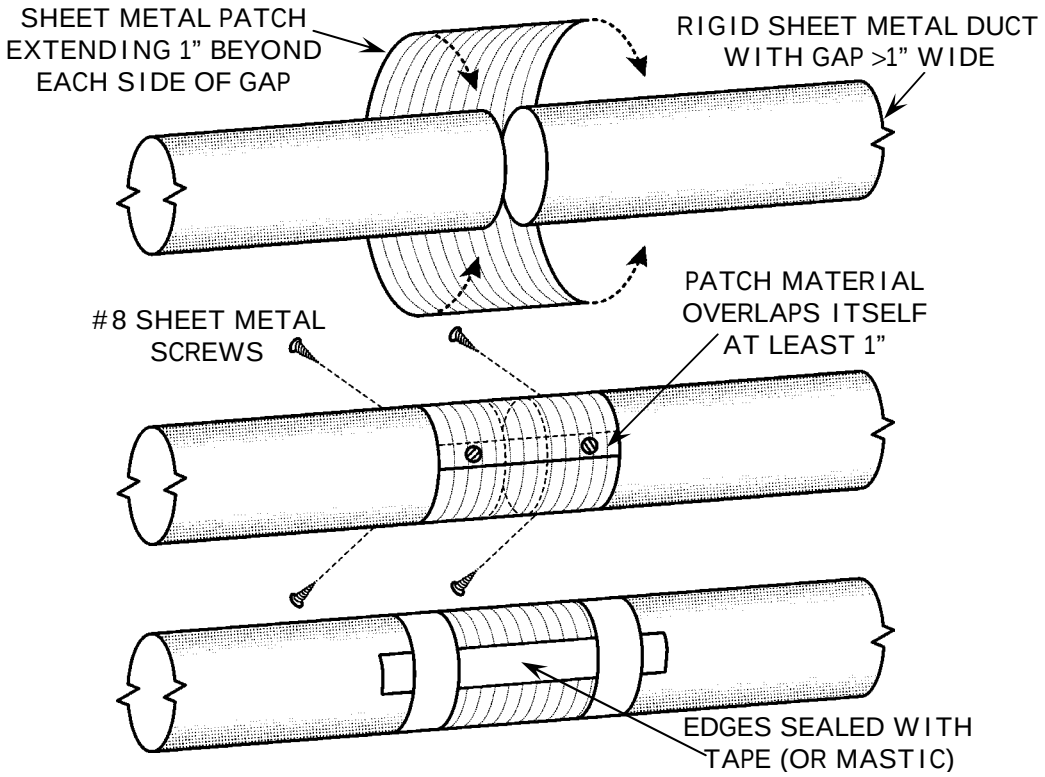
- **Gaps ~~1/8~~*1/4*" or smaller may be sealed with:**
  - Duct mastic, or
  - *Metallic* pressure sensitive tape.
  - ~~Aerosol-applied sealant.~~
- **Gaps ~~larger than~~*over* ~~1/8~~*1/4*" *up to 1" wide* shall be sealed with:**
  - Duct mastic *with* embedded ~~with~~ fiberglass mesh, or
  - *Metallic* 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 37) and sealed with mastic or metallic tape.***
- **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.*



~~37. 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:~~

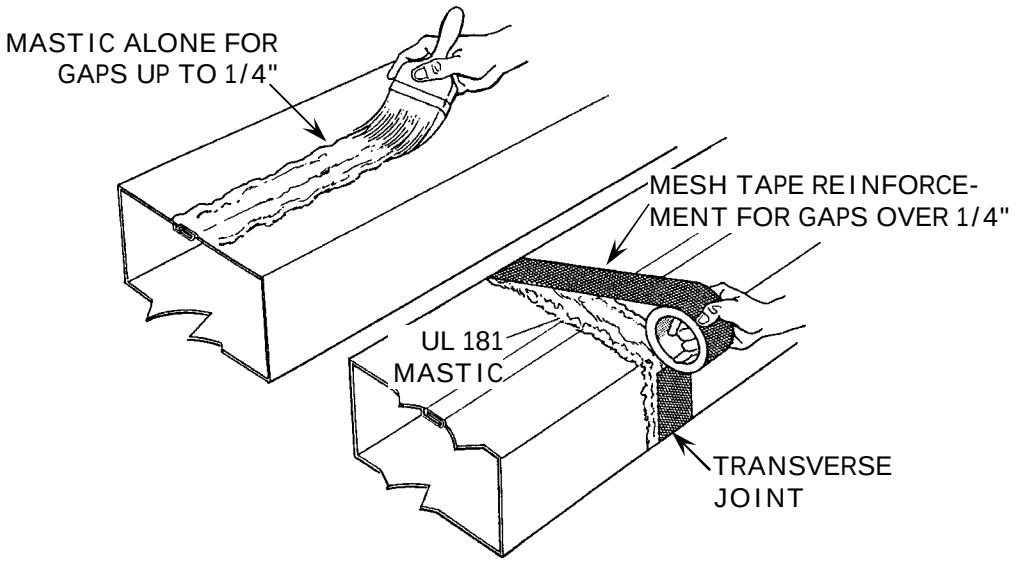
  ~~-Externally applied over the duct core and rigid fitting, or~~

  ~~-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).~~

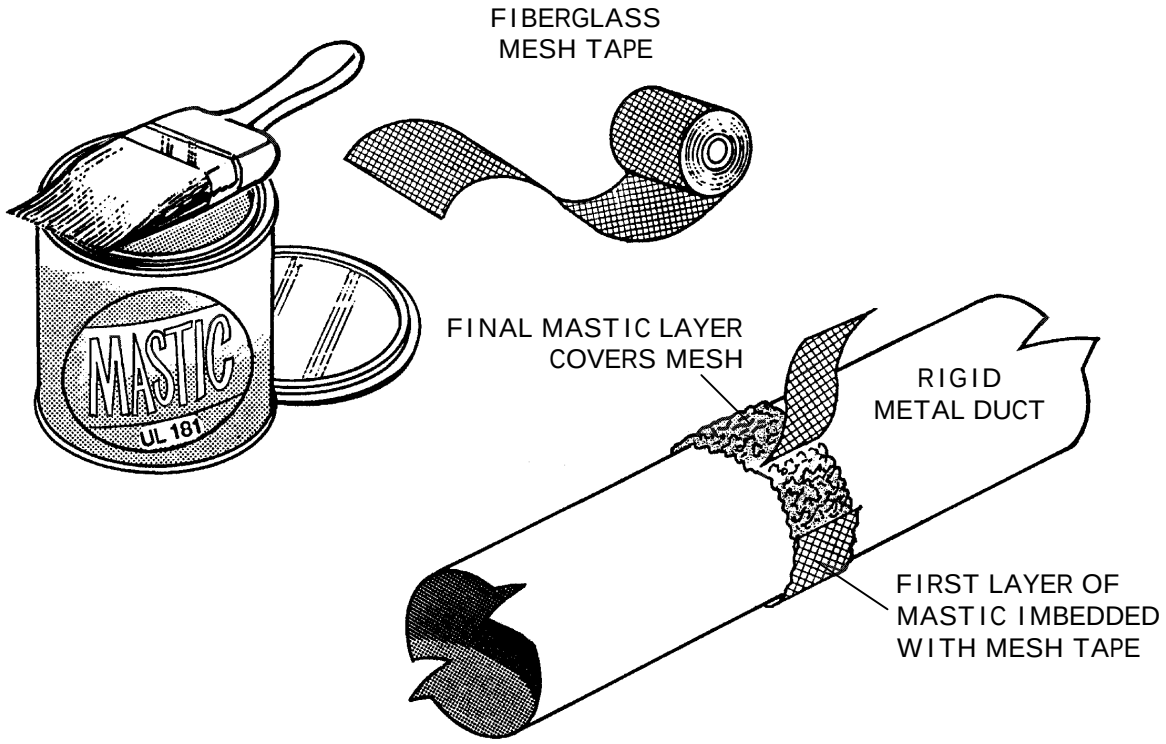
38. SEALING WITH MASTIC

- ***Mastic shall be applied as prescribed by manufacturer, including:***
  - *Surface preparation/cleaning.*
  - *Temperature and moisture limitations.*
  - *Thickness and set-up time.*
- ***Rigid Metal and fiberglass 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.*
- ***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).*



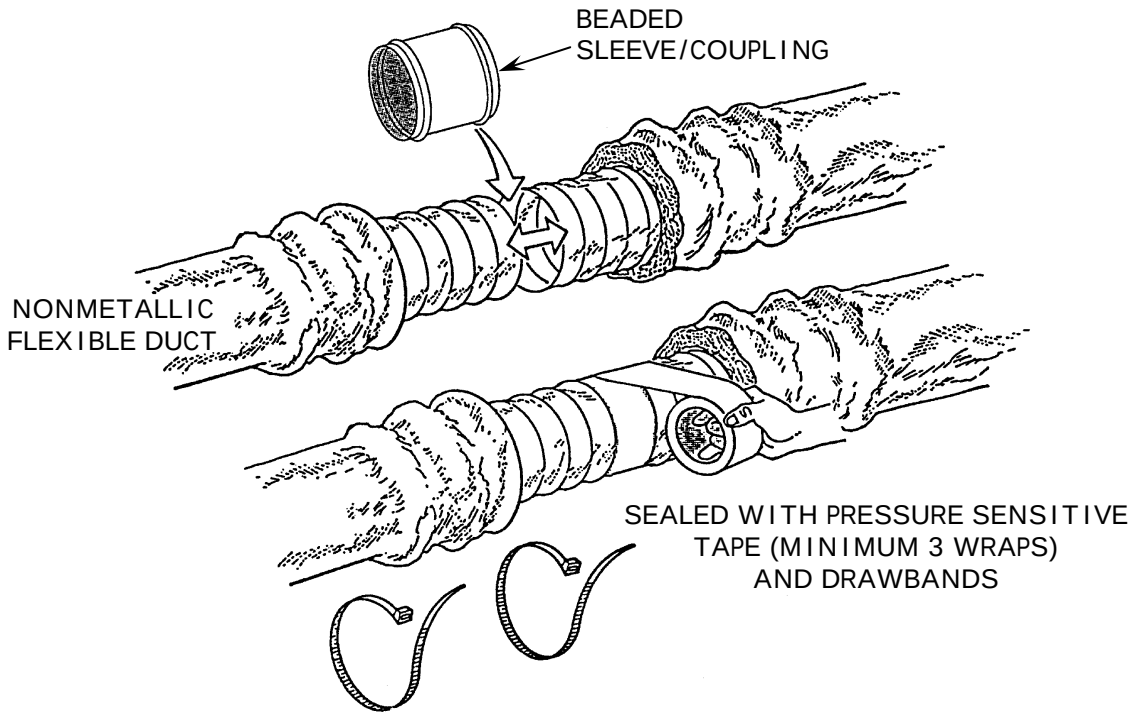
38. DUCT MASTIC SEALING PROCEDURE (continued)

- **Reinforcement of Mastic with Fiberglass Mesh Tape**
  - Mesh fabric shall be imbedded between two layers of duct mastic to form a mastic closure system.
    - The first layer of mastic shall:
      - Be centered over the joint or gap to be sealed.
      - Extend at least 1" onto each of the joined surfaces.
      - Extend beyond the width of the mesh.
    - The mesh fabric shall be:
      - Embedded in the mastic.
      - Applied at least one layer thick over the entire joint or gap.
      - Wrapped around the entire circumference on transverse joints (e.g., where two sections of duct are joined together).
    - A second layer of mastic shall be installed over the mesh, filling the scrim pattern completely and covering the mesh.
  - Mesh Tape
    - Minimum 2" wide.
    - Weave per inch: 0.006" minimum.



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.*



NATURAL GAS CENTRAL FORCED AIR HEATING SYSTEMS REPAIR AND REPLACEMENT STANDARDS

PART 1: MATERIALS

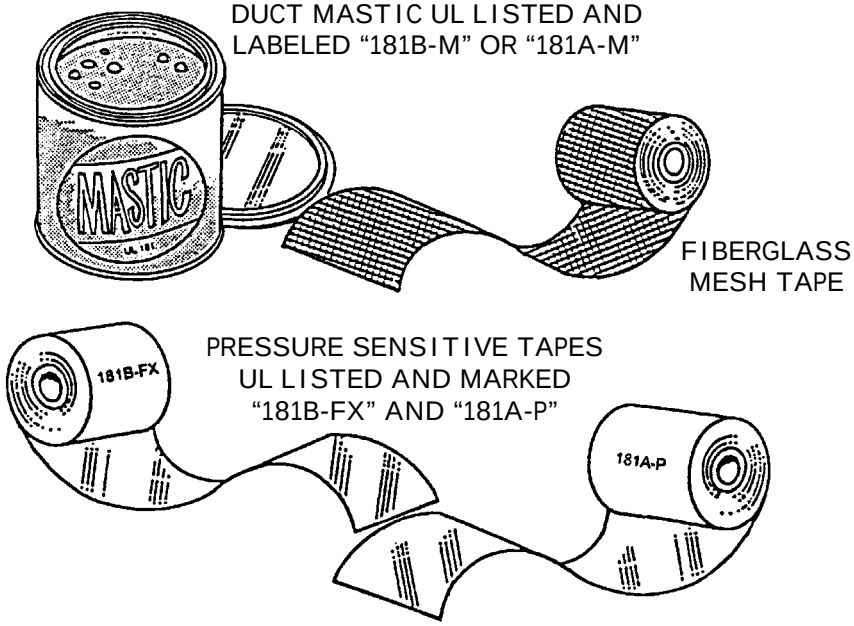
1. APPROVED MATERIALS

- **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® ~~labeled~~*qualified*.
- **Split Systems**
  - Furnace: Minimum AFUE rating of 90%.
  - Air Conditioner, *if replaced in conjunction with furnace*:
    - Minimum EER of 11.~~0~~ *5* 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

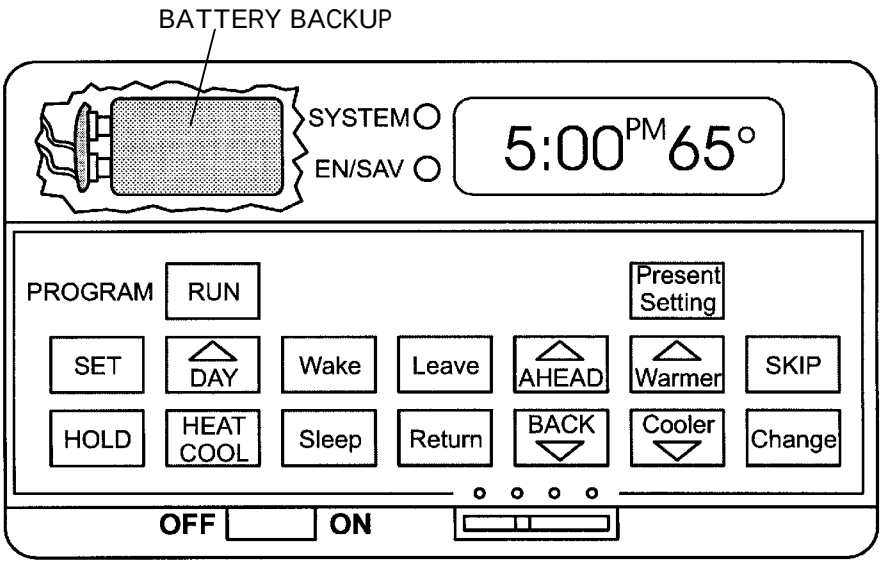
1. APPROVED MATERIALS (continued)

- **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~~*Section 20, Duct Sealing Standards*.



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.



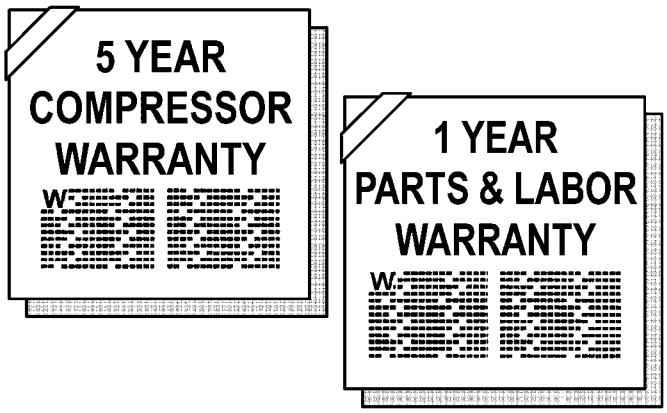
DIGITAL PROGRAMMABLE THERMOSTAT
WITH ON/OFF SWITCH

1. APPROVED MATERIALS (continued)

- **Central Heating and Air Conditioning Air Filters**
  - Shall be washable.
  - Shall be UL listed Class 2 filter material.
  - Shall conform to ARI Standard 680 and UL-900 or UL-1096.
  - "Hog Hair" Type and Other Bonded Fiber
    - 1" thickness shall be used in central HVAC systems.
  - Foam
    - 1/4" single layer foam, 20 to 30 pores per inch (ppi).
    - Foam shall be installed only when bonded fiber is not feasible or is prohibited by the appliance manufacturer.
  - Other Materials
    - "Sock" type foam and other specialty materials may be installed where required by appliance manufacturer.

2. WARRANTY

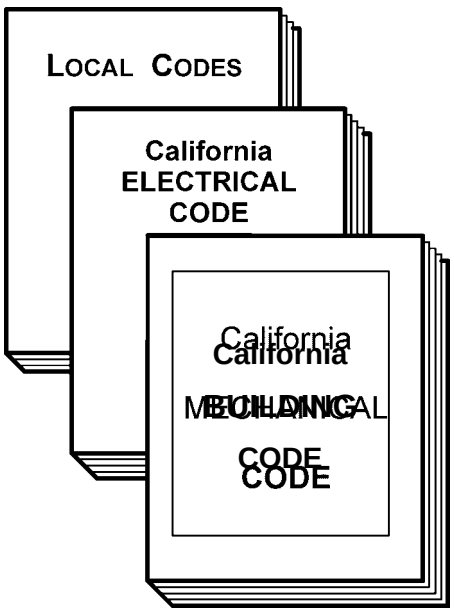
- **HVAC Unit Installations**
  - Parts and labor shall be covered by a minimum one (1) year written parts and labor warranty.
  - Compressor warranty shall extend to five (5) years.
  - All written warranty information and manufacture's operating and maintenance instructions shall be supplied to the customer.
- **Wall Thermostats**
  - Minimum one-year manufacturer's warranty.
  - Minimum one-year parts and labor contractor's warranty.



PART 2: NEW FURNACE AND COMBINED FURNACE AND AIR CONDITIONER INSTALLATION

3. GENERAL REQUIREMENTS

- **A permit for the installation shall be obtained from and finalized by the local jurisdiction.**
- **Installation shall be in compliance with:**
  - Manufacturer's instructions and specifications.
  - Currently adopted California Electrical Code (CEC).
  - Currently adopted California Mechanical Code (CMC).
  - Local building code.
- **Lead-safe practices shall be employed when working with pre-1979 painted materials per state codes T8 Section 1532.1 and T17 Section 36000, et seq.**
- ***Air* Distribution System**
  - 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)~~ *leaks 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 shall be installed in conformance with manufacturer's instructions.



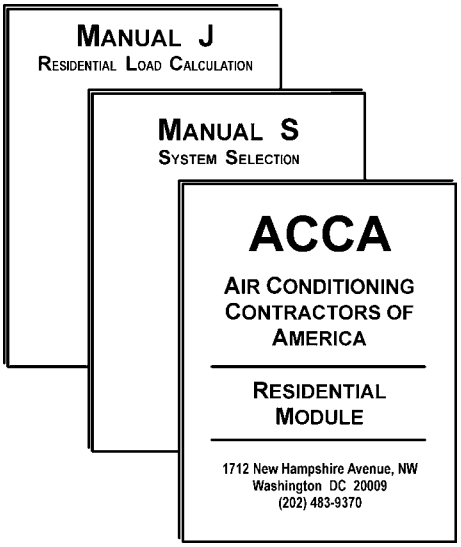
PART 3: NEW FURNACE INSTALLATION

4. LOCATION

- **FAU Enclosure**
  - Enclosure shall be the proper size for required clearances and combustion air venting.
  - Access shall be provided per Item 13.
  - Enclosure shall provide adequate service space for:
    - A 120V receptacle, and
    - An appliance line valve.

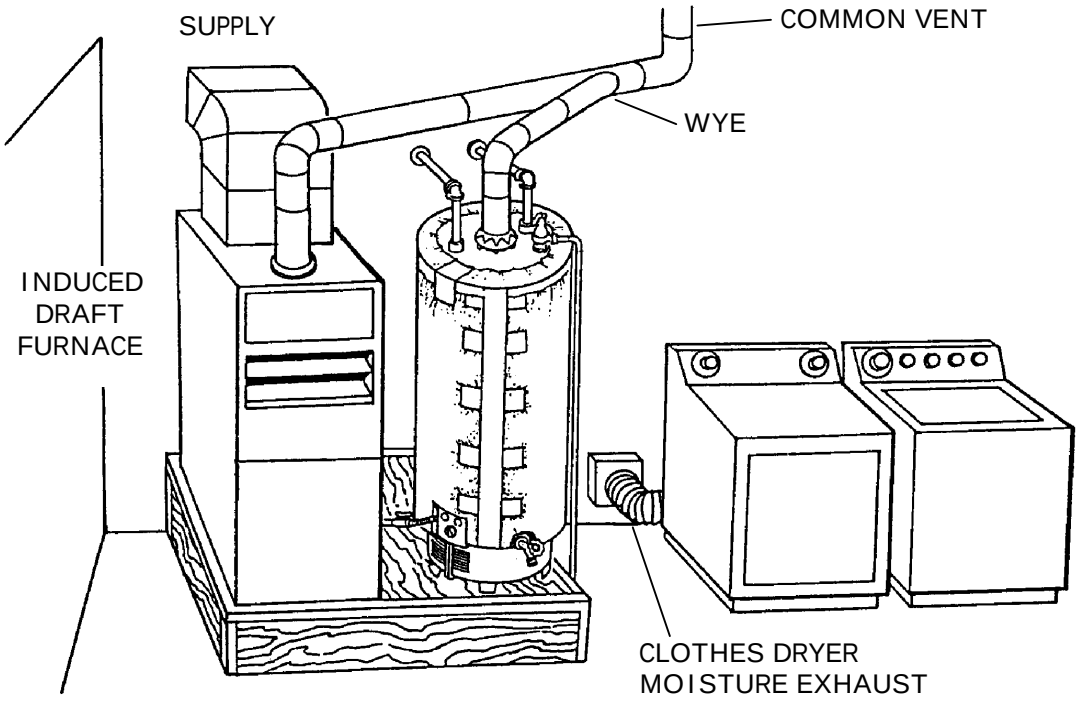
5. SYSTEM DESIGN AND PERFORMANCE

- **All Installations**
  - ~~Heating capacity and system design shall be in conformance with standard practices set forth by ACCA (Air Conditioning Contractors of America), Manual J and Manual S.~~
  - *Unit shall be properly sized in accordance with Title 24 or local code, whichever is more stringent.*
  - ~~Furnace shall perform as designed.~~*Capacity of the new system should be equal to or smaller than the existing system.*
- **Installations Utilizing Existing Ducts**
  - New FAU shall be compatible with existing duct system.



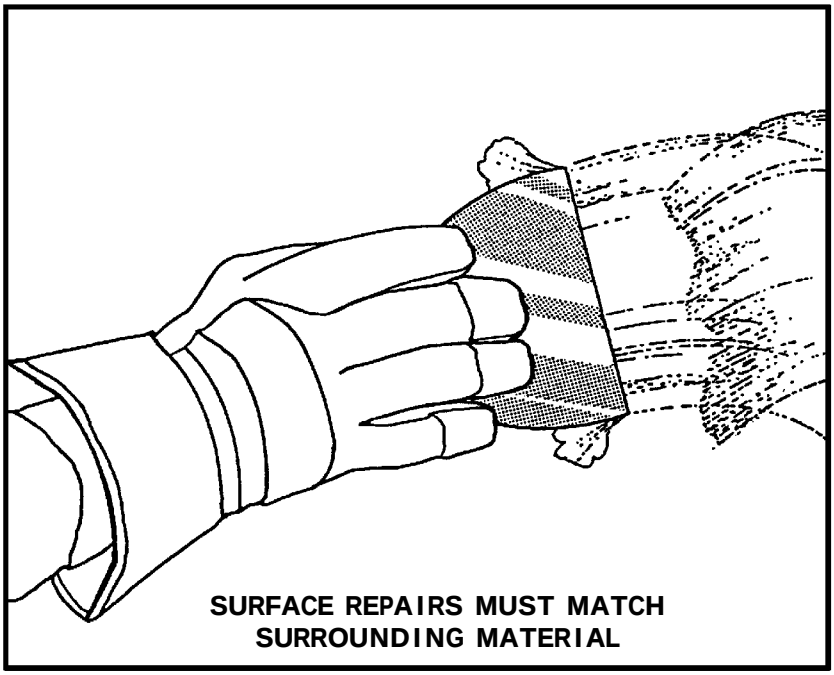
6. NEW FURNACE INSTALLATION

- **Appliance Venting**
  - Appliance venting shall be in conformance with state and local codes, manufacturer's installation instructions and venting tables.
  - When an existing furnace that shares a common vent with another appliance is replaced with a new unit, contractor shall ensure that both appliances are properly vented.
- **Plumbing/Piping**
  - All pipes, valves, fittings, flexible connectors, etc. shall comply with local codes, CMC and CBC.
  - Only new parts shall be installed; used parts not allowed.
  - Shutoff valve shall be within 3' of the appliance and in the same room or space where the appliance is located.



6. NEW FURNACE INSTALLATION (continued)

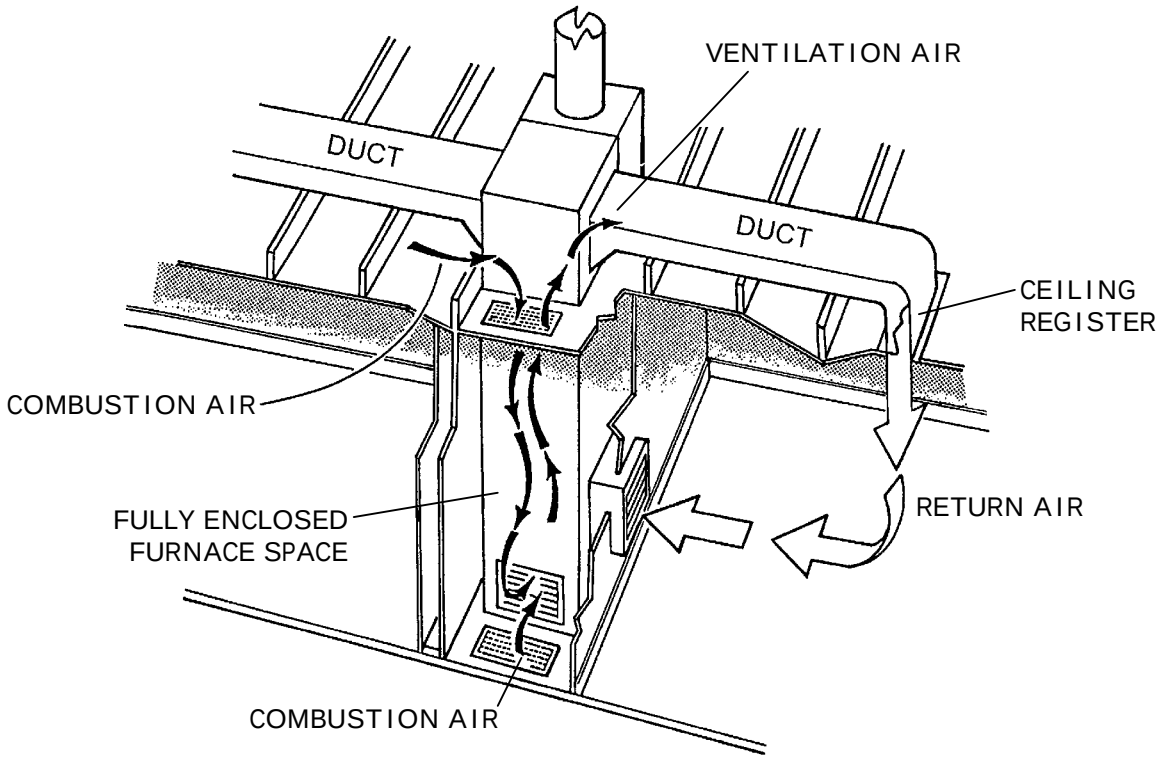
- **Wall Repairs**
  - Wall repairs shall match plane of adjacent material.
  - Repairs shall match texture of, and blend with, surrounding surfaces.
- **Floor Repairs**
  - Abandoned floor openings shall be closed in a workmanlike manner:
    - Framed on all four sides.
    - Finished with minimum 3/4" CCX plywood or better material.
  - Floor shall be surfaced in conformance with the customer's wishes:
    - Flush with surrounding flooring material, or
    - Recessed to accommodate future installation of floor covering material.
  - All construction debris shall be removed from the crawl space and the premises.



SURFACE REPAIRS MUST MATCH SURROUNDING MATERIAL

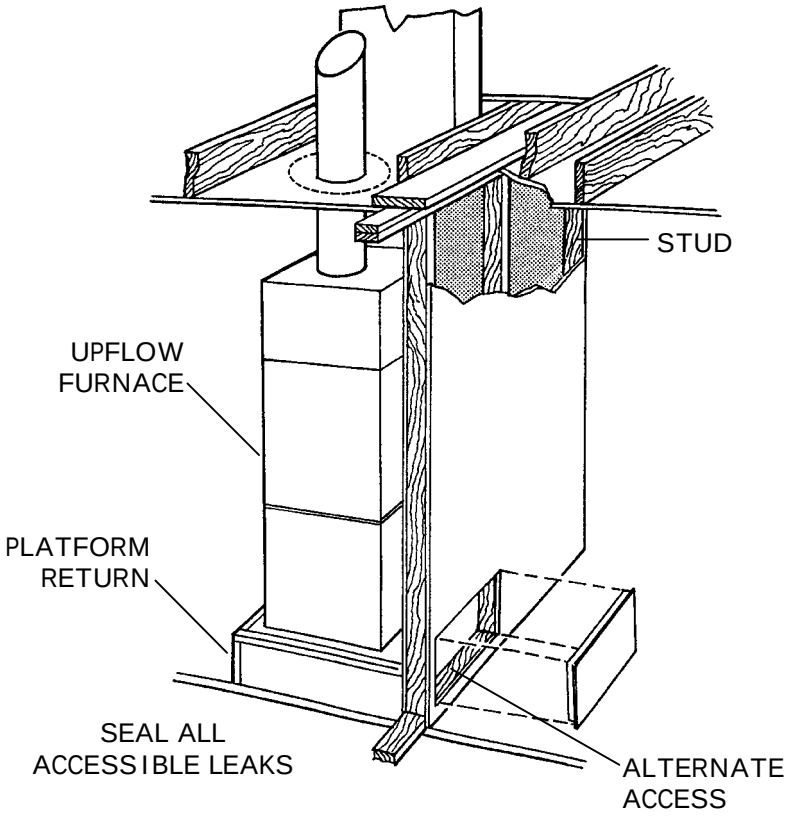
7. COMBUSTION AIR

- **All Forced Air Units**
  - Combustion air shall be supplied in conformance with manufacturer's instructions and local code (see WIS Appendix -A- and CMC Chapter 7).
  - Existing combustion air vents shall be free of obstructions (e.g., over-blown ceiling insulation, duct insulation, etc.).
  - Return air shall be isolated from combustion air.
- **Open Combustion Furnaces Inside a Building**
  - Combustion air shall be obtained entirely from either outdoors or inside the building.



8. FAU, PLENUMS, AND DUCTS

- **Return Air 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 *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 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

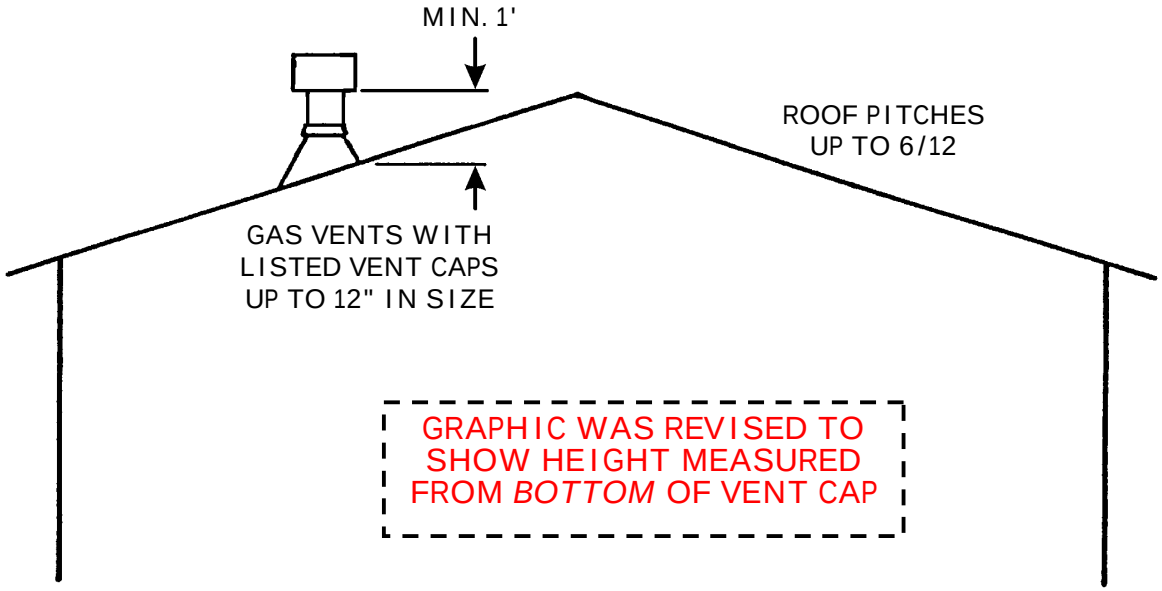
- **All Furnaces**
  - New vent/flue system shall be installed and secured in conformance with manufacturer's instructions and local code.
  - Reference Standard: CMC Chapter 8.

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

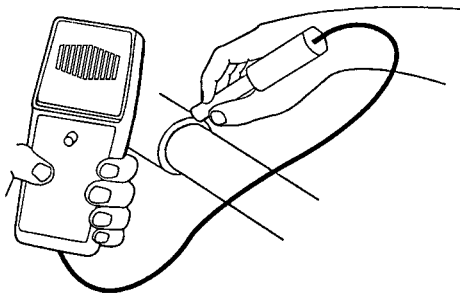
- **When required ~~by the Program Policy and Procedures~~, a programmable thermostat shall be installed as prescribed in Part 6.**



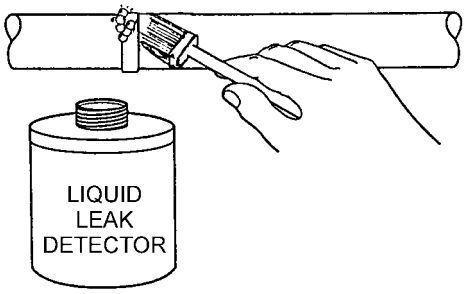
12. GAS LINES, FITTINGS AND VALVES

- **All Installations**
  - All gas piping (e.g., risers, flexible connectors, fittings and valves) shall be installed in conformance with manufacturer's instructions and local code.
    - Gas shut-off valve shall be in good condition and in conformance with Item 1.
    - Gas flexible connector shall be new (existing shall not be reused).
  - All new and affected lines and components shall be checked for gas leaks by a method approved by the local jurisdiction, such as one of the following:
    - Commercial leak detection liquid.
    - Electronic leak detector.
    - Pressure test of the line.

ELECTRONIC LEAK DETECTOR



LIQUID LEAK DETECTION METHOD



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

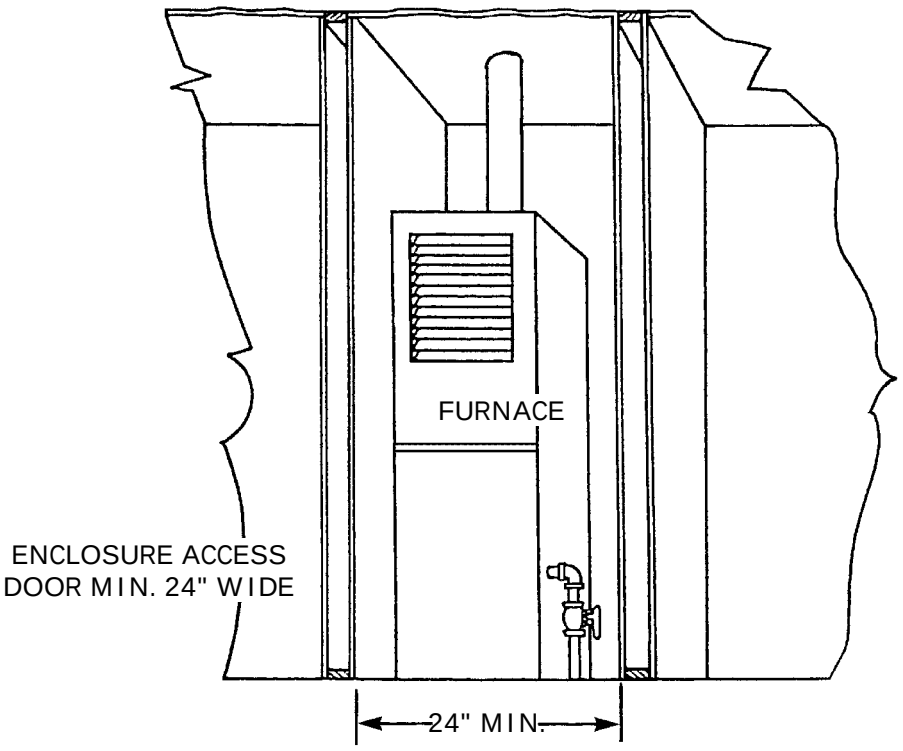
13. ACCESS AND SERVICE SPACE

- **All installations**
  - Access and service space shall be provide*d* 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).~~

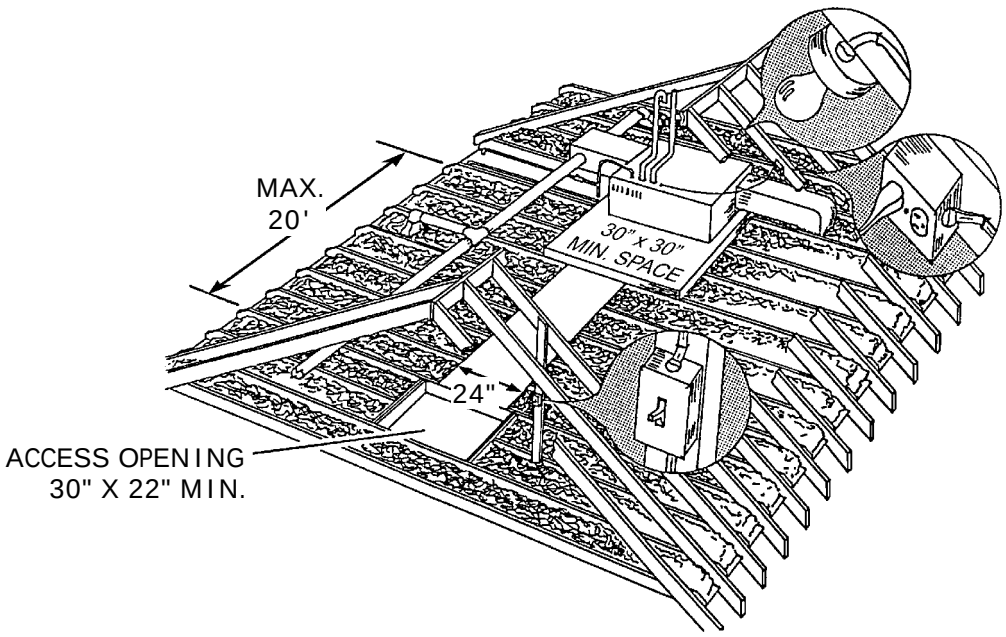


13. ACCESS AND SERVICE SPACE (continued)

- **Equipment in Attics**
  - Access opening shall be large enough to accommodate removal of the appliance, but no smaller than 30" by 22".
  - An unobstructed passageway shall be provided which:
    - is large enough to accommodate removal of the appliance, but no smaller than 30" wide and 30" high.
    - Is no more than 20' in length (from access opening to the equipment).
    - has continuous solid flooring not less than 24" wide.
  - A level service space shall be provided at the front or service side of the equipment which is at least 30" wide and 30" deep.
- **Illumination for Attic Installation**
  - Permanent switch-controlled lighting shall be installed.
  - Switch shall be located at the access/entrance and readily accessible.
  - Lighting shall provide sufficient illumination to safely approach the equipment and perform the task for which access is provided.

14. CENTRAL AIR CONDITIONERS COMBINED WITH FURNACE

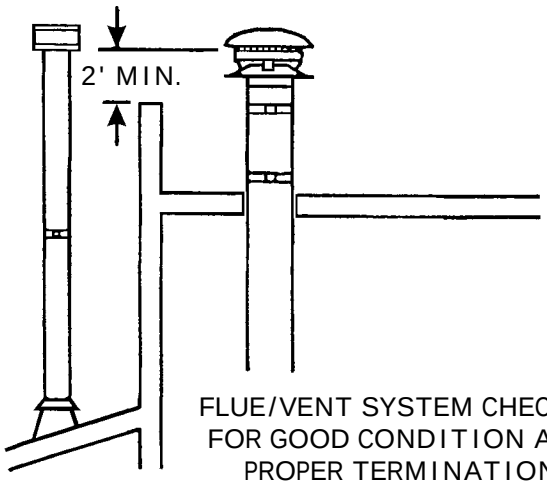
- **Equipment shall be installed as prescribed in Part 5.**



PART 4: FURNACE REPAIRS

15. PRELIMINARY EXAMINATION

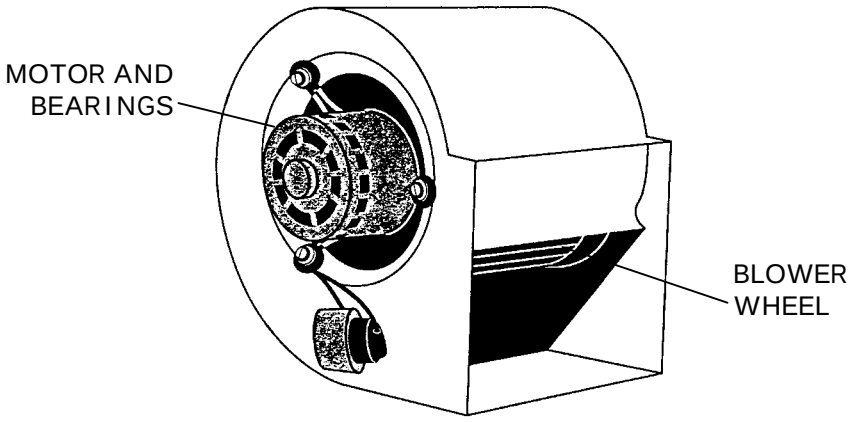
- **The furnace shall be checked for the presence of defects, such as the following:**
  - Gas leaks at valves, fittings, joints, or flexible gas connectors.
  - Presence of copper gas line or butt-soldered joints.
  - Heat exchanger defects (e.g., cracks, holes, deterioration).
  - Excessive rust in the draft hood or heat exchanger.
  - Flue/vent system defects, such as:
    - Disconnections, leaks, obstructions, etc.
    - Defective/missing cap.
    - Misaligned, defective or multiple draft hoods.
    - Inadequate clearance from combustibles.
    - Improper termination.
    - Single-wall pipe used where double-wall is required (e.g., extending beyond ceiling.
  - Burner defects, such as:
    - Excessive soot or rust.
    - Dirty or improperly adjusted.
    - Flame impingement and/or abnormal flame.
    - Delayed or rollout ignition.
    - Incorrect orifice.
    - Over- or under-fired.



FLUE/VENT SYSTEM CHECKED FOR GOOD CONDITION AND PROPER TERMINATION

15. PRELIMINARY EXAMINATION (continued)

- **The furnace shall be checked for the presence of defects, such as the following:**
  - Improper position of thermocouple/pilot generator, pilot or flame.
  - Inadequate/improper combustion air venting.
  - Controls
    - Electrical disconnection or defect.
    - Improper adjustment.
  - Distribution System
    - Return leaks that could draw in combustion products or other pollutants.
    - Furnace-to-floor/plenum gaps/leaks.
    - Dirty, defective, or missing furnace filter.
  - Blower Chamber
    - Need for cleaning or lubrication of blower.
    - Loose or unsafe wiring.
  - Evaporator Coil Box
    - Dirty or damaged evaporator coil.
    - Air leaks at plumbing or wiring penetrations.
  - Heating unit integrity:
    - Loose or hazardous wiring.
    - Loose or missing components.
    - Improper alteration of the heating unit.



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

- **Duct system shall be *examined* ~~checked~~ for ~~catastrophic~~ leaks and disconnections *and brought into conformance with* ~~Title 24~~*LIEE 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*.**

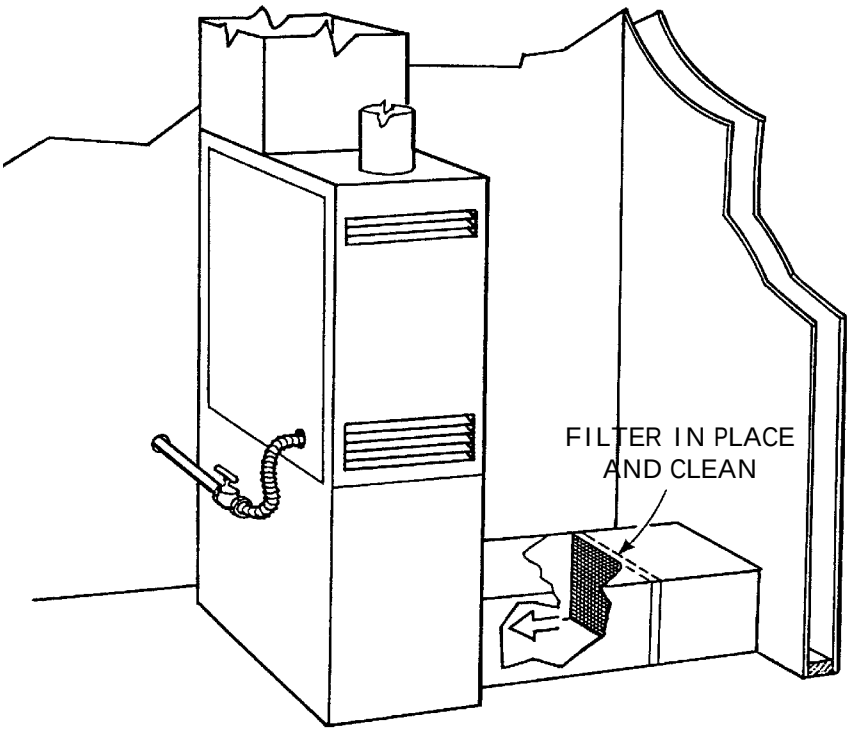
~~**-Closures shall be in compliance with CEC Title 24 standards.**~~

~~·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.**

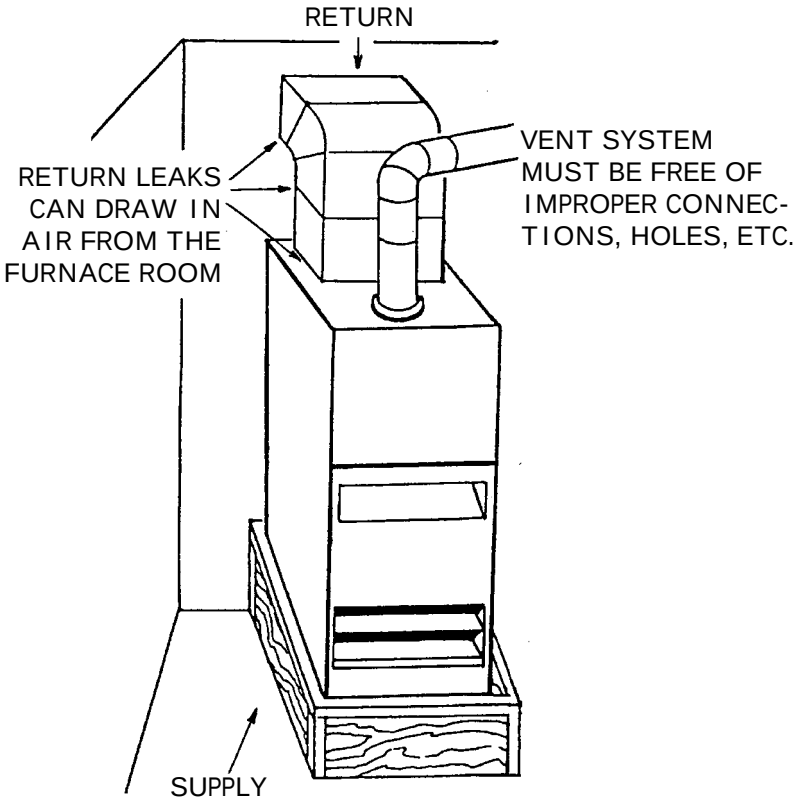


18. HEATING UNIT INTEGRITY

- **Loose items shall be tightened (e.g., screws, bolds, panels, etc.).**
- **Missing/damaged components critical to proper operation shall be replaced/repaired (e.g., access doors, roll-out shield, etc.).**
- **Improper alterations that adversely affect unit operation shall be corrected.**

19. RETURN AND SUPPLY

- **Return leaks in plenum/cabinet/duct that could draw in combustion products or other pollutants shall be repaired.**
- **Dirty blower chamber and fan blades shall be cleaned.**
- **Evaporator Section**
  - Evaporator coil shall be clean.
  - Penetrations shall be sealed (i.e., with cork tape).



20. GAS CONTROL VALVE

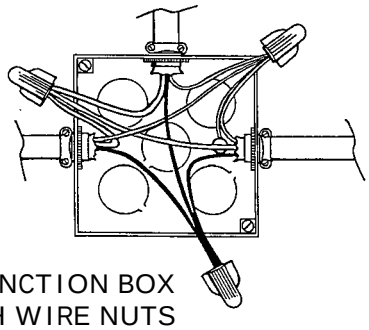
- **The valve shall turn properly and be free of leaks and electrical defects (e.g., short or open).**
- **Gas pressure shall comply with manufacturer's specifications.**

21. GAS PIPING AND VALVES

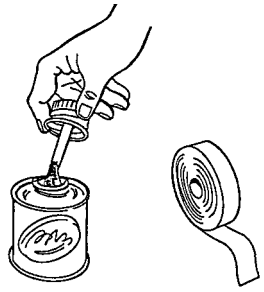
- **Joints, fittings, appliance line valve, rigid and flexible connector, and gas control valve shall be checked for gas leaks by:**
  - Leak detection liquid/spray, or
  - Electronic leak detector.
- **Nonconforming items, including the following, shall be replaced with materials conforming to applicable code requirements:**
  - Defective gas shutoff valve or pipe fittings.
  - Rigid or flexible copper connector.
  - Butt-soldered joints.

22. WIRING

- **Unit shall be free of wiring defects (e.g., frayed or burned wires, loose or improper connections, etc.).**
- **Splices shall be:**
  - Located in junction boxes.
  - Secured with pressure splicing connectors (e.g., wire nuts).
- **Aluminum/copper splices shall not be made *unless:***
  - Splicing connectors used are identified for that purpose.
  - Conditions of use are met (e.g., application of antioxidant).



SPLICES IN JUNCTION BOX SECURED WITH WIRE NUTS



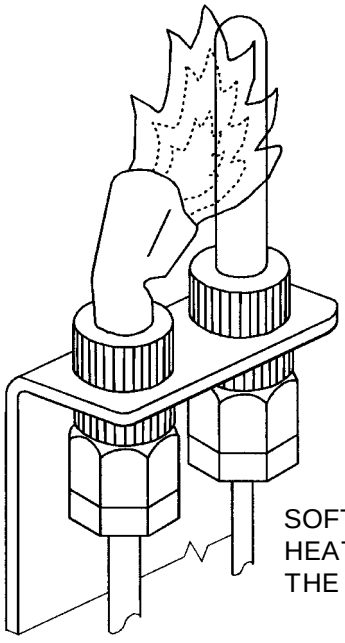
ANTIOXIDANT AND ELECTRICIAN'S TAPE

23. PILOT AND THERMOCOUPLE OR PILOT GENERATOR

- **Thermocouple or pilot generator shall be correctly positioned in pilot flame.**
- **Pilot flame shall be properly adjusted.**
- **Voltage output shall be within specifications for proper operation of the Gas Control Valve.**

24. THERMOSTATS AND CONTROLS

- **Wall thermostat shall function properly:**
  - Anticipator correctly set to 24 volt heating control circuit amperage, when applicable.
  - Wiring connections correct and tight.
  - Unit level and securely installed.
- **Furnace controls, including limit switch and blower fan switch, shall operate in accordance with manufacturer's specifications.**
- **Power switches shall function properly, including:**
  - Blower access lockout/safety switch.
  - Switch controlling power to the unit (disconnect).
  - Blower speed control switch.



SOFT, STEADY PILOT FLAME HEATING TOP HALF-INCH OF THE THERMOCOUPLE

25. HEAT EXCHANGER

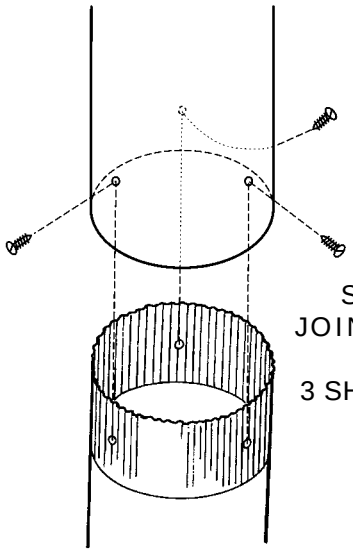
- **Heat exchanger shall be visually inspected for evidence of damage, deterioration, obstruction, etc.**
  - Mirror and a light shall be used, at a minimum.
  - A more sophisticated analysis shall be performed when necessary (e.g., smoke bomb or heat exchanger removal).
- **Observation shall be made for flame interference when blower starts.**

26. COMBUSTION AIR

- **Adequate combustion air shall be available to the furnace, as prescribed in Item 7.**

27. FLUE/VENT SYSTEM

- **Vent system defects shall be corrected.**
- **New components shall conform to applicable codes.**
- **Single-wall Flue/Vent Pipes**
  - Joints and connections shall be secured with 3 evenly-spaced sheet metal screws when:
    - New components are installed.
    - Existing connections are loose or unsafe.
- **Double-wall Type B or BW Flue/Vent Pipes**
  - Shall not be drilled or have screws installed, unless permitted by the manufacturer and local code.



SINGLE WALL PIPE
JOINTS & CONNECTIONS
SECURED WITH
3 SHEET METAL SCREWS

26. FLUE/VENT SYSTEM (continued)

- **Termination**
  - Vent termination shall be in conformance with local code.
  - Vent pipes within 10' of an evaporative cooler shall terminate at least 3' above the cooler.

28. BLOWER SECTION

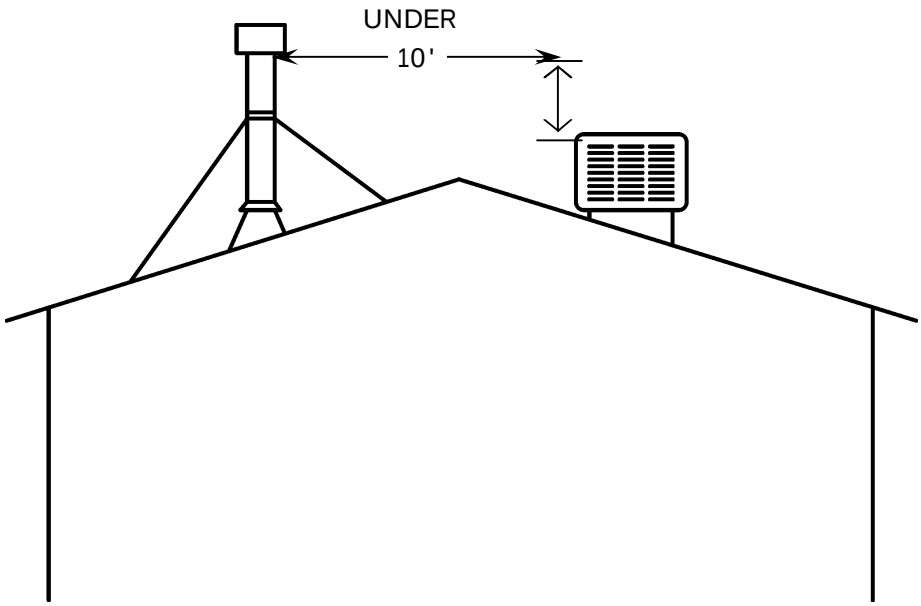
- **The following conditions shall be corrected as needed to ensure proper operation of the unit:**
  - Dirty blower chamber and/or fan blades.
  - Evidence of loose or unsafe wiring.
  - Bearings in need of lubrication.

29. EVAPORATOR SECTION

- **Evaporator coil shall be clean.**
- **Plumbing and wiring penetrations shall be sealed with cork tape.**

30. 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.



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*.

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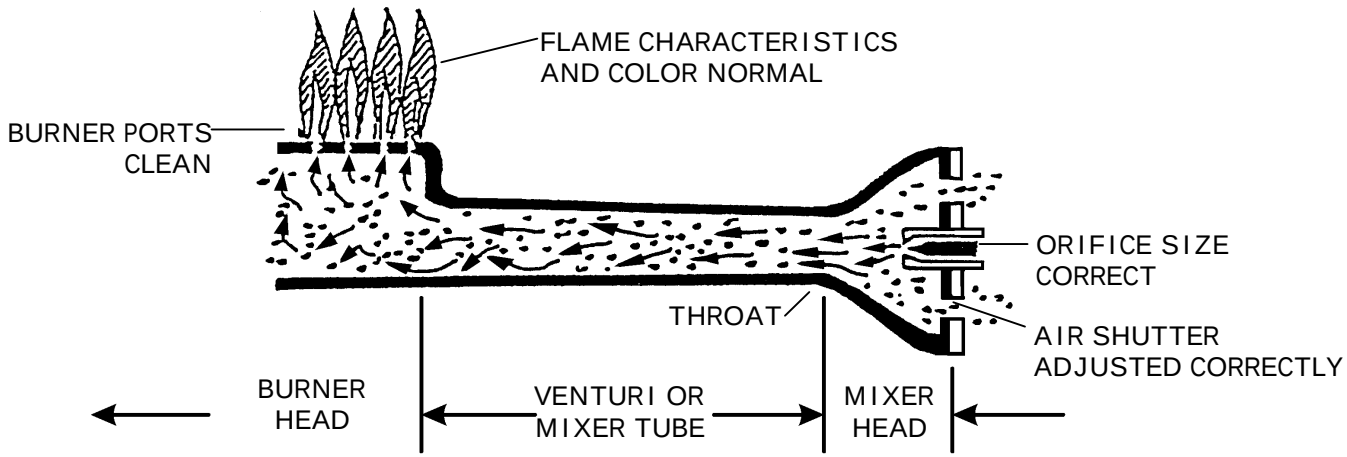

FLAME CHARACTERISTICS
AND COLOR NORMAL
BURNER PORTS
CLEAN
ORIFICE SIZE
CORRECT
THROAT
AIR SHUTTER
ADJUSTED CORRECTLY
BURNER
HEAD
VENTURI OR
MIXER TUBE
MIXER
HEAD

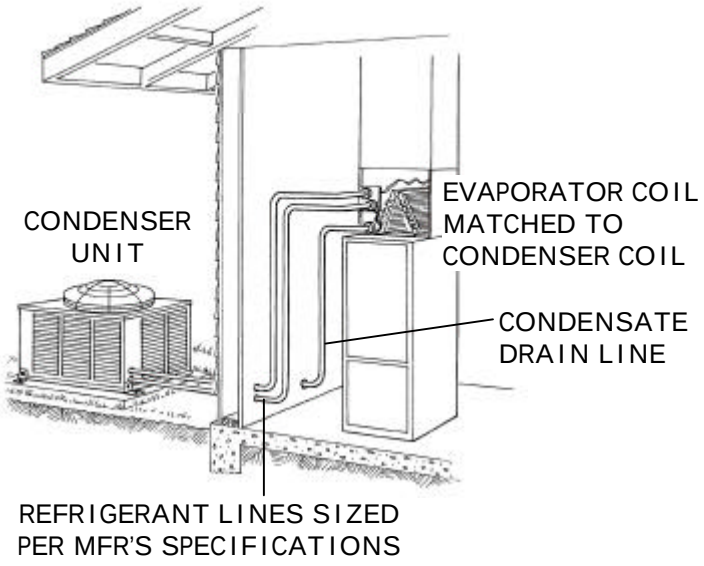
PART 5: NEW AIR CONDITIONER INSTALLATION WHEN COMBINED HEATING AND AIR CONDITIONING SYSTEM IS REPLACED

32. SIZING CRITERIA

- **System Size**
  - Unit shall be ~~properly~~ sized ~~by the Contractor in accordance with ACCA Manual J and Manual S procedures.~~*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.

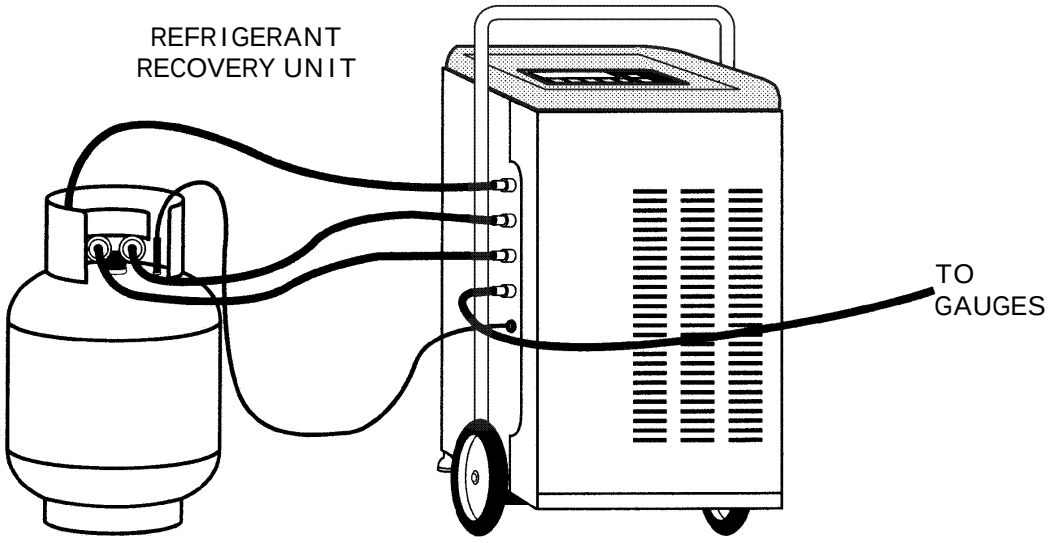
33. EVAPORATOR (INDOOR) COIL AND CONDENSER (OUTDOOR) COIL

- **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.



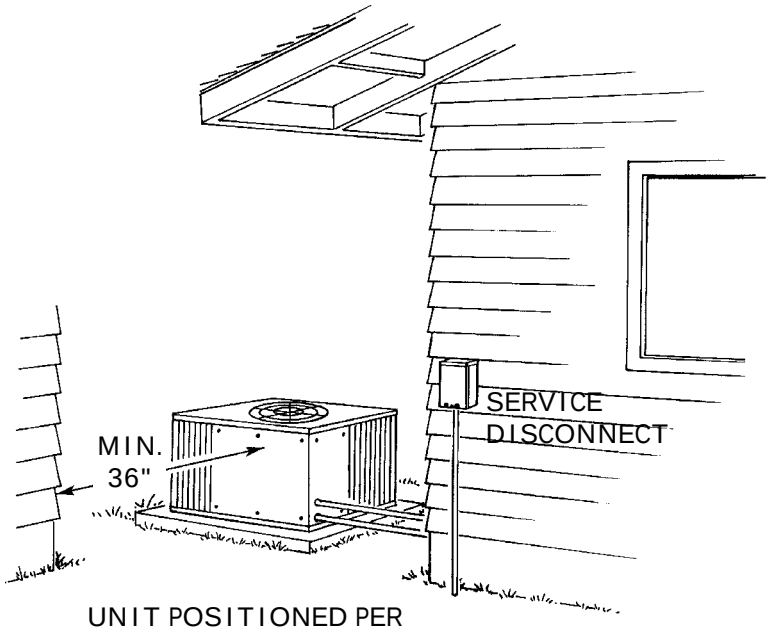
34. OPERATIONAL REQUIREMENTS

- **Air Flow**
  - Air flow through the indoor coil shall be adequate to meet manufacturer's specifications.
- **Refrigerant System Charging**
  - Refrigerant system shall be properly charged using methods specified by the manufacturer.
  - Refrigerant recovery shall be performed in accordance with Federal law.
    - A recovery device shall be used.
    - Ventilation to the atmosphere is not allowed.
  - Technicians performing evacuation and charging must have EPA-approved certification as a Type II or Universal technician.



35. ELECTRICAL ACCESSIBILITY AND GROUNDING

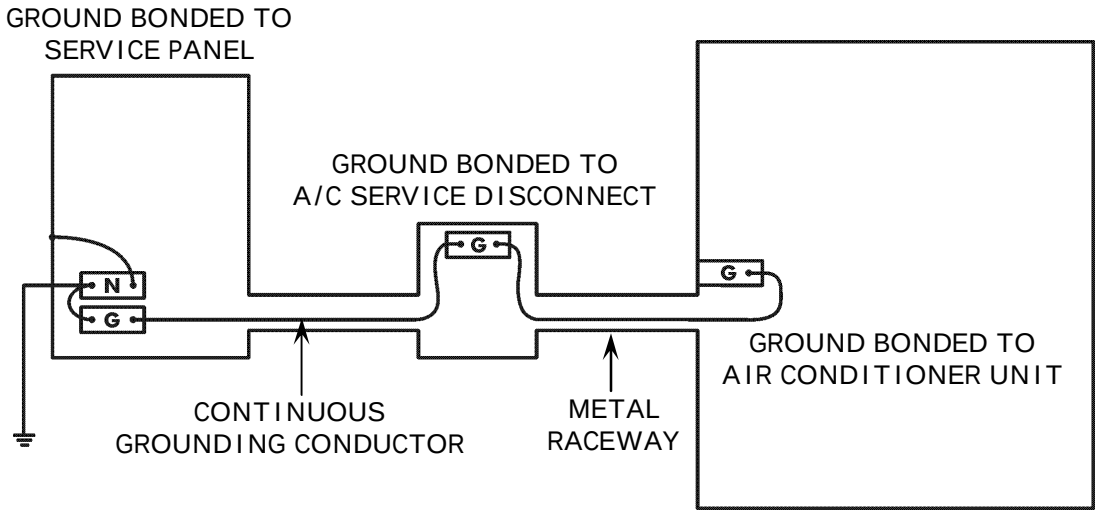
- **All Equipment Installations**
  - Access and working space shall be provided in conformance with CEC Section 110-16 and local code.
- **Open Space for Panels and Equipment**
  - An open space shall be provided around electrical panels and equipment requiring servicing, which shall be minimum 30" 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

35. ELECTRICAL ACCESSIBILITY AND GROUNDING (continued)

- **Service Receptacle**
  - A 120-volt service receptacle shall:
    - Be located within 25' of the equipment.
    - Be on the same level as the equipment.
    - Not be connected on the load side of the disconnect.
- **Grounding**
  - Exposed noncurrent-carrying metal parts shall be grounded in compliance with CEC Article 250, Part J., Grounding Conductors (Sections 250-91 through 250-99), and Part K., Grounding Conductor Connections (Sections 250-112 through 250-119).
  - Parts of the equipment capable of carrying electrical current shall be grounded to the service ground by a continuous:
    - metal raceway,
    - wire, or
    - appropriate conductor in a cable assembly.
  - Connections and splices in the grounding conductor shall:
    - Be made in compliance with the CEC.
    - Provide a continuous path to the service ground with all disconnects and controllers in the open position.



CONTINUOUS GROUNDING PATH FROM SERVICE PANEL
TO A/C UNIT PROVIDED BY CONDUCTOR OR RACEWAY

36. BRANCH-CIRCUIT PROTECTION

- **General Requirements**
  - Air-conditioning equipment shall be provided with:
    - Overcurrent protection per CEC Article 240.
    - Disconnecting means per CEC Article 440, Part B.
    - Branch-circuit short-circuit and ground-fault protection per CEC Article 440, Part C.
- **Protection Device Type**
  - The overcurrent protection device shall be the type specified on the air-conditioning equipment nameplate (see Table 18-1).
  - When nameplate specifies an HACR circuit breaker, the installed circuit breaker shall be listed and labeled HACR type (suitable for use with heating, air-conditioning and refrigeration equipment).
- **Protection Device Rating**
  - The branch-circuit protection device shall not exceed the maxi-mum amperage rating specified on the nameplate of the air-conditioning unit.

TABLE 18-1: OVERCURRENT PROTECTION SELECTION GUIDE

HEAT PUMP UNIT NAMEPLATE MARKED:	OVERCURRENT PROTECTION DEVICE* MUST BE:
"Maximum Fuse Size _X_ Amps"	An _X_ Amp Fuse
"Maximum Fuse or HACR Circuit Breaker _X_ Amps"	An _X_ Amp Fuse or HACR-Type Circuit Breaker
"Maximum Fuse, HACR Circuit Breaker, or Circuit Breaker _X_ Amps"	An _X_ Amp Fuse, HACR-Type Circuit Breaker, or Standard Circuit Breaker
"Maximum Overcurrent Protection Device _X_ Amps"	An _X_ Amp Fuse, HACR-Type Circuit Breaker, or Standard Circuit Breaker

***Amperage rating of the device must not exceed that specified on the nameplate.**

37. BRANCH CIRCUIT CONDUCTORS

- **Ampacity and Rating of Conductors**
  - Minimum wire size shall, as applicable, be:
    - Selected from CEC Tables 310-16 through 310-19, or
    - Calculated in accordance with CEC Section 310-15.
- **Voltage Drop and Wire Length**
  - Circuits shall be installed in conformance with CEC Section 210, Branch Circuits and Section 215, Feeders.
  - The voltage drop over the branch-circuit conductor should not exceed 2%. (See CEC Section 210-19(a) (Fine Print Note No. 4).)
  - In 240v circuits, the maximum conductor length should not exceed the values given in Table 18-2.

TABLE 18-2: MAXIMUM LENGTH OF CIRCUIT (IN FEET)

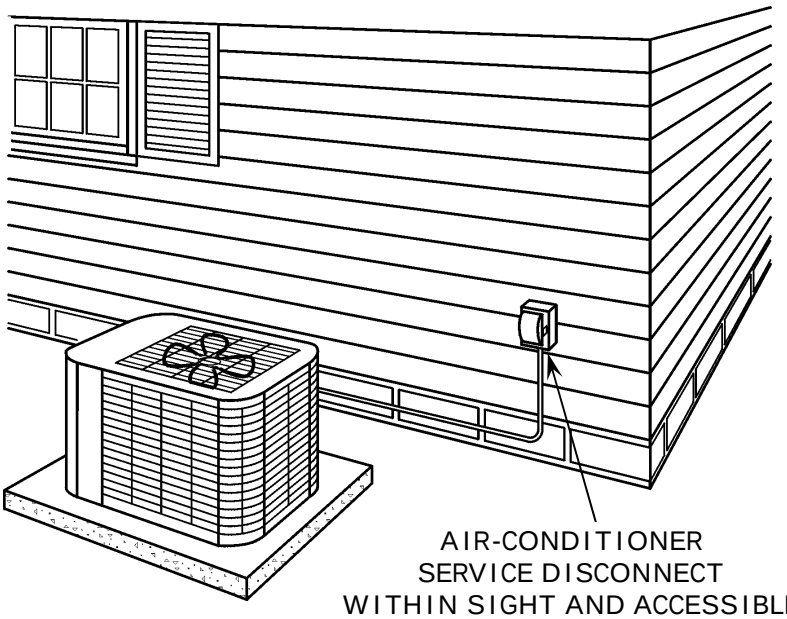
WIRE SIZE	AMPACITY OF CIRCUIT			
AWG	15	20	30	40
12	160'	120'	–	–
10	250'	190'	130'	–
8	300'	225'	150'	115'

Notes:

- **The table is based on a 4.6v drop (230v X 2% = 4.6v).**
- **The table applies to non-plated (uncoated) solid wire copper conductors at 75°C (167°F) ambient temperature.**
- **For alternate conditions or conductors, use applicable CEC Tables (e.g., see Article 210, "Branch Circuits"; Article 215, "Feeders"; and Chapter 9, Table 8, "Conductor Properties").**

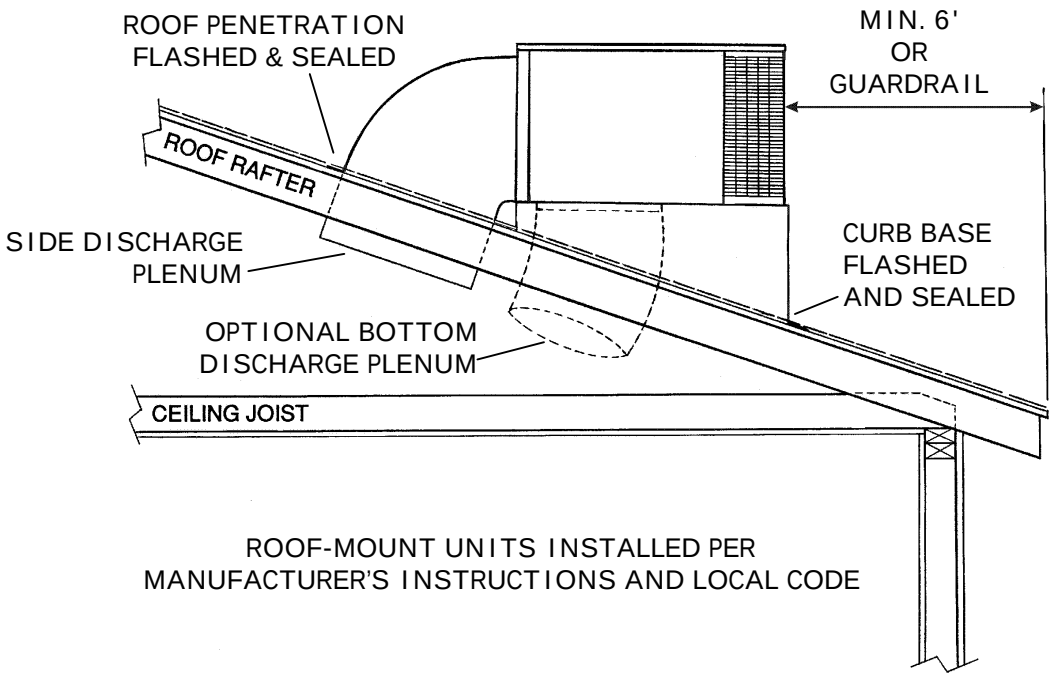
38. UNIT DISCONNECTING MEANS (SERVICE DISCONNECT)

- **All Installations**
  - A disconnecting means, which is capable of disconnecting the air-conditioning equipment from the circuit feeder shall be installed in conformance with CEC Article 440, Part B, Disconnecting Means.
- **Location**
  - The service disconnect:
    - Shall be located within sight from, and readily accessible from the air-conditioning equipment, or as required by the local jurisdiction.
    - May be installed on or within the air-conditioning equipment.
- **Rating**
  - The rating of the disconnecting means shall not exceed the over-current rating of the installed equipment.
  - The rating of the installed fuses or circuit breakers shall not exceed:
    - The overcurrent rating of the installed air-conditioning equipment.
    - The rating of the box in which they are located.



39. MOUNTING OF EQUIPMENT

- **Roof Mount**
  - The roof shall be structurally adequate to properly support the installed equipment in conformance with CBC and local code.
  - Design and installation of support frame or curb and installation of air-conditioning equipment and applicable safety apparatus shall be in conformance with manufacturer's instructions and local code.
  - Curb base and exposed roof penetrations shall be properly installed, flashed and sealed watertight.
  - The condensate drain line shall be:
    - Equipped with a trap.
    - Painted to resist UV degradation if PVC is used.
  - Roofing materials shall be in good condition and not in need of repair or replacement.

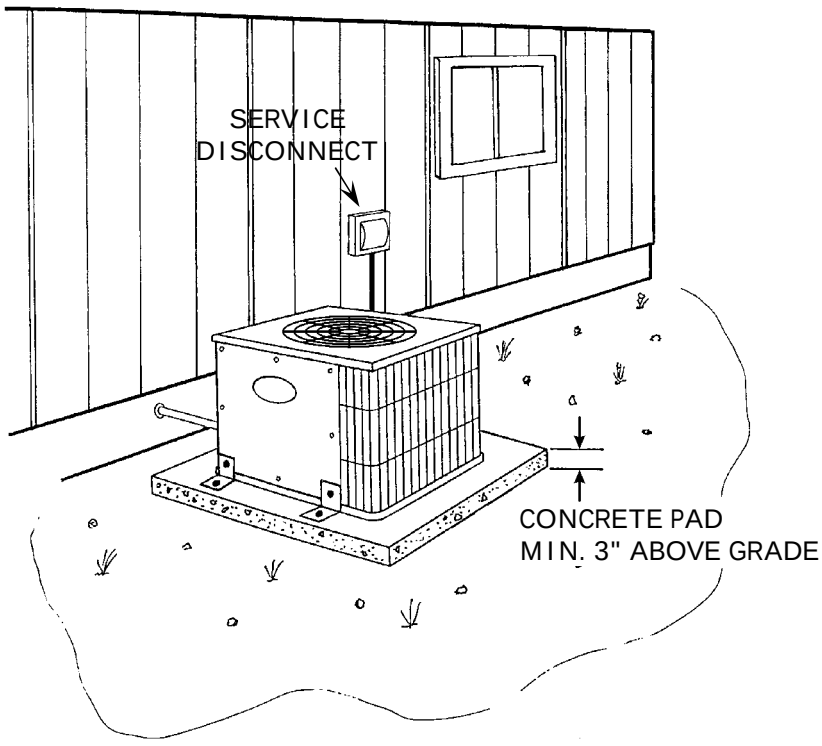


39. MOUNTING OF EQUIPMENT (continued)

- **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.
- **Overhead Clearance**
  - Overhead clearance shall be provided in conformance with manufacturer's specifications and local code.

40. PACKAGE UNIT FUEL-GAS PIPING

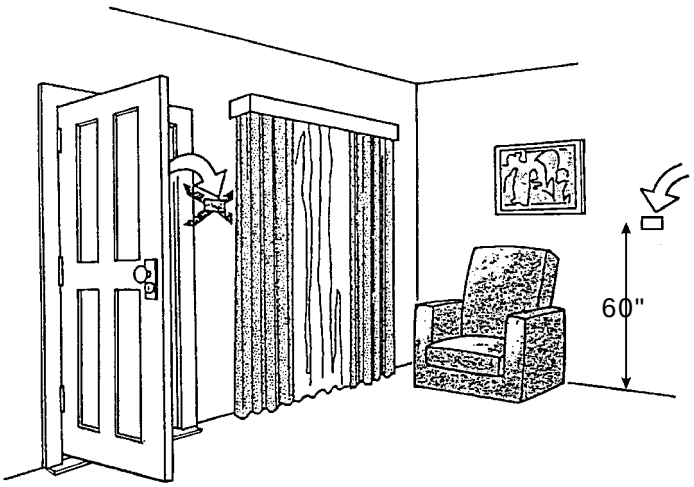
- **Gas lines, fittings, and valves shall be in conformance with Item 12.**



PART 6: WALL THERMOSTAT INSTALLATION

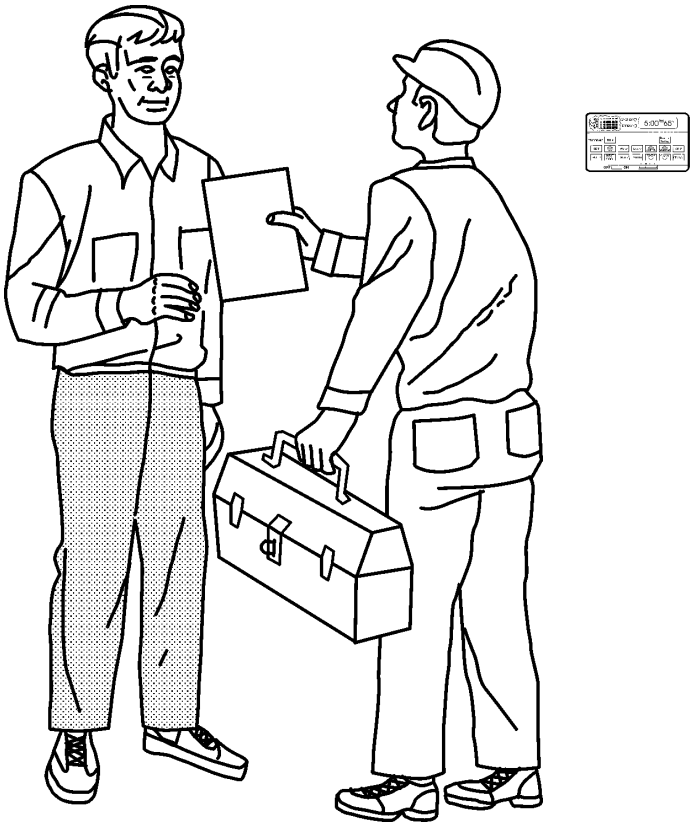
41. THERMOSTAT INSTALLATION

- **Location and Mounting**
  - New thermostat shall be installed at existing location unless affected by drafts, heat from direct sun, or adjacent appliances.
  - Thermostat installed in a new location:
    - Shall be mounted with the top of thermostat 60" above the floor when occupants are not handicapped.
    - May me installed as low as 48" above the floor when an occupant uses a wheelchair.
  - Thermostat shall be located away from direct sunlight, doors, windows, return/supply air, appliances, and sources of electrical interference.
  - Mounting bracket shall be securely attached to wall with screws for wood, or appropriate anchors for drywall and plaster.
  - Any holes or damage to wall from installation or removal of thermostat shall be repaired in a workmanlike manner.
- **Wiring**
  - All wiring shall be a minimum of 18 gauge and conform to manufacturer's specifications and local codes.
  - All wiring shall be installed inside wall cavities when possible.
  - When not inside a wall, exposed wiring shall be enclosed in a raceway.



41. THERMOSTAT INSTALLATION (continued)

- **Programming and Operation**
  - Thermostat shall be cycled to insure proper operation of all functions.
  - Setbacks shall be programmed in accordance with customer's wishes.
- **Instructions and Warranty**
  - Customer shall be provided with:
    - A demonstration with verbal instructions for operating the thermostat and installing batteries.
    - The manufacturer's written instructions and warranty.

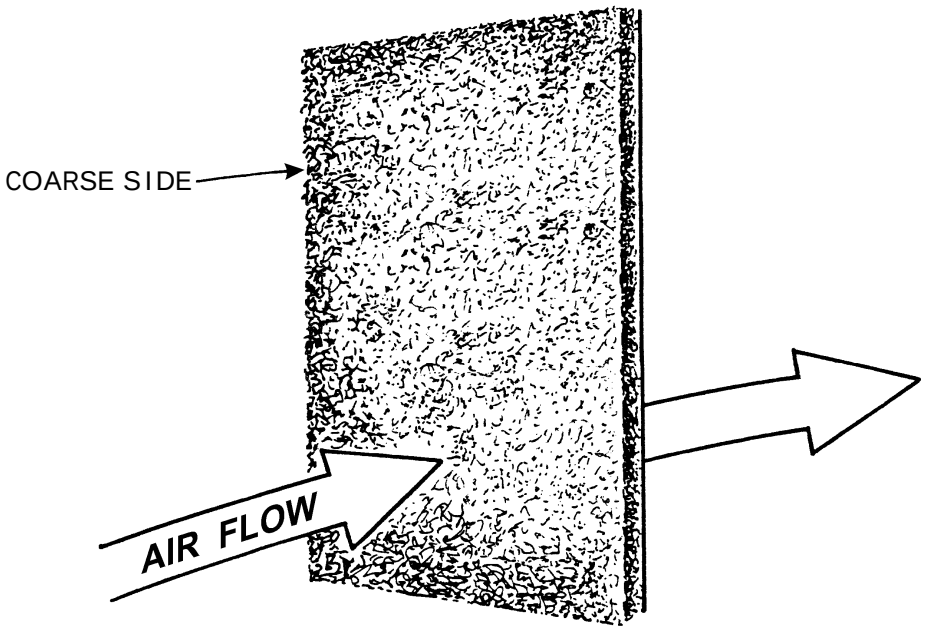


INSTRUCTIONS AND WARRANTY
PROVIDED TO CUSTOMER

PART 7: CENTRAL HEATING AND AIR CONDITIONER AIR FILTER INSTALLATION

42. FILTER SIZE AND INSTALLATION

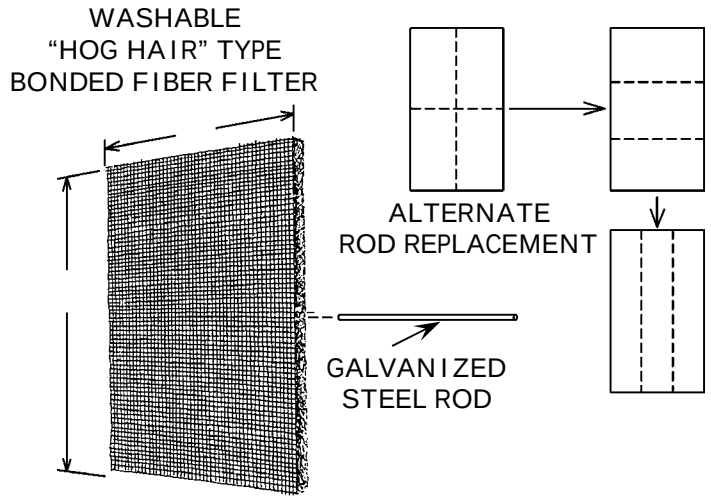
- **Size**
  - Unframed filters shall be cut for a snug fit with maximum 1/4" tolerance.
  - Framed filters shall fit within the filter housing without crimping or buckling.
- **Installation**
  - All filters shall be installed in conformance with appliance and filter manufacturer's instructions.
  - The coarse (“hairy”) side of “hog hair” type bonded fiber filters shall always face the incoming air.



“HOG HAIR” TYPE
BONDED FIBER FILTER

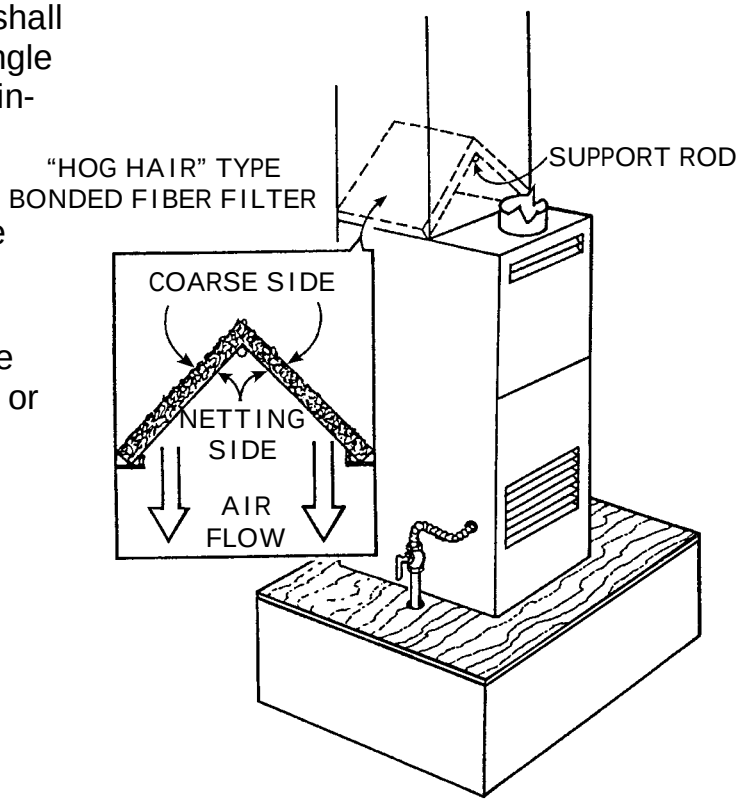
43. UNFRAMED FILTER SUPPORTS

- **All Unframed Filters**
  - Unframed filters shall be supported, as needed, to prevent being drawn toward the air handler.
  - Manufacturer's instructions shall be followed.
- **1" Bonded Fiber Filters**
  - When not in conflict with appliance or filter manufacturer's instructions, steel rods (galvanized recommended) shall be internally installed, as needed, to stiffen filters over 20" long in either direction.
    - Support rods shall be:
      - Adequate gauge to provide the necessary stiffness.
      - Spaced a maximum of 20" on center.
      - Sized to fully extend from one edge of the filter to the other.
      - Inserted into the coarse filter layer near the netting side of “hog hair” type.
      - Inserted in the center of the filter medium, or per manufacturer's instructions, for other types.
  - At least one rod shall be positioned so that both ends are supported by a solid surface.
- **Other Materials**
  - Materials thinner than 1" shall be secured externally.
  - Filters shall not be installed when adequate support cannot be provided.



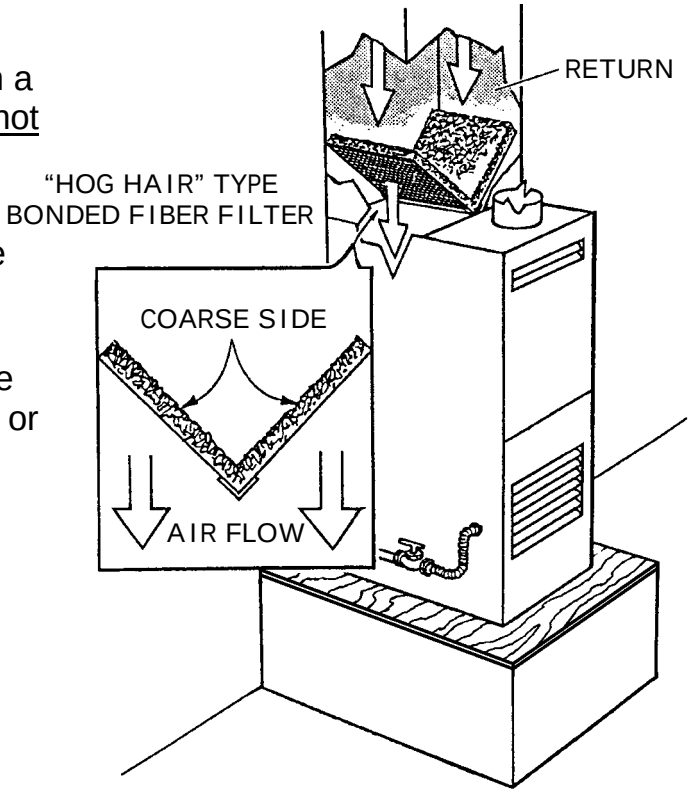
44. "A" SHAPED 1" BONDED FIBER FILTERS

- **All Filters**
  - The HVAC unit shall have:
    - Both upper and lower support devices.
    - Filter access which does not require the removal of any flue, duct, or pipe.
  - A single piece of material shall be used when possible.
  - Filters shall be sized, supported, and installed per Items 42 and 43.
- **One-Piece Unframed**
  - "Hog Hair" Type
    - The coarse side shall be slit deep enough to facilitate folding the material in an "A" shape.
    - The netting side shall not be cut.
  - Other Bonded Fiber Filters
    - Shall be cut and installed per manufacturer's instructions.
- **Two-Piece Unframed**
  - Two pieces of material shall be used only when a single larger piece can not be installed.
- **Framed**
  - Two framed filters of the correct size shall be installed.
  - Larger filters shall not be modified to fit by cutting or folding.



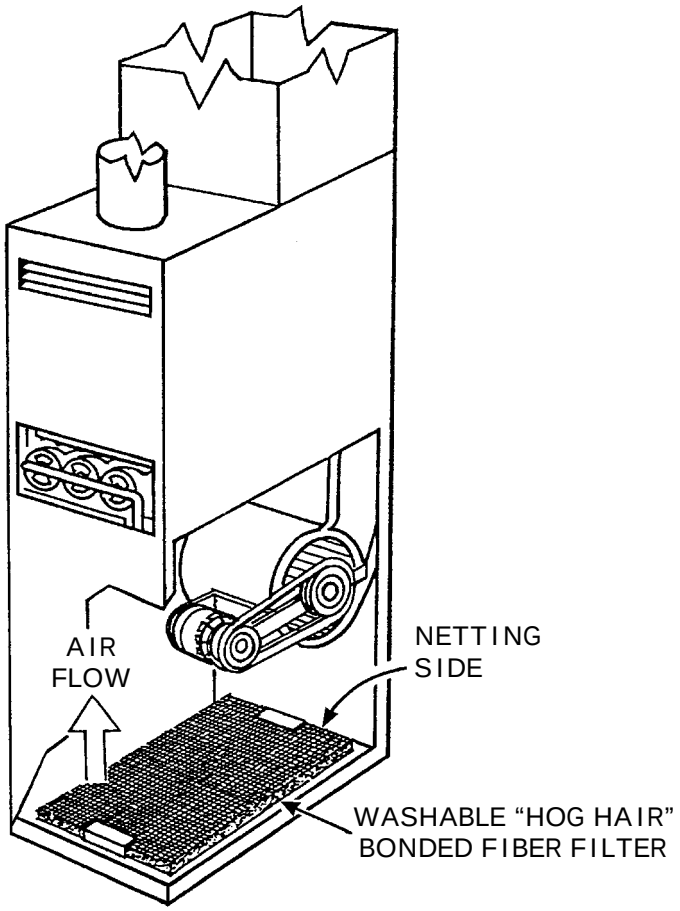
45. "V" SHAPED 1" BONDED FIBER FILTERS

- **All Filters**
  - The HVAC unit shall have:
    - A bottom support for the filter.
    - Filter access which does not require the removal of any flue, duct, or pipe.
  - A single piece of material shall be used when possible.
  - Filters shall be sized, supported, and installed per Items 42 and 43.
- **One-Piece Unframed**
  - "Hog Hair" Type
    - A "V" shaped groove shall be cut, as needed, in the coarse side to facilitate folding the material into a "V" shape.
    - The netting side shall not be cut.
  - Other Bonded Fiber Filters
    - Shall be cut and installed per manufacturer's instructions.
- **Two-Piece Unframed**
  - Two pieces of material shall be used only when a single larger piece can not be installed.
- **Framed**
  - Two framed filters of the correct size shall be installed.
  - Larger filters shall not be modified to fit by cutting or folding.



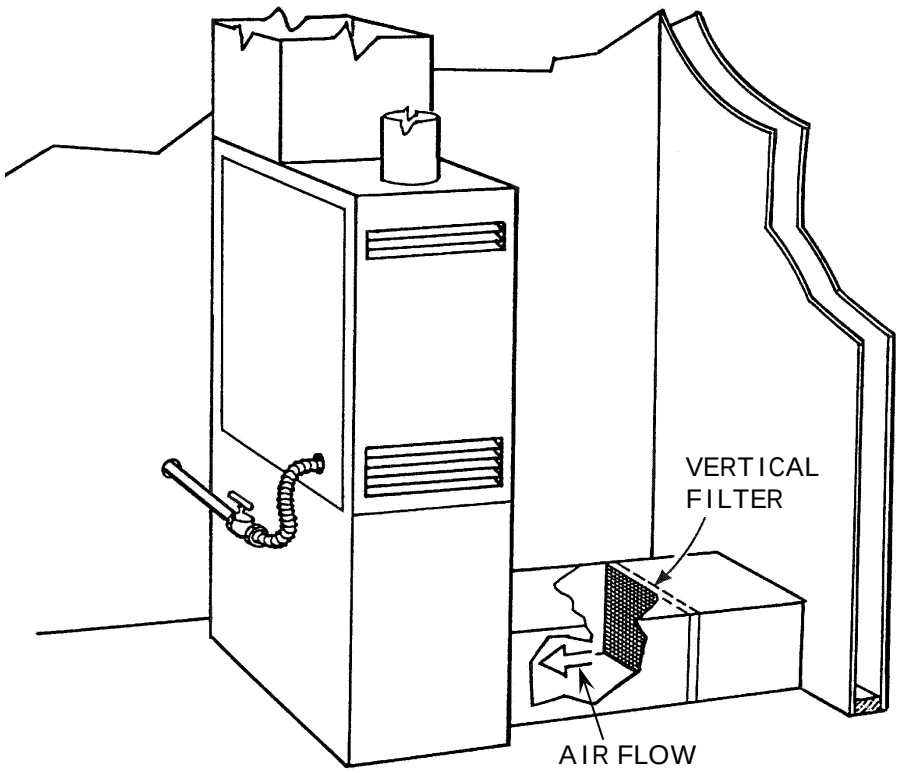
46. HORIZONTAL AND HAMMOCK STYLES 1" BONDED FIBER FILTERS

- **All Filters**
  - Filters shall be sized, supported, and installed per Items 42 and 43.
- **Horizontal Unframed**
  - Internal support shall be installed as needed.
- **Horizontal Framed**
  - Internal support not required.
- **Hammock Style**
  - Unframed filters shall be used.
  - Filter shall be secured with the wire mesh hammock.



47. VERTICAL 1" BONDED FIBER FILTERS

- **All Filters**
  - Filters shall be sized, supported, and installed per Items 42 and 43.
- **Unframed**
  - Internal support shall be installed as needed.
- **Framed**
  - Internal support not required.
- **Vertical-Filter Cap**
  - Cap must be present.
  - Replacement cap must be formed from 26 gauge galvanized sheet metal.

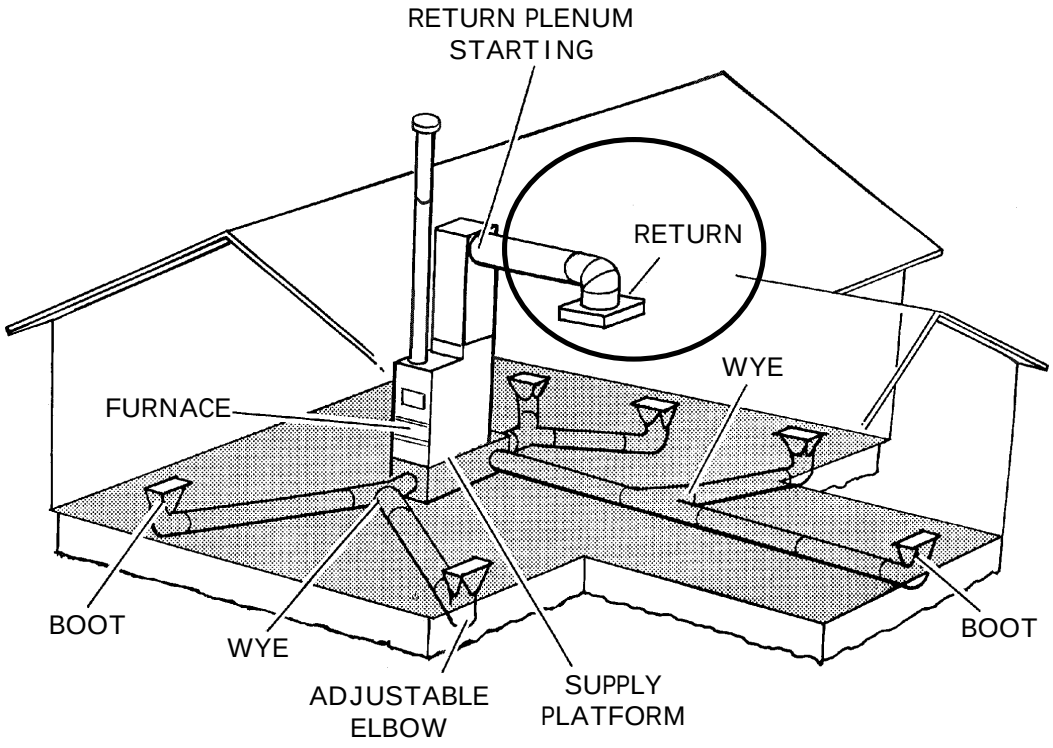


48. RETURN INTAKE GRILLE APPLICATIONS

- **All 1" Bonded Fiber Filters**
  - Filters shall be sized, supported, and installed per Items 42 and 43.
- **Unframed**
  - Internal support shall be installed as needed.
- **Framed**
  - Internal support not required.

49. TWO FILTERS

- **One Return**
  - When two filters exist within the same return path, one shall be eliminated.
  - The most accessible filter shall be replaced with a washable filter.
- **Two Returns**
  - Each return shall be treated separately as specified above for one return.



PART 8: POST-INSTALLATION/REPAIR

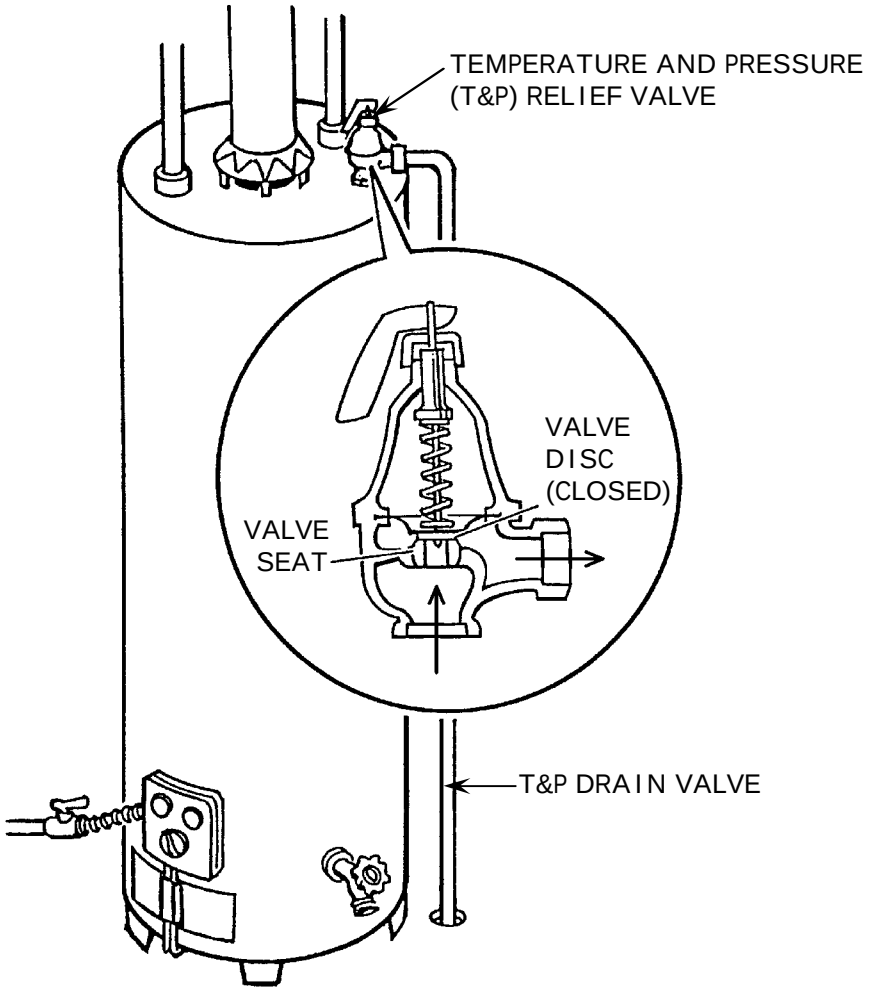
50. POST-INSTALLATION/REPAIR REQUIREMENTS

- **Appliance Operation**
  - The installed unit shall be tested for proper operation.
  - Proper operation shall be explained and demonstrated to the customer, including:
    - Operation of all user-accessible controls.
    - Filter replacement.
    - Routine maintenance recommended by manufacturer.
  - Manufacturer's written instructions and warranty documents shall be supplied to the customer.
- **Cleanup and Disposal**
  - Paint dust and chips, scraps, and other debris resulting from weatherization activities shall be cleaned up and removed from the premises—utilizing lead-safe practices when applicable.
  - All packing materials and installation debris shall be cleaned up and removed from the premises.
  - All replaced equipment and parts shall be removed from the premises and properly disposed of unless specified otherwise in the home improvement contract.
  - Refrigerant shall be recovered and all hazardous waste materials shall be disposed of in conformance with federal, state and local codes.

INFORMATION ABOUT HANDLING REFRIGERANT AND OTHER HAZARDOUS MATERIALS IS AVAILABLE FROM EPA'S STRATOSPHERIC OZONE INFORMATION HOT LINE

7. TEMPERATURE AND PRESSURE ~~(T&P) RELIEF VALVE~~*PROTECTION*

- **All Water Heaters**
  - ***Tank shall be protected by a:***
    - ***Temperature and pressure (T&P) relief valve, or***
    - ***Gas shutoff valve (e.g., a "Watts 210" valve)~~in combination with a pressure-only relief valve in the cold water line~~.***
  - **T&P *relief* valve*, or gas shutoff valve,* shall be:**
    - **Present and located within 6" of the tank.**
    - **In conformance with local codes.**
  - **Valve*s* shall not be covered by the blanket.**
  - **End of *T&P* drain line:**
    - **Shall be open and unobstructed (not capped or plugged).**
    - **Shall not be covered or obstructed by the blanket.**



ELECTRIC WATER HEATERS

15. THERMOSTATS AND IDENTIFICATION LABEL

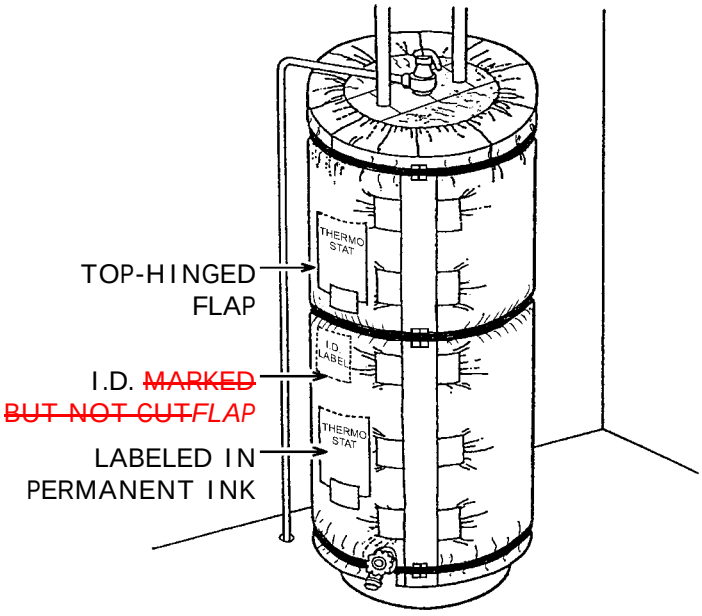
- **Upper and Lower Thermostats *and ID Label***
  - **Locations shall be identified and made easily accessible.**
    - **Blanket shall be cut on sides and bottom to create a top-hinged flap over each thermostat cover plate.**
    - **Flap shall be held closed with tape installed along bottom slit.**
    - **Each flap shall be labeled in permanent ink: "Thermostat" *or "ID Label"*.**
- **Identification Label**

~~•The location shall be:~~

~~-Marked but not cut.~~

~~-Labeled in permanent ink to identify the item : (i.e., Lighting Instructions, Model Number, etc.).~~

- ***Flaps shall be held closed with tape.***
  - ***A minimum of one tape strip shall be installed along slit opposite flap hinge.***
  - ***All slits longer than 12" shall be secured with tape installed lengthwise along the slit.***
- ***Flaps shall be labeled in permanent ink to identify what is underneath.***

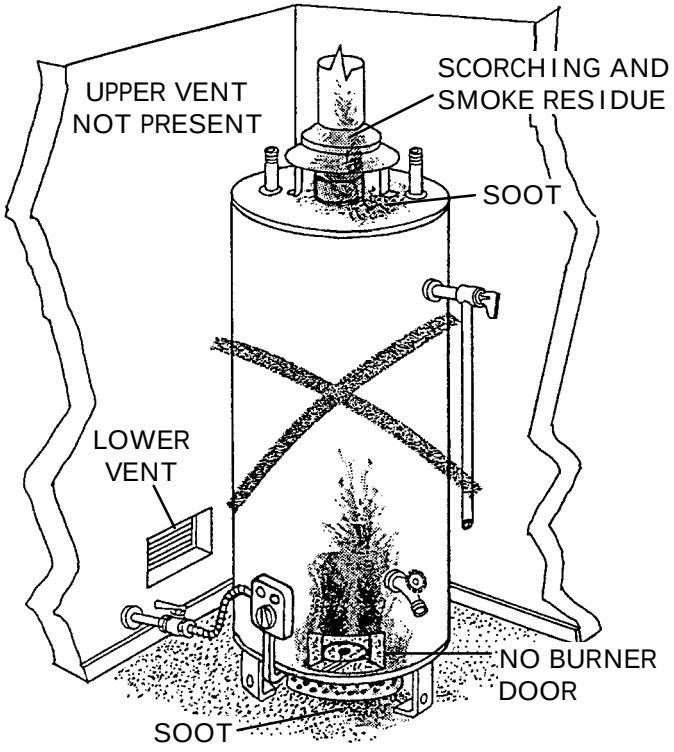


17. COMBUSTION SAFETY REQUIREMENT—GAS UNITS

- **Combustion Air Supply**
  - **Both an upper and lower combustion air vent shall be present.**
  - **Vents shall <u>not</u> be obstructed.**
- **Evidence of Improper Combustion**
  - **Insulation shall <u>not</u> be installed when there is evidence of improper combustion, such as:**
    - **Soot accumulation near draft hood or on floor underneath tank.**
    - **Scorching or smoke residue at the draft hood or combustion chamber access.**
- **Combustion Chamber Access Cover**
  - **At least one access cover shall be present.**
  - **There shall be no signs of scorching or incomplete combustion.**

18. WATER HEATER COMPARTMENT FLOOR

- ***The tank shall be in a stable position on flooring that is adequately sound to support the weight of the water heater.***
- ***If the floor is weak or damaged and/or the tank is leaning abnormally, water heater insulation shall <u>not</u> be installed.***

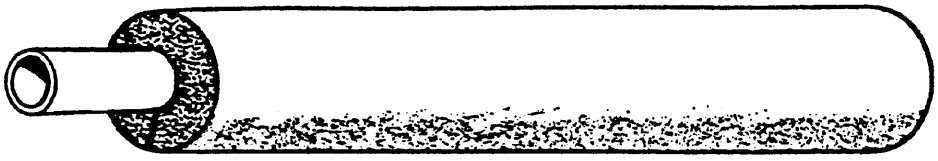


DO <u>NOT</u> INSULATE TANK

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***
  - *Plastic cable ties.*



PREFORMED FOAM PIPE INSULATION

2. R-VALUE *OF PIPE INSULATION*

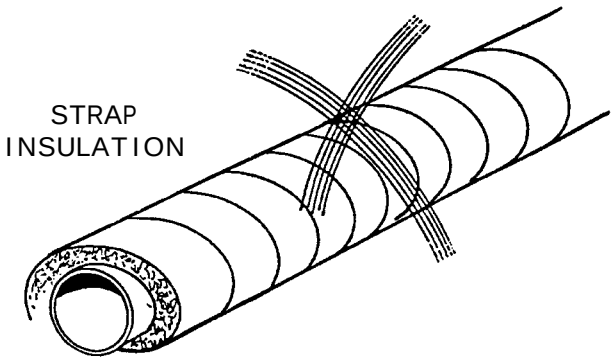
- **R-4 minimum for pipes up to 2" in diameter.**
  - *Minimum 1" insulation wall thickness.*
  - *Exception: 3/4" wall thickness acceptable if R-value requirement is met.*
- **R-6 minimum for pipes greater than 2" in diameter.**
  - *Minimum* 1.*5*" ~~or greater~~ *insulation* wall thickness.

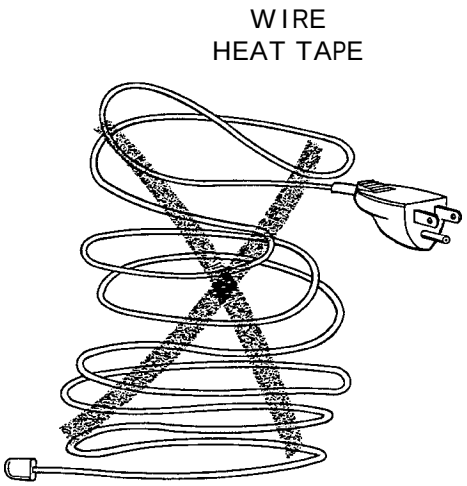
3. SHEET OR SEMI-MOLDED INSULATION

- **All Units**
  - Not allowed.

4. HEAT TAPE OR STRAP INSULATION

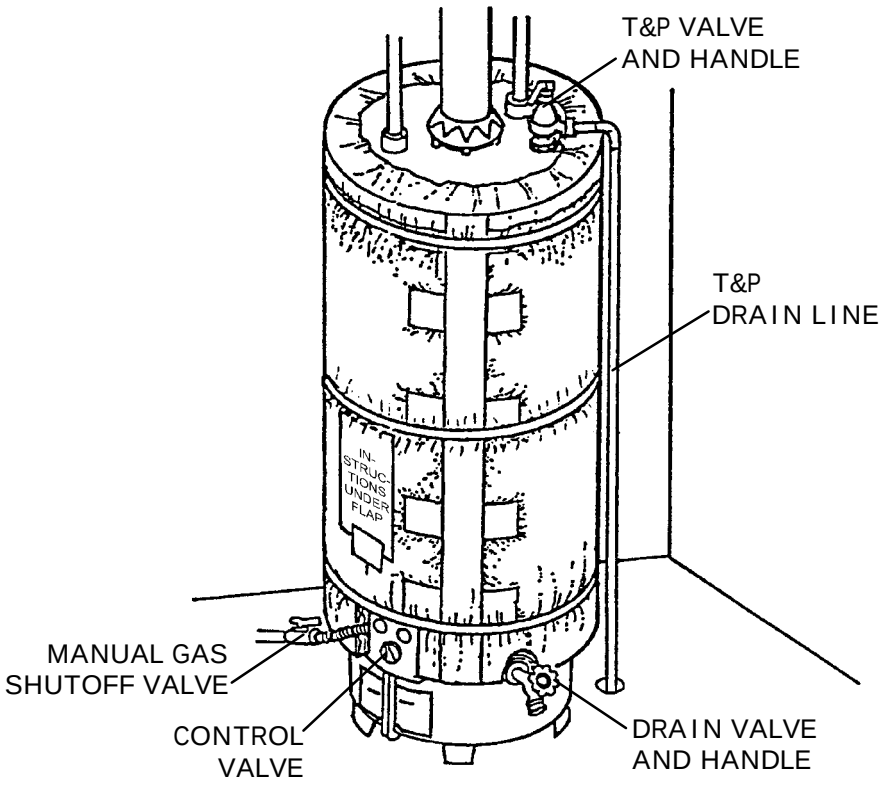
- **All Units**
  - Not allowed.





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.



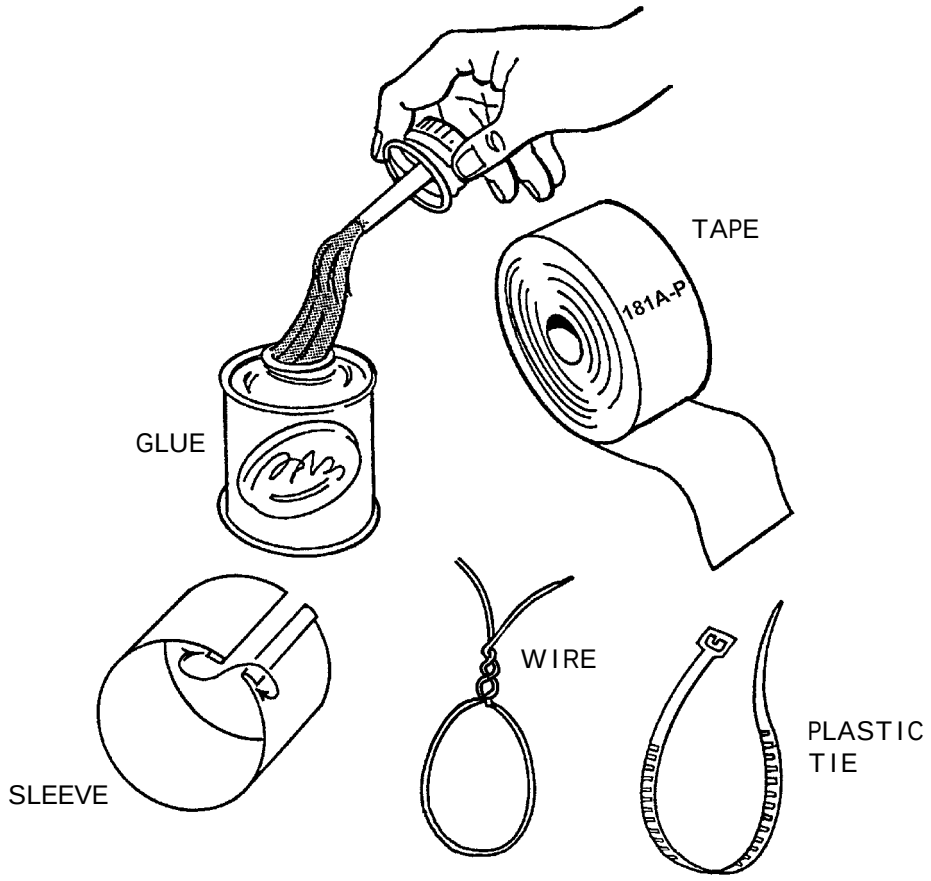
ITEMS NOT TO BE COVERED

10. GENERAL ATTACHMENT REQUIREMENTS

- **Insulation shall be firmly secured with 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.**



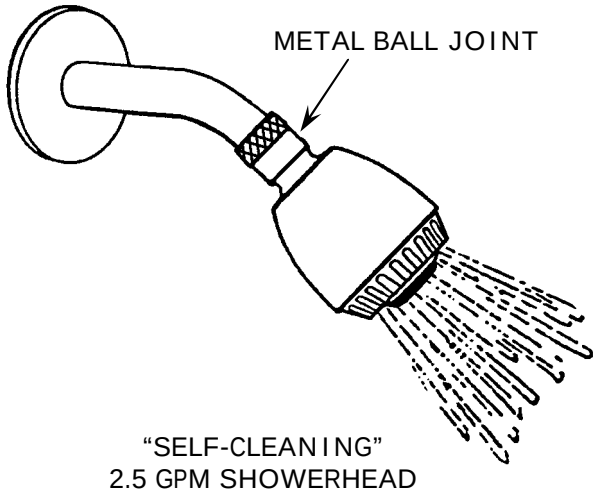
ENERGY-SAVER SHOWERHEAD AND FAUCET AERATOR STANDARDS

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 5.2.5*.
- **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

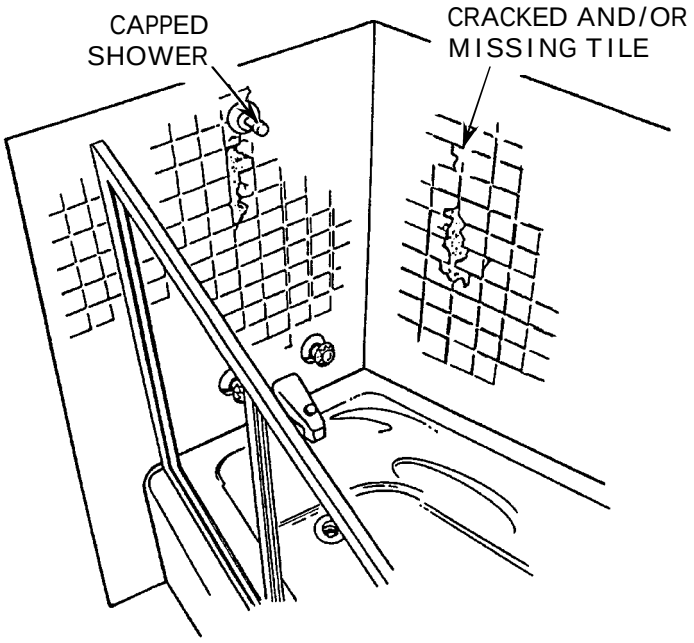
- **Showerheads**
  - Maximum flow rate: 2.50 gpm at 80 psi.
  - Minimum flow rate: 2.0 gpm at 40 psi.
- **Faucet Aerators**
  - Maximum flow rate: ~~2.50~~ *2.2* gpm at ~~80~~ *60* psi.

4. FLOW CONTROL

- **Showerheads**
  - 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**~~

~~•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

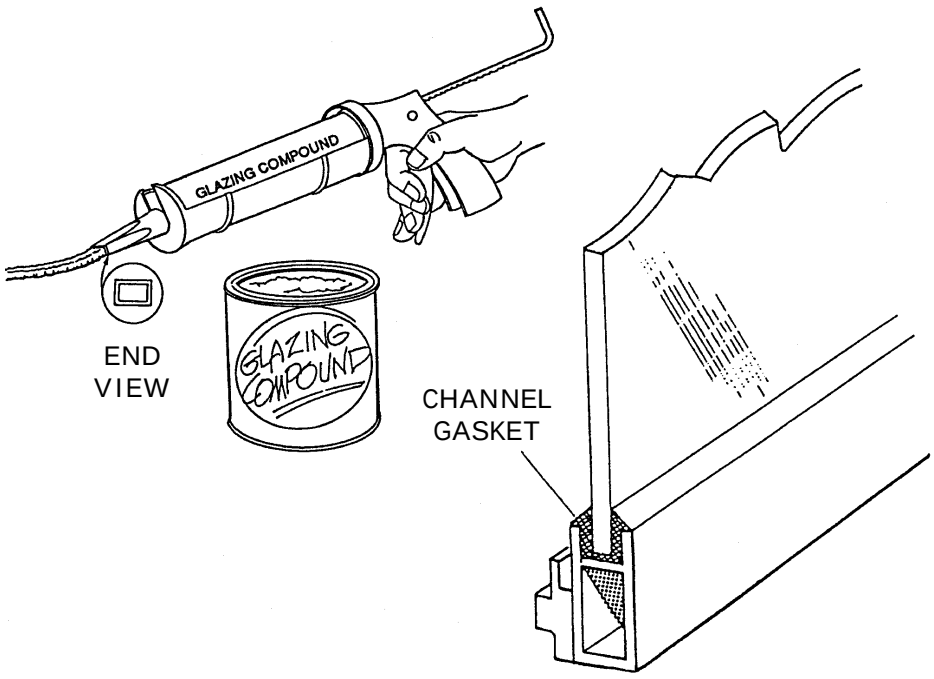
EFFICIENCY FACTOR	CLIMATE ZONE	MAXIMUM VALUE
Solar Heat Gain Coefficient (SHGC)	2, 4, & 7 – 15	0.40
	1, 3, 5, 6, 16	No Requirement
U-Factor	16	0.55
	1, 2, 10 – 16	0.57
	3 – 9	0.67

3. GLAZING COMPOUND

- **Required in sashes designed to use glazing compound.**
- **Caulk not allowed in lieu of glazing compound.**
- **Glazing compound shall:**
  - **Be the type which remains pliable.**
  - **Conform to ~~F.S. A-A-378 (wood sash) or~~ ASTM C669 ~~(~~*for* **metal sash*es*~~)~~.**

4. CHANNEL GASKETS

- **Gasket shall make watertight seal all around the metal sash.**
- **New replacement gasket shall be:**
  - **Installed when feasible.**
  - **Proper size to form snug fit in channel.**
- **Existing gasket may be reused.**
  - **Shall be in satisfactory condition to provide a complete seal.**
  - **Clear silicone caulk or equivalent may be added to fill in the gaps.**
- **Where proper gasket cannot be provided, glass shall be stabilized in clear silicone caulk or equivalent.**



SECTION 14

THREAD-BASED COMPACT FLUORESCENT LAMP STANDARDS

1. MATERIALS

- **Compact Fluorescent Lamps (CFLs) must be:**
  - ~~**ENERGY STAR® compliant**~~***ENERGY STAR® qualified*****.**
  - **Warranted for one year from date of purchase.**

2. INSTALLATION

- **All Types**
  - **All lamps, without exception, shall be installed by the contractor.**
  - **Only incandescent and halogen lamps shall be replaced.**
  - **Manufacturer's recommendations shall be followed.**

ALL UNITS MUST MEET OR EXCEED
ENERGY STAR PROGRAM EFFICIENCY STANDARDS

~~5. TABLE LAMPS~~

~~-Shades~~

- ~~Harp extensions or expanders shall be installed when needed.~~
- ~~The harp shall expand to fit snugly.~~

~~5. TABLE LAMPS (continued)~~

~~-Height Limitation~~

- ~~The height of the lamp shall not exceed 3 times the width of the base.~~

~~7. CLUSTER LIGHTING~~

~~-All Types~~

- ~~CFLs shall not be installed in chandeliers or other cluster lighting fixtures unless the CFL is specifically designed for such applications.~~

~~8. DIMMERS, PHOTOSENSORS, AND OCCUPANCY SENSORS~~

~~-All Types~~

- ~~Only CFLs rated for use with dimmers, photosensors, and occupancy sensors shall be installed in fixtures controlled by such devices.~~

~~9. TIMERS~~

~~-Mechanical~~

- ~~CFLs may be installed in fixtures equipped with mechanical timers.~~

~~-Solid State~~

- ~~CFLs shall not be installed in fixtures equipped with solid state timers.~~

7. CLUSTER LIGHTING

- **All Types**
  - **CFLs shall not be installed in chandeliers or other cluster lighting fixtures unless the CFL is specifically designed for such applications.**
  - ***The fixture shall remain level after installation of the CFL.***

8. DIMMERS, PHOTOSENSORS, AND OCCUPANCY SENSORS

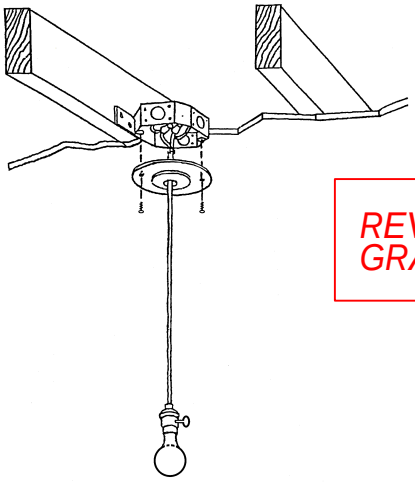
- **All Types**
  - **Only CFLs rated for use with dimmers, photosensors, and occupancy sensors shall be installed in fixtures controlled by such devices.**

9. TIMERS

- **Mechanical**
  - **CFLs may be installed in fixtures equipped with mechanical timers.**
- **Solid State**
  - **CFLs shall not be installed in fixtures equipped with solid state timers.**

10. LAMP CORD SUPPORTED

- **All Types**
  - **CFLs shall not be installed in fixtures supported only by a lamp cord unless the manufacturer allows the use of CFLs in such fixtures.**



REVISED GRAPHIC

SECTION 15

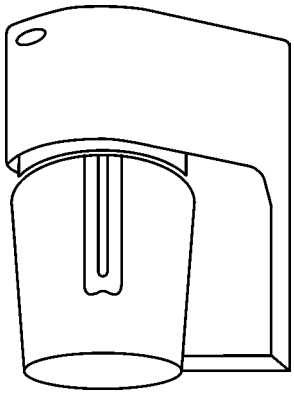
HARD-WIRED COMPACT FLUORESCENT FIXTURE STANDARDS

1. MATERIALS

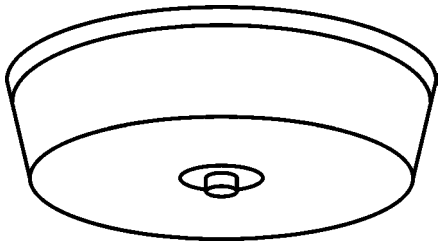
- **Fixture must be UL listed and meet ANSI/UL Standard 935 Class-P.**
- **CFLs must be ~~ENERGY STAR® compliant~~ *ENERGY STAR® qualified*.**
- **Compact fluorescent lamp (CFL) tube glass and other housing materials must be UV resistant and heat stable.**
- **Hardwired fixtures and lamps must be fully 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.**



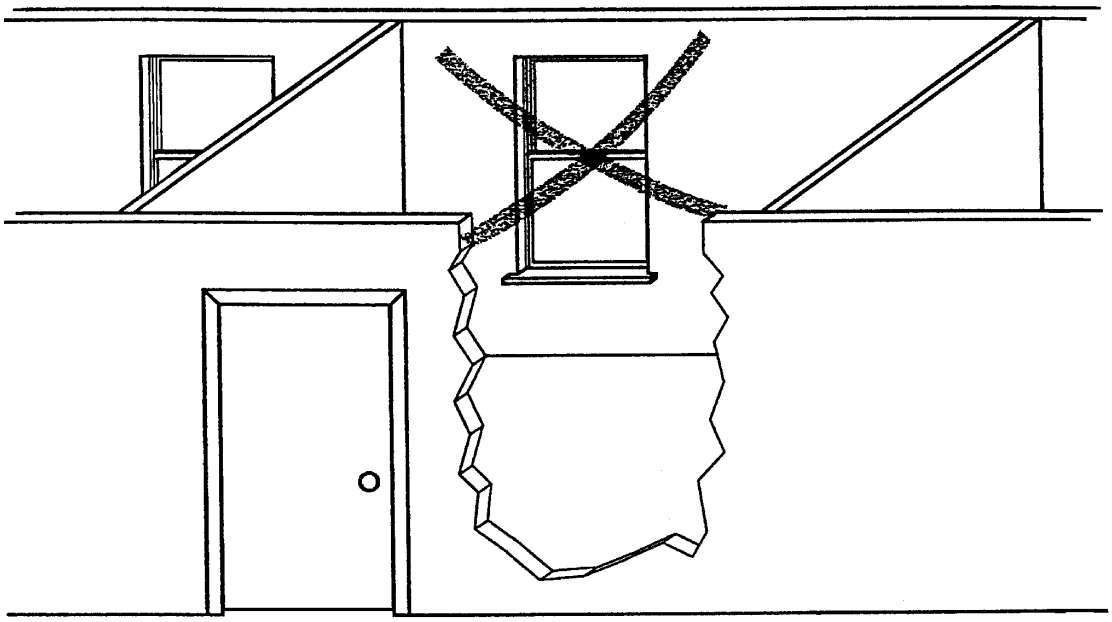
WALL-MOUNT
FLUORESCENT FIXTURE
WITH PHOTO CELL CONTROL



CEILING-MOUNT
COMPACT FLUORESCENT
REPLACEMENT FIXTURE

10. EGRESS WINDOWS (continued)

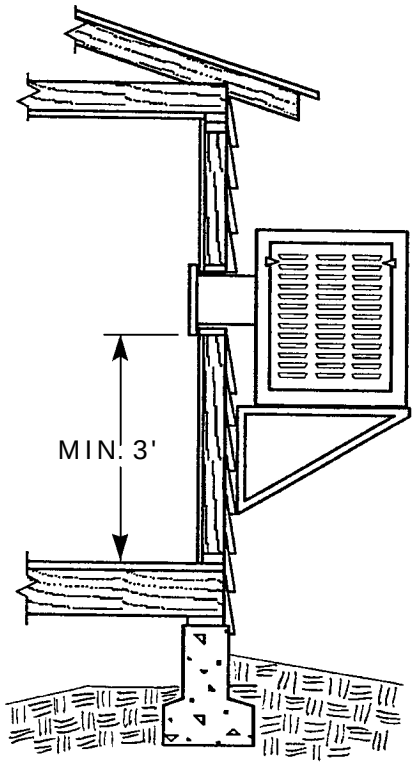
- ***Cooler shall not be installed in egress windows unless:***
  - ***Allowed by customer, and***
  - ***One of the following is present in the same room:***
    - ***Another operable window which meets egress requirements, or***
    - ***An operable exterior door which meets egress requirements.***



COOLER NOT INSTALLED
IN THE ONLY EGRESS OPENING

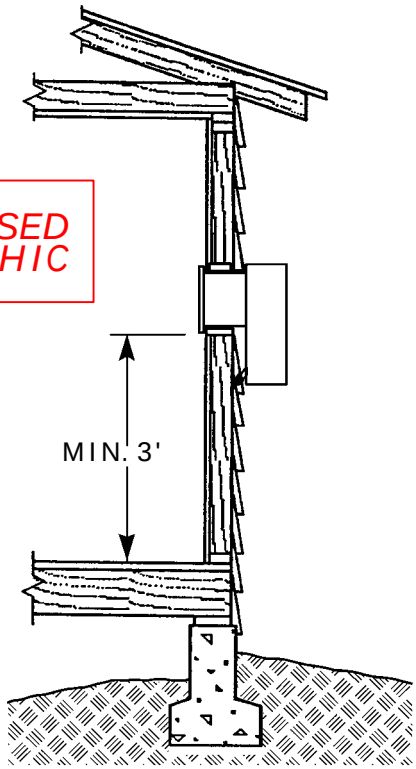
11. LOCATION

- **All Units**
  - **Clearances and mounting height shall be in compliance with local code.**
  - **Unit shall be installed only in a window or wall opening.**
  - **Exterior portion of unit shall be located a minimum of 1' above grade.**
  - **Discharge shall not be located where it can disturb combustion appliance burners/pilots (e.g., in kitchen near gas range).**
- **Wall-Mount Units**
  - **Air discharge outlet shall be located a minimum of:**
    - **~~5'~~ *3'* above the floor~~, or~~ *unless mounted under window.***
    - ~~**3' above floor if occupant requires a wheel chair.**~~
    - ***18" above floor if:***
      - ***Discharge grille is equipped with directional louvers, and***
      - ***Location is allowed by manufacturer.***



STANDARD
WALL UNIT

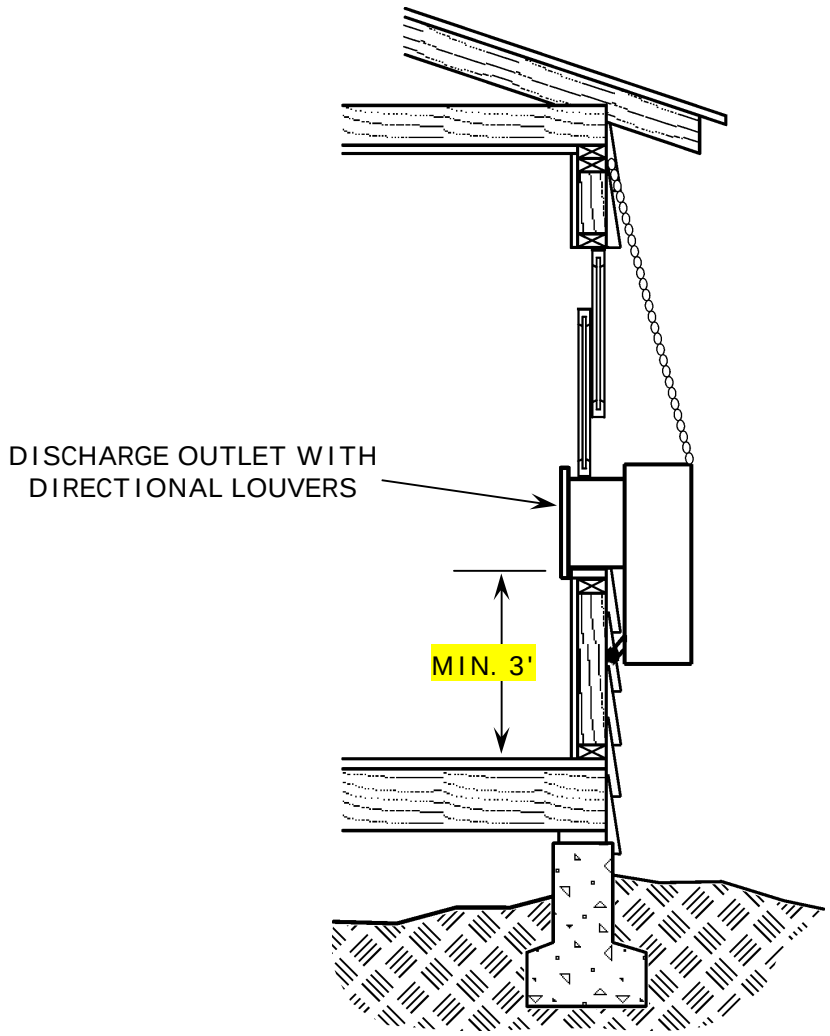
REVISED GRAPHIC



HIGH-EFFICIENCY
WALL UNIT

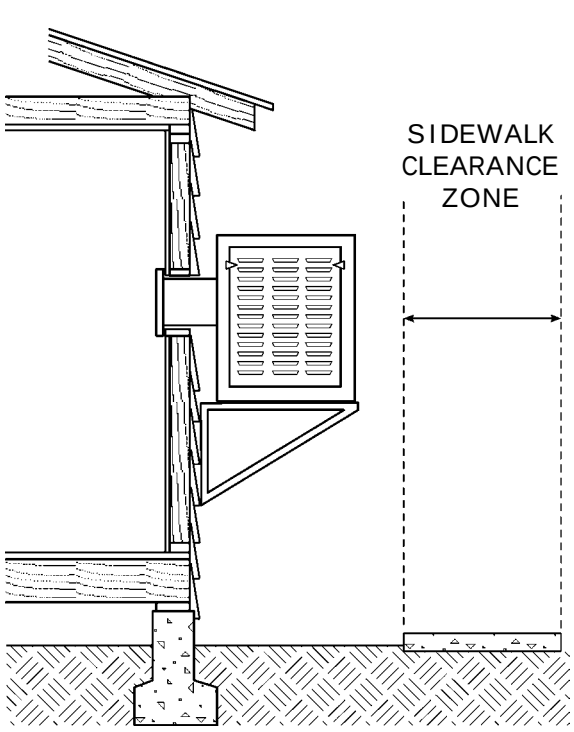
11. LOCATION (continued)

- **Window-Mount Units**
  - **Air discharge outlet shall be located a minimum of:**
    - **~~5'~~ *3'* above the floor~~, or~~ *unless mounted under window.***
    - **~~3' above floor if occupant requires a wheel chair, or~~**
    - **~~1'-6~~*18*" above floor if:**
      - **Discharge grille is equipped with directional louvers, and**
      - **Location is allowed by manufacturer.**

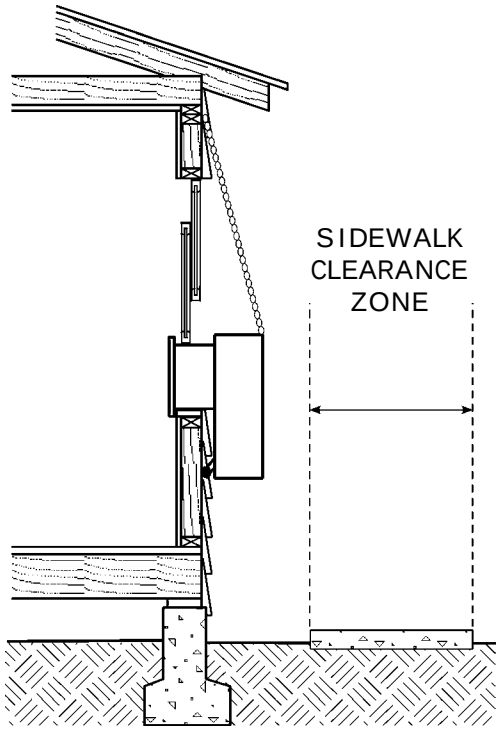


11. LOCATION (continued)

- **Sidewalk Clearance**
  - **Unit shall <u>not</u> extend into sidewalk clearance zone (i.e., over sidewalk).**
  - **Clearance from sidewalk shall be 21" ~~when possible~~*~~if~~ allowed by local code*.**



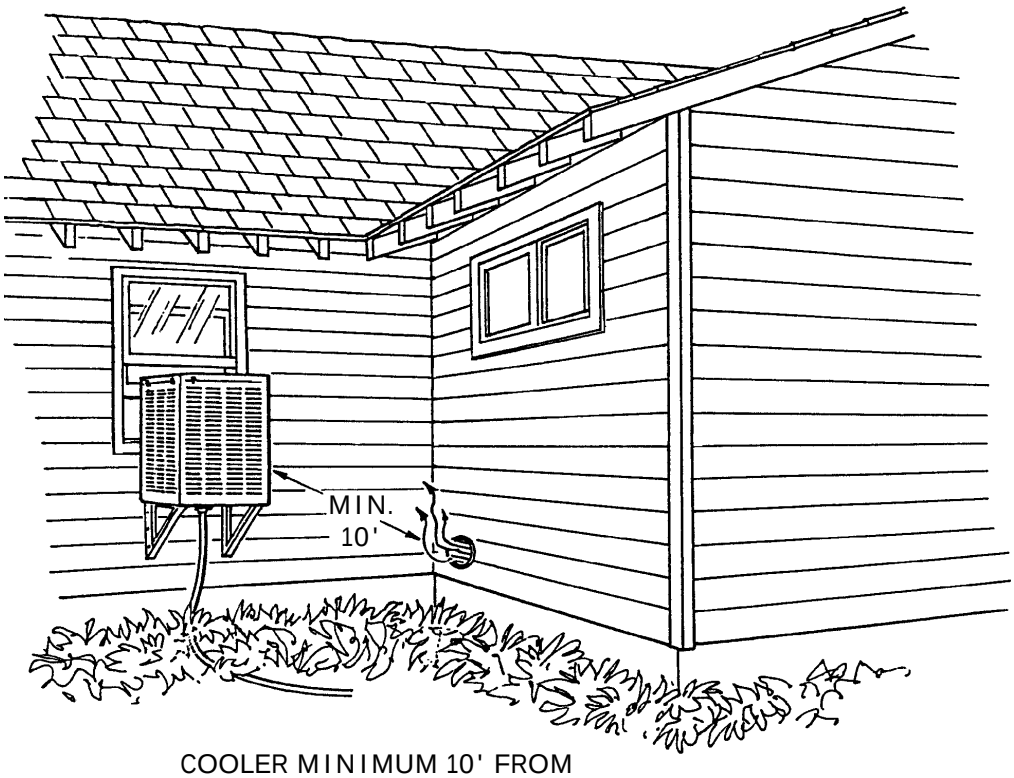
STANDARD
WALL UNIT



HIGH-EFFICIENCY
WINDOW UNIT

11. LOCATION (continued)

- **Exterior Clearance**
  - **Clearance shall comply with local code.**
  - **Cooler air intake shall be located:**
    - **Minimum of ~~7'~~ *3'* from the gas meter.**
    - **Minimum of 10' away from, or 3' below, the following:**
      - **~~Open combustion appliance (e.g., water heater, slab-mount HVAC package unit, etc.).~~**
      - **Combustion appliance flue/vent terminations.**
      - **Clothes dryer moisture exhaust termination.**
      - **Plumbing vent terminations.**
      - **Exhaust fan vent termination.**
  - **Unit shall <u>not</u> be installed if clearance requirements cannot be met.**
- ***Interior Clearance***
  - ***Unit shall be free of obstructions, such as furniture, curtains, plants, etc.***



COOLER MINIMUM 10' FROM
CLOTHES DRYER MOISTURE EXHAUST

21. PRE-OPERATION CHECK (continued)

- **Water system shall be checked for:**
  - **Proper flow and no leaks.**
  - **Proper float and splash shield adjustment.**
  - **Even water distribution over pads.**
- **Pump and screen shall be checked for:**
  - **Properly installed screen.**
  - **Debris-free inlet with proper clearance from obstructions.**
  - **Proper pump impeller operation (turns freely).**
- **Blower fan shall be checked to assure:**
  - **Proper clearance from housing.**
  - **Free rotation.**
  - **Proper operation of both motor and fan.**
- **Drain line shall be checked to determine that it:**
  - **Is properly installed and free of leaks.**
  - **Terminates correctly.**
- **Other procedures recommended by manufacturer shall be followed.**

SAMPLE PRE-OPERATION CHECKLIST

#	✓	ITEMS TO BE VERIFIED (CHECK OFF EACH AS IT IS COMPLETED)
1.	❑	Installation requirements
2.	❑	Electrical circuitry
3.	❑	Blower and motor
4.	❑	Water system
5.	❑	Pump and screen
6.	❑	Drain line
7.	❑	Other…

SECTION 17

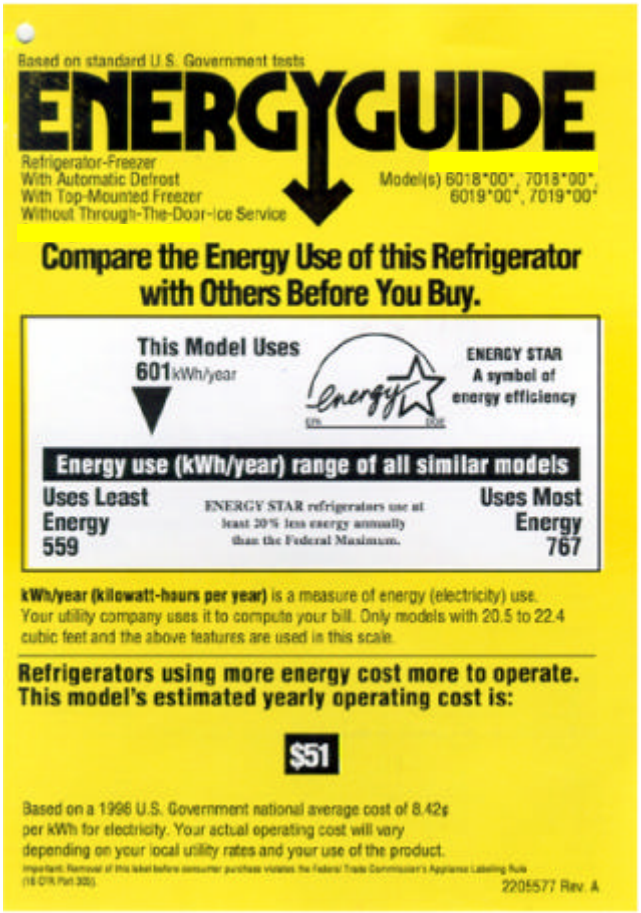
REPLACEMENT REFRIGERATOR STANDARDS

1. REPLACEMENT REFRIGERATOR

- **All units shall be:**
  - **UL listed.**
  - ~~**ENERGY STAR® labeled**~~ ***ENERGY STAR® qualified*****.**
  - **Frost free.**
- **19 cubic foot capacity maximum. (Exception: Two refrigerators and/or freezers exchanged for a single unit may be replaced with a unit no larger than 23 cu ft.)**

2. WARRANTY

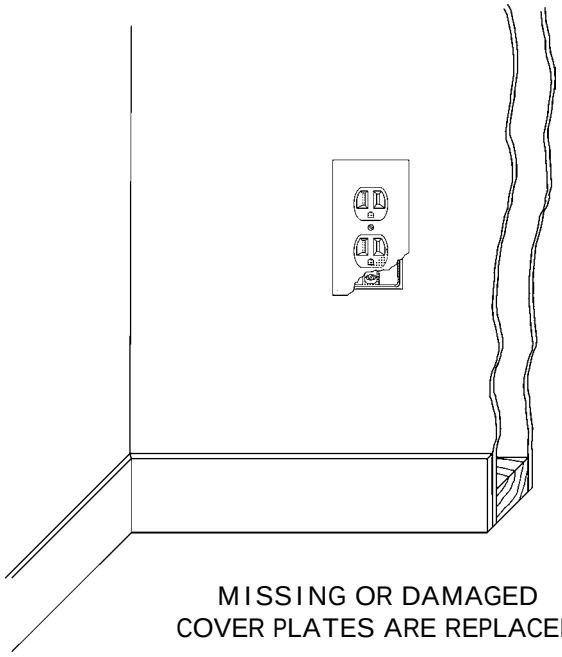
- **All Units**
  - **Shall have a minimum 1 year warranty parts and labor.**



ENERGY GUIDE LABEL
WITH
ENERGY STAR® LOGO

6. ELECTRICAL REQUIREMENTS

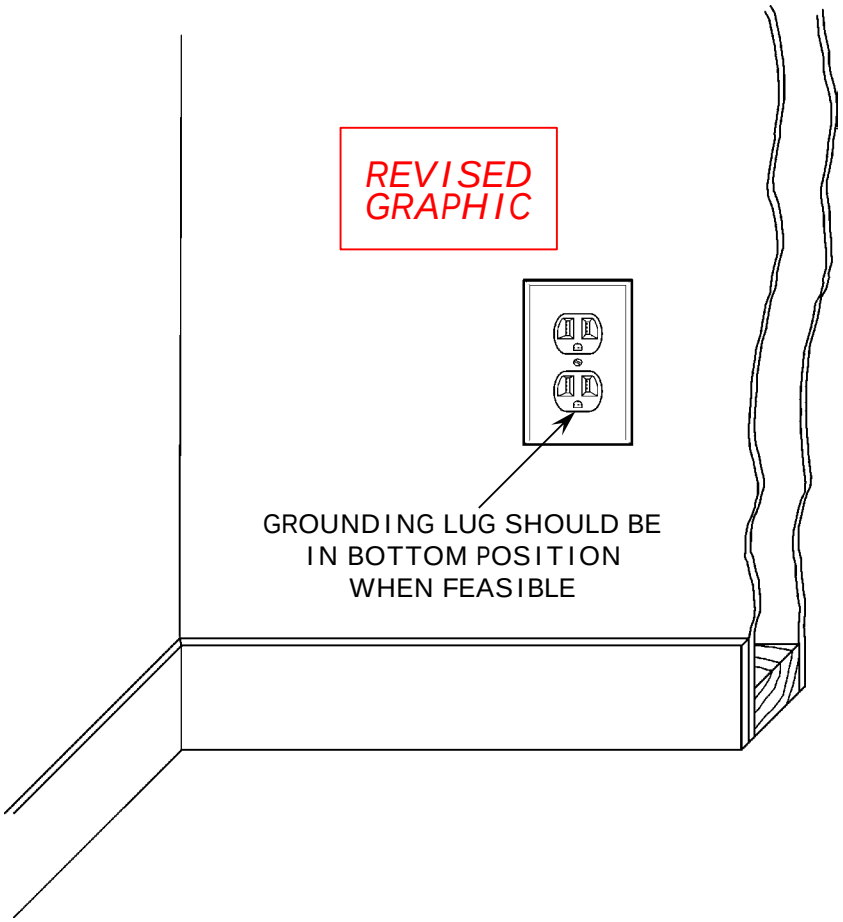
- **Electrical Circuit**
  - **Overcurrent protection and size of conductors shall be in conformance with manufacturer's specifications and local code.**
  - **A GFCI-protected circuit or receptacle shall not be used.**
- **Electrical Outlet**
  - **Refrigerator shall be plugged into its own individual electrical outlet (not shared with another appliance).**
  - **The receptacle and cover plate shall be in good condition.**
  - **The receptacle shall be properly grounded in conformance with the California Electrical Code (CEC) and local code.**
- **Extension Cord**
  - **~~One~~*An* extension cord may be used when allowed by manufacturer's instructions *and with prior approval of Program Manager*.**
  - **Extension cord shall be:**
    - **UL listed, 3-conductor cord, with 3-prong plug and receptacle.**
    - **Minimum 14 AWG.**
    - **Maximum 6' in length.**
- **Appliance cord and extension cord shall not be located where either can create a walking hazard (where people can trip).**



MISSING OR DAMAGED
COVER PLATES ARE REPLACED

8. INSTALLATION OF A NEW GROUNDED RECEPTACLE

- **A new 3-prong receptacle with ground lug shall be installed when the preexisting receptacle is nonconforming.**
- **A building permit shall be obtained and finalized when required by the local jurisdiction.**
- **The new receptacle shall be properly grounded:**
  - **To the equipment grounding conductor (e.g., green or bare wire), or**
  - **To an alternative grounding means when an equipment grounding conductor is not present.**
  - **The new outlet must be installed with the ground lug in the bottom position, *unless refrigerator cord has a right-angle plug designed to be installed with ground lug at top*.**



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

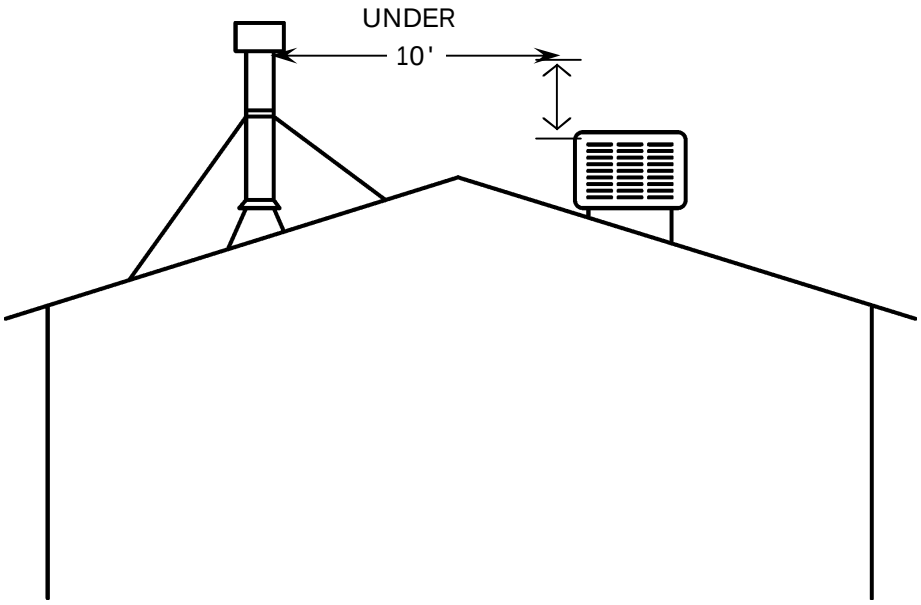
FURNACE TYPE	BTU/HR. ~~INPUT~~ *OUTPUT* ~~RATING~~CAPACITY	MINIMUM ~~EFFICIENCY~~AFUE (%)
WALL WITH FAN	• up to 42,000 • over 42,000	• 73% • 74%
WALL WITHOUT FAN	• 15,001 - 19,000 • 19,001 - 27,000 • 27,001 - 46,000 • over 46,000	• 62% • 63% • 64% • 65%
FLOOR	• up to 37,000 • over 37,000	• 56% • 57%

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 standard*s*:
    - 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.**
- ***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~~*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
    - *LIEE WIS Section 29, NGAT.*

    ~~-The LIEE Policies & Procedures, Table 5: "Recommended Minimum Standard for Gas Appliance Testing.~~

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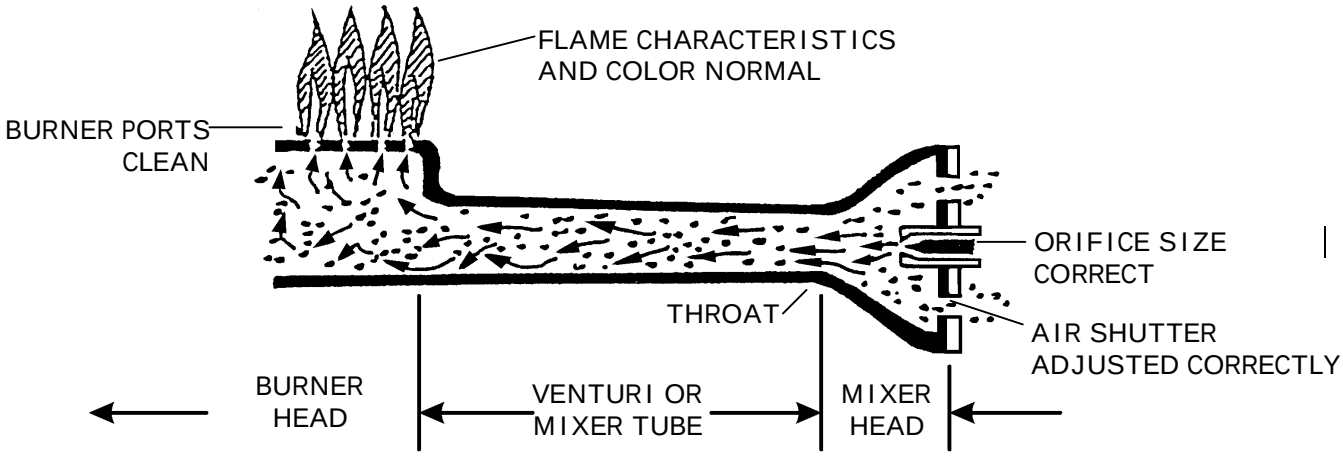

FLAME CHARACTERISTICS
AND COLOR NORMAL
BURNER PORTS
CLEAN
ORIFICE SIZE
CORRECT
THROAT
AIR SHUTTER
ADJUSTED CORRECTLY
BURNER
HEAD
VENTURI OR
MIXER TUBE
MIXER
HEAD

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~~

SECTION 22

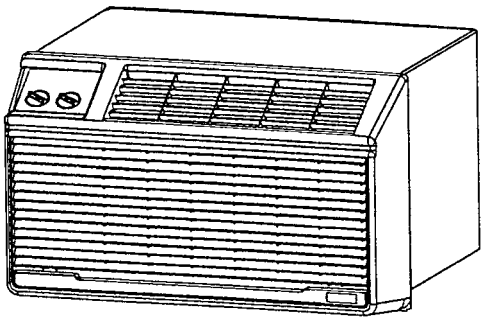
WALL AND WINDOW AIR CONDITIONER STANDARDS

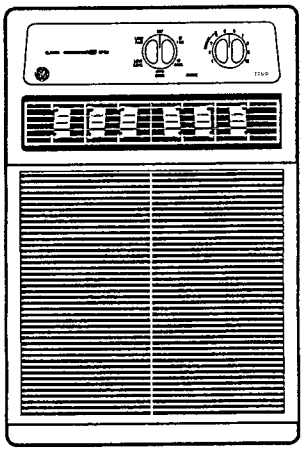
1. MATERIALS

- **All Units**
  - **Unit shall be UL listed and equipped with:**
    - **Minimum two-speed fan.**
    - **Adjustable thermostat with a minimum of six positions.**
    - **Removable, washable foam filler.**
    - **Air directional control, minimum four-way.**
  - **Must be ~~ENERGY STAR® labeled~~ *ENERGY STAR® qualified*.**
  - **Must have a minimum EER rating of 10.7.**
- **Wall Units**
  - **Must be equipped with thru-the-wall chassis (sleeve).**

2. WARRANTY

- **All Installations**
  - **Parts and labor shall be covered by a minimum one (1) year written warranty.**
  - **Compressor warranty shall extend to five (5) years.**
  - **All written warranty information and manufacturer's operating and maintenance instructions shall be supplied to the customer.**





3. MANUFACTURER'S INSTRUCTIONS

- **Installer shall:**
  - **Review manufacturer's instructions before beginning the installation.**
  - **Properly install the air conditioner in accordance with those instructions.**

4. MAXIMUM SIZE UNIT

- **Replace like-for-like: The Btu output of the new unit shall match the Btu output of the unit being replaced (± 500 Btu).**
- **Unit may be down-sized *with prior approval of Program Manager*, but the new unit must comply with the chart below.**

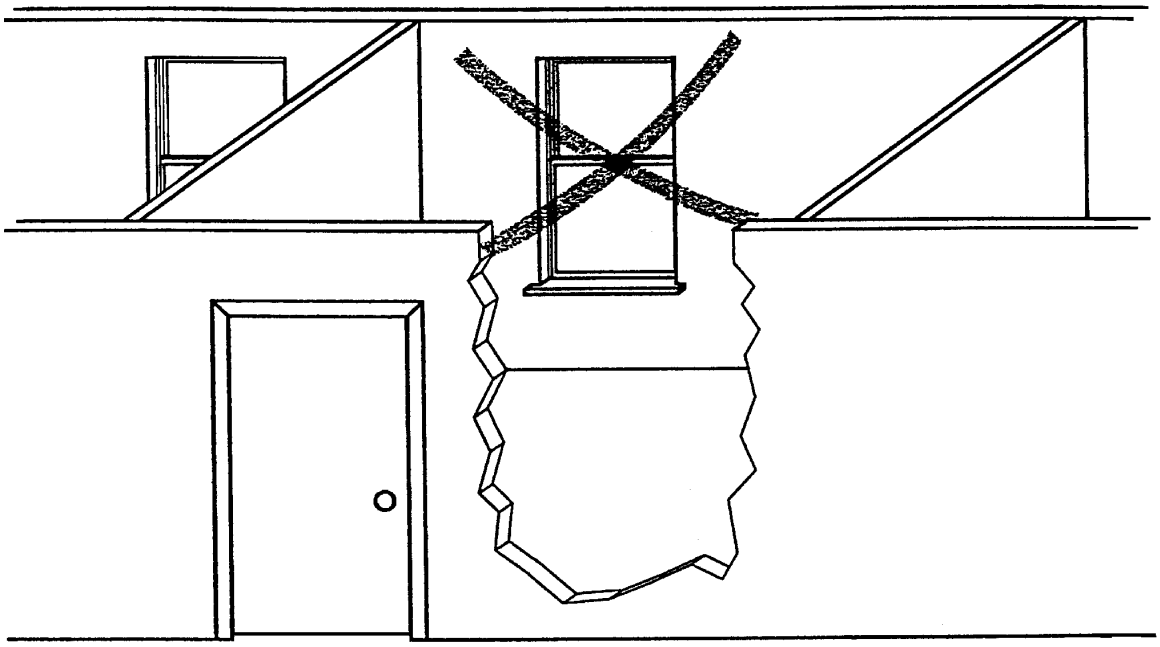
AREA TO BE COOLED (SQ. FT.)	CAPACITY (BTU/HR)*
100 TO 150	5,000
151 TO 250	6,000
251 TO 300	7,000
301 TO 350	8,000
351 TO 400	9,000
401 TO 450	10,000
451 TO 500	12,000
501 TO 700	14,000
701 TO 1000	18,000

***Adjustments to make:**

- **If the room is heavily shaded, reduce capacity by 10 percent.**
- **If the room is very sunny, increase capacity by 10 percent.**
- **If more than two people regularly occupy the room, add 600 Btu/Hr for each additional person.**
- **If the unit is for a kitchen, increase capacity by 4,000 Btu/Hr.**

~~9.~~*10.* EGRESS WINDOWS (continued)

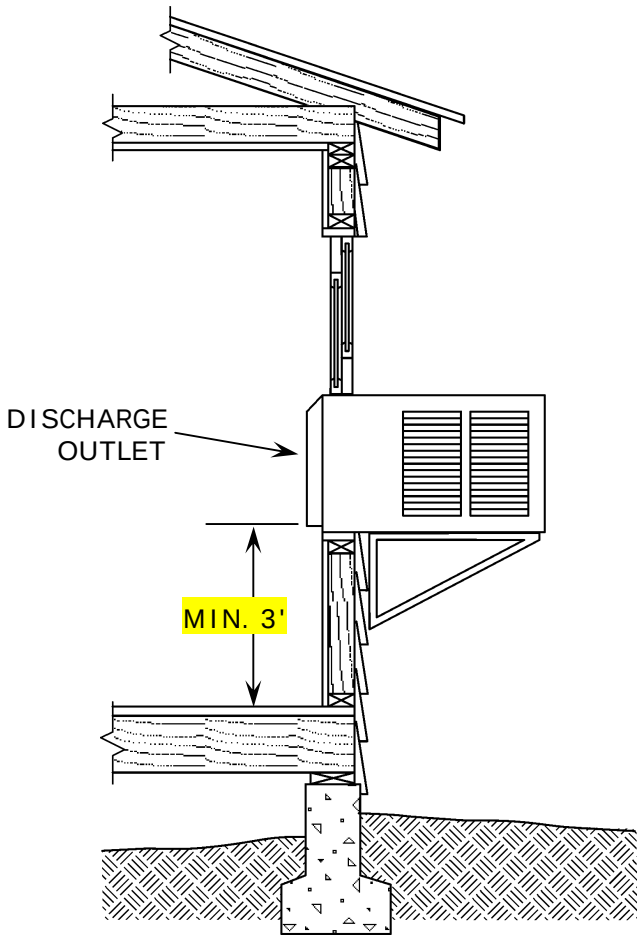
- **Air conditioner shall not be installed in egress windows <u>unless</u>:**
  - **Allowed by customer, <u>and</u>**
  - **One of the following is present in the same room:**
    - **Another operable window which meets egress requirements, <u>or</u>**
    - **An operable exterior door which meets egress requirements.**



AIR CONDITIONER <u>NOT</u> INSTALLED
IN THE ONLY EGRESS OPENING

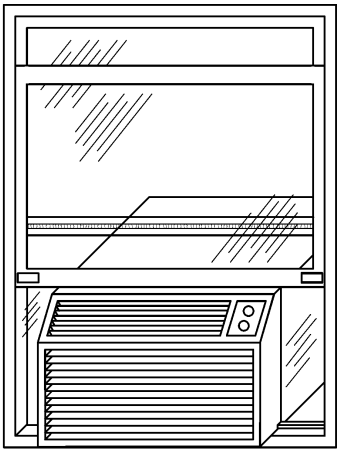
11. MINIMUM HEIGHT

- **All Units**
  - **Unit shall be installed only in a window or wall opening.**
  - **Exterior portion of unit shall be located a minimum of 2' above grade.**
- **Wall-Mount Units**
  - **Air discharge outlet shall be located a minimum of ~~5'~~ *3' above the floor unless mounted below a window.***
  - ***Shall be installed in existing location if the location meets requirements of local code, and is***
    - ***18" above floor if:***
      - ***Discharge grille is equipped with directional louvers, and***
      - ***Location is allowed by manufacturer.***



12. LOCATION

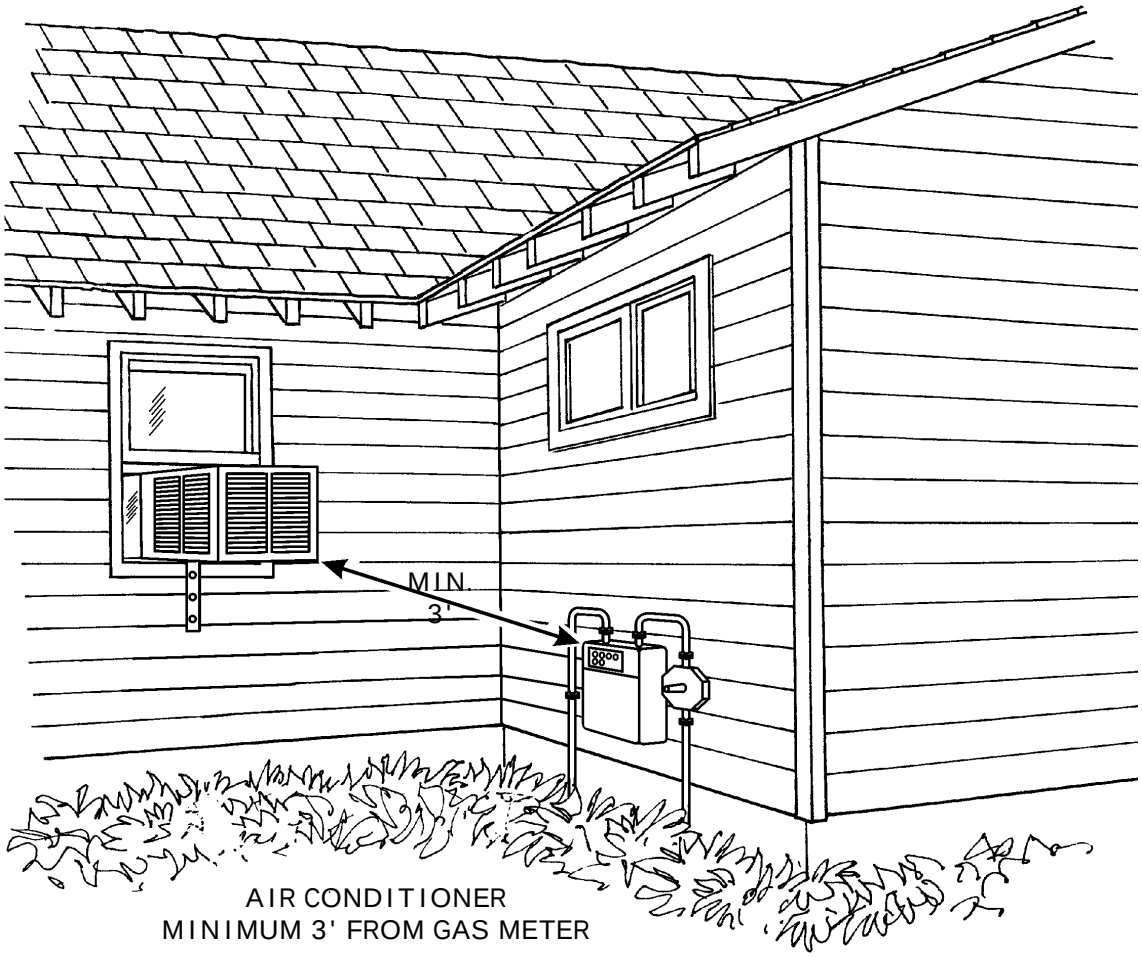
- **Window-Mount Units**
  - **All Windows**
    - **Air conditioner shall be placed in center of window opening.**
    - **Permanent window panels shall be installed to completely fill empty spaces over 12" wide.**
    - **Side window panels over 12" wide shall be transparent.**
    - **Window panels shall be sealed in place.**
    - **Unit shall be placed on north or east side of home out of direct sun when possible.**
    - **Place unit in the shade of trees and shrubs *when feasible*.**
  - **Double-Hung Windows**
    - **Air conditioner shall be installed in lower sash opening.**
    - **Lower sash shall seal against unit and side panels.**



AIR CONDITIONER CENTERED
IN WINDOW OPENING

12. LOCATION (continued)

- **Exterior Clearance (continued)**
  - ~~•There shall be at least 5' between the wall containing the air conditioner and adjacent walkways.~~
  - **There shall be at least a ~~7'~~ *3'* clearance from A/C inlet to the gas meter.**
  - **Property setback requirements shall <u>not</u> be violated.**
  - **Unit shall be free of obstructions, such as landscaping, plants, structures, etc.**
- **Interior Clearance**
  - **Unit shall be free of obstructions, such as furniture, curtains, plants, etc.**



AIR CONDITIONER
MINIMUM 3' FROM GAS METER

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
  - S*torage 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

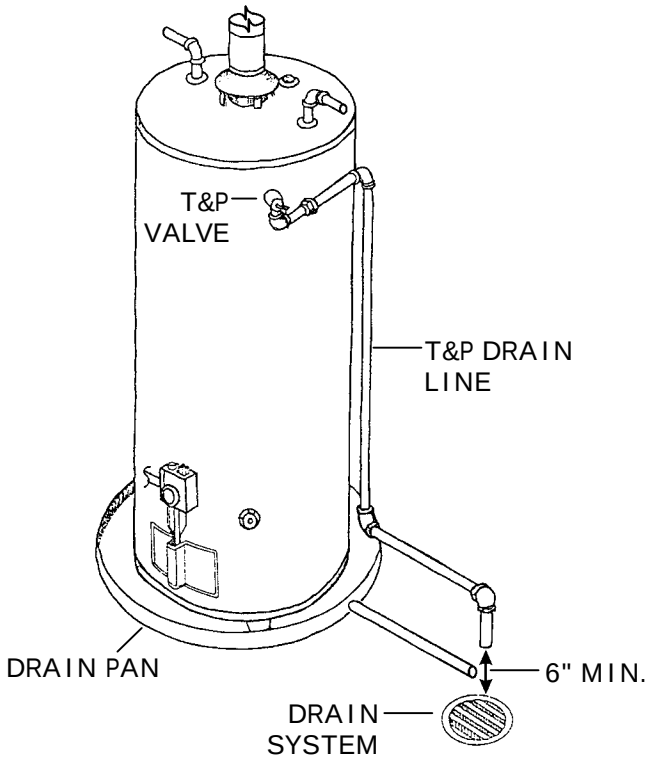
***First Hour Rating, the water heating capacity expressed in gallons, is the amount of hot water the heater can supply per hour (starting with a tank full of hot water). The First Hour Rating is shown on the yellow EnergyGuide label.**

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.

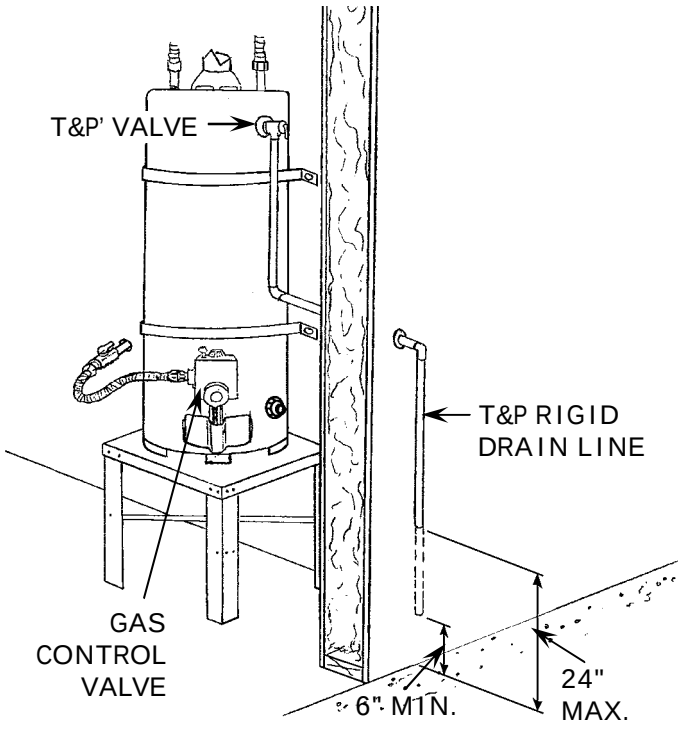


9. TEMPERATURE AND PRESSURE ~~(T&P)~~ RELIEF ~~VALVE~~

- **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.



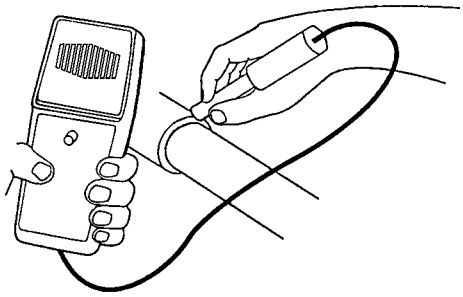
11. GAS LINES, FITTINGS AND VALVES

- ***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.

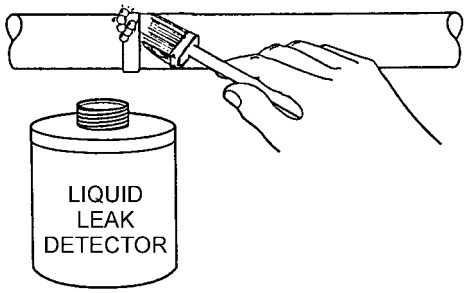
12. COMBUSTION AIR

- ***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



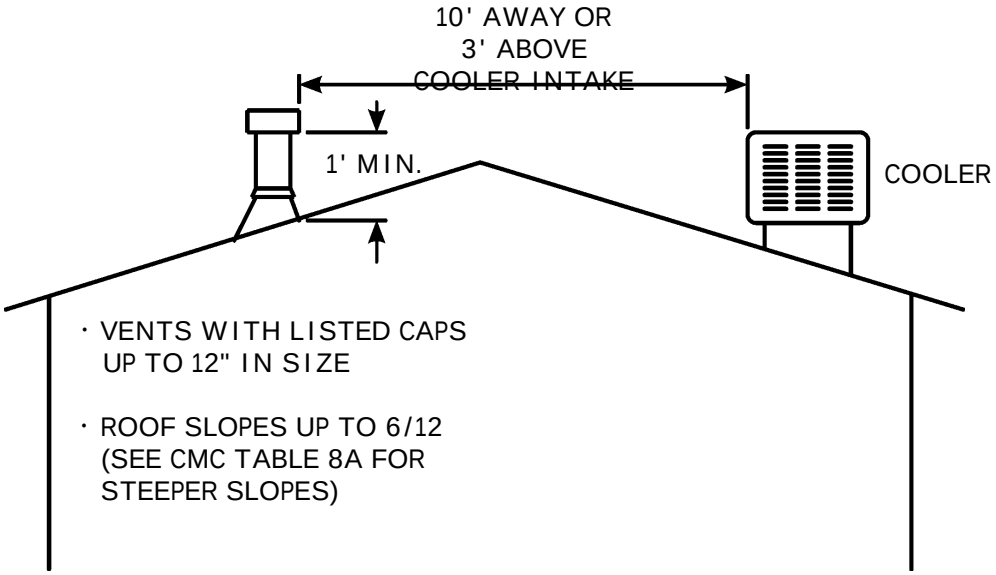
LIQUID LEAK DETECTION METHOD



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.



SECTION 2 PREFACE
FOR
DOOR WEATHERSTRIPPING

1. INSTALLATION POLICIES

~~1.1.Existing weatherstripping that is functional and operating properly shall not be replaced, even if it is not an approved material.~~

~~*1.2.*~~*1.1.* The contractor may adjust existing weatherstripping in lieu of replacement only if existing weatherstripping is functional and creates a proper seal.

~~*1.3.*~~*1.2.* Door shoe and threshold combinations must be installed unless proven to be nonfeasible.

~~*1.4.*~~*1.3.* A threshold should not be installed ~~if it~~*which* exceeds 1" in height from the finished floor (1/2" in height for handicapped).

~~*1.5.*~~*1.4.* When the installation of a door shoe and threshold combination is not feasible for the following reasons, an automatic sweep may be used:

- Medical reasons, such as wheelchairs or walkers, require that the floor be as flat as possible.
- Metal doors cannot be cut to accommodate a shoe.
- Doors open outward and do not overlap a floor surface when closed. “Bumper” type thresholds may be used in this circumstance if a tripping hazard will not be created.
- The installation of a proper threshold requires carpet cutting or repair to wooden or concrete sills.
- The door is unusually expensive and might be aesthetically damaged by cutting.

~~*1.6.*~~*1.5.* A stationary sweep can be used in lieu of an automatic sweep if a door shoe and threshold combination is not feasible and an automatic sweep cannot be installed. The use of flip up sweeps is not allowed.

SECTION 9 PREFACE

FOR

EVAPORATIVE COOLER AND AIR CONDITIONER VENT COVERS

1. INSTALLATION POLICIES

1.1. Shop-built wood*en* vent covers can only be used whenever a ~~commercially-available~~*factory-made* cover is not available.

1.2. Each cover must be checked for proper fit. Removal and reinstallation must be demonstrated to the customer.

1.3. In the cooling season when the cooler or window/wall air conditioner is in use, Contractor can leave the cooler cover uninstalled after the initial installation and customer instruction.

SECTION 10 PREFACE
FOR
DUCT TESTING

1. INSTALLATION POLICIES FOR DUCT TESTING AND SEALING AS A FREE-STANDING MEASURE[1]

1.1. Duct testing and sealing as a measure will be offered only in Single Family and Mobile Homes,

1.2. Duct testing and sealing as a measure will be offered in all Climate Zones for Homes with Natural Gas Space Heating provided by the IOU,

1.3. For homes with electric space heat provided by the IOU, duct testing and sealing as a measure will be offered only in Climate Zones 10-16,

1.4. In order to be considered as a Program measure, the potential for duct leakage reduction must be at least 13% of total fan flow (airflow).

1.5. For a duct system to be considered sealed, (a) the duct leakage reduction must equal or exceed 13% of airflow; (b) the final duct leakage must be reduced to less than 15% of airflow, or, if this cannot be reached, (c) all accessible duct leaks must be sealed as verified by smoke tests.

1.6. Duct sealing is <u>not</u> required unless initial leakage is at least 28% of airflow.

1.7. The utility or its designee will verify initial and final duct leakage rates, in accordance with the procedures in WIS Section 10, Duct Testing Standards, and Appendix D, Methods for Estimating and Measuring Airflow.

2. INSTALLATION POLICIES FOR DUCT TESTING AND SEALING AS A MEANS OF TITLE 24 COMPLIANCE

2.1. Beginning October 1, 2005, when "alterations" are made to HVAC systems in conventional homes located in climate zones 2 & 9-16, the requirements for duct testing and duct sealing outlined below apply.

2.2. HVAC Contractors must:

a. Ensure that duct leakage is at an acceptable level—which involves duct testing and, as needed, duct sealing, or

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[1] Although Duct Testing and Sealing is a single measure, there are separate WIS sections for Duct Testing (Sec. 10) and Duct Sealing (Sec. 20). The Preface Pages are identical in both WIS Sections (10 and 20).

b. Utilize a Title 24 High Efficiency Alternative in lieu of duct testing and sealing.

2.3. When duct testing and sealing is performed:

a. All accessible ducts must be sealed by the HVAC Contractor, and

b. A minimum of 1 in 7 of each contractor's completed installations must be verified by a HERS Rater to be in compliance with Title 24 Standards. However, Title 24 gives the homeowner the option to request HERS verification for his/her home, rather than being part of a 1-in-7 sample.

2.4. Exceptions: Duct testing and sealing requirements do not apply when:

a. Total length of ducts located in unconditioned space is less than 40 linear feet.

b. Ducts are constructed, insulated, or sealed with asbestos.

c. Ducts have been previously verified by a HERS rate to be incompliance with Title 24.

2.5. HERS verification of duct testing and sealing is tied to the building permit process. Under Title 24, a building permit for an HVAC alteration cannot be finalized until a form CF-6R has been completed and submitted to the HERS rater and a form CF-4R is completed by a HERS Rater and submitted to the Building Department.

2.6. The Title 24 definition of an HVAC "alteration" is:

a. Installation or replacement of an HVAC unit (central furnace and/or air conditioner or heat pump), or

b. Replacement of any of the following major HVAC components (the entire component, not a part within the component):

- *Air handler*
- *Condenser (outdoor unit)*
- *Indoor coil*
- *Furnace heat exchanger*
- *More than 40 feet of new ductwork in unconditioned space*

2.7. By contrast, a "repair" is servicing an HVAC unit or fixing/replacing a defective part within a major component—such as the fan motor or blade within the air handler, or the compressor or cooling fan motor or blade within the condenser (outdoor unit). "Repairs" are not within the scope of Title 24 standards and do not mandate duct testing and sealing.

2.8. When Title 24 duct testing and duct sealing is required, final duct leakage must be in conformance with the following criteria:

a. *Measured duct leakage shall be less than 15% of fan flow (airflow), or*

b. *Measured duct leakage to outside shall be less than 10% of fan flow, or*

c. *Measured duct leakage shall be reduced by more than 60% compared to measured duct leakage prior to the alteration, with visual inspection and smoke test by a HERS Rater performed to verify that all accessible leaks have been sealed.*

2.9. If it is not possible to meet the duct sealing options a., b. or c. listed above:

a. *All accessible duct leaks shall be sealed, and*

b. *A HERS Rater shall verify that all accessible leaks have been sealed by performing a visual inspection and a smoke test.*

2.10. Conformance with Title 24 duct leakage criteria must be verified by a HERS Rater for a minimum of 1 in 7 jobs completed by each HVAC contractor. However, Title 24 gives the homeowner the option to request HERS verification for his/her home, rather than being part of a 1-in-7 sample.

SECTION 15 PREFACE

FOR

HARD-WIRED COMPACT FLUORESCENT FIXTURES

1. INSTALLATION POLICIES

1.1. This measure is limited to the installation of hard-wired compact fluorescent porch light fixtures.

1.2. Hard-wired compact fluorescent porch light fixtures may be installed only in single family ~~residences~~*non-mobile homes*.

1.3. No more than an average of three fixtures may be installed.

1.4. Replaced porch light fixtures may be left with the customer or the property manager only if requested.

SECTION 17 PREFACE
FOR
REFRIGERATOR REPLACEMENT

1. INSTALLATION POLICIES

1.1. The minimum size for primary refrigerators replaced under the LIEE Program is 10 cubic feet.

1.2. Refrigerators may ~~not~~ be replaced ~~unless~~ *only if* the existing refrigerator ~~is more than 10 years old~~*was manufactured before 1993*.

1.3. One of the refrigerators replaced under the Program must be a primary refrigerator. The primary refrigerator is the main refrigerator in the home, usually the kitchen refrigerator.

1.4. The size of the replacement refrigerator shall be approximately equal to the size of the existing unit, not to exceed 19 cubic feet. When two refrigerators and/or freezers are exchanged for a single unit, the replacement unit may not be larger than the combined size of the two existing units, ~~provided that the new unit is no~~ *and may not be* larger than 23 cubic feet.

1.5. Space must be physically large enough to accommodate the new refrigerator, with entrance and passageways sufficient to allow removal of the existing refrigerator.

1.6. Contractor shall dispose and recycle (de-manufacture) replaced refrigerators in an environmentally safe manner and in accordance with federal, state, and local regulations and codes. Contractor represents that it has knowledge of the Metal Discard Act, effective January 1, 1994, which prohibits disposal of refrigerators/freezers in landfills.

SECTION 18 PREFACE

FOR

NATURAL GAS CENTRAL FORCED AIR HEATING SYSTEM REPAIR AND REPLACEMENT

1. FURNACE REPAIR/REPLACEMENT ~~INSTALLATION~~ POLICIES

1.1. Furnace repair or replacement may be provided only when the appliance ~~is non-operational or~~ fails NGAT, and correction cannot be achieved with Service/Adjustment by utility gas service personnel (or their designated representative). Note that NGAT fails include the following two scenarios:

- *The furnace is non-operable.*
- *No furnace is present and the household uses another gas appliance for space heating.*

1.2. A central furnace may be replaced only if the cost of repairing the unit would be more than 50% of the cost of replacement.

~~*1.1.*~~*1.3.* Furnace replacements and major furnace repairs may be provided only if the residence is owner-occupied. *Service/*Adjustment ~~and minor repairs~~ may also be conducted in ~~non-owner~~*renter*-occupied homes.

~~*1.2.*~~*1.4.* Furnace repairs and replacements will be provided only if the fuel used by the furnace is supplied by the utility providing LIEE Program services.

~~*1.3.*~~*1.5.* Furnace replacement will not include hazardous material abatement, major structural alteration, concrete work, painting, or floor covering.

~~*1.4.*~~*1.6.* An air conditioning unit may be replaced in conjunction with a furnace replacement if:

- The unit being replaced is a combined forced air heating and central AC package system, also referred to as a dual-pack (i.e., the AC and furnace is manufactured as one unit and is housed in a single sheet metal housing); or
- The furnace being replaced is part of a split forced air heating and AC system and the AC evaporative coil and/or the outside system cannot be matched with the new furnace.

~~*1.5.*~~*1.7.* Replaced units must be de-manufactured in compliance with all laws and regulations.

~~*1.6.*~~*1.8.* Installer must have C-20 HVAC license.

1.9. A furnace will not be replaced is Title 24 provisions relating to alterations cannot be satisfied.

1.10. A furnace that is not abandoned or inaccessible and cannot be made operable through Servicing fails NGAT.

2. PROGRAMMABLE THERMOSTAT INSTALLATION POLICIES

2.1. Programmable thermostats ~~are~~ *may be* installed only ~~in conjunction with~~*if a* ~~central~~ furnace *or central air conditioner is* ~~repair/replacement~~ *replaced* ~~and only when required by state or local code as part of furnace repair/replacement~~. *(A programmable/setback thermostat is required by Title 24 when a central heating system and/or central air conditioner is replaced.)*

2.2. Before installing a programmable thermostat, Contractor shall explain ~~their~~ *its* operation and provide the customer an opportunity to refuse the measure.

3. CENTRAL SYSTEM ~~AIR~~ *HVAC* FILTER INSTALLATION POLICIES

3.1. *HVAC* filters *may be replaced* ~~are installed~~ only ~~in conjunction~~ *as part of* ~~with~~ central ~~forced air heating system~~*furnace* repair *or central air conditioner replacement*.

3.2. Contractors must show customers how to remove, clean, and re-install the filters.

SECTION 19 PREFACE
FOR
NATURAL GAS WALL AND FLOOR FURNACE REPAIR AND REPLACEMENT

1. ~~INSTALLATION~~ *FURNACE REPAIR/REPLACEMENT* POLICIES

1.1. Furnace repair or replacement may be provided only when the appliance ~~is non-operational or~~ *fails NGAT, and correction cannot be achieved with Service/Adjustment by utility gas service personnel (or their designated representative).*

1.2. A furnace may be replaced only if the cost of repairing the unit would be more than ~~50%~~*25% of the cost of replacement.*

~~*1.1.*~~*1.3.* Furnace *repair or* replacement ~~and major furnace repairs~~ may be provided only if the residence is owner-occupied. *Service/*Adjustment ~~and minor repairs~~ may also be conducted in ~~non-owner~~*renter*-occupied homes.

~~*1.2.*~~*1.4.* Furnace repairs and replacements will be provided only if the fuel used by the furnace is supplied by the utility providing the ~~weatherization~~ *LIEE Program* service*s*.

~~*1.3.*~~*1.5.* Furnace replacement will not include hazardous material abatement, major structural alteration, concrete work, painting, or floor covering.

SECTION 20 PREFACE
FOR
DUCT SEALING

1. INSTALLATION POLICIES FOR DUCT TESTING AND SEALING AS A FREE-STANDING MEASURE[1]

1.1. Duct testing and sealing as a measure will be offered only in Single Family and Mobile Homes,

1.2. Duct testing and sealing as a measure will be offered in all Climate Zones for Homes with Natural Gas Space Heating provided by the IOU,

1.3. For homes with electric space heat provided by the IOU, duct testing and sealing as a measure will be offered only in Climate Zones 10-16,

1.4. In order to be considered as a Program measure, the potential for duct leakage reduction must be at least 13% of total fan flow (airflow).

1.5. For a duct system to be considered sealed, (a) the duct leakage reduction must equal or exceed 13% of airflow; (b) the final duct leakage must be reduced to less than 15% of airflow, or, if this cannot be reached, (c) all accessible duct leaks must be sealed as verified by smoke tests.

1.6. Duct sealing is <u>not</u> required unless initial leakage is at least 28% of airflow.

1.7. The utility or its designee will verify initial and final duct leakage rates, in accordance with the procedures in WIS Section 10, Duct Testing Standards, and Appendix D, Methods for Estimating and Measuring Airflow.

2. INSTALLATION POLICIES FOR DUCT TESTING AND SEALING AS A MEANS OF TITLE 24 COMPLIANCE[1]

2.1. Beginning October 1, 2005, when "alterations" are made to HVAC systems in conventional homes located in climate zones 2 & 9-16, the requirements for duct testing and duct sealing outlined below apply.

2.2. HVAC Contractors must:

a. Ensure that duct leakage is at an acceptable level—which involves duct testing and, as needed, duct sealing, or

[1] *Although Duct Testing and Sealing is a single measure, there are separate WIS sections for Duct Testing (Sec. 10) and Duct Sealing (Sec. 20). The Preface Pages are identical in both WIS Sections (10 and 20).*

b. Utilize a Title 24 High Efficiency Alternative in lieu of duct testing and sealing.

2.3. When duct testing and sealing is performed:

a. All accessible ducts must be sealed by the HVAC Contractor, and

b. A minimum of 1 in 7 of each contractor's completed installations must be verified by a HERS Rater to be in compliance with Title 24 Standards. However, Title 24 gives the homeowner the option to request HERS verification for his/her home, rather than being part of a 1-in-7 sample.

2.4. Exceptions: Duct testing and sealing requirements do not apply when:

a. Total length of ducts located in unconditioned space is less than 40 linear feet.

b. Ducts are constructed, insulated, or sealed with asbestos.

c. Ducts have been previously verified by a HERS rate to be incompliance with Title 24.

2.5. HERS verification of duct testing and sealing is tied to the building permit process. Under Title 24, a building permit for an HVAC alteration cannot be finalized until a form CF-6R has been completed and submitted to the HERS rater and a form CF-4R is completed by a HERS Rater and submitted to the Building Department.

2.6. The Title 24 definition of an HVAC "alteration" is:

a. Installation or replacement of an HVAC unit (central furnace and/or air conditioner or heat pump), or

b. Replacement of any of the following major HVAC components (the entire component, not a part within the component):

- *Air handler*
- *Condenser (outdoor unit)*
- *Indoor coil*
- *Furnace heat exchanger*
- *More than 40 feet of new ductwork in unconditioned space*

2.7. By contrast, a "repair" is servicing an HVAC unit or fixing/replacing a defective part within a major component—such as the fan motor or blade within the air handler, or the compressor or cooling fan motor or blade within the condenser (outdoor unit). "Repairs" are not within the scope of Title 24 standards and do not mandate duct testing and sealing.

2.8. When Title 24 duct testing and duct sealing is required, final duct leakage must be in conformance with the following criteria:

a. Measured duct leakage shall be less than 15% of fan flow (airflow), or

b. Measured duct leakage to outside shall be less than 10% of fan flow, or

c. Measured duct leakage shall be reduced by more than 60% compared to measured duct leakage prior to the alteration, with visual inspection and smoke test by a HERS Rater performed to verify that all accessible leaks have been sealed.

2.9. If it is not possible to meet the duct sealing options a., b. or c. listed above:

a. All accessible duct leaks shall be sealed, and

b. A HERS Rater shall verify that all accessible leaks have been sealed by performing a visual inspection and a smoke test.

2.10. Conformance with Title 24 duct leakage criteria must be verified by a HERS Rater for a minimum of 1 in 7 jobs completed by each HVAC contractor. However, Title 24 gives the homeowner the option to request HERS verification for his/her home, rather than being part of a 1-in-7 sample.

SECTION 21 PREFACE
FOR
CENTRAL AIR CONDITIONER REPLACEMENT

1. CENTRAL AIR CONDITIONER REPLACEMENT POLICIES

1.1. Central air conditioner replacements will be offered only in Title 24 climate zones 14 and 15.

1.2. A programmable/setback thermostat may be installed only if a central air conditioner is replaced (a programmable thermostat is required by Title 24 when a central air conditioning system is replaced).

1.3. Prior to installation, contractors installing programmable thermostats shall explain their operation and provide the customer an opportunity to refuse the measure.

1.4. HVAC filters may be replaced only as part of central furnace repair or central air conditioner replacement.

1.5. Contractors who replace filters must show customers how to remove, clean and reinstall the filters.

1.6. Replacement of refrigerant line sets is beyond the scope of this Program.

SECTION 25 PREFACE

FOR

NATURAL GAS WATER HEATER REPLACEMENT

1. *WATER HEATER REPAIR/REPLACEMENT* POLICIES

1.1. Water heater repair or replacement may be provided only when the appliance ~~is non-operational or~~ *fails NGAT, and correction cannot be achieved with Service/Adjustment by utility gas service personnel (or their designated representative).*

1.2. A water heater may be replaced only if the cost of repairing the unit would be more than 50% of the cost of replacement.

~~1.1.The replacement water heater must have an energy factor of 0.60 or greater.~~

1.3. Water heater repair or replacement may be provided only if the residence is owner-occupied. Service/Adjustment may also be conducted in renter-occupied homes.

1.4. Water heater repairs and replacements will be provided only if the fuel used by the ~~furnace~~ *appliance is supplied by the utility providing* ~~the weatherization~~ *LIEE Program services.*

1.5. Water heater replacement will not include hazardous material abatement, major structural alteration, concrete work, painting, or floor covering.

~~1.2.A new natural gas water heater can only replace an existing natural gas water heater that has failed a natural gas appliance test, and cannot be repaired in a manner that enables it to pass an appliance test.~~

SECTION 29 PREFACE
FOR
NATURAL GAS APPLIANCE TESTING (NGAT)

1. INSTALLATION POLICIES

1.1. Combustion appliance testing will be conducted *only* for ~~all~~ homes that receive infiltration reduction measures and that have at least one natural gas appliance affecting the living space. (Appliances affecting the living space are those identified as such in this section of this WIS manual.)

1.2. Homes with non-IOU (e.g., propane) space heating fuel:

1.2.1. Homes with non-IOU (e.g., propane) space heating fuel are not eligible for ~~combustion~~ *natural gas* appliance testing *n*or infiltration reduction measures. *The IOU will refer these homes to local LIHEAP agencies to conduct testing and do any repairs or replacement of non-IOU combustion fuel appliances and charge such services to the LIHEAP agencies' CSD-funded weatherization programs. Whether the LIHEAP agencies would also install infiltration reduction measures, or any other weatherization measures under their LIHEAP programs, would be subject to voluntary agreements freely entered into by the IOUs and the local LIHEAP agencies.*

1.2.2. Any agreement between an IOU and a local LIHEAP agency which does not contract with that IOU to provide weatherization services under the IOU's LIEE program will be voluntarily negotiated on a case-by-case basis, given different geographic areas served, and different situations which might occur in different parts of each IOU's service area.

1.2.3. In any part of a given IOU service area where the local LIHEAP agency chooses NOT to enter into such an agreement, the IOU will continue to install all feasible non-infiltration weatherization measures under its LIEE program, then refer the customers to the local LIHEAP agency if they want to have their non-IOU fuel combustion appliances tested, repaired or replaced, and/or want to have infiltration reduction measures installed in their home by the LIHEAP agency.

~~1.2.Effective PY2004For Program Year 2005, pending further CPUC action, homes with IOU space heating but with other appliances using non-IOU fuel will be treated in accordance with the following utility-specific policies:~~

~~– In the SDG&E and SoCalGas programs, these homes will not be subjected to combustion appliance testing of non-IOU fueled appliances. Instead, they will be assessed using the PY2003 Minimum Standard adopted by the~~

~~Commission in D. 101-12-020, which does not involve testing of appliances other than space heating.~~

~~– In the SCE program (for which electric space heating is present), combustion appliance testing will not be conducted.~~

~~– In the PG&E Program, these homes will be subjected to combustion appliance testing on all combustion appliances prior to weatherization (and, for a sample of homes, after weatherization). For homes failing the pre-weatherization test, infiltration-reduction measures will be deemed non-feasible~~

1.3. In order to avoid cases in which post-weatherization NGAT protocol would discover nonconforming conditions that: (a) preclude installation of infiltration reduction measures, and (b) cannot be corrected within the scope of the program, some pre-weatherization evaluations of gas appliances are performed as part of the initial home assessment. Pre-weatherization appliance evaluations include the following components:

- *Gas Leaks. Each gas-burning appliance is checked for the presence of gas leaks. When a natural-gas leak is found, the utility is contacted for gas service repairs. Non-IOU gas leaks are treated in accordance with utility-specific policies. All gas leaks must be repaired before weatherization commences.*
- *Combustion and Ventilation Air (CVA) Evaluations. CVA is evaluated for furnaces and water heaters to determine if it is adequate and, if inadequate, whether correction is feasible*/possible.
- *Flue and Vent Pipe Termination Evaluations. Flue and vent pipe terminations are checked to determine if any violate NGAT criteria and, if nonconforming, whether correction is feasible.*
- *Appliance Operation and Accessibility. All gas-burning appliances are checked to determine whether: (a) they are accessible for testing, and (b) they are operable. Non-operable natural gas appliances are referred to the appropriate utility service department. Non-operable propane appliances are treated in accordance with utility-specific policies.*
- *Unvented Space Heater. The dwelling is checked for presence of an unvented combustion appliance used for heating the living space (which will preclude installation of infiltration reduction measures if not removed/elimiated).*

~~*1.3.–*~~ *Whole House Fan. When a whole house fan exhausting into the attic is present, the attic is checked for the presence of a gas water heater or gas furnace with standing pilot (which will preclude installation of infiltration reduction measures).*

- *Gas Clothes Dryer. If located within the living space, the clothes dryer moisture exhaust is checked to determine if it is properly vented outdoors.*

If not properly vented outdoors, infiltration reduction measures will not be installed. This restriction does not apply to a gas clothes dryer located in an attached garage.

- *Gas Range with Heater/Incinerator. When a gas range has a built-in space heater and/or incinerator, if the appliance is not properly vented outdoors, infiltration reduction measures will not be installed.*
- *Water Heater in Bedroom. If an open combustion water heater is present in a sleeping area, infiltration reduction measures will not be installed.*

Required corrections will be performed before weatherization commences. The owner will be informed of conditions that preclude installation of infiltration reduction measures and cannot be remedied by the LIEE program (e.g., exhausting clothes dryers outdoors, and repair or replacement of appliances and gas vents for which ~~R&R~~ *repair or replacement is not available).*

1.4. After completion of weatherization that includes infiltration reduction measures, NGAT is performed for all natural gas appliances affecting the living space. Testing of appliances using non-IOU fuels is conducted in accordance with utility-specific policies (see 1.3 and 1.8). NGAT includes the following components:

~~1.4.In each home containing at least one combustion appliance affecting the living space, the following combustion appliance protocols will be conducted:~~

- Visual Examinations, including flue and vent system checks, ~~as well as~~ appliance component checks, *re-check for gas leaks, inoperable or inaccessible appliances, nonconforming appliances; and check for properly-blocked fireplace damper if gas log is used as the primary heat source.*
- Combustion *and Ventilation* Air *(CVA)* ~~Evaluation~~ *Verification*.
- *Ambient* Carbon Monoxide Tests, as prescribed below in 1.6.
- Draft Tests, using smoke, on appliances for which draft tests are applicable *(e.g., open combustion natural draft space- and water-heating appliances)*.

1.5. *For IOU-fueled natural gas appliances, ambient* CO Testing will be conducted using the following protocol~~s~~:

- Heating Appliances: ~~Room~~ *Appliance* ambient CO testing is performed *for all space heating appliances*.
- Water Heaters: ~~Room~~ *Appliance* ambient CO testing is performed ~~when unit is in the home's envelope or in a closet abutting conditioned space. When water heater is in a closet abutting conditioned space, room ambient CO test is performed at the draft hood~~ *if the water heater is in a location affecting the living space*.

- Kitchen Appliances: Room ambient CO tests are performed in the kitchen ~~while kitchen appliances are operating~~ *separately during operation of each cooking appliance component (cook top, oven, and broiler)*.
- Gas Logs: Exhaust/flue CO test is performed inside the top edge of the fire-place opening.
- Clothes Dryers: No CO tests are performed~~; however, visual inspection is conducted to ensure that the dryer is exhausted outdoors~~.

1.6. If a problem is identified through application of the overall NGAT protocol, *(i.e., elevated CO, inadequate draft, or defect causing an unsafe condition),* the case will be referred *for resolution* to qualified utility-trained personnel ~~for resolution~~*or a contractor licensed to repair appliances*. Such resolution may involve the use of flue CO testing as well as other procedures.

1.7. Timing of combustion appliance testing will be as follows:

1.7.1. Homes with Natural Gas Appliances

For homes other than those using non-IOU combustion fuels with natural gas appliances, combustion appliance testing post-weatherization NGAT protocols is are conducted after weatherization. Post-weatherization NGAT shall be conducted within five (5) working days from the date that infiltration reduction measures are installed.

1.7.2. Homes with Non-IOU Combustion Appliances

Timing of combustion appliance testing will temporarily differ across utilities for homes using non-IOU combustion fuels. For SDG&E, SoCal Gas and SCE, no tests will be conducted on appliances using non-IOU fuels. For PG&E, tests for homes with non-IOU combustion appliances will be conducted prior to weatherization and, in a sample of homes, after weatherization.

1.7.3. Homes for which Infiltration Reduction is Simulated

Temporary sealing/blocking of defective windows and doors, in order to perform post-weatherization NGAT, is allowed when required materials (such as specialty glass or special-order windows or doors) are not available to be installed concurrently with the other weatherization measures. NGAT will be conducted with the defect sealed/blocked (e.g., with plastic sheeting) to simulate infiltration reduction achieved by the completed window/door repair/replacement. A repeat of NGAT following the completed repair/replacement is not required.

~~Post-weatherization NGAT protocol shall be conducted the same day as infiltration reduction measures are installed.~~

~~1.8.Homes normally receiving post-weatherization testing:~~

~~(a) Evaluation of the following will be conducted prior to installing weatherization measures (e.g., during initial home assessment) to determine that any required corrections are feasible:~~

- ~~Existence of gas leak(s)~~
- ~~Adequacy of combustion air venting~~
- ~~Adequate clearance between water heater vent termination and evaporative cooler inlet.~~

~~(b) Required corrections will be performed before weatherization work commences.~~

~~1.9.~~1.8. The following actions will be taken when appliances *fail NGAT*~~are found to have problems~~:

- In owner-occupied homes, natural gas space heaters *and water heaters* failing one or more of the tests covered by the ~~new~~ *NGAT* protocol will *be provided with Service/Adjustment and, if necessary, will* be repaired or replaced.
- ~~In owner-occupied homes, natural gas water heaters failing one or more of the tests will be repaired or replaced.~~
- In owner-occupied homes, non-program appliances failing one or more of the tests covered under the ~~new~~ *NGAT* protocol*s* will be ~~serviced~~*provided with Service/Adjustment*. If ~~these repairs do~~*Service/Adjustment does* not correct the problem, the appliances in question will be *tagged, shut off*, *and/or* capped and reported to the owner.
- In renter-occupied homes, appliances failing one or more of the tests covered by the ~~new~~ NGAT protocol*s* will be ~~serviced~~ *provided with Service/Adjustment*. If *Service/Adjustment* ~~servicing an appliance~~ does not correct the problem, the appliance be will be *tagged*, shut off, *and/or capped* and reported to the tenant and the landlord.

NONFEASIBILITY CRITERIA FOR CAULKING

1. ~~Already properly installed~~*The existing caulk is functional and performing properly, even if not installed in accordance with current Installation Standards*.
2. Crack does not penetrate the *building* envelope.
3. Crack/gap too wide to be caulked (wider than 5/8") and must be repaired/patched.
4. Customer refuses.

NONFEASIBILITY FOR WEATHERSTRIPPING DOORS

1. ***The existing weatherstripping is functional and performing properly, even if not installed in accordance with current Installation Standards*** ~~Already properly installed~~.
2. Door is located between two conditioned or two unconditioned spaces.
3. Door ***i***s in ***a*** multi-unit dwelling~~s~~ ***and*** separate***s*** the living space from a heated hallway.
4. Door ***is*** labeled to have a fire rating <u>greater than</u> 20 minutes.
5. Functional storm door ***is*** present.
6. Customer refuses.

NONFEASIBILITY FOR WEATHERSTRIPPING APPLIANCE CLOSET DOORS

1. Combustion appliance receives air from conditioned space (i.e. combustion air grilles present in the enclosure door or wall).
2. Inadequate combustion air (as defined in Appendix A) is being supplied to the appliance.

NONFEASIBILITY CRITERIA FOR CEILING INSULATION

1. ~~Already properly installed~~*The existing insulation level precludes raising the R-value* **(see chart below):**

CLIMATE ZONE	EXISTING INSULATION LEVEL
CEC Climate Zones 2 through 15	More than R-11
CEC Climate Zones 1 and 16	More than R-19

2. **The roof is leaky or shows signs of water damage from leaks that have not been repaired.**

3. **Adequate venting is not present and cannot be installed per Attic Ventilation Standards (Section 4).**

4. **Hazardous electrical wiring or other hazardous conditions are present.**

5. **An enclosed cavity ~~as defined in the installation standards~~ is present.**

6. **Exhaust vents terminating in the attic ~~that~~ cannot be vented to the outside.**

7. **Disconnected or damaged space heating/cooling ducts are present and cannot be repaired.**

8. **Attic accessibility is inadequate:**
   - **An inspector can not gain safe physical access to all treated areas of the attic after insulation is installed.**
   - **~~There is less than 24"~~ Clearance between top of ceiling joist*s* and bottom of ridge board *is less than 24 inches.***
   - ***Structural obstructions, such as cross members of truss systems, provide an opening of less than 18 inches.***
   - ***Access requires crawling over/under HVAC ducts, and clearance is less than 18 inches.***

   ~~-Ceiling or gable access meeting P&P guidelines is not present and cannot be installed.~~

   ~~-Obstructions are present which reduce clearances to less than minimum specified in the P&P.~~

NONFEASIBILITY CRITERIA FOR CEILING INSULATION (continued)

9. **The structure is unsound and will not support the weight of the insulation and installer, such as:**
   - **2" x 4" *@ ~~48"~~greater than 24"* OC.**
   - **Bowed and sagging joists.**
   - **Fiberboard ceiling material.**
   - **1/4" gypsum ceiling.**

10. **Knob-and-Tube (K&T) Wiring is present and:**
   - **Functioning knob-and-tube wiring cannot be certified safe by a C-10 contractor.**
   - **Abandoned K&T wiring is present that cannot be disconnected and certified as abandoned and disconnected by a C-10 contractor.**
   - **Insulation over K&T wiring (live or abandoned) is prohibited by local code.**

11. **Customer refuses.**

NONFEASIBILITY CRITERIA RELATING TO CATASHROPHIC DUCT LEAKS AND DISCONNECTIONS

1. **The reconnection work would disturb asbestos or other hazardous material.**

2. **A combustion-related hazard exists with furnace or other fuel-burning appliance (e.g., excessive CO, cracked heat exchanger, backdrafting, etc.).**

3. **A health or safety hazard is present, such as sewage waste in the crawlspace, insect infestation, hazardous electrical wiring, or a structural hazard, etc.**

4. **Customer refuses.**

NONFEASIBILITY CRITERIA FOR ATTIC VENTING

1. ***The existing venting*** **already** ~~**properly installed**~~***meets Installation Standards***.
2. **Tiled hip roof without overhang, soffit, or accessible frieze blocks.**
3. **Ceiling insulation is nonfeasible.**
4. **Roof-mounted vents are the only option for adding venting, but the roof is tile, wood shingles, or in poor condition (e.g., more than three layers of roofing, roof unable to support additional vents).**
5. **Roof is a flat and/or built-up roof** ~~**as defined in the installation standards**~~***(see Definitions)***.
6. **Customer refuses.**

NONFEASIBILITY CRITERIA FOR WATER HEATER INSULATION

All Water Heaters

1. ~~Already properly installed~~*The existing blanket is functional and performing properly, even if not installed in accordance with current Installation Standards*.
2. External insulation is prohibited by the manufacturer.
3. T&P *relief* valve*, or gas shutoff valve,* is not present, or is not located within 6" of the tank.
4. T&P valve outlet is plugged or capped.
5. Tank is exposed to weather.
6. Leak present in tank or water pipes.
7. Plastic pipe (e.g., CPVC) is present in the cold or hot water line to/from the tank.
8. Tank is located within 12" of a stove, range, or cooktop.
9. Tank capacity is greater than 100 gallons.
10. Customer refuses.

Gas Water Heaters

1. Perimeter clearances prior to blanket installation ~~is~~ *are less than 4" between tank and door and less than 1" on sides and back.*
   ~~-For gas water heaters with non-metal closet doors: less than 4" between tank and door and less than 1" on sides and back.~~
   ~~-For gas water heaters with metal closet doors: less than 1" on the front, sides and back.~~
2. *Gas leak present.
3. *Vent pipe and/or draft hood are not properly installed, including:
   - No draft hood present.
   - Two draft hoods present.
   - Vent pipe defective or missing.

*When these conditions exist, contact the designated utility personnel.

NONFEASIBILITY CRITERIA FOR WATER HEATER INSULATION (continued)

4. *Evidence of improper combustion and/or venting exists as characterized by:
   - Large accumulation of soot near draft hood or on floor underneath.
   - Scorching at draft hood or combustion chamber.

5. No *appliance line valve (*gas shutoff valve*)* present.

6. *Combustion air supply improper or inadequate as characterized by:
   - The absence of both low and high vents.
   - Vent size too small.
   - Room volume is inadequate.
   - Customer refuses modifications needed to create adequate combustion air supply.

7. *Both burner access doors missing.

8. Internal insulation is R-12 or greater.

Electric Water Heaters

1. Perimeter clearances prior to blanket installation ~~is~~ *are less than 1" on the front, sides and back.*
   ~~-For electric water heaters with metal and non-metal closet doors: less than 1" on the front, sides and back.~~

2. Hazardous electrical wiring/conditions are present.

3. Thermostat cover plate(s) not present.

4. Internal insulation is R-16 or greater.

*When these conditions exist, contact the designated utility personnel.

NONFEASIBILITY CRITERIA FOR WATER HEATER PIPE INSULATION

1. ***The existing pipe insulation is functional and performing properly, even if not installed in accordance with current Installation Standards.***

2. ***An unsafe condition is present that causes tank insulation to be nonfeasible.***

~~**1.Already properly installed.**~~

~~*2.*~~*3.* **Water heater pipes are leaky.**

4. ***T&P relief valve, or gas shutoff valve, is not present, or is not located within 6" of the tank.***

5. ***T&P valve outlet is plugged or capped.***

~~*3.*~~*6.* **Water heater pipes are exposed to the elements (especially sunlight, which can quickly degrade the insulation).**

~~*4.*~~*7.* **Less than 1 foot of continuous insulation can be installed.**

~~*5.*~~*8.* **Plastic piping (e.g. CPVC) is present in the cold or hot water tank lines *to/from the tank*.**

~~*6.*~~*9.* **Pipes are inaccessible, or the configuration prevents proper installation.**

~~*7.*~~*10.* **Customer refuses.**

NONFEASIBILITY CRITERIA FOR COVER PLATE GASKETS

1. **Evidence of electrical malfunction or hazard, such as:**
   - **Electrical box not permanently attached.**
   - **Loose electrical connection.**
   - **Signs of burning or charring or other evidence of hazardous wiring condition.**

2. ***Gaskets are already present, even if not installed in accordance with current Installation Standards.*** ~~**Already properly installed.**~~

3. **Cover plate located on a wall between two conditioned or two unconditioned areas.**

4. **Cover plate located behind** ~~**fragile**~~ **furniture**~~**, heavy furniture,**~~ **or major appliances** ***that are too fragile or*** **too heavy to move.**

5. **Removal of the cover plate will damage the wall surface (paint, wallpaper, etc.).**

6. **Utility box is an odd size and standard gaskets will not work.**

7. **Customer refuses.**

NONFEASIBILITY CRITERIA FOR ENERGY-SAVER SHOWERHEADS

1. **Showerarm and ball joint are not made from the same material.**

2. **Existing showerhead(s):**
   - **Have a flow rate less than or equal to 3.0 gpm.**
   - **Are required for medical reasons.**

3. **Existing showerarm:**
   - **Is made of plastic.**
   - **Is cracked, broken, or missing.**
   - **Requires removal.**

4. **Shower is not mechanically functional.**

5. **Standard metal adapters (i.e., American Standard®, Gerber®, and Price Pfister®) will not work.**

6. **Piping is in such poor condition that showerhead installation could cause plumbing problems.**

7. **Customer refuses.**

NONFEASIBILITY CRITERIA FOR FAUCET AERATORS

1. ***The aerator is functional and performing properly, even if not installed in accordance with current Installation Standards.*** ~~***Already properly installed.***~~

2. **Faucet has special fitting for attaching appliance (e.g., portable dishwasher).**

3. **Faucet does not provide hot water.**

4. **The faucet or faucet threads are found to be damaged and/or leaky.**

5. ***Removal of the existing aerator is likely to cause damage to the aerator or the faucet.***

~~***5.***~~***6.*** **Standard aerators will not fit.**

~~***6.***~~***7.*** **Customer refuses.**

NONFEASIBILITY CRITERIA FOR WINDOW/WALL EVAPORATIVE COOLER INSTALLATION

1. ~~Already properly installed and~~*The existing cooler is* operational.
2. Proper electrical service is not present.
3. *Proper exhaust ventilation is not available.*
4. ~~*3.*~~ Substandard wiring exists (e.g., ungrounded outlets, decayed insulation, or exposed wires).
5. ~~*4.*~~ No feasible window or wall location available.
6. ~~*5.*~~ Exterior clearance requirements cannot be met.
7. ~~*6.*~~ Egress requirements cannot be met.
8. ~~*7.*~~ Wood windows are decayed or deteriorated.
9. ~~*8.*~~ Siding is decayed or damaged.
10. ~~*9.*~~ Customer refuses.

NONFEASIBILITY CRITERIA FOR REPLACEMENT REFRIGERATORS

1. ~~The customer has an Energy Star®~~ *The* refrigerator *to be removed was manufactured after 1992*.
2. The electrical outlet used by the existing refrigerator is not properly grounded and cannot be properly grounded.
3. The refrigerator is not accessible *for removal* (*e.g.,* doors from room *are* too small, refrigerator *is* encased in tile~~, etc.~~).
4. Floor is not level and cannot safely support a new refrigerator.
5. ~~Other~~ Hazardous electrical conditions exist at the outlet used by the existing refrigerator.
6. Customer refuses.

NONFEASIBILITY CRITERIA FOR CENTRAL FORCED AIR SYSTEM REPAIRS AND REPLACEMENTS

1. *The existing furnace* ~~*isproperly functioning and passes NGAT, or is abandoned*, or*~~ *is inaccessible*[1]*.*
2. *The property is renter-occupied.*
3. *Fuel used by the existing unit is not supplied by the utility providing LIEE Program services.*

~~7.Disconnected ducts or damaged catastrophic duct leaks cannot reasonably be repaired.~~

4. *Ducts cannot be brought into compliance with WIS Section 20, Duct Sealing Standards.*
5. *No furnace is present and no natural gas line or electrical outlet is available to accommodate the installation of a furnace.*
6. *Customer refuses.*

NONFEASIBILITY CRITERIA FOR CENTRAL FORCED AIR FURNACE REPLACEMENT

1. ~~Already properly installed~~*The existing furnace can feasibly be repaired per the Program P&P.*
2. **For roof-mount unit, roof is not structurally adequate to support the installation.**
3. **For a unit in a confined location, adequate access and/or combustion air cannot be provided.**
4. *Disconnected or damaged space heating ducts are present and cannot be repaired.*

~~10.Catastrophic duct leaks cannot feasibly be repaired.~~

~~11.Customer refuses.~~

[1] *See Definitions*

NONFEASIBILITY CRITERIA FOR CENTRAL FORCED AIR FURNACE REPAIR

1. **Repair is not economically feasible per the program P&P *(e.g., cost to repair is more than 50% of the cost to replace the unit)*.**

~~**2.Catastrophic duct leaks cannot feasibly be repaired.**~~

~~**3.Customer refuses.**~~

NONFEASIBILITY CRITERIA FOR CENTRAL AIR CONDITIONER REPLACEMENT

1. **Heating system can be repaired with existing refrigeration equipment intact.**

~~**2.Existing system is a combined HVAC unit and The property is renter-occupied.**~~

~~*3.*~~*2.* **For roof-mount unit, roof is <u>not</u> structurally adequate to support the installation.**

~~*4.*~~*3.* **Electrical service requirements cannot be met.**

~~**5.duct damage/leaks and disconnections cannot feasibly be repaired.**~~

~~**6.Existing HVAC unit is a combined fuel unit and one of the fuels is not provided by one of the following IOUs:**~~
~~**-Pacific Gas & Electric Company**~~
~~**-Southern California Edison**~~
~~**-Sempra Utilities**~~

~~*7.*~~*4.* **System air flow is inadequate.**

~~**8.Customer refuses.**~~

NONFEASIBILITY CRITERIA FOR ~~INSTALLATION~~ *REPAIR/ REPLACEMENT* REQUIRING ATTIC OR CRAWL SPACE ACCESS

1. ***Crawl clearance is inadequate:***
   - ***Attic clearance is less than 24" between top of ceiling joists and bottom of ridge board.***
   - ***Under-floor clearance is less than 18" from the ground to bottom of floor joist system.***

2. **Any of the following conditions is present in the crawl space area where access is required:**
   - **Hazardous insect or pest infestation.**
   - **Excessive ground moisture (standing water or mud).**
   - **Sewage waste is on the ground or other unsanitary condition is present which poses a health and safety hazard.**

NONFEASIBILITY CRITERIA FOR PROGRAMMABLE THERMOSTATS

1. The furnace is not being replaced.

~~10.~~2. **Already ~~properly installed~~ *present* and operational.**

~~**11.Furnace utilizes a millivolt system.**~~

~~**12.Upgraded thermostat wiring (heavier gage or more conductors) is required.**~~

~~4.~~3. **Customer refuses.**

NONFEASIBILITY CRITERIA FOR HVAC AIR FILTER REPLACEMENT

1. The furnace will not be repaired.

2. A serviceable~~, reusable~~ filter is already present.

3. The types of filters provided by the Program are specifically prohibited by the appliance manufacturer.

4. *Filter replacement would require removal of a flue, duct, or pipe.*

5. *The proper filter support or retaining device is not present, and installation is not feasible.*

6. *Customer refuses*.

NONFEASIBILITY CRITERIA FOR WALL AND FLOOR FURNACE REPAIR AND REPLACEMENT

1. ~~Already properly installed.~~ *The existing furnace* ~~is properly functioning and passes NGAT, or is abandoned*, or~~ *is inaccessible*[1].

2. *The property is renter-occupied.*

3. *Fuel used by the existing unit is not supplied by the utility providing LIEE Program services.*

~~*2.*~~**4.** **Location is confined, and adequate access and/or combustion air cannot be provided.**

~~*3.*~~**5.** **Existing open combustion appliance is in a location prohibited by the replacement unit instructions** ***or local code*****, and relocation to an approved location is not feasible.**

~~*4.*~~**6.** **Customer refuses.**

NONFEASIBILITY CRITERIA FOR WALL AND FLOOR FURNACE REPAIR

1. *Repair is not economically feasible (i.e., cost to repair is more than* ~~*50%*~~ *25% of the cost to replace the unit).*

NONFEASIBILITY CRITERIA FOR INSTALLATION OR REPAIRS REQUIRING CRAWL SPACE ACCESS

1. **Crawl space clearance is less than 18" from the ground to the bottom of the floor joist system.**

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[1] *See Definitions*

2. Any of the following conditions is present in the crawl space area where access is required:

- **Hazardous insect infestation.**
- **Excessive ground moisture (standing water or mud).**
- **Sewage waste on ground or other unsanitary conditions posing a health and safety hazard.**

NONFEASIBILITY CRITERIA FOR WALL AND WINDOW AIR CONDITIONERS

1. **Unit is already present and operational, and is less than *15 years old.* ~~required age (to be determined)years old.~~**

2. **Electrical requirements cannot be met.**

~~**3.Dwelling unit has security bars on windows.**~~

~~*4.*~~**3.** **A structurally sound mounting platform and/or suitable mounting location is not available.**

~~*5.*~~**4.** **Customer refuses.**

NONFEASIBILITY CRITERIA FOR NATURAL GAS WATER HEATER REPLACEMENT

~~1.Existing unit is less than 10 years old and operates properly.~~

1. *The property is renter-occupied.*

2. *Fuel used by the existing unit is not supplied by the utility providing LIEE Program services.*

3. *The existing water heater:*
   - ~~Is properly functioning and Passes NGAT, or~~
   - *Is inaccessible*[1]*, or*
   - *Can be feasibly repaired (i.e., cost to repair is less than 50% of the cost to replace the unit).*

~~2.~~4. **Drain line for T&P valve or drain pan cannot be properly terminated to outdoors or to an approved indoor drain if required by local code*, and a gas shutoff valve and pressure relief valve cannot be installed in lieu of a T&P valve and drain line*.**

~~3.~~5. **For a unit in a confined location: required access, clearance, or combustion air cannot be provided.**

~~4.~~6. **For a unit on a raised floor or in an attic: structure cannot properly and safely support the installation.**

~~5.~~7. **No suitable mounting locations for seismic bracing available.**

~~6.~~8. **A safety hazard is present which cannot be repaired (e.g., vent system defect, nonconforming gas piping~~, double-downdraft diverter~~).**

~~7.~~9. **A watertight pan cannot be installed under the unit when required.**

10. *A plumbing condition exists which prevents achieving satisfactory water pipe connections.*

~~8.~~11. **A whole house fan is present, the existing water heater is in the attic, and a closed combustion unit cannot be installed.**

~~9.~~12. **The unit is a central water heater serving more than one unit.**

13. **Customer refuses.**

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[1] *See Definitions*