

CHAPTER III

SPECIFIC REQUIREMENTS, SCOPE, PRINCIPLES CLEARANCES AND ACCESSIBILITY FOR EQUIPMENT (Based on NFPA and AIA References)

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SCOPE—This code is intended to prescribe regulations consistent with nationally recognized good practice for reasonable minimum requirements for safety to life and property from fire, explosion and health hazards, involved in the installation and use of heat producing appliances, heating, ventilating, air conditioning, blower and exhaust systems, refrigeration and other equipment pertinent thereto. It does not attempt to establish a procedure or code for the design of warm air heating, or air conditioning, or refrigeration, from the standpoint of performance.

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PRINCIPLES—The basic principles of this code are enunciated as goals worthy of accomplishment through properly designed installations that are acceptable, and adequately maintained heating and air conditioning systems. Some of the details of construction may vary, but the basic principles are the same. The principles may serve to define the intent.

Principle No. 1. Design Criteria

Recommended criteria for the design of heating and air conditioning, together with a map indicating different requirements within the State of North Carolina will be found in "Appendix "H".

Principle No. 2. License and Bond for Contractors

License for H-1, H-2, H-3 and Plumbing is obtained from:

State Board of Examiners of Plumbing & Heating Contractors
Attention—Mr. F. O. Bates, Exec. Secy.
P.O. Box 110
Raleigh, N.C. 27602
Telephone (919) 828-8203

License for Refrigeration is obtained from:

State Board of Refrigeration Examiners
Att: Mr. James Dean, Secy.
512 St. Mary's Street
Raleigh, N.C. 27604
Telephone (919) 834-5484

Regulations for L-P Gas are obtained from:

Department of Agriculture
Agriculture Bldg.,
Raleigh, N.C. 27602
Telephone (919) 829-3313

Bonds for contractors are as required by local ordinance.

Principle 3. Right of Owner to do work

Home owners may install heating, air conditioning, refrigeration and ventilation work provided:

- (a) It is for work in their own home or residence in which they live.
- (b) Inspection department has determined that they are qualified either by an oral or written test, depending on the nature of the work.

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- (c) Proper permit is secured.
- (d) All work is inspected as any other project and the inspector finds it acceptable and meeting the code.

Principle No. 4. AGA-UL-Label & Approval

(a) All heating and air conditioning equipment shall be installed in accordance with AGA, U.L., and/or commercial standards and/or ANSI standards, and/or manufacturers' instructions and recommendations, and this code; NEMA, ASME, ARI ASHRAE and similar recognized standards will be acceptable, and Section 11.4 NFPA 54.

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(b) All solid, liquid and gas-burning equipment shall be Underwriters' Laboratories labeled or approved, commercial standard indicated, or marked with the AGA (American Gas Association) or ASME label. If these approvals are not available on commercial and industrial equipment, then the component parts shall be certified with the Underwriters' Laboratories or the American Gas Association approval, or other approved independent Testing Laboratories, or inspected and approved by local authority having jurisdiction.

In case of equipment with no labels or approvals listed by U.L., the equipment may be accepted by the inspector if F.M. or F.I.A. has accepted it for insurance and so certified.

Principle No. 5. Electric Boiler Grounding

Electric boilers shall be grounded in accordance with the recommendations of the boiler manufacturer and the National Electric Code.

Principle No. 6. Foundation and Support (Heating & Cooling Equipment)

(a) A foundation shall be provided for outside heating and cooling equipment. It shall be of pre-cast or poured concrete, or masonry units properly grouted in the ground, or elevated structural steel on concrete or blocks.

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section 521

(b) In a crawl space, a minimum of 4" x 8" x 16" block or brick supports shall be installed under equipment. In an attic some other method of protection of combustible material subject to inspector's approval shall be used. All masonry units shall be held in place with mortar. Below grade installations shall be provided with a natural drain or an automatic lift or sump pump. Formed concrete or prefabricated steel units are acceptable.

(c) When a warm air furnace, air conditioning equipment, automatic domestic water heater, steam boiler or water boiler is installed in a crawl space area where excavated, it is required that in order to prevent the crawl space floor from caving in around said equipment, there shall be a retaining wall of masonry units or concrete or the dirt shall be sloped to a 45 deg. angle so as to prevent caving in.

(d) When warm air or air conditioning equipment or a boiler is installed in a residential utility room and the utility room floor is to be concrete, it shall be installed using one of the following methods:

1. When using a sheet metal base, it shall be min. 24 gauge metal properly designed to support the equipment.
2. When using a structural steel base, it shall be of properly sized members to support equipment with riveted, bolted or welded joints.
3. When using a masonry type base, it shall be of formed concrete or masonry units having mortar joints.

*NOTE: Wood supports or base shall not be substituted for methods, a, b, or c.

(e) Supports for roof mounted equipment shall be treated lumber, structural steel, masonry or concrete.

- (f) Where conditions permit, equipment may be hung to floor system if quiet in operation, and does not set up objectional vibration.
- (g) Furnances that are hung shall be supported by pipe, rod or structural steel of sufficient size to carry the load, or other hangers supplied by the manufacturer.

Principle No. 7. Clearance-Electrical

When installing heating and air conditioning equipment in an area in which there is a main electrical panel, the said equipment shall be installed at a minimum of three feet from the front, back, or face of the electrical panel, and access to the electrical panel shall not be obstructed in any way, such as by equipment, duct work, piping, etc. to comply with National Electric Code.

Principle No. 8. Fuel Cut-Off Location

When installing gas and/or oil fired equipment, the master 100% cut-off valve for fuel *for that one piece of equipment* shall be located within 24 inches of said equipment, but not to be located within the casing of said equipment for natural gas; and six ft. (6'-0") for LP Gas in accordance with NFPA 58. *with above ground tank delete*

Principle No. 9. Return Air (Residential)

- (a) On non-engineered projects, buildings with 1200 square feet or less area, a central return will be accepted; when above 1200 feet in area, use multiple returns.
- (b) Return air requirements of warm air systems and/or air conditioning systems shall return as much volume of air to the equipment as the equipment is supplying, and in accordance with CFM requirements of the manufacturer. *6-11-74*
- (c) The temperature rise must be within limitations of manufacturers' recommendations.

Principle No. 10. Natural Gas Rules (Piping & Venting)

- (a) Sizing of natural gas piping shall be in accordance with the sizing chart, Table 2A or 2B, page 14, NFPA 54, Bulletin (ASA Standard Z-21.30), and Section 1404 (c) this code, Chapter XIV.
- (b) New or used gas pipe for natural gas shall be tested as follows: *move to GAS*
 - (1) Operating pressure less than one pound, 10 psig minimum test for a period of 10 minutes.
 - (2) Operating pressure over one pound shall be tested at 50 psig minimum for a period of 20 minutes.
- (c) All new or used gas piping shall be inspected and tested as stated above.
- (d) See Principle No. 12 relative to gas with power boilers.
- (e) LP gas piping shall be installed in accordance with NFPA 58 or NFPA 54.
- (f) All gas piping (natural and liquefied petroleum) shall be inspected by the inspector of the municipality having jurisdiction. He shall also be responsible for inspection of the combustion air and boiler controls.

Principle No. 11. Welding

3 **(6-11-74) Page 3-3—Principle #11—Revise last sentence to read as follows:** "Once a warm air heating system has been installed there shall be no further welding done on the heat exchanger or the warm air system, unless approved by the authority having jurisdiction." *Chpt 6*

Principle No. 12. Steam and Hot Water Heating System Units

- (a) All boilers shall be installed in accordance with the current N. C. Boiler Inspection Laws, Rules and Regulations. (See Appendix for excerpt). *6-8-76*

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- (b) Boilers of more than 15 psig shall be inspected by the State Boiler Inspector or authorized insurance companies. For 15 psi and below, inspection shall be by local inspection department.
- (c) Steam or hot water boilers shall not be installed directly on combustible floors.

Principle No. 13. Oil Rules (Also see Chapter XIII this Code).

- 1305.0 (a) (a) For oil tanks of nominal 275 gallon capacity, when installed above ground, the fill cap shall not exceed a height more than nine (9) feet from the ground. The tank legs shall be set in solid ~~in~~ concrete; or other suitable material as approved by the heating inspector. Provide a 1 1/4" vent with a weather cap, in addition to the 2 inch fill cap.
- 1308.0 (f) - (b) All oil tanks shall be U.L. approved, and in accordance with NFPA 31
- delete (c) Portable type oil cook stoves shall not be approved.
- 1312 (f) - (d) A cut-off valve on the supply line shall be provided at the tank.
- delete (e) Pedestal type conversion burners shall be securely fastened to the floor to keep in place.
- delete (f) Non-vented residential type portable oil heaters are prohibited.

(See Chapter XIII)

Principle 14 Mobile Homes

Mobile Homes and Modular Dwelling Units shall be governed by "Standard for Mobile Homes", ANSI A119.1. All heating, air conditioning and other heat producing appliances must be labeled by Underwriter's Laboratories and installed in accordance with the conditions of such label, except that gas appliances may be AGA labeled.

Principle No. 15. Vents and Venting (Also See Chpt. VIII.)

- 12-12-78 803.1(a) (a) *Double Wall Venting* shall be used in unheated areas for gas fired equipment. Once double walled venting is started, the entire vent must continue to termination with double wall venting, terminating with UL or AGA approved cap or top.
Single wall pipe can only be used as permitted by NFPA 211 uses paragraph 901 D and installation paragraph 905 B. Note clearances above roof are more for single wall pipe. *INCINERATORS*
- Approx Stack Temperatures
oil - 500°F
Gas - 300°F
803.5 (c) - (b) When venting heating equipment, if the weight of a vertical or horizontal vent is not supported by the equipment, a non-combustible support bracket shall be installed to support the vent.
- 803.5 (f) - (c) All vertical vents exposed to the out of doors shall be plumb, on all installations and shall be uniform in height with respect to the top of the building on project work, and meet minimum code requirements.
- delete (d) All outside and double wall oil or gas venting and appurtances shall be U.L approved, gas to be B or BW vent and oil to be type L vent, or "All Fuel" or "Universal" vents, or approved fabricated stacks.
- 803.0 (b) - (e) Vent tops or caps shall be UL approved, downdraft-proof and weather proof.
- 803.3(d) (f) A mechanical draft inducer shall be used in venting system where a negative draft condition exists. When motor fails, controls will turn off power to burner or void equipment. Refer to better Engineering practice in NFPA 54.
- deleted (g) Masonry chimneys, properly sized and built in accordance with the N.C. Building Code are acceptable.

Principle No. 16. Duct Work (Applicable to non-engineering projects)

- 6-8-76 Moved to Chapter 6 (a) Radius elbows or turning vanes shall be required, in supply duct, and shall not diminish the cross sectional area or throat.
- (b) Balancing dampers shall be used in supply runs.
- (c) All metal duct work for heating or cooling installed in an attic or non-air conditioned space for heating and/or cooling shall be insulated.

Insulation may be omitted in crawl space when heating only is installed.

- (d) All duct work shall be sized in accordance with the ASHRAE Guide, SMACNA Standards, and/or other acceptable warm air and air conditioning manuals.
- (e) When installing round pipe for air distribution systems and/or for furnace venting systems and/or for exhaust systems, any change of direction from a straight line run shall be made with a factory made fitting or equal approved by the inspector.
- (f) Ducts installed in and/or under slab floors shall be waterproofed and/or have acceptable method of drainage.
- (g) For residential systems when installing heating and/or air conditioning duct work systems:
 1. Maximum length of extended plenum type trunk line shall be 75 feet in length as measured from equipment to the end of the trunk line.
 2. Maximum length of branch lines shall be 35 feet in length as measured from trunk line to register.
 3. The maximum length of 35 feet from a branch line shall be reduced by:
 - (1) 5 feet in length per 90 deg. elbow used
 - (2) 2½ feet in length per 45 deg. elbow used
- (h) Cutting a hole in a plenum or duct system and inserting the pipe in or dove-tailing is prohibited. Take-off fittings shall be used. All plenums shall be constructed of non-combustible material.
- (i) Duct liner glue shall be fire-resistant.
- (j) All round pipe and fittings used for supply and return air systems for warm air furnaces and cooling systems shall be secured with three or more sheet metal screws; then tape the circumferential joints with fire resistant tape.

Principle No. 17, Chimneys & Flues (Also See Chapter VIII) - 12-12-78

- 803.1 (c) → (a) Chimney Caps or Hoods:
- (1) Shall be used for all pot type oil burners to prevent down drafts and to control in a large measure the draft variation due to wind and atmospheric changes.
 - (2) Chimney caps or hoods must be removed where a heating system of the pot type burner is changed to a central gun type burner.
- delete - (b) Flues and Flue Connections:
- (1) All fired boilers and warm air furnaces shall be properly and firmly connected to a chimney or stack of effective internal area not less than the inside area of flue provided on furnace by the manufacturer. The *effective flue* to which a heating system is to be connected is measured from the inside and not on the outside of the liner. The *effective flue* shall in no case be less than the diameter of the flue connection provided on the furnaces or boiler.

817.0 Principle No. 18. Installation - 12-12-78

- (a) 1. Furnaces or boilers shall be installed in accordance with manufacturers specifications relating to safety.
- 2. In residential work and non engineered projects permanent type coal and oil heating equipment must be provided with not less than 24 gage minimum, galvanized smoke pipe. It shall be secured by at least three sheet metal screws per joint. The section from the equipment to the chimney for gas fired equipment may be 26 gage minimum, galvanized steel. 28
- (b) All installations shall have 24 gage minimum metal or tile thimble in chimney. If metal is used, turn edge on equipment side to indicate

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so. In lieu of the above, short ends of soil pipe, galvanized or black steel pipe may be used. Where combustible material is encountered provide proper clearance as indicated in Section 305, Chapter III.

- (c) Where the permanent heating system is used, approval for temporary heat will be granted if deemed necessary. Supply and return plenum shall be installed and smoke pipe permanently connected, with at least eight feet return and supply plenum.
- (d) Final inspection is required before occupancy to see that the system is safe, and properly installed.

(e) Chimney Requirements—New and Old

- (1) All new masonry chimneys shall be lined with flue liners according to the North Carolina State Building Code, Vol. I, and shall be properly sized for the equipment or multiple units being used on any one chimney.
- (2) Existing chimneys shall be in reasonable good condition and capable of transmitting heat, smoke and fumes to the outside air without danger to the building or occupants. Refer to Section 1005, Chapter X, Vol. 1, page 10-1 North Carolina Building Code.
- (3) Chimneys which are not capable of safely removing heat, smoke or fumes to the outside air shall be properly repaired or replaced to render them safe.
- (4) Pre-fab chimneys shall be Underwriters' Laboratories approved. They shall be installed according to the manufacturer, Underwriters' Laboratories or American Gas Association requirements.

(f) Single Wall Venting Requirements

- (1) Venting for all types of equipment shall never be reduced in size.
- (2) A bull-headed or semi-bull-headed connection shall not be used on horizontal runs or back-to-back connections.
- (3) Vents may be above or below existing equipment or on a 45 degree "Y" arrangement. One exception: All gas fired equipment must be vented above oil, or stoker fired equipment.
- (4) When additional equipment is under consideration, the chimney or vent of an existing job shall be calculated and found large enough for the added equipment.
- (5) Two elbows of single wall vent piping will be accepted in a vent line for oil or gas fired equipment.
- (6) Three elbows in a single wall vent line will be accepted providing the job has a -.02 draft over fire, and -.04 draft in vent stack for oil or gas fired equipment.
- (7) Single wall venting shall be as follows: GAS—Horizontal run shall not exceed 75% of effective stack height.
OIL—Horizontal run shall not exceed 50% of effective stack height.

Note: The horizontal run shall be graded up from unit to thimble ¼ inch per foot. In jobs where draft is insufficient due to an excessive number of elbows or poor chimney conditions, a proper mechanical draft inducer may be used to provide necessary draft.

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Principle No. 19 Condensate Drains

- (a) Condensate drains from air conditioning units are to be sized and installed in accordance with the manufacturers recommendations. Where a condensate drain must be connected to the plumbing system it shall not be directly connected to any part of the plumbing system, drain or vent, but may be connected to properly trapped drain by means of an air-gap (called an indirect connection) having a trap, seal and vented, or shall be piped to the outside of the building, natural drain, dry well, roof water drain or storm sewer. In case a dry well is used, the dry well shall be located outside the building. Condensate shall spill into the dry well by means of an air gap.

Should none of these solutions be possible, a automatic sump pump may be used for the purpose, especially where natural drainage is not possible.

- (b) In attic or other areas where condensate damage may occur, an auxiliary drain shall be installed under the cooling and or heating equipment, with the equipment having a separate drain.
- (c) Condensate drainage may be connected directly into a storm sewer, or roof leader.
- (d) Condensate shall not be piped to ground under a building or crawl space or allowed to flow across a sidewalk or concrete floor to a floor drain.

Principle No. 20. Safety

- (a) Proper protection shall be provided to prevent short circuits, cross connections, back flow, contamination of potable water supply, explosions and fire hazards.
- (b) Heating and air conditioning equipment shall be installed with due regard to preservation of the strength of structural members and prevention of damage to walls, roof and other surfaces through usage and/or access for maintenance.

Principle No. 21. Final Inspection

- (a) When the installation, alterations, restoration of the heating or cooling equipment has been completed in accordance with provision of the Code, and in conformance with general accepted good practice and workmanship, a request for a final inspection shall be made.
- (b) All heating and air conditioning systems shall be inspected in their entirety.

Principle No. 22. Used Equipment

All existing, or reused equipment requiring repairs shall be:

- (1) Brought up to code requirements if a new heat exchanger is installed.
- (2) Inspected after repair work has been completed on used equipment.

Principle 23 Isolation Valves.

All equipment, such as circulating pumps and booster heaters connected to storage tanks or boilers which must be either disconnected or removed for service, must be reinstalled with isolating valves provided the valves do not interfere with the operation and safety of the system, or equipment.

Principle 24. Incinerators, Refuse Burners, and Solid Fuel Combustion Equipment

These are governed by "Regulations and Emission Control Standards for Suspended Particulates and Sulfur Oxides" by the Board of Water and Air Resources, Raleigh, N.C. Operators for this equipment should contact this Board for appropriate documents for registration and issuance of a permit prior to construction. Residential heating equipment is exempted.

303.0—ACCESSIBILITY (General) (RESIDENTIAL)

- (a) The installation of heating and air conditioning equipment ~~should~~^{shall} in all cases be such as to make the equipment accessible for cleaning, servicing and maintenance. All roof mounted installations ~~should~~^{shall} be accessible by a permanent ladder and/or fold-away stairs or other means approved by the Inspection Department. 6-11-74
- (b) Access to all equipment (electric strip heater, ~~all dampers~~^{deleted}, electronic air cleaners, coils, etc.) ~~should~~^{shall} have access door of sufficient size for equipment to be removed and installed without the removal of the door or trim. A suitable access opening (minimum 24" x 24") with a suitable passage (minimum of 36" x 36") or as approved by the Inspection Department, ~~should~~^{shall} be provided to all equipment installed in an attic and/or in an overhead storage area. There ~~should~~^{shall} be a

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minimum 2' wide catwalk in attic from the access entrance to the control side of equipment. Permanent steps, folding stairs, stairway or a ladder up to access opening ^{shall} be provided.

*Crawl
space*

- (c) Where heating or cooling equipment is installed in a crawl space of a new building, the distance from the crawl space entrance to the control side of the equipment via a permanent passageway ^{shall} not exceed 24 feet. On old construction the outside access doorway ^{shall} be at least 30" x 30". On new construction the outside access doorway ^{shall} be at least 36" x 36". A trap door 24" x 24" minimum may be used in lieu of the above. The passageway must be at least 36" x 36" from the entranceway to control side of the equipment. There ^{shall} be a passageway to the vent side of equipment at least 24" x 24" unobstructed. Refer to the N.C. Building Code, or residential code for minimum distance from bottom of joists to the ground, and minimum distance from bottom of girder to ground.
- (d) A weatherproof convenience outlet for emergency use (lights, tools, etc..) is required by the National Electric Code for roof mounted equipment.
- (e) In crawl spaces, and equipment rooms, adequate lights shall be provided. It is recommended that convenience outlets be provided near the equipment for emergency use (power tools, etc.).
- (f) It is also recommended that no piping, wiring or equipment supports shall in any way obstruct the passageway to or service area around any piece of heating, air-conditioning or refrigeration equipment.

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303.1 ACCESSIBILITY TO BURNERS, FILTERS & CONTROLS

- (a) Duct work or smoke pipe or conduit shall not restrict removal and renewing of filters, burners or controls, or maintenance thereon.
- (b) Proper permanent lighting shall be provided at the roof access. The switch for such lighting shall be located inside the building near the access means leading to the roof.
- (c) Heating and air conditioning equipment shall be so located that it is accessible for adjusting, cleaning and servicing without extensive disassembly.

303.2—ABSORPTION UNITS

ACCESS—Unless approved by the Building Official, every absorption unit shall be accessible for inspection, service, and replacement without removing permanent construction. An unobstructed access and passageway of not less than 2 feet (2') width by six feet six inches (6'6") in height shall be provided to every absorption unit.

An unobstructed working space not less than thirty inches (30") in depth and six feet six inches (6'6") in height, shall be provided along the entire firebox and control side of every absorption unit.

An unobstructed access space not less than twenty-four inches (24") in width and thirty inches (30") in height shall be provided to every air filter, fuel control valve, and air handling unit.

EXCEPTION: An access opening from this unobstructed access space, which opens directly to such equipment, may be reduced to fifteen inches (15") in the least dimension if the equipment can be serviced, repaired, and replaced from this opening without removing any permanent construction.

An unobstructed access space not less than twenty-four inches (24") in width and eighteen inches (18") in height shall be provided to every absorption unit vent collar, unless the vent collar is accessible from an access panel approved with the unit.

In addition to the applicable provisions of this Section, access to absorption units located on a roof or on an exterior wall of a building shall be provided as required for furnaces in sections 601 and 605 of this Code.

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Every absorption unit located in an attic space or furred area shall be readily accessible.

Every passageway to any absorption unit located in an attic or furred space shall have solid continuous flooring not less than two feet (2') in width from the access opening to the required working space in front of the unit. Solid flooring extending thirty inches (30") in width along the entire firebox and control side of the unit shall be provided.

A permanent electric light outlet, controlled from the required passageway opening, shall be provided at every absorption unit installed in an under-floor space, attic, or furred space.

304.0—APPLIANCES ON ROOFS - From AIA CODE

- (a) Appliances shall be listed for outdoor installation or shall be designed to withstand atmospheric and climatic conditions in the areas in which they are to be installed.
- (b) Roofs on which appliances are to be installed shall be capable of supporting the additional load or shall be reinforced to support the additional load.
- (c) All access locks, screws and bolts shall be of corrosion-resistant material.
- (d) Appliances shall be installed in accordance with their approval and in accordance with the manufacturer's installation instructions.
- (e) Appliances shall be installed on a well drained surface.
- (f) The appliance shall be separated from the edge of a roof or similar hazard by a clearance of at least 6 feet; or by rigidly fixed rails, guards, parapets, or other building structures at least 4 feet in height. *(NFPA specifies more than 1 floor)*
- (g) Each appliance or group of appliances shall have an accessible disconnect switch and a 110-120 volt a-c grounding type convenience outlet on the roof near to the appliance. The convenience outlet shall be on the supply side of the disconnect switch.
- (h) Buildings of more than one story in height shall have an inside means of access to the roof.
- (i) The inside means of access shall be a permanent, or foldaway, inside stairway or ladder, terminating in an enclosure, scuttle or trap door. Such scuttles or trap doors shall be at least 24 inches by 24 inches in size, and shall open easily and safely under all conditions, especially snow, and shall be constructed so as to permit access from the roof side unless deliberately locked on the inside. At least 6 feet clearance shall be available between the access opening and the edge of the roof or similar hazard or rigidly fixed rails or guards at least 3 feet in height shall be provided on the exposed side except that parapets at least 3 feet in height may be utilized in lieu of guards or rails or other building structure.
- (j) When climatic or safety conditions warrant, protection from the weather shall be provided either by the design of the appliance itself or by an enclosure. This enclosure shall permit easy entry and movement, shall be of reasonable height, and shall have at least 2 feet of clearance to either side of the service access panel of the appliance.

304.1—INSTALLATION:

- (a) Piping and conduit shall not lie flat on the roof, but be placed on suitable permanent supports of metal, masonry or creosoted wood, and placed close enough to prevent sagging.
- (b) When water stands on the roof at the appliance or in the passageways to the appliance, or when the roof is of a design having a water seal, a suitable platform or walkway, or both shall be provided above the water line. Such platform(s) or walkway(s) shall be located adja-

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cent to the appliance and control panels so that the appliance can be safely serviced when water stands on the roof.

**304.2—FOR ROOF-MOUNTED OR CEILING-SUSPENDED UNITS:
(Oil Fired)**

- (a) The fuel unit integral with the burner is limited to approximately 10" Hg. vacuum for 1-stage units and 20" Hg vacuum for 2-stage. If these suction limitations are exceeded, a fuel supply system is needed, and shall be provided.
- (b) The fuel supply system shall meet the following general specifications:
 - (1) All components (pumps, reservoirs, valves, regulators, relief valves, controls, etc.) shall be approved by the manufacturer and UL label for handling oil.
 - (2) Control provision shall be included to preclude supply pump operation when a line, normally under pressure, is ruptured.
 - (3) Control and relief provisions shall be included to preclude supply pump operation that would pressure lines abnormally due to other control malfunction, line blockage, etc..
 - (4) Adequate valving and drip-trays shall be available to prevent oil spillage when service calls are made.
 - (5) No closed oil line loops, either drops or rises, shall be permitted unless plugged tees are used for air purging and water drainage.
 - (6) For roof-mounted units, liquefied petroleum gas will not be acceptable as a fuel. 3-13-73

305.0—CLEARANCE (General)

Adequate clearance shall be provided on all sides of equipment for access when located in a crawl space, equipment room or on a roof. This shall apply to ductwork, appliances, heat exchangers or auxiliary equipment and controls. Duct work may be placed against a wall, if there are no access doors on the wall side; or if it is to be insulated space is provided for the insulation.

305.1 CLEARANCES (Low pressure or Residential Type Boilers)

*NFPA 54
4.7.3*

Not NFPA

Not NFPA

- (a) Low pressure or residential type boilers installed in rooms which are large in comparison with the size of the appliance, except as provided in sections (1), (2) and (3) below, shall be installed to provide clearances to combustible material not less than as shown in Table 1.
 - (1) Low pressure boilers that have been tested by an approved testing agency and found to require clearances greater than specified in Table 1 shall be installed with such clearances unless protected as specified in Table 2.
 - (2) Low pressure boilers that are approved specifically for installation with clearances less than specified in Table 1 may be installed in accordance with the conditions of such approval.
 - (3) Low pressure boilers may be installed in rooms, but not in confined spaces such as alcoves or closets, with reduced clearances to combustible material provided the combustible material or appliance is protected as described in Table 2.
- (b) Low pressure or residential type boilers shall not be installed in confined spaces such as alcoves or closets unless they have been approved specifically for such installation and are installed in accordance with the conditions of such approval. Installation clearances for residential or low pressure typeboilers that have been approved in confined spaces shall not be reduced by protection methods described in Table 2.

*Rooms Large in Comparison
Furnace x 12 times = room volume
Boiler x 16 times = " "
Room height max - 8 feet
[3 - 10]*

Table 1. Clearances, Inches, for Residential Type Appliances

Type Appliances For Installation in Rooms Which Are Large in Comparison to the Size of the Appliance.	APPLIANCE						Chimney or Vent Connector See Note 1		
	Above Top of Casing or Appliance	From Top and Sides of Warm-Air Bonnet or Plenum	From Front	From Back	From Sides	From Sides			
<i>Note 6</i>									
Boilers and Waters Heaters									
Steam Boilers—15 psi	Automatic Oil	}	6	—	24	6	6	18	
Water Boilers—250° F	or								
Water Heaters—200° F	Comb. Gas-Oil								
All Water Walled or Jacketed	Automatic Gas		6	—	18	6	6	9	
	Solid		6	—	48	6	6	18	
	Electric		6	—	18	6	6	—	
Furnaces—Central Gravity, Upflow, Downflow, Horizontal and Duct. Warm-Air 250° F Max.	Automatic Oil	}	62	62	24	6	6	18	
	or								
	Comb. Gas-Oil			62	62	18	6	6	9
	Automatic Gas			183	183	48	18	18	18
	Solid		62	62	18	6	6	—	
	Electric								
Furnaces—Floor	Automatic Oil		36	—	12	12	12	18	
For Mounting in Combustible Floors	or								
	Comb. Gas-Oil		36	—	12	12	12	9	
	Automatic Gas		36	—	12	12	12	—	
	Electric								
Heat Exchanger Steam—15 psi Max. Hot Water—250° F Max.	—		1	1	1	1	1	—	
Room Heaters									
Circulating Type Vented or Unvented	Oil or Solid Gas		36	—	24	12	12	18	
	Gas		36	—	24	12	12	9	
	Oil or Solid Gas		36	—	36	36	36	18	
	Gas		36	—	36	18	18	9	
Radiant or Other Type Vented or Unvented	Gas with double metal or ceramic back		36	—	36	12	18	9	
	See Note 4								
					Firing Opp. Side	Side			
Ranges—Cooking Stoves	Oil		30	—	9	24	18	18	
	Gas		30	—	6	6	6	—	
	Solid—Clay Lined firepot		30	—	24	24	18	18	
Vented or Unvented	Solid—Unlined Firepot		30	—	36	36	18	18	
	Electric		30	—	6	6	—	—	
Clothes Dryers Approved Types	Gas		6	—	24	6	6	—	
	Electric		6	—	24	0	0	—	
Incinerators Domestic Types	—	See Note 5	36	—	48	36	36	18	

Single wall per 8917

NOTES TO TABLE 1

1. The minimum dimension ^{shd} should be 18 in. for gas appliances not equipped with draft hoods, except clothes dryers. The dimensions may be 6 in. for approved gas appliances equipped with draft hoods and for boilers and furnaces equipped with approved gas conversion burners and with draft hoods. A vent connector of approved Type B or L venting material may be used with approved gas appliances with draft hoods and may be installed at clearances marked on the material.

2. For a listed oil, combination gas-oil, gas, or electric furnace this dimension may be continued

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2 in. if the furnace limit control cannot be set higher than 250° F or this dimension may be 1 in. if the limit control cannot be set higher than 200° F.

3. The dimension may be 6 in. for an automatically stoker-fired forced warm-air furnace equipped with 250° F limit control and with barometric draft control operated by draft intensity and permanently set to limit draft to a maximum intensity of 0.13 in. water gage.

4. To combustible material or metal cabinets. If the underside of such combustible material or metal cabinet is protected with asbestos millboard at least ¼ in. thick covered with sheet metal of not less than No. 28 gauge the distance may be not less than 24 in.

5. Clearance above charging door should be not less than 48 in.
6. Rooms large in comparison to unit

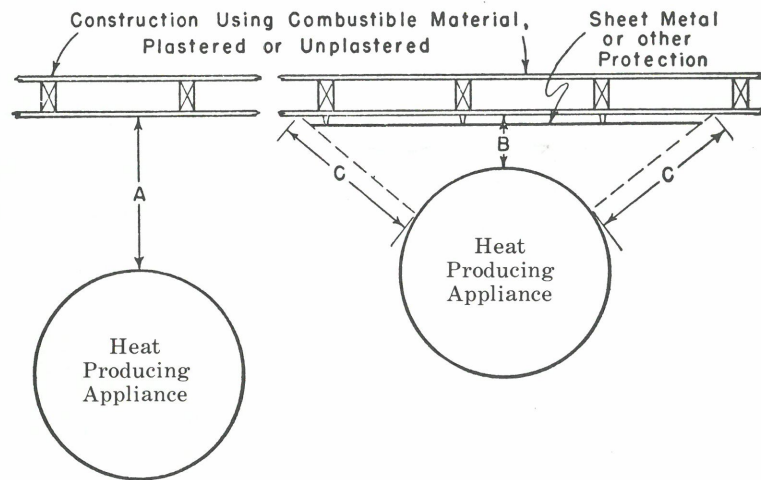


Figure 305.1 Extent of protection required to reduce clearances from heating appliances, chimneys or vent connectors.

A equals the required clearance with no protection, specified in Table 1 and in the sections applying to the various types of appliances.

B equals the reduced clearance permitted in accordance with Table 2. The protection applied to the construction using combustible material shall extend far enough in each direction to make C equal to A.

Table 2 (From NFPA 800)
Clearances, Inches, With Specified Forms of Protection.*

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Type of Protection Applied to the combustible material unless otherwise specified and covering all surfaces within the distance specified as the required clearance with no protection. (See Fig. 305.1 Thicknesses are mini- mum.)	Where the required Clearance with no protection is:								
	36 inches	18 inches	12 inches	9 inches	6 inches				
(a) 1/4 in. asbestos millboard spaced out 1 in.†	30	18	15	9	12	6	3	2	3
(b) 28 gauge sheet metal on 1/4 in. asbestos millboard	24	18	12	9	12	9	6	4	2
(c) 28 gauge sheet metal spaced out 1 in.†	18	12	9	6	9	6	4	4	2
(d) 28 gauge sheet metal on 1/8 in. asbestos millboard spaced out 1 in.†	18	12	9	6	9	6	4	4	2
(e) 1 1/2 in. asbestos cement cover- ing on heating appliance	18	12	36	9	6	18	6	4	9
(f) 1/4 in. asbestos millboard on 1 in. mineral fiber batts rein- forced with wire mesh or equivalent	18	12	18	6	6	6	4	4	2
(g) 22 gauge sheet metal on 1 in. mineral fiber batts reinforced with wire or equivalent	18	12	12	4	3	3	2	2	2
(h) 1/4 in. asbestos cement board or 1/4 in. asbestos millboard	36	36	36	18	18	18	12	12	9
(i) 1/4 in. cellular asbestos	36	36	36	18	18	18	12	12	9

*Except for the protection described in (e), all clearances shall be measured from the outer surface of the appliance to the combustible material disregarding any intervening protection applied to the combustible material but in no case shall the clearance be such as to interfere with the requirements for combustion air and for accessibility.

For the protection described in (e), the clearance shall be measured from the outer sur-
face of the protective covering to the combustible material.

†Space shall be of noncombustible material.

Note: Asbestos Millboard noted above is not the same as Asbestos Cement Board

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From NFPA 89M

(Commercial)

Table 3. Clearances, Inches, for Industrial Type Low-Heat Appliances.

Industrial Type Low-Heat Appliances Any and All Physical Sizes Except As Noted		APPLIANCE					
		Above Top of Casing or Appliance See Note 2	From Top and Sides of Warm-Air Bonnet or Plenum	From Front	From Back See Note 2	From Sides See Note 2	Chimney or Vent Connector See Note 1
Boilers and Water Heaters							
100 cu ft or less Any psi Steam	All Fuels	18	—	48	18	18	18
50 psi or less Any Size	All Fuels	18	—	48	18	18	18
Unit Heaters							
Floor Mounted or Suspended—Any Size	Steam or Hot Water	1	—	—	1	1	—
Suspended— 100 cu ft or less	Oil or Comb. Gas-Oil	6	—	24	18	18	18
Suspended— 100 cu ft or less	Gas	6	—	18	18	18	9
Suspended— Over 100 cu ft	All Fuels	18	—	48	18	18	18
Floor Mounted Any Size	All Fuels	18	—	48	18	18	18
Ranges—Restaurant Type							
Floor Mounted	All Fuels	48	—	48	18	18	18
Other Low-Heat Industrial Appliances							
Floor Mounted or Suspended	All Fuels	18	18	48	18	18	18

Single wall

1. The minimum dimension should be 18 in. for gas appliances not equipped with draft hoods, except clothes dryers. The dimension may be 6 in. for approved gas appliances equipped with draft hoods and for boilers and furnaces equipped with approved gas conversion burners and with draft hoods. A vent control of approved Type B or L venting material may be used with approved gas appliances with draft hoods and may be installed at clearances marked on the material.
 2. If the appliance is encased in brick, the 18 in. clearance above and at sides and rear may be reduced to not less than 12 in.

305.2—FURNACES, BOILERS, HEAT EXCHANGERS, HEAT PUMPS, AND COOLING UNITS. *(RESIDENTIAL & NON-COMMERCIAL)*

6-8-76

- (a) Except as provided in Table 1 and 305.2 (b), minimum clearances from furnaces, boilers, heat exchangers and their chimney or vent connectors installed in rooms which are large in comparison with the size of the appliance shall be as given in Table 5.
- (b) Heating furnaces and boilers used in residence type central warm air heating systems may be installed in rooms which are large in comparison with the size of the appliance with clearances reduced as designated in Table 1 where combustible material is protected in the manner specified. Such reductions shall not apply to installations in alcoves or closets.
- (c) Furnaces and boilers used in residence type central warm air heating systems shall not be installed in a confined space such as an alcove or closet unless specifically approved for such installation and then only when installed in compliance with the approval and with the

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clearances from the walls and ceiling of the alcove or closet not less than specified regardless of the type of construction.

- (d) Equipment involving furnaces, boilers, or electric resistance heating, shall not be installed in an attic or in a space in the building construction used as a supply or return plenum and cooling units or heat pumps shall not be installed in such a supply or return plenum unless specifically approved for such use as a result of tests and listing by a nationally recognized testing laboratory. Such units or equipment shall be installed in accordance with the conditions of such approval.
- (e) Furnaces, boilers, heat exchangers, heat pumps, and air conditioning and cooling units shall be installed so as to provide reasonable accessibility for cleaning heating surfaces, removing and replacing burners, motors, compressors, controls, air filters, draft regulators and other working parts and for adjusting, cleaning and lubricating parts requiring such attention.

305.3—CLEARANCE (Gas Fired—Floor Furnaces) *From NFPA 54*

The lowest portion of the floor furnace shall have at least a 6-inch clearance from the general ground level, except that when the lower 6-inch portion of the floor furnace is sealed by the manufacturer to prevent entrance of water, the clearance may be reduced to not less than 2 inches. When these clearances are not present, the ground below and to the sides shall be excavated to form a "basin-like" pit under the furnace so that the required clearance is provided beneath the lowest portion of the furnace. A 12-inch clearance shall be provided on all sides except the control side, which shall have an 18-inch clearance.

*See 521b
for drainage
requirements*

305.4—CLEARANCES (Floor Furnaces) *From AIA Residential Section*

The bottoms of floor furnaces shall have at least 6 inches clearance from the ground. Where the ground must be excavated to provide this clearance, the excavation shall extend at least 12 inches beyond the furnace on all sides and not less than 18 inches on the control side. Where such excavation exceeds 12 inches or the ground contour and ground moisture conditions are such that water may come to within 6 inches of the bottom of the floor furnace, a water-tight, properly anchored pan constructed of copper, galvanized iron, or other suitable corrosion resistant material, or a waterproof concrete pit shall be provided under the furnace. Sides of pan or pit shall extend 4 inches above ground level.

305.5—CLEARANCES, CENTRAL FURNACES (Residential Type)

- (a) Residential Type central furnaces installed in rooms which are large in comparison with the size of the appliance, except as provided in sections (1), (2) and (3) below shall be installed to provide clearances to combustible material not less than as shown in Table 1.
 - (1) Residential type central furnaces that have been tested by an approved testing agency and found to require clearances greater than specified in Table 1, shall be installed with such clearances unless protected as specified in Table 2.
 - (2) Residential type central furnaces that are approved specifically for installation with clearances less than specified in Table 1 may be installed in accordance with the conditions of such approval.
 - (3) Residential type central furnaces may be installed in rooms, but not in confined spaces such as alcoves or closets, with reduced clearances to combustible materials provided the combustible material or the appliance is protected as described in Table 2.
- (b) Residential type central furnaces shall not be installed in confined spaces such as alcoves or closets unless they have been approved specifically for such installation and are installed in accordance with

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the conditions of such approval. Installation clearances for residential type central furnaces that have been approved for installation in confined spaces shall not be reduced by protection methods described in Table 2.

- (c) Where the plenum is adjacent to plaster on metal lath or other non-combustible material attached to combustible material, the clearance shall be measured to the surface of the plaster or other noncombustible finish where the clearance specified is 2 inches or less.

305.6—CLEARANCE (Duct Furnaces—Gas Fired) *From NFPA 54*

*305.11(c)
1507*

- (a) Listed duct furnaces shall be installed with clearances of at least 6 inches between adjacent walls, ceilings and floors of combustible material and the appliance projecting flue box or draft hood, except that duct furnaces listed for installation at lesser clearances may be installed in accordance with their listings. In no case shall the clearance be such as to interfere with combustion air and accessibility. (See 3.3.1 and 3.4.) (NFPA 54-61)
- (b) Unlisted duct furnaces shall be installed with clearances to combustible materials in accordance with the clearances specified for unlisted furnaces and boilers in Table 7. (NFPA 54) Combustible floors under unlisted duct furnaces shall be protected in an approved manner.

305.7—CLEARANCES: INDUSTRIAL TYPE HIGH HEAT APPLIANCES

Above 1500°F

Industrial type high heat appliances shall be installed to provide a clearance to combustible material, of not less than 10 feet at the sides and rear, and not less than 15 feet above, and not less than 30 feet at the front or side where hot products are removed.

305.8—CLEARANCES: INDUSTRIAL TYPE MEDIUM HEAT APPLIANCES

600-1500°F

Medium heat appliances shall be installed to provide a clearance to combustible material of not less than shown in Table 6, of this Section, except a clearance of not less than 24 inches shall be provided from medium heat

From 89m

Table 6. Clearances, Inches, for Industrial Type Medium-Heat Appliances

Industrial Type Medium-Heat Appliances	APPLIANCE						Chimney Connector
	Above Top of Casing or Appliance See Note 1	From Top and Sides of Warm-Air Bonnet or Plenum	From Front	From Back See Note 1	From Sides See Note 1		
Boilers and Water Heaters Over 50 psi Over 100 cu ft	All Fuels	48	—	96	36	36	36
Other Med-Heat Industrial Appliances All Sizes	All Fuels	48	36	96	36	36	36
Incinerators All Sizes	—	48	—	96	36	36	36

NOTE:

1. If the appliance is encased in brick, the clearance above and at sides and rear may be reduced to not less than 12 inches.

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appliances to walls or ceilings of noncombustible construction which have combustible material or construction placed on the outer or upper sides thereof, or which due to occupancy may have combustible material so placed.

305.9—CLEARANCES (Low-heat Industrial Appliances)

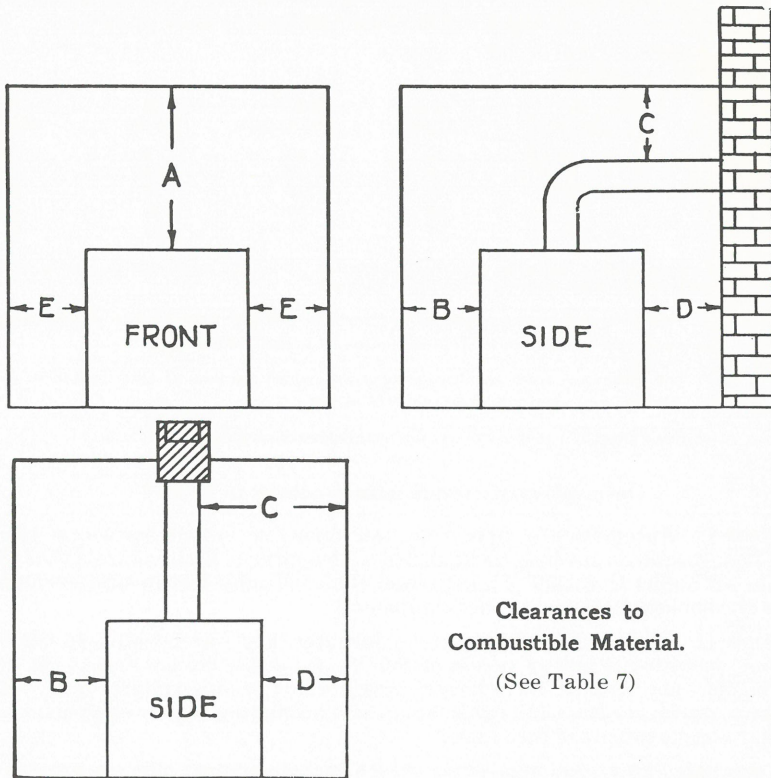
600°F and less

- (a) Except as provided in sections 305.9(b) and 305.9(c), low heat appliances shall be installed to provide a clearance to combustible material, of not less than shown in Table 305.9(a), except a clearance of not less than 12 inches shall be provided from low heat appliances to walls or ceilings of noncombustible construction which have combustible material placed on the outer or upper sides thereof, or which due to occupancy may have combustible material so placed.
- (b) Low heat appliances which are approved specifically for installation with lesser clearances than specified in section 305.9(a), may be installed in accordance with the conditions of such approval.
- (c) Low heat appliances may be installed with reduced clearances to combustible material, provided the combustible material or the appliance is protected as described in Table 2.

305.10—CLEARANCES—OIL FIRED EQUIPMENT *From NFPA 31*

I. Requirements for Specific Appliances (Clearances, Mounting, Etc.).
Boilers, Furnaces, Floor-Mounted Unit Heaters and Water Heaters.

- (a) Oil-fired appliances shall be installed in rooms that are large compared with the size of the appliance except that an appliance specifically



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listed for installation in a confined space such as an alcove or closet may be so installed when the installation is in compliance with the listing. In alcove and closet installations, the clearances from the appliance to the walls and ceilings shall be not less than as specified in the listing, regardless of the type of construction.

- (b) Appliances in rooms shall be installed with the clearances from combustible material not less than as indicated in Figure below and Table 7, except that appliances specifically listed for installation at lesser clearance may be installed in accordance with their listing. In no case shall the clearance be such as to interfere with the requirements for combustion air and accessibility.
- (c) Appliances may be installed in rooms, but not in alcoves or closets, with lesser clearances to combustible material, provided the combustible material or appliance is protected as described in Figure 305.1 Chapter III.
- (d) Floor-mounted appliances, except as provided in Paragraphs (e) and (f), shall be placed on the ground, or on floors of fire-resistive construction with noncombustible flooring or surface finish and with no combustible material against the underside thereof, or on fire-resistive slabs or arches having no combustible material against the underside thereof. Such construction shall extend not less than 12 inches beyond the appliance on all sides.

TABLE 7 (Oil Fired Appliances) From NFPA 31

CLASSIFI* CATION AS TO TYPE OF APPLIANCE	A ABOVE (1)	B FRONT	C CHIMNEY CON* NECTOR (4)	D REAR	E SIDES
Form I	2 (2)	24	18	6	6
Form II (3)	6	24	18	6	6
Form III	18	48	18	18	18
Form IV	48	96	36	36	36
Form V (3)	6	24	18	18	18

NOTES: (1) This column indicates clearness above the top of the appliance or above the top and from the sides of furnace bonnet or plenum.

(2) This clearance may be reduced to 1 inch for a listed, forced air or gravity system equipped with a limit control that cannot be set higher than 200 F.

(3) The clearance from the bottom of a suspended furnace or unit heater to combustible material shall not be less than 18 inches.

(4) See Paragraph 1602 NFPA-31 for installation of chimney connectors.

Description of Classifications—Refer to Table 7

FORM I. Automatically fired warm-air furnaces, except horizontal types, and floor mounted unit heaters equipped with approved limit controls that cannot be set higher than 250° F., not larger than 100 cubic feet in size (excluding blower compartments and burner equipment).

FORM II. Horizontal type warm-air furnaces, and water-wall type heating boilers operating at not in excess of 250° F., for water boilers and at not over 15 pounds per square inch gauge pressure for steam boilers, and water heaters, not larger than 100 cubic feet in size (excluding burner equipment and blower compartments of furnaces).

FORM III. Low-heat appliances, which include steam boilers operating at not more than 50 pounds per square inch gauge pressure, or not larger than

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ten boiler horsepower regardless of operating pressure, and boilers, furnaces except floor furnaces, and heaters not classified under Forms I, II, IV, and V.

FORM IV. Medium-heat appliances, which include steam boilers other than as classified above.

FORM V. Suspended-type unit heaters not more than 100 cubic feet in size (excluding fan and burner equipment).

(e) Appliances listed specifically for installation on a floor constructed of combustible material may be placed in accordance with the conditions of such listing.

(f) ^{See NFPA 31 Page 57 Para (f)} The supply and return duct system of a central heating appliance shall be installed in accordance with the NFPA Standards for Air Conditioning and Ventilating Systems of Other Than Residence Type, No. 90A and Residence Type Warm Air Heating and Air Conditioning Systems, No. 90B as per excerpts in this code.

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In Oil Section

(g) A return system shall be arranged so that negative pressure from the circulating fan cannot affect the air supply for combustion or act to draw products of combustion from joints or openings in the appliance, chimney connectors or chimney.

^{See NFPA 31 Page 57 Para (i) & (j)}

II. ATTIC FURNACES (Oil Fired) NFPA-31

(a) A furnace may be installed in an attic provided it is listed for such installation and installed in accordance with its conditions of listing.

III. DUCT FURNACES (Oil Fired) NFPA-31

(a) A duct furnace except as provided in Paragraph (c) below shall be installed with clearances of at least 6 inches to adjacent walls, ceilings and floors of combustible material except a duct furnace listed for installation at lesser clearance may be installed in accordance with its listing.

(b) A duct furnace flue pipe ^{single wall} shall be installed to provide a clearance to combustible material of not less than 18 inches.

(c) A duct furnace and its chimney connector may be installed in a room but not in a confined space such as an alcove or closet, with reduced clearances to combustible material, provided the combustible material is protected as described in Table 2 and the requirements for combustion air and accessibility comply with Sections 1507, Chapt. XV.

(d) A duct furnace shall be firmly supported.

(e) Access panels shall be provided in the ducts on both the upstream and downstream sides of the furnace.

(f) Controls shall be located outside the duct except for the sensing element of a control.

IV FLOOR FURNACES (Oil Fired)

(a) Floor furnaces shall not be installed in floors of combustible construction unless specifically listed for such installation and installed in accordance with their listing.

(b) The floor around the furnace shall be braced and headed with a framework of material not lighter than the joists. Floor furnaces shall be supported independently of the floor grills.

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- (c) With the exception of wall-register models, a floor furnace shall be placed not closer than six inches to the nearest wall, and wall-register models shall be placed not closer than six inches to a corner. The furnace shall be so placed that a door, drapery, or similar object cannot be nearer than 12 inches to any portion of the register of the furnace.
- (d) The bottoms of the floor furnaces shall have at least six inches clearance from the ground. Where the ground must be excavated to provide this clearance, the excavation shall extend at least 12 inches beyond the furnace on all sides, and not less than 18 inches on the control side. Where such excavation exceeds 12 inches, or the ground contour and ground moisture conditions are such that water seepage is likely, a watertight pan constructed of copper, galvanized iron, or other suitable corrosion resistant material and properly anchored in place, or a waterproof concrete pit shall be provided under the furnace. The sides of a pan or pit shall extend four inches above ground level.
- (e) Floor furnaces shall be made readily accessible. Openings in foundation walls and trap doors in floors shall be not smaller than 18 by 24 inches. Under-floor passageways to the furnace shall be not less than 24 inches high by 24 inches wide.
- (f) Provision shall be made for proper air supply for combustion, (See Chapt. XVI).
- (g) Listed floor furnaces may be installed in an upper floor provided the furnace assembly projects below into a utility room, closet, garage, or similar nonhabitable space. In such installations, the floor furnace shall be enclosed completely (entirely separated from the nonhabitable space) with means for air intake and with access facilities for servicing on the control side. The minimum furnace clearance shall be six inches to all sides and bottom. The enclosure shall be constructed of Portland cement plaster on metal lath or material of equal fire resistance.
- (h) No floor furnace shall be installed in the floor of any aisle or passageway of any auditorium, public hall or public assembly room or in an exit way from any such room or space.
- (i) Except as indicated in (j) below, a floor furnace chimney connector shall be installed with clearances to combustible material of not less than nine inches.
- (j) A floor furnace chimney connector may be installed with lesser clearances to combustible material provided the combustible material is protected as described in Table 2.

V. OIL FIRED FURNACES USED WITH REFRIGERATION SYSTEMS *11779 31*

- (a) A furnace shall not be installed in conjunction with a refrigeration coil when circulation of cooled air is provided by the blower unless the blower has sufficient capacity to overcome the external static resistance imposed by the duct system, furnace and the cooling coil at the air throughput required for heating or cooling whichever is greater.
- (b) To avoid condensation within heating elements, furnaces used in conjunction with cooling equipment shall be installed in parallel with or on the upstream side of cooling coils unless the furnace has been specifically listed for downstream installation. With a parallel flow arrangement, the dampers or other means used to control the flow of air shall be sufficiently tight to prevent any circulation of cooled air through the unit.

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- (c) When furnaces are to be located upstream from cooling units, the cooling unit shall be so designed or equipped as to not develop excessive temperatures or pressures.
- (d) Furnaces may be installed downstream from evaporative coolers or air washers if the heating element is made of corrosion-resistant material. *Type 321 only* Stainless steel, ceramic-coated steel, or an aluminum-coated steel in which the bond between the steel and the aluminum is an iron-aluminum alloy, are considered to be corrosion resistant. Air washers operating with chilled water which delivers air below the dew point of the ambient air at the appliance are considered as refrigeration systems.

VI. INDUSTRIAL FURNACES AND BOILERS, STATIONARY TYPE. (Oil Fired) *NFPA-31*

- (a) Industrial furnaces and power boilers, stationary type, shall include low heat, medium heat and high heat appliances. See Definitions for examples of each.
- (b) Low-heat appliances:
- (1) Low-heat appliances shall be installed with clearances not less than those indicated by Table 7, *Form III*
 - (2) Low-heat appliances which are approved for installation with lesser clearances than specified in paragraph (1) above, may be installed in accordance with their listing.
 - (3) Low-heat appliances may be installed with lesser clearances to combustible material provided the combustible material is protected as described in Table 2.
 - (4) Floor-mounted low-heat appliances, except as provided in Paragraphs (5) and (6) below, shall be placed on the ground, or on floors of fire-resistive construction with noncombustible flooring or surface finish and with no combustible material against the underside thereof, or on fire-resistive slabs or arches having no combustible material against the underside thereof. Such construction shall extend not less than 12 inches beyond the appliance on all sides.
 - (5) Appliances which are listed specifically for installation on a floor constructed of combustible material may be placed in accordance with the conditions of such listing.
 - (6) Low-heat appliances may be placed on combustible floors although not listed for such installation, provided the floor under the appliance is protected in accordance with the requirements of accepted building code practice.*
- (c) Medium-heat appliances:
- (1) Medium-heat appliances shall be installed with clearances not less than those indicated by Form IV, Table 7.
 - (2) Medium-heat appliances, except as provided in Paragraph (3) below, shall be placed on the ground or on floors on fire-resistive construction with noncombustible flooring or surface finish and with no combustible material against the underside thereof, or

* For details of protection reference may be made to the Code for the Installation of Heat Producing Appliances, obtainable from the American Insurance Association (NBFU), 85 John St., New York, N.Y. 10038, or Part 6 of the National Building Code of Canada published by The National Research Council, Ottawa.

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on fire-resistive slabs or arches having no combustible material against the underside thereof. Such construction shall extend not less than three feet beyond the appliance on all sides.

- (3) Medium-heat appliances may be placed on combustible floors although not listed for such installation, provided the floor under the appliance is protected in accordance with accepted building code practice.*
 - (4) Rooms containing medium heat appliances shall be provided with means of ventilation adequate to prevent accumulation of hot air over or near the appliance.
- (d) High-heat appliances:
- (1) High-heat appliances shall be installed with clearances to combustible material of not less than 10 feet at the sides and rear, and not less than 15 feet above, and not less than 30 feet at the front or side where hot products are removed.
 - (2) Rooms containing high-heat appliances shall be provided with means of ventilation adequate to prevent accumulation of hot air over or near the appliance.
 - (3) High-heat appliances shall be mounted on the ground, or on floors of fire-resistive construction with noncombustible flooring or surface finish and with no combustible material or construction against the underside thereof, which floors shall in all cases extend not less than ten feet on all sides and not less than 30 feet at the front or side where hot products are removed.

VII. MISCELLANEOUS HEATERS (Air heater, Salamander, etc.) (Temporary use, or Construction only) *NFPA-31*

- (a) A direct-fired heater, salamander, shall not be used within an enclosed space or in proximity to combustible material. It may be used where salamanders fired by coal or coke are allowed.
- (b) An air heater shall be of a type designed to discharge air at a temperature of not more than 250° F.
- (c) A flexible duct, if used, shall be made of material resistant to heat and flame and that will withstand prolonged exposure to temperatures as high as 250° F.
- (d) An air heater installed inside a building shall be provided with a chimney connector to conduct the flue gases to the outside.

305.11—ACCESSIBILITY AND CLEARANCE (Gas Appliances) *NFPA-54*

Accessibility for Service:

- (a) Every gas appliance shall be located with respect to building construction and other equipment so as to permit access to the appliance. Sufficient clearance shall be maintained to permit cleaning of heating surfaces; the replacement of filters, blowers, motors, burners, controls and vent connections; the lubrication of moving parts where necessary; and the adjustment and cleaning of burners and pilots. For

* For details of protection reference may be made to the Code for the Installation of Heat Producing Appliances, obtainable from the American Insurance Association (NBFU), 85 John St., New York, N. Y. 10038, or Part 6 of the National Building Code of Canada published by The National Research Council, Ottawa.

305.12(a) - Unlisted hot plates & Griddles

305.12(b) - " Coffeebrewers, waffle bakers, hot water sterilizers

305.12(c) - Food & Dish Warmers

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attic installation the passageway and servicing area adjacent to the appliance shall be floored.

- (b) Appliances listed for outdoor installation may be installed without protection in accordance with the provisions of their listing and shall be accessible for servicing.
- (c) Gas appliances and their vent connectors shall be installed with clearances from combustible material so that their operation will not create a hazard to persons or property.
- (d) Minimum clearances between combustible walls and the back and sides of various conventional types of appliances and their vent connectors are specified in Parts 4 and 5. (NFPA 54)
- (e) Gas equipment shall be located where it will easily be accessible with adequate clearance available about the equipment to permit inspection and maintenance, and proper functioning of explosion vents, if provided.
- (f) Consideration shall be given to space requirements for automatic sprinklers, if provided, and proper use of fire hose streams.
- (g) Exterior surfaces of gas equipment shall be sufficiently insulated or the surrounding space sufficiently ventilated or both to keep temperatures of adjacent combustible structures below 160°F.

305.12—CLEARANCES FOR COUNTER TYPE GAS BURNING APPLIANCES *NFPA 54*

- (a) Counter type commercial hot plates except as provided in (e) and (d) shall be installed to provide a horizontal clearance of not less than 18 inches to combustible material.
- (b) Counter type appliances other than those mentioned in section 515.5a, except as provided in (c) and (d) shall be installed to provide a horizontal clearance of not less than 12 inches to combustible material.
- (c) Counter type appliances that are approved specifically for such installations may be installed with a minimum horizontal clearance of not less than 6 inches to combustible material.
- (d) Counter type appliances may be installed with reduced clearances to combustible material provided the combustible material is protected as described in Table 2.
- (e) Counter type commercial hot plates and griddles shall be installed to provide a vertical clearance of not less than 48 inches above the top to combustible material.

unlisted

305.13—CLEARANCES FOR RANGES (*NFPA-54 Para 4.2.2*)

- (a) Residential type ranges shall have clearances as provided in section ~~305.4~~ and Table 1 except as provided in section 305.13(b).
- (b) Residential type ranges shall have a vertical clearance above the cooking top of not less than 30 inches to combustible material or metal cabinets except the clearance may be reduced to not less than 24 inches as follows:
 - (1) The underside of the combustible material or metal cabinet above the cooking top is protected with asbestos millboard at least 1/4 inch thick covered with sheet metal not lighter than No. 28 manufacturer's standard gauge, or
 - (2) A metal ventilating hood of not lighter than No. 28 manufacturer's standard gauge sheet metal is installed above the cooking top with

same for built-in ranges

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a clearance of not less than ¼ inch between the hood and the underside of the combustible material or metal cabinet and the hood is at least as wide as the range and centered over the range.

305.14—CLEARANCES FOR OPEN TOP BROILERS *NFPA - 54*

Unlisted Open top broiler units shall not be installed in combustible material except approved open top broilers may be installed with clearances in accordance with the conditions of the approval.

305.15—CLEARANCES OF FLOOR MOUNTED RESTAURANT TYPE COOKING EQUIPMENT *NFPA - 54*

- (a) Floor mounted restaurant type cooking equipment, except as provided in sections 305.15(b) through 305.15(e), shall be installed to provide a clearance to combustible material of not less than as shown in Table 3.
- Listed* (b) Floor mounted restaurant type cooking equipment that is approved specifically for installation with lesser clearances than specified in section 305.15(a) may be installed in accordance with the conditions of such approval.
- (c) Gas burning, floor mounted restaurant type cooking equipment that is designed and marked "For use only in fire-resistive locations" shall not be installed elsewhere.
- (d) Floor mounted restaurant type cooking equipment may be installed in rooms, but not in confined spaces such as alcoves or closets, with reduced clearances to combustible material, provided the combustible material or the appliance is protected as described in Table 2.
- (e) Any portion of a wall or fixture that is constructed of combustible material and is adjacent to the cooking top section of a floor mounted restaurant type cooking appliance shall be protected as described in item (c) of Table 2 for a distance of at least 2 feet above the surface of the cooking top, unless such portion of the wall or fixture is shielded from the cooking top section by a high shelf or warming closet. Such wall or fixture shall be protected even though the appliance is certified for "close-to-wall" installation.
- (f) **Clearance for Listed Appliances**—Listed floor-mounted commercial cooking appliances, such as hotel and restaurant ranges, deep fat fryers, unit broilers, gas-fired kettles, steam cookers, steam generators and portable baking and roasting ovens, shall be installed at least 6 inches from combustible material except that at least 2 inches clearance shall be maintained between the flue box or draft hood and combustible material. Floor-mounted commercial cooking appliances listed for installation at lesser clearances may be installed in accordance with their listing and the manufacturer's instructions. Appliances designed and marked "For use only in fire-resistive locations" shall not be installed elsewhere.
- (g) **Clearance for Unlisted Appliances**—
- 419.2* a Unlisted floor-mounted commercial cooking appliances, except as provided in (b) *NFPA 54* shall be installed to provide a clearance to combustible material of not less than 18 inches at the sides and rear of the appliance and from the vent connector and not less than 48 inches above cooking tops and at the front of the appliance.

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- b Unlisted floor-mounted commercial cooking appliances may be installed in rooms, but not in confined spaces such as alcoves, with reduced clearances to combustible material, provided the combustible material or the appliance is protected as described in Table 1, 2 & 3.

See NFPA 54 for mounting on combustible floors - 4.19.3 a, b, c, d.

305.16—CLEARANCES (Electrical Heating Appliances)

Electric furnaces, duct heaters, electric boilers, and any other heating appliance shall be installed for clearance in accordance with the recommendations of the manufacturer, and or, the UL Listed information. Installation in general shall also follow NFPA 90A and 90B.

305.17—CLEARANCES (Flue-fed Incinerators) *See Definitions*

Flue-fed incinerators shall be installed to provide clearance to combustible material of not less than shown in Table 6 Section 305.8. A clearance of not less than 12 inches shall be provided from the flue-fed incinerators to walls or ceilings of noncombustible construction which have combustible material placed on the outer and upper sides thereof, or which due to occupancy may have combustible material so placed.

305.18—CLEARANCE (Industrial Type Incinerators) *See Definitions*

Commercial and industrial type incinerators shall be installed to provide a clearance to combustible material of not less than shown in Table 6 provided that for a commercial and industrial type incinerator encased in brick the clearance above may be 36 inches and at the sides and rear it may be 18 inches. A clearance of not less than 1 inch shall be provided from commercial and industrial type incinerators to walls or ceilings of noncombustible construction. Under no circumstances shall the walls of the incinerator be used as a part of the structural walls of the building.

305.19—CLEARANCES (Residential Type Incinerators)

- (a) Residential type incinerators, except as provided in sections 305.19(b) and 305.19(c) shall be installed to provide clearances to combustible material, of not less than as shown. Table 1.
- (b) Residential type incinerators that are specifically approved for installation with clearances less than specified in section ~~9.3.2~~ *305.19 (a)* may be installed in accordance with the conditions of such approval, provided that in any case, the clearances shall be sufficient to afford ready accessibility for firing, clean-out and any necessary servicing, and with a minimum clearance of 3 inches to combustible material.
- (c) Residential type incinerators may be installed in rooms, but not in confined spaces such as alcoves, with reduced clearances to combustible material, provided the combustible material is protected as described in Table 2 but in no case shall this clearance be less than 3 inches to the protection.
- (d) When a residential type incinerator that is refractory lined or insulated with heat-insulating material is encased in common brick not less than 4 inches in thickness, the clearances may be reduced to 6 inches at the sides and rear, and the clearance at the top may be reduced to 24 inches provided the combustible material above the charging door is protected with sheet metal not less than 28 U.S. gauge spaced out 1 inch on noncombustible spacers, or equivalent protection. Such protection shall extend 18 inches beyond all sides of the charging door opening.

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305.20—CLEARANCES (Water Heaters)

Residential type water heaters shall have clearances as provided in section 305.27, and Table 1.

Electric ~~305.21~~—CLEARANCES (Residential Type Clothes Dryers)

(Gas 305.31)

- (a) Residential type clothes dryers, except as provided in section 305.21(b) and 305.21(c) shall be installed to provide a clearance to combustible material not less than as shown in Table 1.
- (b) Residential type clothes dryers that are approved specifically for installation with lesser clearances than specified in section 305.21(a) may be installed in accordance with the conditions of such approval.
- (c) Residential type clothes dryers may be installed in rooms, but not in confined spaces such as alcoves or closets, with reduced clearances to combustible material, provided the combustible material or the appliance is protected as described in Table 2.

305.22—CLEARANCES FROM WARM AIR DUCTS

- (a) Metal warm air ducts shall be installed with clearances to combustible material as follows:
 - (1) As provided in sections 305.24 except that beyond the distance from the plenum, the clearance shall be not less than ½ inch.
 - (2) As provided in section 305.24(c) and (d).
- (b) Where a metal warm air duct passes through or pierces a partition or enclosure constructed of combustible material, the ends of the space providing the required clearance may be closed with a thimble and collar or the wall surfaces extended to the duct with noncombustible building materials such as plaster on metal lath.

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305.23—CLEARANCES TO COMBUSTIBLE MATERIAL

General

- (a) The clearances specified below apply except where an appliance, duct work, or chimney or vent connector is listed for different clearances, in which case the listed clearances take precedence.
- (b) Where ducts are adjacent to plaster on metal lath, or to other noncombustible finish attached to a combustible material, the clearance shall be measured to the combustible material, except that the clearance shall be measured to the surface of the plaster or other noncombustible finish where a clearance of 2 inches or less is specified above a bonnet or plenum chamber or above supply ducts. This shall not be construed to prohibit closure of openings with noncombustible material where ducts pass through walls and partitions, as provided in paragraph 305.24.

6-8-76

305.24—CLEARANCES FROM HORIZONTAL SUPPLY DUCTS—

Minimum clearances from horizontal supply ducts shall be as follows:

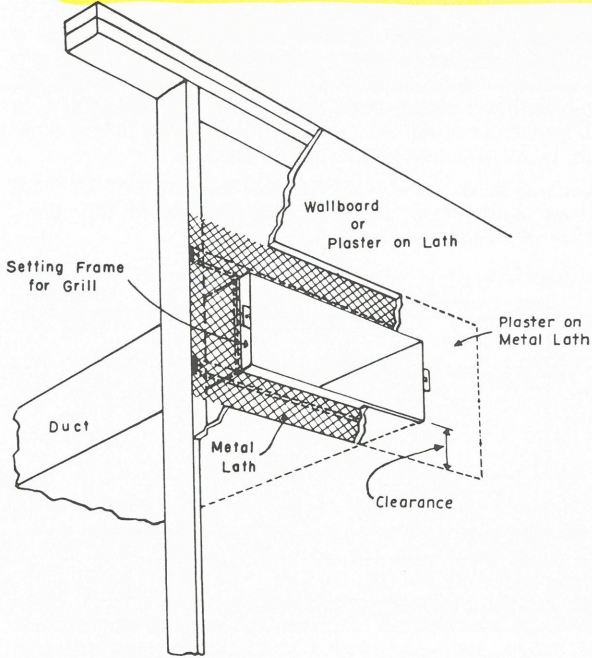
- (a) Within a distance of 3 feet of the plenum of a system classified under Table 5, the clearance shall be not less than that specified above the bonnet of plenum.
- (b) Within a distance of 6 feet of the plenum of a system classified under Table 5, the clearance shall be not less than 6 inches. From ducts of furnaces, the clearance shall be not less than one inch beyond 6 feet from the plenum to a point where there is a change in direction equivalent to 90 degrees or more.

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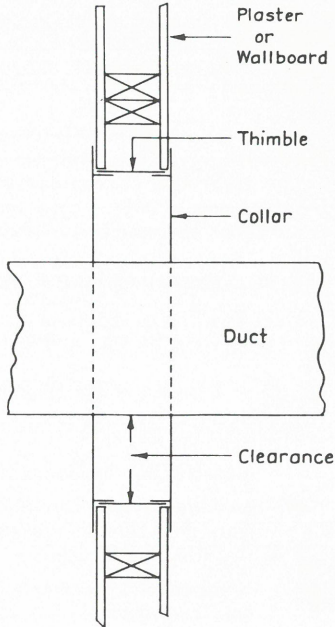
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- (c) From ducts of furnaces classified under Table 5 the clearance shall be not less than 18 inches out to 3 feet from the bonnet or plenum, not less than 6 inches from 3 feet to 6 feet, and not less than one inch beyond 6 feet.
- (d) Beyond the distances from the plenum or change in direction specified in paragraphs (a) and (b) no clearance is required.

6-8-76



An arrangement for closing ends of clearance space around a supply duct. A similar arrangement can be used where a duct continues on through the partition.



An arrangement for passing ducts through combustible walls or partitions.

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NFPA-91 305.25—DUCT CLEARANCES (Blower & EXHAUST SYSTEMS) 6-8-76

- (a) All duct systems handling noncombustible materials and operating at approximately room temperature shall have a clearance of at least 6 inches from stored combustible materials, and not less than 1/2-inch clearance from combustible construction even though flameproofed, fire-retardant treated or plastered, except as noted in paragraphs below.
- 2A (b) Duct systems handling combustible material shall have a clearance of not less than 18 inches from combustible construction or any combustible material. The clearance to combustible construction may be reduced, provided the combustible construction is protected as described in Table 1. If a duct system is equipped with adequate automatic sprinklers, clearance may be as provided in paragraph above.
- (c) Duct systems operating at elevated temperatures (above 100° F) shall have clearance from combustible building construction or any combustible material not less than shown in table below:

Stock
Duct &
Vapor
Removal

Duct Gas Temperature	Largest Duct Dimension	Clearance
Up to 600° F. incl.	8 in.	8 in.
Over 600°-900° F. incl.	Over 8 in.	12 in.
	8 in.	18 in.
Over 900° F.	Over 8 in.	24 in.
	All ducts lined with refractories	24 in.

NOTE—Where experience indicates that fires in duct systems are a fairly common occurrence or there is a likelihood that fires will occur, because of the very nature of the occupancy using such duct systems, a greater clearance may be required as is the case of NFPA No. 33, Spray Finishing Using Flammable Materials; and NFPA No. 96, Ventilation of Restaurant Cooking Equipment, where a clearance of 18 inches between ducts and unprotected combustible material is required.

Ducts handling materials at temperatures in excess of 900° F shall be lined with refractory material or the equivalent.

The clearance to combustible construction for ducts handling materials not in excess of 900° F may be reduced provided the combustible construction is protected as described in Table on next page.

305.26—ABSORPTION UNITS—CLEARANCES

Fuel burning absorption units shall be installed with clearances in accordance with their listing, and or recommendations of the manufacturer.

305.27—CLEARANCES (Room Heaters, General)

Covered
in 505.1

- (a) Residential type room heaters, except as provided in sections 305.27(b) and 305.27(c) shall be installed to provide clearances to combustible material not less than as shown in Table 1.
- (b) Residential type room heaters that are approved specifically for installation with lesser clearances than specified in section 305.1 may be installed in accordance with the conditions of such approval.
- (c) Residential type room heaters may be installed in rooms, but not in confined spaces such as alcoves or closets, with reduced clearances to

TABLE
Clearances, Inches, with Specified Forms of Protection*

Type of Protection Applied to the Combustible Material Thicknesses are Minimum	Where the Required Clearance with No Protection is:			
	8 in.	12 in.	18 in.	24 in.
a) ¼-in. asbestos millboard spaced out 1 in.†	3	6	12	18
b) 28-gauge sheet metal on ¼-in. asbestos millboard	3	6	12	16
c) 28-gauge sheet metal spaced out 1 in.†	2	4	9	12
d) 28-gauge sheet metal on ⅛-in. asbestos millboard spaced out 1 in.†	2	4	9	12

* All clearances shall be measured from the surface of the duct to combustible material disregarding any intervening protection applied to the combustible material.

† Spacers shall be of noncombustible material.

combustible material, provided the combustible material or the appliance is protected as described in Table 2.

- (d) Liquid fuel burning, floor-mounted residential type room heaters which have a fuel tank attached thereto shall in all cases be installed with sufficient clearances to provide direct and easy access to the fuel tank. Also see Section 305.28.

305.28—CLEARANCE—(Room Heaters, Radiant & Circulating) *NFPA 54*

A room heater shall be placed so as not to cause a hazard to walls, floors, curtains, furniture, doors when open, etc., and to the free movements of persons within the room. Appliances designed and marked "For use in noncombustible fire-resistive fireplaces only," shall not be installed elsewhere. Listed room heaters shall be installed with clearances not less than specified in Table 1, except that appliances listed for installation at lesser clearances may be installed in accordance with their listings. In no case shall the clearances be such as to interfere with the requirements of combustion air and accessibility.

Unlisted room heaters shall be installed with clearances from combustible material not less than the following:

- (a) *Circulating Type.* Room heaters having an outer jacket surrounding the combustion chamber, arranged with openings at top and bottom so that air circulates between the inner and outer jacket, and without openings in the outer jacket to permit direct radiation, shall have clearance at sides and rear of not less than 12 inches.
- (b) *Radiating Type.* Room heaters other than those described above as of circulating type shall have clearance at sides and rear of not less than 18 inches; except that heaters which make use of metal, asbestos or ceramic material to direct radiation to the front of the appliance shall have a clearance of 36 inches in front, and if constructed with a double back of metal or ceramic may be installed with a clearance of 18 inches at sides and 12 inches at rear.

305.29—CLEARANCE: (Infrared Radiant Heaters) *NFPA-54*

- (a) Listed heaters shall be installed with clearances from combustible material in accordance with their listing and the manufacturer's instructions.

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TABLE 4 (NFPA-54)

Minimum Clearances for Listed Room Heaters

Types of Appliance	Distance from Combustible Material, Inches	
	Jacket, Sides and Rear	Projecting Flue Box or Draft Hood
Warm Air Circulators	6	2
Radiant Heaters	6	2
Wall Heaters	Flush

Also See 305.4

- (b) Unlisted heaters shall be installed in accordance with clearances from combustible material acceptable to the authority having jurisdiction.

305.30—REFRIGERATORS (Commercial) CLEARANCE (NFPA-54)

Refrigerators shall be provided with adequate clearances for ventilation at the top and back. They shall be installed in accordance with the manufacturer's instructions. (SEE 4.17.1 NFPA 54)

305.31—CLEARANCE: (Clothes Dryers) (Gas) NFPA 54

- (a) Listed Type 1 clothes dryers shall be installed with minimum clearance of 6 inches from adjacent combustible material except that clothes dryers listed for installation at lesser clearances may be installed in accordance with their listing.
- (b) Listed Type 2 clothes dryers shall be installed with clearances of not less than shown on the marking plate and in the manufacturer's instructions. Type 2 clothes dryers designed and marked "For use only in fire-resistive locations" shall not be installed elsewhere.
- (c) Unlisted clothes dryers shall be installed with clearances to combustible material of not less than 18 inches. Combustible floors under unlisted clothes dryers shall be protected in an approved manner. Also see 305.8.

305.32—CLEARANCE: (Unit Heaters) (Gas) NFPA-54

(a) Suspended Type Unit Heaters.

1. Listed unit heaters shall be installed with clearance from combustible material of not less than 18 inches at the sides, 12 inches at the bottom and 6 inches above the top when the unit heater has an internal draft hood of 1 inch above the top of the sloping side of a vertical draft hood.
2. Unit heaters listed for reduced clearances shall be installed in accordance with their listing and the manufacturer's instructions.
3. Unlisted unit heaters shall be installed with clearance to combustible material of not less than 18 inches.
4. Additional clearances for servicing shall be in accordance with the manufacturer's recommendations contained in the installation instructions.

Similar to Table 1

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TABLE 5

NEPA-54 } Gas fired only
NEPA-90B }

Clearances To Combustible Material For Furnaces And Boilers Installed In Rooms Which Are Large In Comparison With Size Of Appliance, Except As Provided Otherwise

	Minimum Clearance, Inches				
	Above and Sides of Bonnet or Plenum	Jacket Sides and Rear	Front (See Note 1)	Projecting Flue Box or Draft Hood	Vent Connector (See Note 2)
I. Listed automatically fired, forced air or gravity system, with 250 °F temperature limit control.	2 (See Notes 3 and 4)	6	18	6	6
II. Unlisted automatically fired, forced air or gravity system, equipped with temperature limit control which cannot be set higher than 250 °F.	6 (See Note 5)	6	18	18 (See Note 6)	18 (See Note 6)
III. Listed Automatically Fired Heating Boilers — Steam boilers operating at not over 15 psi gage pressure and hot water boilers operating at not in excess of 150 °F.	6 (See Note 7)	6	18	6	6
IV. Unlisted Automatically Fired Heating Boilers— Steam boilers operating at not over 15 psi gage pressure and hot water boilers operating at not in excess of 250 °F.	6 (See Note 7)	6	18	18 (See Note 6)	18 (See Note 6)
V. Central heating boilers and furnaces, other than above.	19 (See Note 8)	18	18	18 (See Note 6)	18 (See Note 6)

NOTES APPLICABLE TO TABLE 5

- Front clearance shall be sufficient for servicing the burner and furnace or boiler.
- The vent connector clearance does not apply to listed Type B gas vents.
- The clearance may be reduced to 1 inch for a listed forced air or gravity furnace equipped with:
 - A limit control that cannot be set higher than 200° F, or
 - A marking to indicate that the outlet air temperature cannot exceed 200° F.
- Clearance from supply ducts within 3 feet of the plenum shall not be less than that specified from the bonnet or plenum. No clearance is required beyond this distance.
- Clearance from supply ducts within 6 feet of the plenum shall not be less than 6 inches. No clearance is required beyond this distance.
- For unlisted gas appliances equipped with an approved draft hood, this clearance may be reduced to 9 inches.
- This clearance is above top of boiler.
- Clearance from supply ducts shall not be less than 18 inches out to 3 feet from the bonnet or plenum, not less than 6 inches from 3 feet to 6 feet, and not less than 1 inch beyond 6 feet.
- Rooms which are large in comparison with the size of the appliance are rooms having a volume equal to at least 12 times the total volume of a furnace and at least 16 times the total volume of the boiler. Total volume of furnace or boiler is determined from exterior dimensions and is to include fan compartments and burner vestibules, when used. When the actual ceiling height of a room is greater than 8 feet, the volume of a room shall be figured on the basis of a ceiling height of 8 feet.

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(b) Floor-mounted Type Unit Heaters. *NFPA-54*

1. Listed unit heaters shall be installed with clearance from combustible material at the back and one side only of not less than 6 inches. When the flue gases are vented horizontally, the 6 inch clearance shall be measured from the draft hood or vent instead of the rear wall of the unit heater.
2. Unit heaters listed for reduced clearances shall be installed in accordance with their listing and the manufacturer's instructions.
3. Floor-mounted type unit heaters may be installed on combustible floors if listed for such installation.
4. Unlisted floor-mounted unit heaters shall not be approved, for combustible floors.
5. Additional clearances for servicing shall be in accordance with the manufacturer's recommendations contained in the installation instructions.

*See NFPA 54
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ATA Page 49 — (c) **Steam or hot water unit heaters.** Steam or hot water unit heaters shall be installed to provide clearances from all heated portions thereof to woodwork or other combustible material of not less than one inch.

305.33—ILLUMINATING APPLIANCES — *NFPA-54*

(A) Clearances for Listed Appliances:

Listed illuminating appliances shall be installed in accordance with their listings and the manufacturer's instructions.

(B) Clearances for Unlisted Appliances:

(a) Enclosed Type.

1. Unlisted enclosed illuminating appliances installed outdoors shall be installed with clearances in any direction from combustible material of not less than 12 inches.
2. Unlisted enclosed illuminating appliances installed indoors shall be installed with clearances in any direction from combustible material of not less than 18 inches.

(b) Open-flame type.

1. Unlisted open-flame illuminating appliances installed outdoors shall have clearances from combustible material not less than that specified in Table below. The distance from ground level to the base of the burner shall be at least seven (7) feet when installed within two feet of walkways. Lesser clearances may be used when acceptable to the authority having jurisdiction.
2. Unlisted open-flame illuminating appliances installed outdoors shall be equipped with a limiting orifice or other limiting device

Flame Height Above Burner Head, Inches	Minimum Clearance from Combustible Material, Feet*	
	Horizontal	Vertical
12	2	6
18	3	8
24	3	10
30	4	12

* Measured from the nearest portion of the burner head.

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which will maintain a flame height consistent with the clearance from combustible material, as given in Table above.

3. Appliances designed for flame heights in excess of 30 inches may be installed if acceptable to the authority having jurisdiction. Such appliances shall be equipped with a safety shutoff device or automatic ignition.
4. Unlisted open-flame illuminating appliances installed indoors shall have clearances from combustible material acceptable to the authority having jurisdiction.

305.34—CLEARANCE: (Draft Hood) *NFPA-54*

A draft hood shall be located so that the draft hood relief opening is not less than six inches from any surface except that of the appliance it serves and the venting system to which the draft hood is connected. When a greater or lesser clearance is indicated on the appliance label, the clearance shall not be less than specified on the label. These clearances shall not be reduced.

