

2016 CALBO Education Week

2016 California Mechanical, Plumbing and Energy Codes: Significant Changes

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2016 CMC SIGNIFICANT CHANGES

GENERAL

- Effective 01/01/2017
- Include the standard numbers in the section instead of referencing Chapter 17
- Note "Section Relocation" table at front of code

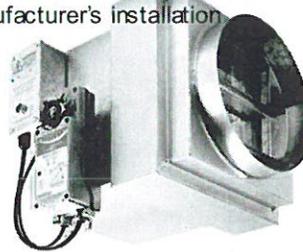
GENERAL

- Effective 01/01/2017
- Include the standard numbers in the section instead of referencing Chapter 17
- Note "Section Relocation" table at front of code

For example:

2012 UMC – **605.1 Smoke Dampers.** Smoke dampers shall comply with the standards for leakage-rated dampers referenced in Chapter 17, and shall be installed in accordance with the manufacturer's installation instructions where required by the building code.

2015 UMC – **605.1 Smoke Dampers.** Smoke dampers shall with UL 555S, and shall be installed in accordance with the manufacturer's installation instructions where required by the building code.



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2015 Location	2012 Location	2015 Location	2012 Location
Table 505.4	Table 505.2	602.3, 602.4	602.5, 602.6
502.2.2	506.9	603.2, 603.3	603.1, 603.2
507.3 - 507.3.2.1	507.2 - 507.2.2.1	603.3.2 - 603.3.2.3	603.2.1 - 603.2.4
507.3.2.3 - 507.5	507.2.2.2 - 507.4	603.4	603.3
508.3	508.1.1	603.7 - 603.9	603.4 - 603.6
508.6	508.1.2	701.10.1	701.10(2)
508.7	508.2, 508.2.1	701.10.2	701.10(3)
508.7.1	508.2.2	802.6.2.5	802.6
508.7	508.2.3	802.6.3.2	802.6.1
508.2.2, 508.2.3	508.2.4, 508.2.5	802.6.2.6	802.6.2.5
508.8, 508.8.1	508.2.6, 508.2.7	802.6.3.3, 802.6.3.4	802.6.3.2, 802.6.3.3
Figure 508.8	Figure 508.2.6	802.6.4.1 - 802.6.6	802.6.5 - 802.6.8
507.2, 507.2.1	508.2.10, 508.2.11	Figure 802.6.4.1	Figure 802.6.5
508.9 - 508.10.1.1	508.3 - 508.4.1.1	Figure 802.6.4.2	Figure 802.6.6
508.10.2.2	508.4.2	802.6.1	802.6.9
508.11 - 508.11.3.3	508.5 - 508.5.4	Table 802.7.3.4	Table 802.7.3.4(1)
508.2	508.6	Table 303.10.1	Table 802.7.3.4(2)
508.12	508.7	802.7.3.6	802.7.3.5
508.2.1	508.8	802.8 - 802.8.5	802.8.1 - 802.8.6

CHAPTER 3

- 303.2 Clarify and compile requirements for closet or alcove installations
 - Must be listed for installation in rooms “not large in comparison to the equipment”
 - Listed clearances from combustibles cannot be reduced
- 303.10.1 Allow both listed & unlisted appliances to use Table 303.10.1

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TABLE 303.10.1
REDUCTION OF CLEARANCES WITH SPECIFIED FORMS OF PROTECTION^{1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11}
[NFPA 54, TABLE 10.2.3]

WHERE THE REQUIRED CLEARANCE WITH NO PROTECTION FROM APPLIANCE, VENT CONNECTOR, OR SINGLE-WALL METAL PIPE IS:

TYPE OF PROTECTION APPLIED TO AND COVERING SURFACES OF COMBUSTIBLE MATERIAL WITHIN THE DISTANCE SPECIFIED AS THE REQUIRED CLEARANCE WITH NO PROTECTION (SEE FIGURE 303.10.1-1 THROUGH FIGURE 303.10.1-30)	ALLOWABLE CLEARANCES WITH SPECIFIED PROTECTION (inches)									
	USE COLUMN 1 FOR CLEARANCES ABOVE APPLIANCE OR HORIZONTAL CONNECTOR. USE COLUMN 2 FOR CLEARANCES FROM APPLIANCES, VERTICAL CONNECTOR, AND SINGLE WALL METAL PIPE.					USE COLUMN 1 FOR CLEARANCES ABOVE APPLIANCE OR HORIZONTAL CONNECTOR. USE COLUMN 2 FOR CLEARANCES FROM APPLIANCES, VERTICAL CONNECTOR, AND SINGLE WALL METAL PIPE.				
	ABOVE COLUMN 1	SIDES AND REAR COLUMN 2	ABOVE COLUMN 1	SIDES AND REAR COLUMN 2	ABOVE COLUMN 1	SIDES AND REAR COLUMN 2	ABOVE COLUMN 1	SIDES AND REAR COLUMN 2	ABOVE COLUMN 1	SIDES AND REAR COLUMN 2
(1) 3/8 inch thick masonry wall without ventilated air space	—	24	—	12	—	9	—	6	—	5
(2) 1/2 inch insulation board over 1 inch glass fiber or mineral wool bats	24	18	12	9	8	6	6	5	4	3
(3) 0.024 inch sheet metal over 1 inch glass fiber or mineral wool bats reinforced with wire on rear face with ventilated air space	18	12	9	6	6	4	5	3	3	3
(4) 3/8 inch thick masonry wall with ventilated air space	—	12	—	6	—	6	—	6	—	6
(5) 0.024 inch sheet metal with ventilated air space	18	12	9	6	6	4	5	3	3	2
(6) 1/2 inch thick insulation board with ventilated air space	18	12	9	6	6	4	5	3	3	3
(7) 0.024 inch sheet metal with ventilated air space over 0.024 inch sheet metal with ventilated air space	18	12	9	6	6	4	5	3	3	3
(8) 1 inch glass fiber or mineral wool bats sandwiched between two sheets 0.024 inch sheet metal with ventilated air space	18	12	9	6	6	4	5	3	3	3

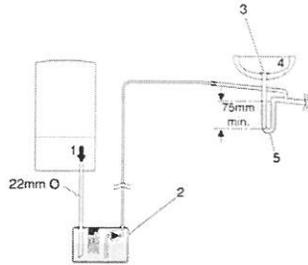
CHAPTER 3

- 302.1.3 AHJ can allow deviations from code for existing buildings but observe health & safety
- 303.7.1 HCD still prohibits LPG in pits and basements
- 304.2 30"x30" platform required for equipment on roofs with slope $\geq 4:12$
- 304.3.1.1 Roof access to allow access from roof side unless deliberately locked from inside
- 304.3.1.2 Access ladder rungs to support 300 lb
- 310.1.1 Condensate pumps:
 - Only when needed
 - Interlocked with equipment
 - Separate pumps for each condenser, but can be combined in one drain with check valves

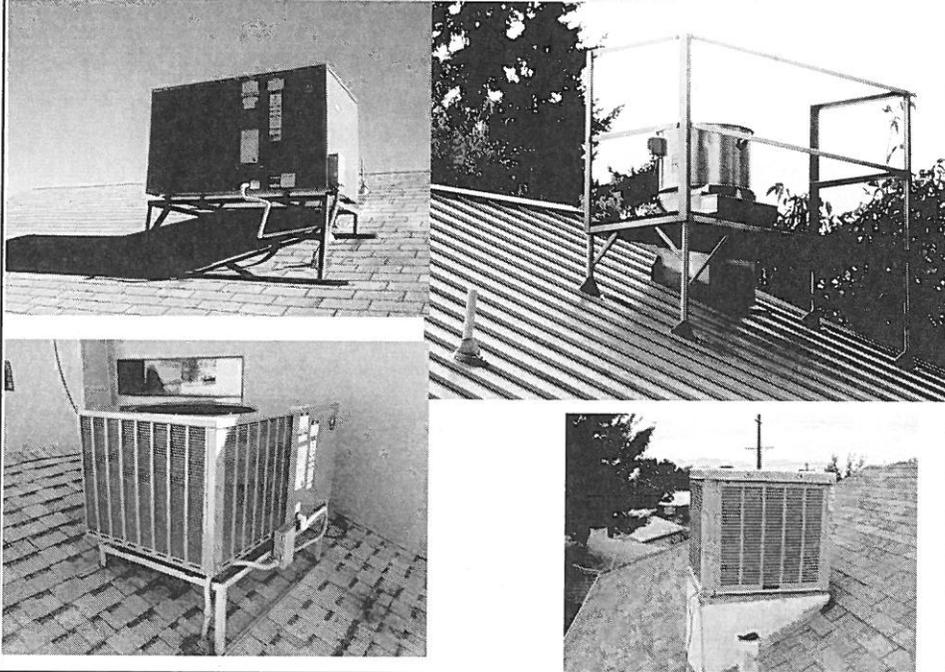
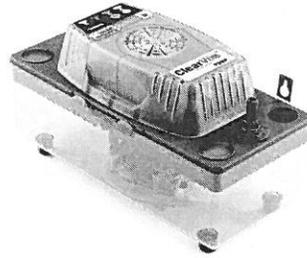


310.1.1 Condensate pumps:

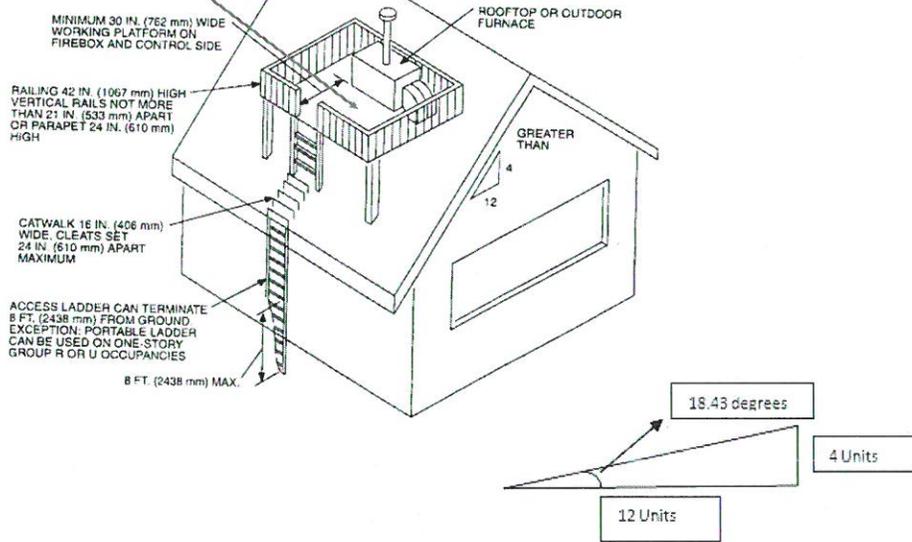
- Only when needed
- Interlocked with equipment
- Separate pumps for each condenser, but can be combined in one drain with check valves



Key
 1 Condensate discharge from boiler.
 2 Condensate pump
 3 Visible air break at plug hole.
 4 Sink or basin with integrated overflow.
 5 75mm sink waste trap.

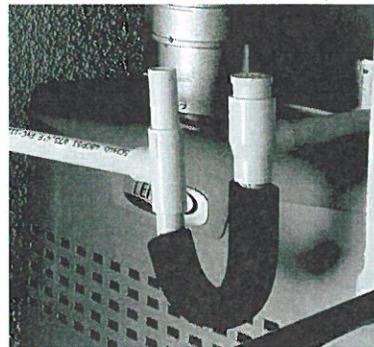
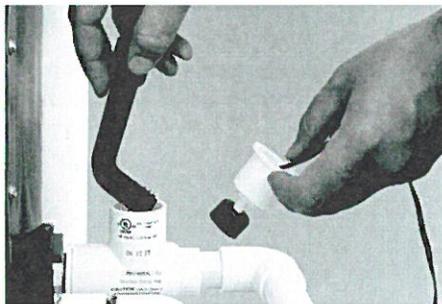


304.2 30"x30" platform required for equipment on roofs with slope $\geq 4:12$



CHAPTER 3

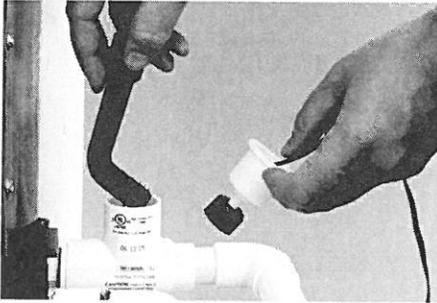
- 310.2 Allow electric shut-off devices in lieu of secondary drains
- 310.3.1 Clean-outs to be provided for condensate drains to allow maintenance without requiring drain to be cut
- 311.2 Listed air filters are required for other than dwelling units & guest rooms
- There are numerous provisions added to the CMC to match those in CPC



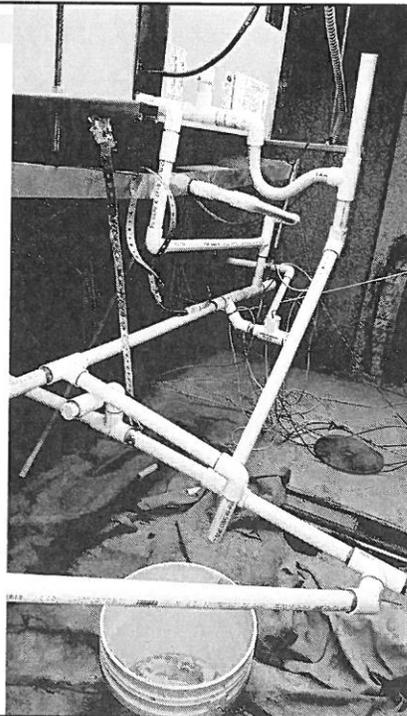
CHAPTER 3

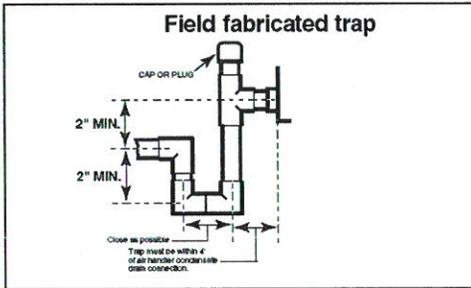
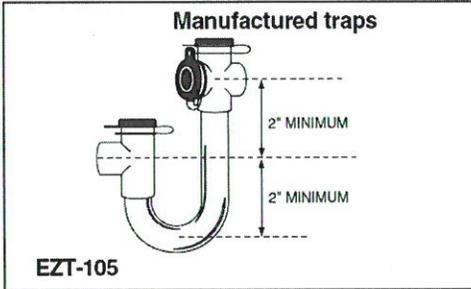


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CHAPTER 4

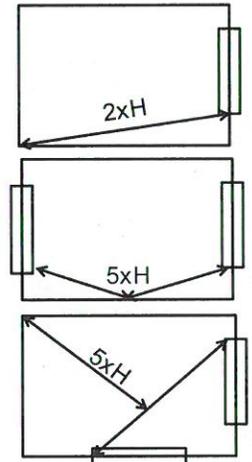
402.2.1 Natural Ventilation Requirements

- Dependent on ceiling height (H)
- Max distance:

- Single side opening = $2xH$

- Double side (opposite sides) = $5xH$

- Corner Openings = $5xH$



Currently, 25' distance as per Energy Code for High Rise residential dwelling units and Hotel/Motel guest rooms. 20 feet for all others.

Example 6-4F - Prescriptive Natural Ventilation Requirements

Q1

The snack bar seating area for a municipal swimming pool has dimensions of 30 ft. x 30 ft. with 8 ft. ceilings. Can windows be the *only* form of ventilation provided to the seating area (i.e., no mechanical ventilation) without getting special approval from the AHJ for an "engineered system"?

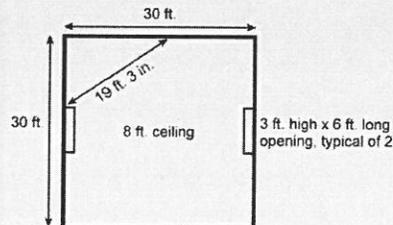
A1

Yes, provided that exception b.1 or b.2 to 6.4 applies and the area and location of the openings complies with 6.4.1 through 6.4.3.

Exception b.1 requires that the openings remain open during the entire period of occupancy. The required controls could be administrative policy carried out by pool management.

Alternatively, exception b.2 allows passive openings alone if there is no heating or cooling equipment serving the zone. In this case, the means to open the windows must be readily accessible to occupants, but need not remain open during occupancy.

Using either of the above exceptions, the area and location of the openings must comply with 6.4.1. Since the 30 ft. dimension of the room is more than twice the ceiling height, a single sided opening will not suffice. Double sided openings are required and they must have an area of 36 ft² (30 ft. x 30 ft. x 4% = 36 ft²). Two openings with net free open dimensions of 6 ft. x 3 ft. on opposite sides of the space will meet this requirement. This is shown graphically below. Note the dimensional check that the location in the room that is farthest from the opening (19 ft. 3 in.) is less than 40 ft away. (5H = 5 x 8 ft. ceiling height).



CHAPTER 4

- 403.9 Classification of types of air so as to impose restrictions on recirculation:
 - Class 1: Allowed to be re-circulated anywhere
 - Class 2: Could be re-circulated to same area or other Class 2 or 3
 - Class 3: Only back to Class 3
 - Class 4: No re-circulation
- Tables 402.1 & 403.7 have Classes of air
- Section 203 defines Classes of air

EXCERPT OF TABLE 403.7

TABLE 403.7
MINIMUM EXHAUST RATES
[ASHRAE 62.1: TABLE 6.5]

OCCUPANCY CATEGORY ⁸	EXHAUST RATE (cfm/unit)	EXHAUST RATE (cfm/ft ²)	AIR CLASS
Arenas ²	–	0.50	1
Art classrooms	–	0.70	2
Auto repair rooms ¹	–	1.50	2
Barber shops	–	0.50	2
Beauty and nail salons	–	0.60	2
Cells with toilet	–	1.00	2
Copy, printing rooms	–	0.50	2
Darkrooms	–	1.00	2
Educational science laboratories	–	1.00	2
Janitor closets, trash rooms, recycling	–	1.00	3
Kitchens – commercial	–	0.70	2
Kitchenettes	–	0.30	2

Air, Class 1. Air with low contaminant concentration, low sensory-irritation intensity, and inoffensive odor. [ASHRAE 62.1:5.16.1]

Air, Class 2. Air with moderate contaminant concentration, mild sensory-irritation intensity, or mildly offensive odors. Class 2 air also includes air that is not necessarily harmful or objectionable but that is inappropriate for transfer or recirculation to spaces used for different purposes. [ASHRAE 62.1:5.16.1]

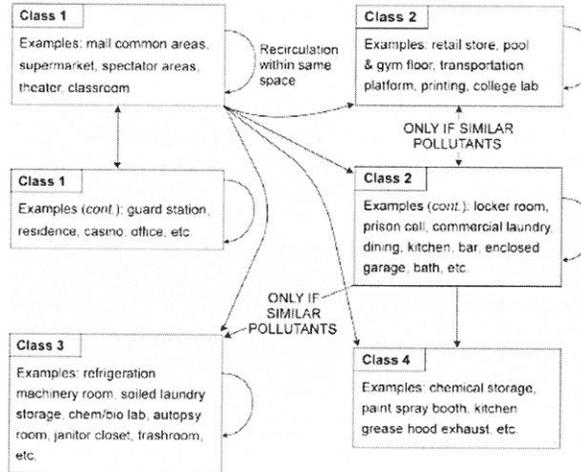
Air, Class 3. Air with significant contaminant concentration, significant sensory-irritation intensity, or offensive odor. [ASHRAE 62.1:5.16.1]

Air, Class 4. Air with highly objectionable fumes or gases or with potentially dangerous particles, bioaerosols, or gases, at concentrations high enough to be considered harmful. [ASHRAE 62.1:5.16.1]

Air Classification & Recirculation (§ 5.16)

Section 5.16 classifies air in various types of spaces as well as that which is exhausted from building spaces with respect to contaminant and odor intensity. It also limits the recirculation of lower quality air into spaces that contain air of higher quality. This requirement applies when using the Ventilation Rate

Figure 5-X -- Recirculation Restrictions for Classified Air



Arrows show allowed recirculation or transfer paths. All other pathways are prohibited.

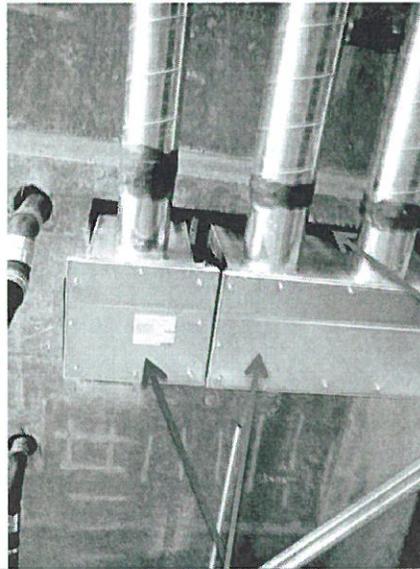
CHAPTER 4

- 403.7.1 State code requires garage ventilation at 0.75 CFM/sq ft. Allows intermittent exhaust if occupancy sensor or CO monitors (Note energy code)
- SFM & HCD amend two sections to allow the alternate (14,000 CFM/car @ 2.5% of parking spaces-50' drops)

CHAPTER 5

- 504.4.4 Common Dryer Exhaust
 - If permitted by manufacturer
 - Rigid 24 ga metal in a rated enclosure as per CBC
 - Enclosure to have clean-out $\geq 12" \times 12"$ at base
 - Fan to be located downstream of branch connections and operated continuously & monitored

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Ducts must be enclosed in a rated shaft

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Base used as cleanout must be accessible

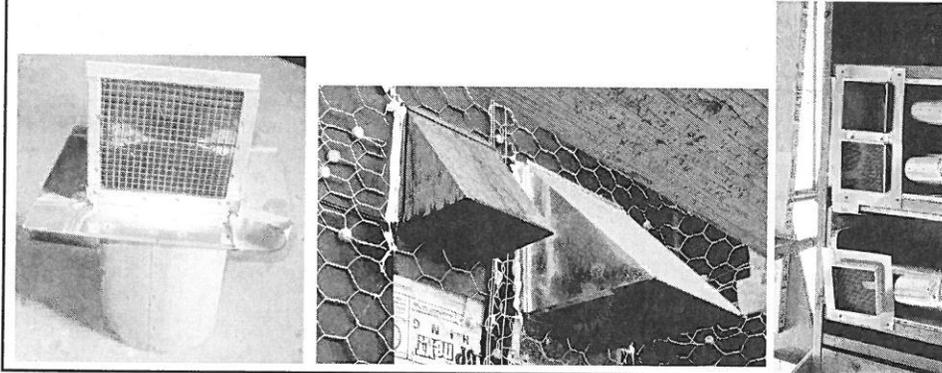
502.0 Termination.

502.1 Exhaust Opening Protection. Exhaust openings terminating to the outdoors shall be covered with a corrosion resistant screen having not less than 1/4 of an inch (6.4 mm) openings, and shall have not more than 1/2 of an inch (12.7 mm) openings.

Exception: Clothes dryers.

502.2 Termination of Exhaust Ducts. Exhaust ducts shall terminate in accordance with Section 502.2.1 through Section 502.2.3.

502.2.1 Environmental Air Ducts. Environmental air duct exhaust shall terminate not less than 3 feet (914 mm) from a property line, 10 feet (3048 mm) from a forced air inlet, and 3 feet (914 mm) from openings into the building. Environmental exhaust ducts shall not discharge onto a public walkway.



CHAPTER 5

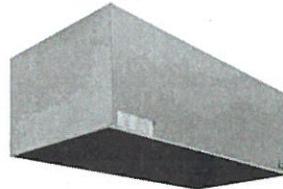
- 505.1.3 Mechanical ventilation to be interlocked with equipment producing flammable vapors, fumes or dusts
- 505.2 If toxic exhaust, no penetration of fire rated assemblies requiring fire dampers; ducts shall not pass thru fire walls
- 508.10 Capacities of Hoods (substantial change)-*(numbers below are for wall mounted hoods)*
 - Based on CFM/lin ft (instead of area of hood)
 - Extra Heavy Duty (solid fuel) 550 (385)
 - Heavy Duty (gas broilers, wok, range) 400 (280)
 - Medium Duty (ranges, griddles, fryers, conveyer pizza ovens) 300 (210)
 - Light Duty (ovens, rotisseries, kettles, pasta, cheesemelters) 200 (140)
 - Type II (dishwashing) 200 (140)
- Note maximum energy flow requirements for ≥ 5,000 CFM aggregate (Table 140.9-A)

New clarification of when Type 1 and Type II Hoods are required.

Section 508.1.1 is being revised to clarify that the section addresses both Type I and Type II hoods.

508.0 Hoods.

508.1 Where Required. Type I hoods shall be installed at or above commercial-type deep-fat fryers, broilers, grills, hot-top ranges, ovens, barbecues, rotisseries, and similar equipment that emits comparable amounts of smoke or grease in a food-processing establishment. For the purpose of this section, a food-processing establishment shall include a building or portion thereof used for the processing of food, but shall not include a dwelling unit. Type II hoods shall be installed above equipment and dishwashers that generate steam, heat, and products of combustion, and where grease or smoke is not present.



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Type I and Type II Hoods.

508.5 Supports. Hoods shall be secured in place by noncombustible supports. The supports shall be capable of supporting the expected weight of the hood and plus 800 pounds (362.9 kg).

2013 UMC Report on Proposals:

The code currently takes into account the weight of service personnel when working in or on ducts but not hoods. The supports should be designed to hold the weight of hood and the weight required for inspections or maintenance. The added language to Section 508.4 (508.5-Supports) will ensure that the safety of personnel is met during inspections or maintenance. The 800 pound weight requirement is consistent with the weight requirement for duct supports



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ENERGY CODE

TABLE 140.9-A MAXIMUM NET EXHAUST FLOW RATE, CFM PER LINEAR FOOT OF HOOD LENGTH

Type of Hood	Light Duty Equipment	Medium Duty Equipment	Heavy Duty Equipment	Extra Heavy Duty Equipment
Wall-mounted Canopy	140	210	280	385
Single Island	280	350	420	490
Double Island	175	210	280	385
Eyebrow	175	175	Not Allowed	Not Allowed
Backshelf / Passover	210	210	280	Not Allowed

HOODS

- 508.10 Capacities of Hoods (substantial change)-(numbers below are for wall mounted hoods)
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 - Extra Heavy Duty (solid fuel) 550 (385)
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 - Type II (dishwashing) 200 (140)
- Note maximum energy flow requirements for $\geq 5,000$ CFM aggregate (Table 140.9-A)

CHAPTER 5

- 508.10.2 Non-canopy Hoods:
 - Edge of hood set back $\leq 12"$ from edge of cooking equipment
 - Vertical distance from lip of hood to cooking surface $\leq 3'$
- 508.10.3 Type I hood shall bear a label indicating exhaust flow rate (cu.ft./min/lin.ft)
- 510.5.6 Duct leakage test for grease duct before concealment or use; liquid tight:
 - Light test
 - Water (or other equivalent method)
- 510.8 Underground installation of grease duct:
 - Corrosion resistant
 - Sloped to a grease collection device
 - A grease collection device at base of vertical risers
 - Cleanout on top of horiz. duct and in compliance with 510.3 & labeled (12' oc, etc.)

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CHAPTER 5

- 510.10 Termination of Type II-Roof
 - 10' from property line
 - Directed away from roof surface, $\geq 40"$
- 510.10 Termination of Type II-Horizontal
 - 10' from adjacent buildings
 - 10' from property line
 - 10' from operable openings
 - 10' from grade level
 - Termination shall not be directed to public way
- 511.2.2.1 Performance test before final to verify exhaust rate (CFM/lin ft for the type of cooking equipment)
- 511.2.2.2 Capture and containment test @ operating temp. Visually verify with actual or simulated smoke or steam
- 511.2.3 Exhaust fan to activate when appliance under the hood is turned on

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CHAPTER 5

- 511.3.1 Design plans to include schedule or diagram to show air balance (can include exfiltration)
- Fire protection code changes not included here (Fire Department)
- 515.1.1 Solid fuel used for flavoring within a gas operating appliance to be in a "Smoke Box" listed with the equipment
- 515.1.1.1 Solid fuel holder shall NOT be added to an existing appliance until fire-extinguishing system is re-evaluated by the fire extinguisher service provider
- 517.3.1.1 Solid Fuel for Flavoring:
 - In a "Smoke Box" listed with equipment
 - Holder located underneath the gas burner
 - Provide spark arrestors
 - Max 4.5 lb/hr/100,000 Btu/h gas burner capacity
 - Fire suppression listed for both gas & holder

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CHAPTER 5

- 517.3.1.1 Solid Fuel for Flavoring, Cont'd
 - Comply with UL 300 (gas radiant char broiler)
 - Nozzle at holder in addition to protecting the entire cooking operation
 - Max holder size 2,000 cu in w/ max dim 20"
 - One holder/100,000 Btu/h or portions thereof of burner capacity
 - Inspection frequency as per Table 514.3 for solid fuel (monthly)
- 518 Downdraft Appliances
- 518.3 Fire extinguishing system for:
 - Cooking surface, duct & plenum
 - Fusible link within exhaust duct opening
 - Fusible link above cooking appliance
 - Manual activation device
 - Portable fire extinguisher to be provided
- 518.3.2 Interlock equip with exhaust system

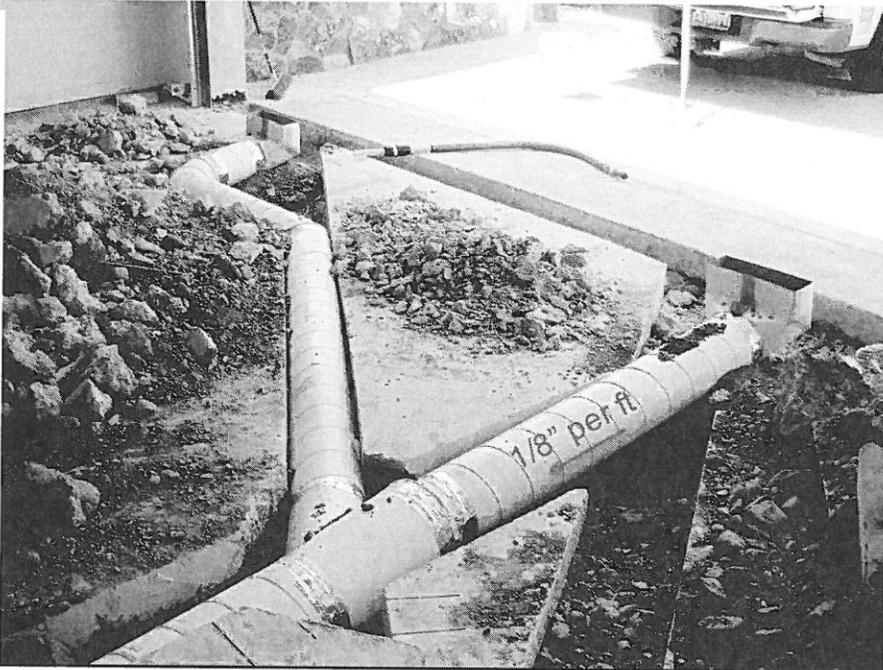
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CHAPTER 5

- 518.4 Airflow switch provided after last filter to ensure minimum airflow, interlocked to deactivate cooking if < 25% of system normal operating flow or < 10% of minimum rating
- 518.5 Surfaces above cooking appliance to be noncombustible or limited combustibles

CHAPTER 6

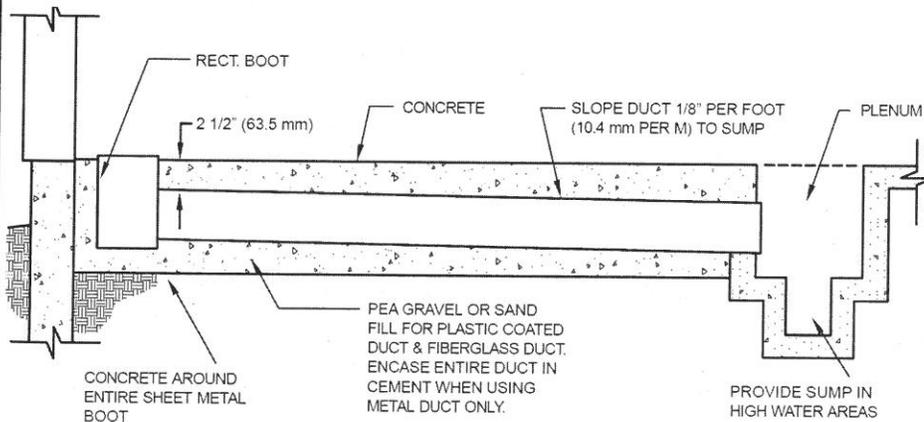
- 603.4.1 Factory-made flex ducts & connectors $\leq 5'$ (except residential), do not use as elbow or fitting (*not allowed in OSHPD3*)
- 603.12 Underground ducts to be sloped 1/8"/ft & encased in concrete
- 608.1 SFM requires duct smoke detectors to be labeled by an approved agency
- State deleted refrigerant port protection as it is now in the model code



3.9 UNDERGROUND DUCT CONSTRUCTION STANDARDS

S3.41 This installation standard is applicable to ducts placed in or beneath concrete floors or in areas free from vehicle traffic.

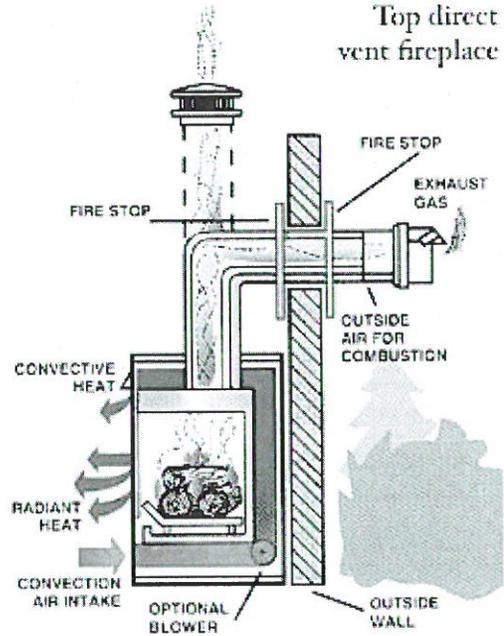
Drawing taken from SMACNA Duct Construction Standards



CHAPTERS 8,9

- 802.6.2.7 Metal shield around vent to extend 2" above insulation
- 905.10 Electric duct heater to be interlocked with fan
- 912.2 HCD requires that all newly installed gas fireplaces to be the direct-vent, sealed combustion type (to match Green Building)

Top direct vent fireplace



CHAPTER 10

- 1001.1 CPC regulates WH: ≤ 120 Gallons, 200,000 Btu/h, 160 psi & 120° F
- 1003.3 Automatic boilers to be equipped with the following gages:
 - Oil temp.
 - Oil Suction pr.
 - High & low gas pr.
 - Stack temp.
 - Windbox pr.
- 1004.2 Open-type expansion tank to be located min. 3' above highest point of system
- 1004.2 Overflow of expansion tank with diameter $\geq 1/2$ size of supply, with min 1"; discharging thru air gap to drainage
- 1005 T&P (or P) discharge to match CPC requirements.
- When operating temperature $> 212^{\circ}\text{F}$, discharge piping to have a splash shield

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CHAPTER 10

- 1005.5 Require vacuum relief on boilers located above system (similar to water heaters)
- 1008.1 Low water cut-off on boilers is now required even for Group R with less than 6 dwellings & U-occupancy (exception deleted)

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CHAPTER 11

- 1102.1 Refrigeration systems shall comply with Chapter 11 and ASHRAE 15
- 1103.3 New section: Higher Flammability Refrigerants: prohibits the use of Group A3 & B3 without AHJ approval. Exceptions:
 - Labs > 100 sq ft/occ
 - Industrial occupancies
 - Listed portable containing ≤ 0.331 lb of A3
- 1104.2 Max amount of refrigerant in a small room-Exceptions:
 - Listed equipment ≤ 6.6 lb of any refrigerant
 - Listed equipment used in labs > 100 sq ft/occ
 - When spaces are connected w/ducts or permanent openings
 - Different stories/floor level: Floor area x 8.2 ft to calculate the volume
 - Do not include spaces above ceilings in volume calculations unless part of return

TABLE 1102.2
REFRIGERANT GROUPS, PROPERTIES, AND ALLOWABLE QUANTITIES
 [ASHRAE 34: TABLE 4-1, TABLE 4-2]

REFRIGERANT	CHEMICAL FORMULA ¹	CHEMICAL NAME ¹ (COMPOSITION FOR BLENDS)	SAFETY GROUP ²	OEL ² (ppm)	POUNDS PER 1000 CUBIC FEET OF SPACE
R-11	CCl ₃ F	Trichlorofluoromethane	A1	<1000	0.39
R-12	CCl ₂ F ₂	Dichlorodifluoromethane	A1	1000	5.6
R-13	CClF ₃	Chlorotrifluoromethane	A1	1000	—
R-13B1	CF ₃ F	Bromotrifluoromethane	A1	1000	—
R-14	CF ₄	Tetrafluoromethane (carbon tetrafluoride)	A1	1000	23
R-21	CHCl ₂ F	Dichlorodifluoromethane	B1	—	—
R-22	CHClF ₂	Chlorodifluoromethane	A1	1000	13
R-23	CHF ₃	Trifluoromethane	A1	1000	7.3
R-30	CH ₂ Cl ₂	Dichloromethane (methylene chloride)	B1	—	—
R-32	CH ₂ F ₂	Difluoromethane (methylene fluoride)	A2L	1000	4.8
R-40	CH ₃ Cl	Chloromethane (methyl chloride)	B2	—	—
R-50	CH ₄	Methane	A3	1000	—
R-113	CCl ₂ CClF ₂	1, 1, 2-trichloro-1, 1, 2-trifluoroethane	A1	1000	1.2
R-114	CClF ₂ CClF ₂	1, 2-dichloro-1, 1, 2, 2-tetrafluoroethane	A1	1000	8.7
R-115	CClF ₂ CF ₃	Chloropentafluoroethane	A1	1000	47
R-116	CF ₃ CF ₃	Hexafluoroethane	A1	1000	34

CHAPTER 11

- 1104.2 Cont'd:
 - You can include volume of ducts
 - "Removed allowance to block open the registers"
- 1104.3 Institutional occupancies: only 50% of the amount in Table is allowed (occupants need assistance to evacuate)
- 1104.4 Restriction of refrigerants do not apply to Industrial occupancies & Ref room if in a machinery room
- 1104.5 A2, B2, A3, B3 (other than R-717—ammonia) shall not exceed 1100 lb unless approved by AHJ
- Table 1104.1 mandates the use of Group A1 refrigerants in most occupancies (except F2, H, S-2 & U)-(no DX in I-3 occupancy)
- 1104.6 In non-industrial occupancies, can only use A1 for human comfort if DX
- 1105.11 Exception is provided to the refrigerant port protection requirement for equipment in secure locations with fence and requiring key access

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CHAPTER 11

- 1105.12.1 Max quantity of ref stored in machinery room and not provided with relief valve is 330 lb
- 1106.1 Machinery room not required for equipment located outdoors
- 1106.4 A second alarm is now required when 25% of LFL is reached (not required for A1 & B1)—(first alarm: 25% LFL, 50% IDLH or the OEL, whichever is less)
- 1106.6 In machinery room:
 - No open flames
 - Combustion equipment not to be installed unless:
 - Duct combustion air to outdoors & sealed from refrigerant; or
 - Refrigerant detector to automatically shut down combustion process
 - Exceptions:
 - CO₂ (R-744) or water (R-718)
 - Ammonia (R-717)

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CHAPTER 11

- 1107.2 Only "purge" ventilation is now required: $Q = 100 \times \sqrt{G}$
- For Ammonia, purge required at 30 ACH
- 1107.3 (New) Natural ventilation:
 - When outdoors and > 20' from opening into a building or in a penthouse, free opening area:
 $F \text{ (ft}^2\text{)} = \sqrt{G} \cdot b$
- 1107.5 Purge ventilation may be used intermittently when room occupied or to maintain temperature (104°F)
- 1108.3 Emergency shut-off of equipment (for other than A1&B1) if alarm 2 is activated

CHAPTER 11

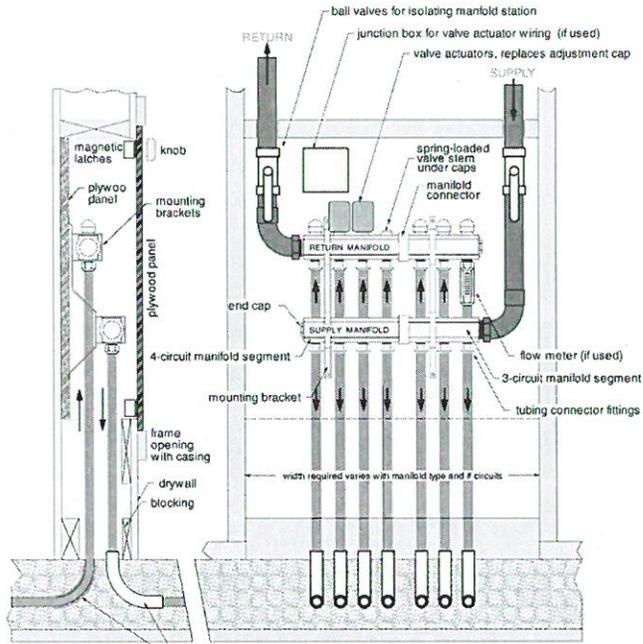
- 1109.3 Refrigerant piping shall not penetrate floors, ceilings or roofs, except:
 - Basement to first floor
 - Top floor to roof room
 - Adjacent floors
 - When not exceeding ref quantities Table 1102.2 of the smallest room that the piping passes through
 - If exceeding Table 1102.2, ok if connecting to other pieces of equipment (FCU) if piping is enclosed in gas tight fire-resistive duct or shaft or located in exterior wall vented to outdoors
- 1109.4 Piping to be min. 7.25' above floor
- 1109.5.1 Piping in concrete floors to be incased in a duct
- 1110.0 Valves: Where required
 - 1110.1 > 6.6 lb of refrigerant
 - 1110.2 > 110 lb of refrigerant

CHAPTER 11

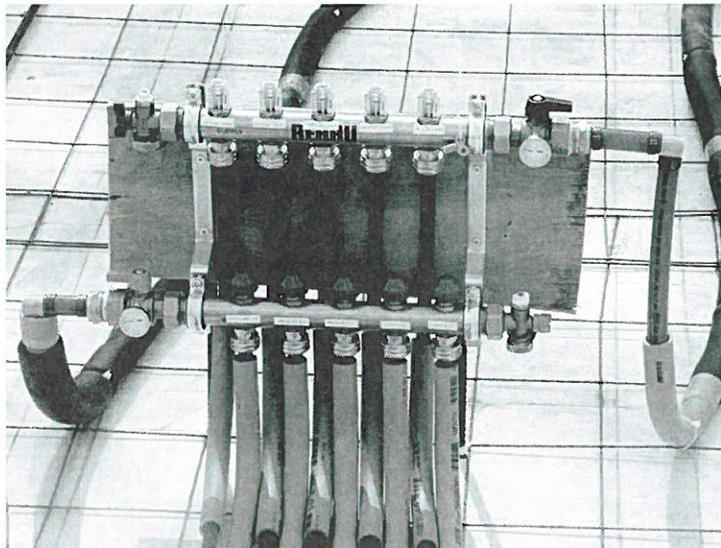
- 1112.2 Positive Displacement Compressor (PDC) new provisions:
- 1112.4 The relief valve required for the evaporator to discharge outside the bldg
- 1112.10.1. Relief valves can discharge inside bldg with certain conditions
- 1112.10.2 Valves can discharge outdoors with certain limitations
- 1112.10.4.1 Water as ref can discharge to floor drain if < 15 psi or to a receptor

CHAPTER 12

- 1201.1 Applicability: Hydronic piping as part of heating, cooling, A/C systems, including steam, water (chilled or hot), condensate, ground-source heat pumps
- 1201.2 Insulation required (note energy), if in a plenum, 25/50
- 1201.3 Provide water hammer protection
- 1201.4 Manifold full-way isolation valves



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CHAPTER 12

- 1204.0 ID of potable and nonpotable water: potable green, nonpotable yellow (CPC), "CAUTION, ..." 20' oc, min. 1 per room visible from floor level
- 1204.6 Flow direction to be indicated
- 1205.2 Pressure testing 1-1/2 operating pressure \geq 100 psi for 30 minutes (water or air, but no air for plastic)
- 1205.3 Flushing required
- 1205.4 PEX, PE-RT & PB in closed hydronic systems to contain oxygen barrier
- 1206.0 safety devices:
 - T&P on sections that can be isolated
 - Pressure relief on pressure vessels
 - Discharge similar to T&P on water heaters
- 1207.3.1 Dual purpose water heaters $>140^{\circ}$ to have mixing valve on potable so as not to exceed 140°

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CHAPTER 12

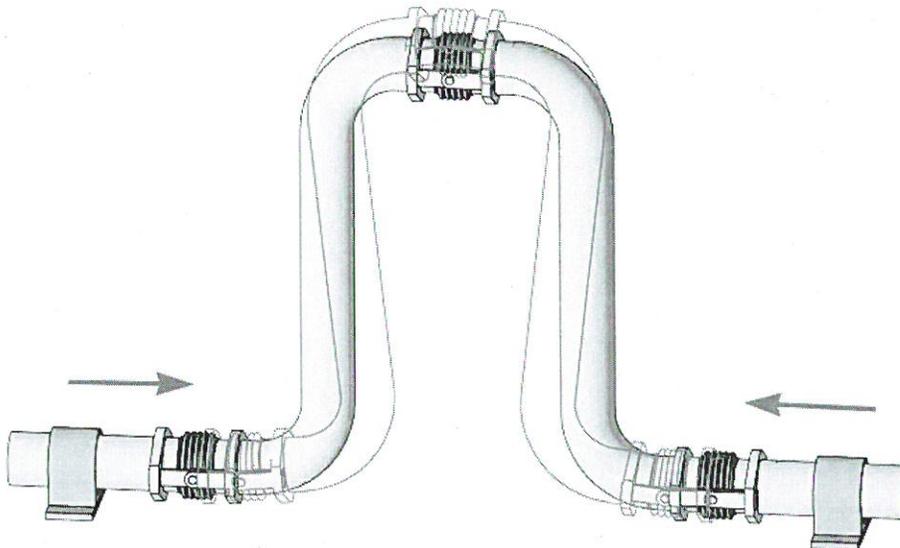
- 1209 Expansion tanks on all hydronic systems
- 1210.0 Material
 - See Table 1210.1
 - Expansion and contraction provisions
 - Hangers & supports Table 313.3
- 1211.0 Joints & connections for:
 - CPVC, Copper, PEX, PEX-AL-PEX, Ductile Iron, PE, PE-AL-PE, PE-RT, PP, PVC, Steel

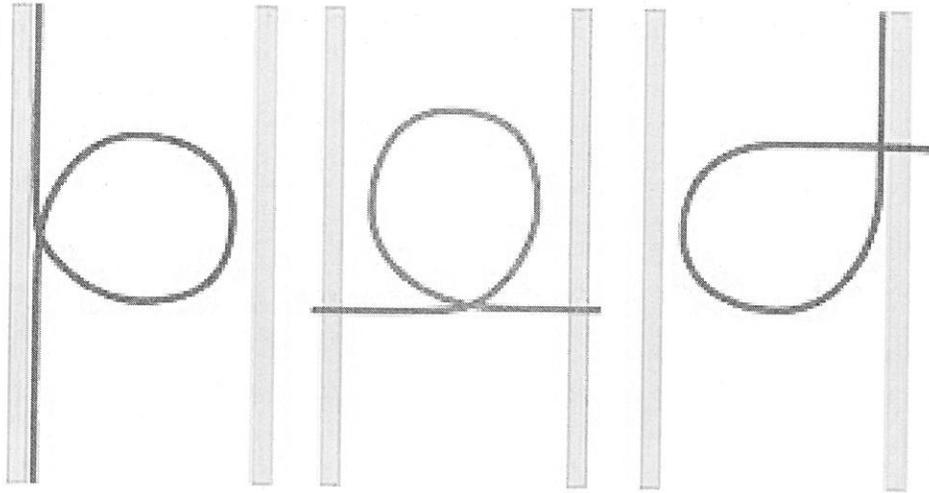
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TABLE 1210.1
MATERIALS FOR HYDRONIC SYSTEM PIPING, TUBING, AND FITTINGS

MATERIAL	STANDARDS	
	PIPING/TUBING	FITTINGS
Copper/Copper Alloy	ASTM B42, ASTM B43, ASTM B73, ASTM B88, ASTM B135, ASTM B251 ¹ , ASTM B302, ASTM B447	ASME B16.15, ASME B16.18, ASME B16.22, ASME B16.23, ASME B16.24, ASME B16.26, ASME B16.29, ASME B16.51
Ductile Iron	AWWA C115/A21.15, AWWA C151/A21.31	AWWA C110/A21.10 ² , AWWA C153/A21.33
Steel	ASTM A53, ASTM A106, ASTM A254	ASME B16.3, ASME B16.9, ASME B16.11, ASTM A420
Gray Iron	—	ASTM A126
Malleable Iron	—	ASME B16.3
Acrylonitrile Butadiene Styrene (ABS)	ASTM D1527	—
Chlorinated Polyvinyl Chloride (CPVC)	ASTM D2846, ASTM F441, ASTM F442	ASTM D2846, ASTM F437, ASTM F438, ASTM F439, ASTM F1970
Polyethylene (PE) Pipe	ASTM D1691, ASTM D2513, ASTM D2683, ASTM D2537, ASTM D3035, ASTM D3350, ASTM F1055	ASTM D2609, ASTM D2683, ASTM D3261, ASTM F1055, CSA B137.1
Cross-Linked Polyethylene (PEX)	ASTM F876, ASTM F877	ASTM F877, ASTM F1807, ASTM F1960, ASTM F1961, ASTM F2080, ASTM F2159, CSA B137.5
Polypropylene (PP)	ASTM F2389	—
Polysulfone (PSU)	ASTM D1783, ASTM D2241	ASTM D2464, ASTM D2186, ASTM D2467, ASTM F1970
Raised-Temperature Polyethylene (PE-RT)	ASTM F2623, ASTM F12769	ASTM F1807, ASTM F2159, ASTM F2735, ASTM F2769
Cross-Linked Polyethylene-Aluminum Cross-Linked Polyethylene (PEX-AL-PEX)	ASTM F1281, CSA B137.10	ASTM F1281, ASTM F1974, ASTM F2434, CSA B137.10
Polyethylene-Aluminum-Polyethylene (PE-AL-PE)	ASTM F1282, CSA B137.9	ASTM F1282, ASTM F1974, CSA B137.9

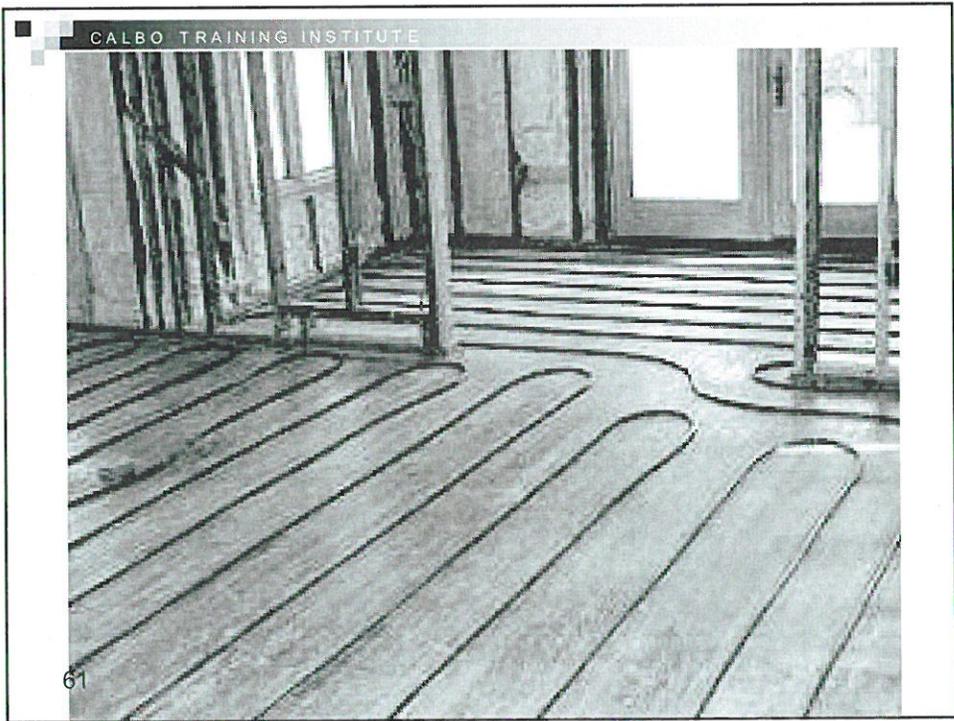
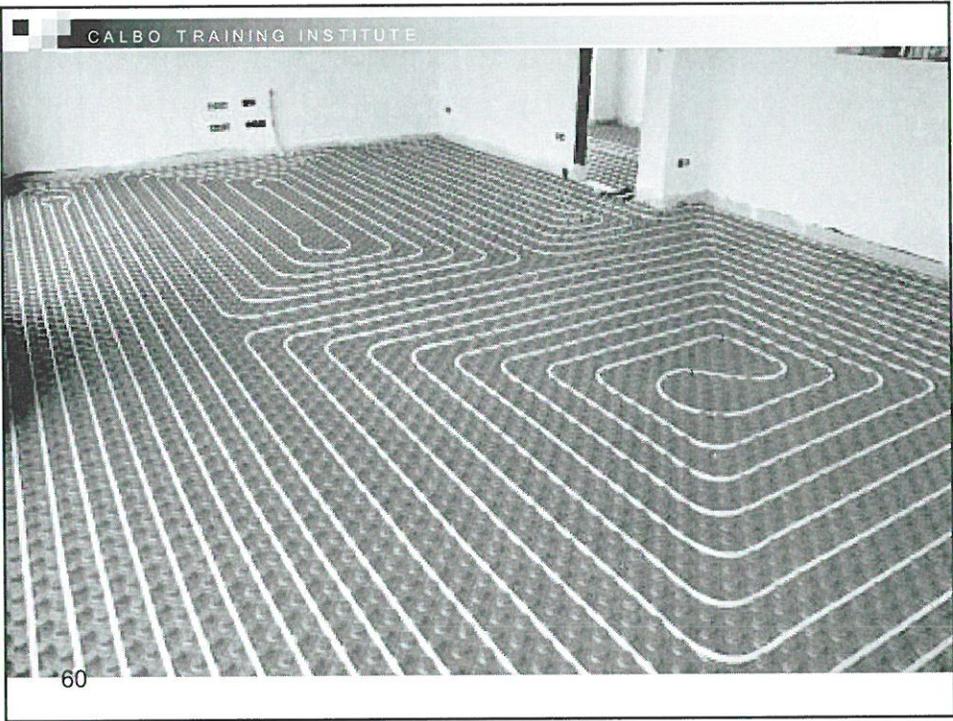
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¹ Ductile and gray iron.
² Only type K, L, or M tubing allowed to be installed.

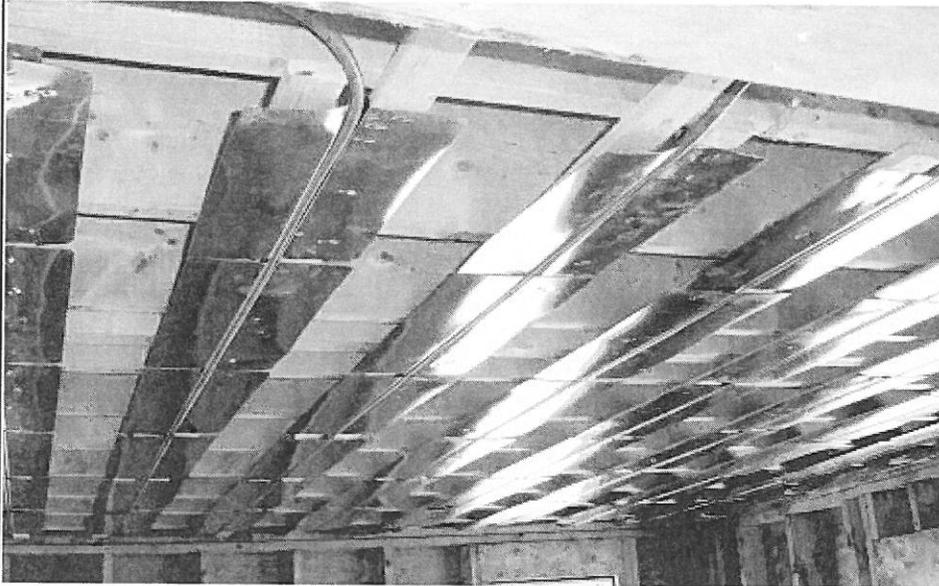




CHAPTER 12

- 1212 Valves-where required
- 1213 System controls
- 1214 Pressure and flow control
- 1215 Hydronic space heating:
 - Freeze protection
 - Balancing
- 1216 Steam systems
- 1217 Radiant heating & cooling





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CHAPTER 12

- 1218 Heat exchangers (see CPC)
- 1219 Indirect fired domestic water heater storage tank: T&P 150% working pressure & 210° & mixing valve to potable for a maximum 140°
- 1220 Auxiliary systems:
 - If use chemical additives, dbl wall ht exch
 - Snow melt to be automatic
- 1221 Installation of piping:
 - Joints in piping embedded in concrete:
 - Welded if steel
 - Brazed if copper
 - Continuous tubing or heat fused
 - Pressure tested prior to pouring concrete: 1-1/2 times working pressure not less than 100 psi
 - Install means to drain system unless embedded in concrete
 - Clearances to comb where > 250°: 1" to comb

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