CHANGE TYPE: Addition

CHANGE SUMMARY: Text has been added to address the allowable length of the bonding jumper wire and the methods of making the bonding connections.

2015 CODE: 310.1.1 CSST. Corrugated stainless steel tubing (CSST) gas piping systems and piping systems containing one or more segments of CSST shall be bonded to the electrical service grounding electrode system. The bonding jumper shall connect to a metallic pipe or fitting between the point of delivery and the first downstream CSST fitting. The bonding jumper shall be not smaller than six AWG copper wire or equivalent. ~~Gas piping systems that contain one or more segments of CSST shall be bonded in accordance with this section.~~

310.1.1.1 Bonding Jumper Length. The length of the bonding jumper between the connection to a gas piping system and the connection to a grounding electrode system shall not exceed 75 feet (22 860 mm). Any additional grounding electrodes used shall be bonded to the electrical service grounding electrode system.

310.1.1.2 Bonding Connections. Bonding connections shall be in accordance with NFPA 70.

310.1.1.3 Connection Devices. Devices used for making the bonding connections shall be listed for the application in accordance with UL 467.

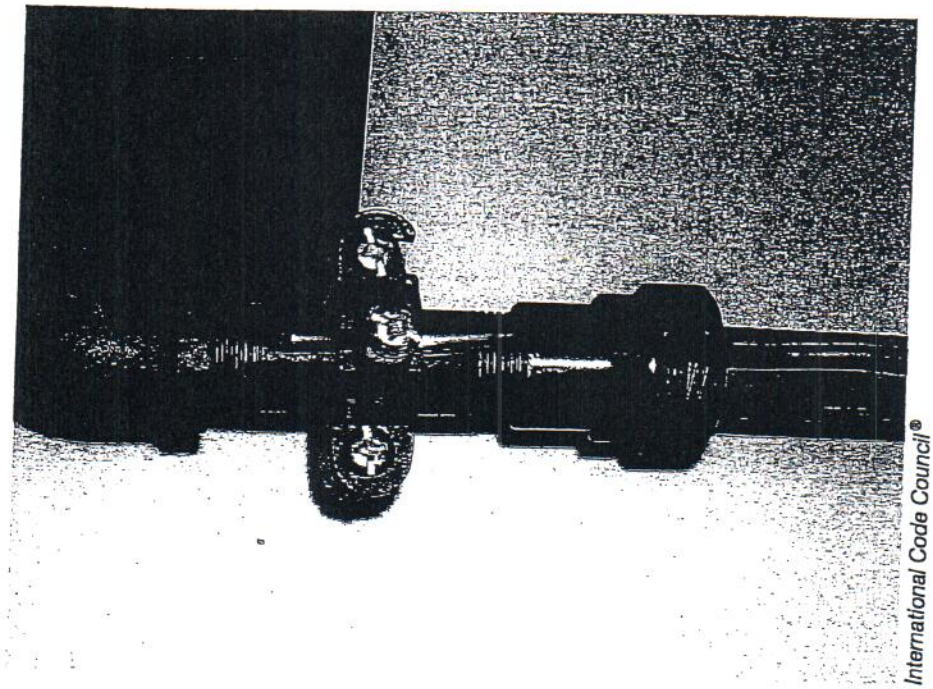
310.1.1 continues

310.1.1

Electrical Bonding of Corrugated Stainless Steel Tubing

2015 IFGC CHANGE

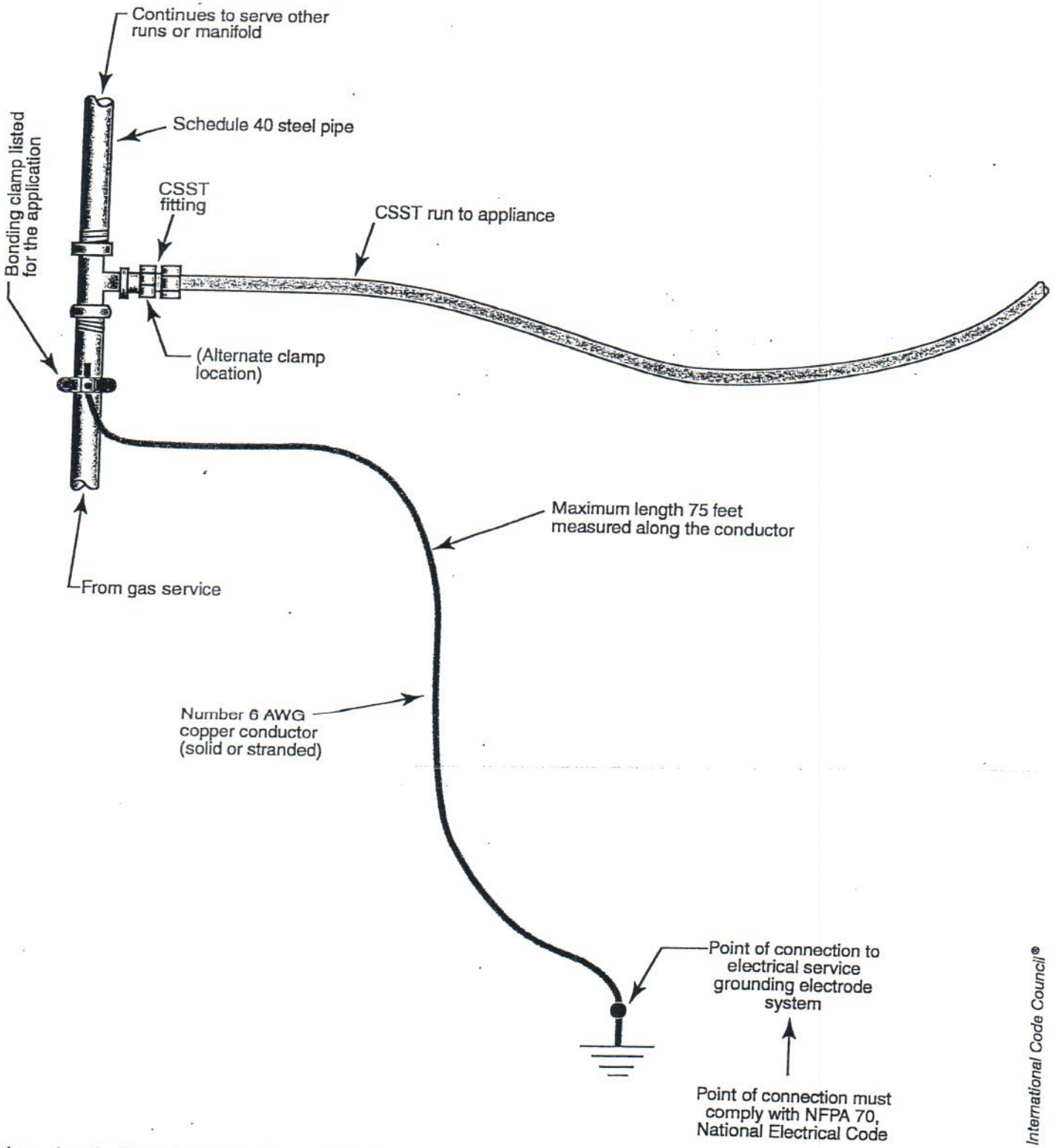
THIS SECTION IS REFERENCED IN THE ICC EVALUATION SERVICE REPORT (CSST BONDING NOT REQ'ED IF INSTALLED PER MGF REQ'MENTS



International Code Council®

Bonding of CSST gas piping

310.1.1 continued



Maximum length of bonding conductor for CSST gas piping

CHANGE SIGNIFICANCE: It is a well-known fact that the longer a bonding jumper is, the less effective it is because of the increasing impedance to electrical flow on the wire. Therefore, the shorter the better for jumper effectiveness. Extensive testing was performed by the CSST industry to determine how well the bonding protects the CSST from indirect lightning strikes and lightning-induced currents. The testing concluded that the bonding was effective in preventing perforations in the CSST under the conditions of the predicted lightning events. The testing also determined that the bonding jumper was functionally adequate up to approximately 100 feet in preventing arcing, thus suggesting the need for a length limit. A length limit of 75 feet was chosen to provide a safety factor and also because it was believed that 75 feet would accommodate the majority of building designs and utility service entrances.

Bonding the CCST to an independent grounding electrode is prohibited; however, the code does not prevent a designer or installer from installing a supplemental grounding electrode ("additional," as stated in the code text) for perceived additional protection. Where such supplemental electrodes are installed, the code requires that they be bonded back to the electrical service grounding electrode system, as this is consistent with NFPA 70 requirements for a common grounding electrode system. The author believes that the code does not intend to allow the length limit to be circumvented by the installation of supplemental electrodes. Where supplemental electrodes are installed by choice, the code implies that the bonding jumpers that connect to the electrical service grounding electrode system are still limited to 75 feet in combined length. An opposing interpretation is that the length of the bonding jumper between the CSST and the supplemental grounding electrode is limited to 75 feet, and the length of the jumper that connects the supplemental grounding electrode back to the electrical service grounding electrode system is limited only by the NEC, NFPA 70. The new code text implies that the more conservative interpretation is intended.

The points of connection to the electrical service grounding electrode system, the methods of connections and the protection of the bonding conductors must be in accordance with NFPA 70 (NEC). The devices, such as clamps, that are used to connect the bonding jumper on both ends must be listed for the application and environment in which they are installed. For example, clamps used outdoors must be listed for exposure to the elements. Some commonly used bonding clamps are suitable only for indoor use, and some are suitable for both indoor and outdoor use.

PICTURE / DETAIL ADDED TO IFGC (2015)

5. The *piping* shall be purged by the gas supplier in accordance with written procedures.

406.7.2.2 Combustible gas detector. Combustible gas detectors shall be listed and shall be calibrated or tested in accordance with the manufacturer's instructions. Combustible gas detectors shall be capable of indicating the presence of fuel gas.

406.7.3 Purging appliances and equipment. After the *piping* system has been placed in operation, appliances and *equipment* shall be purged before being placed into operation.

SECTION 407 (IFGC) PIPING SUPPORT

407.1 General. *Piping* shall be provided with support in accordance with Section 407.2.

407.2 Design and installation. *Piping* shall be supported with metal pipe hooks, metal pipe straps, metal bands, metal brackets, metal hangers or building structural components, suitable for the size of *piping*, of adequate strength and quality, and located at intervals so as to prevent or damp out excessive vibration. *Piping* shall be anchored to prevent undue strains on connected *appliances* and shall not be supported by other *piping*. Pipe hangers and supports shall conform to the requirements of MSS SP-58 and shall be spaced in accordance with Section 415. Supports, hangers and anchors shall be installed so as not to interfere with the free expansion and contraction of the *piping* between anchors. All parts of the supporting *equipment* shall be designed and installed so that they will not be disengaged by movement of the supported *piping*.

SECTION 408 (IFGC) DRIPS AND SLOPED PIPING

408.1 Slopes. *Piping* for other than dry gas conditions shall be sloped not less than $^1/_4$ inch in 15 feet (6.3 mm in 4572 mm) to prevent traps.

408.2 Drips. Where wet gas exists, a drip shall be provided at any point in the line of pipe where condensate could collect. A drip shall be provided at the outlet of the meter and shall be installed so as to constitute a trap wherein an accumulation of condensate will shut off the flow of gas before the condensate will run back into the meter.

408.3 Location of drips. Drips shall be provided with ready access to permit cleaning or emptying. A drip shall not be located where the condensate is subject to freezing.

408.4 Sediment trap. Where a sediment trap is not incorporated as part of the appliance, a sediment trap shall be installed downstream of the appliance shutoff valve as close to the inlet of the appliance as practical. The sediment trap shall be either a tee fitting having a capped nipple of any length installed vertically in the bottommost opening of the tee as illustrated in Figure 408.4 or other device approved as an effective sediment trap. Illuminating appliances, ranges, clothes dryers, decorative vented appliances for installation in vented fireplaces, gas fireplaces and outdoor grills need not be so equipped.

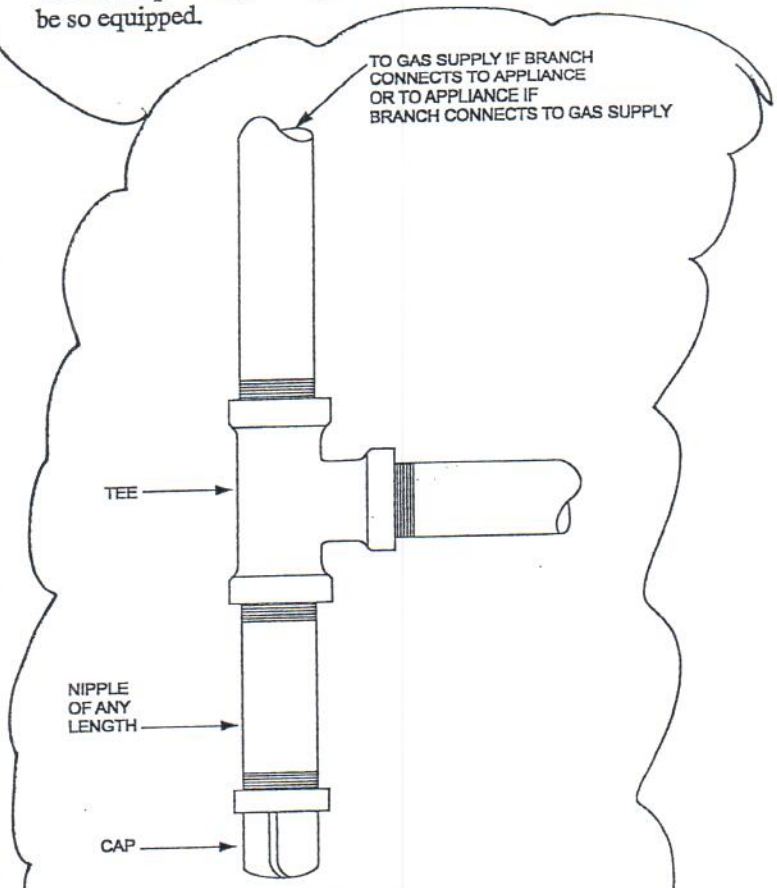


FIGURE 408.4
Method of Installing a tee fitting sediment trap

SECTION 409 (IFGC) SHUTOFF VALVES

409.1 General. *Piping* systems shall be provided with shutoff valves in accordance with this section.

409.1.1 Valve approval. Shutoff valves shall be of an *approved* type; shall be constructed of materials compatible with the *piping*; and shall comply with the standard that is applicable for the pressure and application, in accordance with Table 409.1.1.

409.1.2 Prohibited locations. Shutoff valves shall be prohibited in concealed locations and *furnace plenums*.

409.1.3 Access to shutoff valves. Shutoff valves shall be located in places so as to provide *access* for operation and shall be installed so as to be protected from damage.

409.2 Meter valve. Every meter shall be equipped with a shutoff valve located on the supply side of the meter.

409.3 Shutoff valves for multiple-house line systems. Where a single meter is used to supply gas to more than one building or tenant, a separate shutoff valve shall be provided for each building or tenant.

409.3.1 Multiple tenant buildings. In multiple tenant buildings, where a common *piping* system is installed to supply other than one- and two-family dwellings, shutoff

2015 IMC CODE CHANGE

307.3

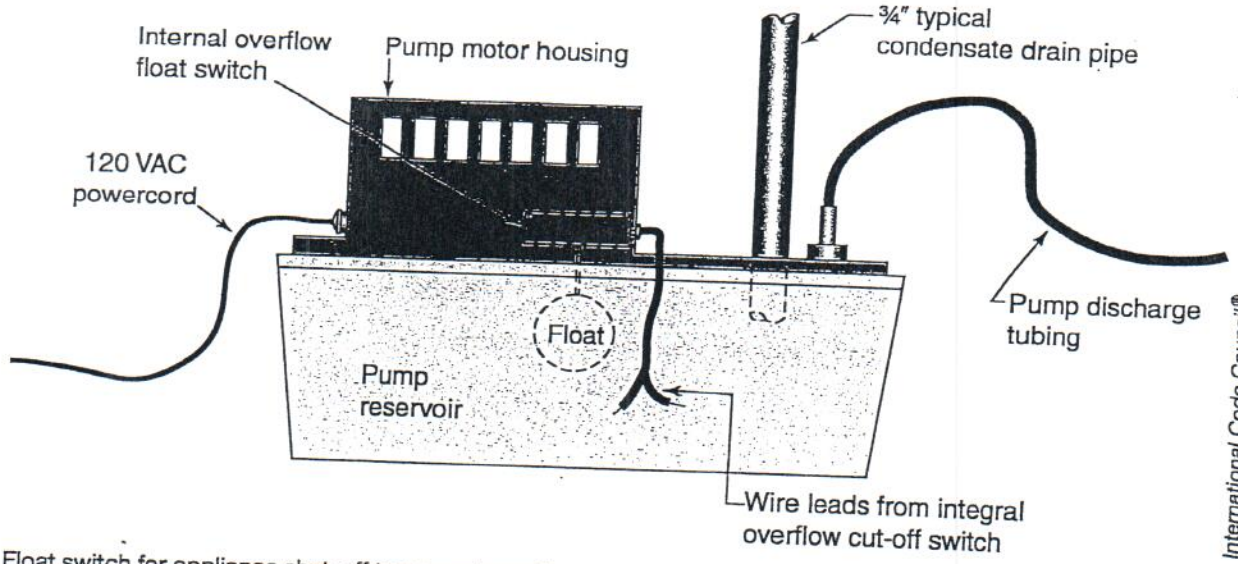
Condensate Pumps in Uninhabitable Spaces

CHANGE TYPE: Addition

CHANGE SUMMARY: Condensate pumps located in uninhabitable spaces and used with condensing fuel-fired appliances and cooling equipment must be connected to the appliance or equipment served by the pump to prevent water damage in the event of pump failure.

2015 CODE: **307.3 Condensate Pumps.** Condensate pumps located in uninhabitable spaces, such as attics and crawl spaces, shall be connected to the appliance or equipment served such that when the pump fails, the appliance or equipment will be prevented from operating. Pumps shall be installed in accordance with the manufacturer's instructions.

CHANGE SIGNIFICANCE: Condensate pumps are often located in attics and crawl spaces and above ceilings where they are not readily observable. If they fail, the condensate overflow can cause structural damage to the building, especially where the overflow will not be noticed immediately. The majority of such pumps are equipped with simple float controls that can be wired in series with the appliance/equipment control circuit. When the pump system fails, the float will rise in the reservoir and open a switch before the condensate starts to overflow the reservoir. These float controls are commonly not connected, and in other cases the pump might not be equipped with an overflow switch. This new code section requires the installation of condensate pumps that have this overflow shutoff capability and requires that the appliance/equipment served be connected to take advantage of that feature.



Float switch for appliance shut-off to prevent overflow

2015 IMC CODE CHANGE

CHANGE TYPE: Addition

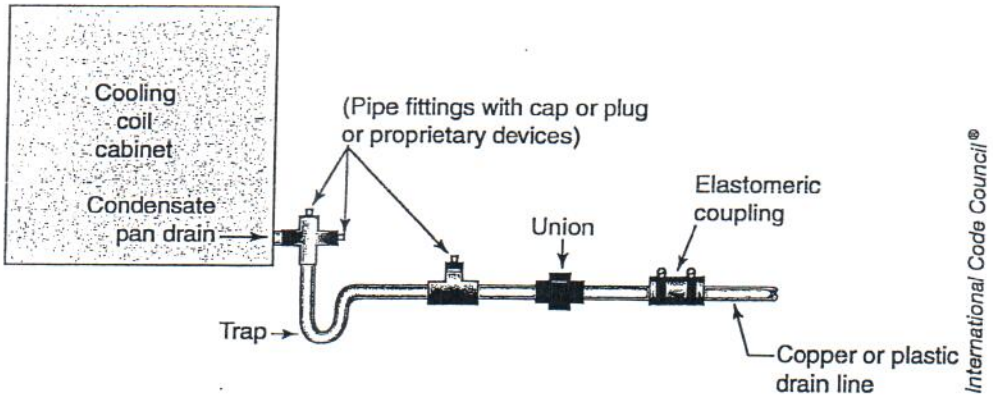
307.2.5

Condensate Drain Line Maintenance

CHANGE SUMMARY: The code requires that condensate drains be configured or equipped to allow maintenance of the drain without the drain pipe or tubing being cut.

2015 CODE: **307.2.5 Drain Line Maintenance.** Condensate drain lines shall be configured to permit the clearing of blockages and performance of maintenance without requiring the drain line to be cut.

CHANGE SIGNIFICANCE: Drains that convey condensate water from cooling coils and evaporators are known to develop blockages as a result of debris and biological growth in the system. These drains are commonly cleared of blockages by a compressed gas such as air or nitrogen being forced through the drain. It is inherently hazardous to pressurize plastic piping such as PVC and CPVC with a compressed gas because of the potential for violent rupture and propelled shards of plastic. The drains are seldom large enough to accommodate mechanical drain cleaning (rodding) equipment. The code permits any arrangement that provides access to the drain interior without the drain being severed or cut. This includes capped or plugged tees and cross fittings, unions, removable mechanical couplings and specialty devices made specifically for the attachment of compressed-gas hoses. The intent is to prevent the spillage of condensate that would cause damage to the structure.



Possible means to provide access to a drain line interior without requiring the pipe to be cut

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PMG-1155

Valid: 01/15 to 01/16

DIVISION: 23 00 00—HEATING, VENTILATING AND AIR CONDITIONING
SECTION: 23 11 00—FACILITY FUEL PIPING

REPORT HOLDER:

TITEFLEX CORPORATION GASTITE DIVISION

1116 VAUGHN PARKWAY
PORTLAND, TN 37148

EVALUATION SUBJECT:

GASTITE® FLASHSHIELD™ CONDUCTIVE JACKETED CORRUGATED STAINLESS STEEL TUBING

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ICC-ES PMG Listing

PMG-1155

Effective Date: January 2015

This listing is subject to re-examination in one year.

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CSI: DIVISION: 23 00 00—HEATING, VENTILATING AND AIR CONDITIONING
Section: 23 11 00—Facility Fuel Piping

Product certification system:

The ICC-ES product certification system includes testing samples taken from the market or supplier's stock, or a combination of both, to verify compliance with applicable codes and standards. The system also involves factory inspections, and assessment and surveillance of the supplier's quality system.

Product: Gastite® FlashShield™ Metallically Shielded Corrugated Stainless Steel Tubing

Listee: Titeflex Corporation Gastite Division
1116 Vaughn Parkway
Portland, Tennessee 37148
www.gastite.com

Compliance with the following codes:

2015, 2012 and 2009 *International Fuel Gas Code®* (IFGC)
2015, 2012 and 2009 *International Mechanical Code®* (IMC)
2015, 2012 and 2009 *International Residential Code®* (IRC)
2012 and 2009 *Uniform Plumbing Code®* (UPC)*
2012 and 2009 *Uniform Mechanical Code®* (UMC)*

**Uniform Mechanical Code and Uniform Plumbing Code are copyrighted publications of the International Association of Plumbing and Mechanical Officials.*

Compliance with the following standards:

ANSI LC 1/CSA 6.26-2014, Fuel Gas Piping Systems Using Corrugated Stainless Steel Tubing (CSST)
NFPA 54-2015, National Fuel Gas Code
ICC-ES LC1027-2011, PMG Listing Criteria for Multi-Layer, Conductive, Jacketed, Corrugated Stainless Steel Tubing
ICC-ES PMG-1019, Gastite Flexible Gas Piping System

Identification:

Tubing: Each 2 feet (610 mm) of tube bears the Gastite® FlashShield™ name, part number, rated pressure [25 psi (172 kPa)], equivalent hydraulic diameter (EHD), the words "Fuel Gas," and the ICC-ES PMG listing mark.

Components: Fittings, termination outlets and distribution manifolds are stamped with the Titeflex logo, the part numbers and the date stamp.

Installation:

General: Installation must be in accordance with the Gastite® FlashShield™ Installation Instructions, IFGC Section 404, IRC Section 2415, UMC Section 1309 and IAPMO UPC Section 1211, as applicable. The system installation consists of CSST distribution lines installed between the point of delivery and fuel gas appliances. The use and system installation must be in accordance with ICC-ES PMG-1019.

Plenum Installation: When tested in accordance with ASTM E 84, Gastite® FlashShield™ satisfies the plenum installation requirement, with a flame spread index of less than 25 and a smoke development index of less than 50.

Electrical Bonding: The Gastite® FlashShield™ Metallically Shielded Corrugated Stainless Steel Tubing (CSST) System is electrically continuous and is considered to be bonded where it is connected to appliances that are connected to the equipment grounding conductor of the circuit supplying that appliance. Additional bonding prescribed by IFGC Section 310.1.1 and IRC Section G2411.1.1 is not required for Gastite® FlashShield™ Metallically Shielded CSST when it is installed in accordance with this listing.

Models: The Gastite® FlashShield™ Metallically Shielded CSST System consists of five parts: (1) a black semi-conductive exterior jacket; (2) aluminum shield to conduct the stray current; (3) a black semi-conductive interior jacket (4) corrugated stainless steel tubing which is recognized in PMG-1019 as conforming to ANSI LC-1; and (5) mechanical fittings designed for use only with the Gastite® FlashShield™ CSST.

Mechanical fittings utilize a metal-to-metal seal, and include mechanical fittings, distribution manifolds, shutoff valves, termination outlet devices, pressure regulators, tee assemblies and protection devices. Protection mesh in the multi-layer product must be electronically engaged with each fitting.

TABLE — PART NUMBERS: GASTITE® FLASHSHIELD™ TUBING AND FITTINGS

TUBING SIZE (inch)	PART NUMBER	DESCRIPTION
1/2	FS-8	1/2" FlashShield™ CSST
3/4	FS-11	3/4" FlashShield™ CSST
1	FS-16	1" FlashShield™ CSST
1 1/4	FS-20	1 1/4 "FlashShield™ CSST
1 1/2	FS-24	1 1/2" FlashShield™ CSST
2	FS-32	2" FlashShield™ CSST
1/2	FSFTG-8	1/2" FlashShield™ Straight Fitting – 1/2" NPT
3/4	FSFTG-11	3/4" FlashShield™ Straight Fitting – 3/4" NPT
1	FSFTG-16	1" FlashShield™ Straight Fitting – 1" NPT
1 1/4	FSFTG-20	1 1/4" FlashShield™ Straight Fitting – 1 1/4" NPT
1/2	XR3FTG-8	1/2" XR3 Straight Fitting – 1/2" NPT
3/4	XR3FTG-11	3/4" XR3 Straight Fitting – 3/4" NPT
1	XR3FTG-16	1" XR3 Straight Fitting – 1" NPT
1 1/4	XR3FTG-20	1 1/4" XR3 Straight Fitting – 1 1/4" NPT
1 1/2	XR3FTG-20	1 1/4" XR3 Straight Fitting – 1 1/2" NPT
2	XR3FTG-16	2" XR3 Straight Fitting – 1" NPT
1/2	FSFTG-FM-8	1/2" FlashShield™ Straight Fitting – 1/2" Female NPT
3/4	FSFTGFM-11-8	3/4" FlashShield™ Straight Fitting – 1/2" Female NPT
3/4	FSFTGFM-11	3/4" FlashShield™ Straight Fitting – 3/4" Female NPT
1/2	XR3FTG-FM-8	1/2" XR3 Straight Fitting – 1/2" Female NPT
3/4	XR3FTGFM-11-8	3/4" XR3 Straight Fitting – 1/2" Female NPT
3/4	XR3FTGFM-11	3/4" XR3 Straight Fitting – 3/4" Female NPT

TUBING SIZE (inch)	PART NUMBER	DESCRIPTION
3/4	FSREDFTG-11-08	3/4" FlashShield™ Straight Reducing Fitting – 1/2" NPT
1	FSREDFTG-16-12	1" FlashShield™ Straight Reducing Fitting – 3/4" NPT
3/4	XR3REDFTG-11-08	3/4" XR3 Straight Reducing Fitting – 1/2" NPT
1	XR3REDFTG-16-12	1" XR3 Straight Reducing Fitting – 3/4" NPT
1/2	FSCPL-8	1/2" FlashShield™ Coupling
3/4	FSCPL-11	3/4" FlashShield™ Coupling
1	FSCPL-16	1" FlashShield™ Coupling
1 1/4	FSCPL-20	1 1/4 " FlashShield™ Coupling Assembly
1/2	XR3CPL-8	1/2" XR3 Coupling
3/4	XR3CPL-11	3/4" XR3 Coupling
1	XR3CPL-16	1" XR3 Coupling
1 1/4	XR3CPL-20	1 1/4" XR3 Coupling
1 1/2	XR3CPL-24	1 1/2" XR3 Coupling
2	XR3CPL-32	2" XR3 Coupling
1/2	FSTRM-8	1/2" FlashShield™ Termination Fitting – 1/2" NPT
3/4	FSTRM-11	3/4" FlashShield™ Termination Fitting – 3/4" NPT
1	FSTRM-16	1" FlashShield™ Termination Fitting – 1" NPT
1 1/4	FSTRM-20	1 1/4" FlashShield™ Termination Fitting Assembly
1/2	XR3TRM-8	1/2" XR3 Termination Fitting – 1/2" NPT
3/4	XR3TRM-11	3/4" XR3 Termination Fitting – 3/4" NPT
1	XR3TRM-16	1" XR3 Termination Fitting – 1" NPT
1 1/4	XR3TRM-20	1 1/4 "XR3 Termination Fitting Assembly – 1 1/4" NPT
1 1/2	XR3TRM-24	1 1/2 "XR3 Termination Fitting Assembly – 1 1/2" NPT
2	XR3TRM-32	2" XR3 Termination Fitting Assembly – 2" NPT
1/2	FST-8	1/2" Run x ½" Run x ½" Tee Fitting
3/4	FST-11	3/4" Run x ¾" Run x ¾" Tee Fitting
1	FST-16	1" Run x 1" Run x 1" Tee Fitting
3/4	FST-11-8-8	3/4" Run x 1/2" Run x 1/2" Tee Fitting
3/4	FST-11-11-8	3/4" Run x 3/4" Run x 1/2" Tee Fitting
1	FST-16-11-8	1" Run x 3/4" Run x 1/2" Tee Fitting
1	FST-16-11-11	1" Run x 3/4" Run x 3/4" Tee Fitting
1	FST-16-16-8	1" Run x 1" Run x 1/2" Tee Fitting
1	FST-16-16-11	1" Run x 1" Run x 3/4" Tee Fitting
1/2	XR3T-8	1/2" Run x ½" Run x ½" XR3 Tee Fitting
3/4	XR3T-11	3/4" Run x ¾" Run x ¾" XR3 Tee Fitting
1	XR3T-16	1" Run x 1" Run x 1" XR3 Tee Fitting
3/4	XR3T-11-8-8	3/4" Run x 1/2" Run x 1/2" XR3 Tee Fitting
3/4	XR3T-11-11-8	3/4" Run x 3/4" Run x 1/2" XR3 Tee Fitting
1	XR3T-16-11-8	1" Run x 3/4" Run x 1/2" XR3 Tee Fitting
1	XR3T-16-11-11	1" Run x 3/4" Run x 3/4" XR3 Tee Fitting
1	XR3T-16-16-8	1" Run x 1" Run x 1/2" XR3 Tee Fitting
1	XR3T-16-16-11	1" Run x 1" Run x 3/4" XR3 Tee Fitting

For **SI:** 1 inch = 25.4 mm.

Conditions of listing:

1. Gastite® FlashShield™ has been tested (in accordance with LC1027) and complies with the minimum performance threshold for indirect effects lightning testing.
   - Indirect Effects 1 Threshold: 10 coulombs minimum utilizing a 10 x 1000 µs current waveform
   - Indirect Effects 2 Threshold:

Component 1 (Return Stroke)	
Peak Amplitude	30 kA minimum
Action Integral	0.055×10^6 A^2s, minimum
Time Duration	≤ 500 µs
Component 2 (Intermediate Current)	
Maximum Charge Transfer	10 coulombs (± 10%)
Average Amplitude	2 kA (± 20%)
Time Duration	≤ 5 ms
Component 3 (Continuing Stroke)	
Amplitude	200 – 800 A
Charge Transfer	26 coulombs, minimum

2. Electrical Bonding: The FlashShield™ Metallically Shielded Corrugated Stainless Steel Tubing System is electrically continuous and is considered to be bonded where it is connected to appliances that are connected to the equipment grounding conductor of the circuit supplying that appliance.
3. The protection is from indirect lightning only and the effect of direct lightning strike is beyond the scope of this listing.
4. The CSST piping system must not be used as a grounding electrode for an electrical system.
5. Additional information and requirements are defined in ICC-ES PMG-1019.
6. Protection metallic shield in the multi-layer product must be electronically engaged with each fitting.
7. The Gastite® FlashShield™ Metallically Shielded CSST System is manufactured by Titeflex Corporation Inc. in Portland, Tennessee, under a quality control program with annual surveillance inspections by ICC-ES.

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PMG-1058

Valid: 02/15 to 02/16

DIVISION: 23 00 00—HEATING, VENTILATING, AND AIR-CONDITIONING

SECTION: 23 11 00—FACILITY FUEL PIPING

SEE ICC ES WEB LING ON P.3 FOR ENTIRE PMG-1058 DOCUMENT

REPORT HOLDER:

OMEGAFLEX® INC.

451 CREAMERY WAY
EXTON, PA 19341-2509

EVALUATION SUBJECT:

TRACPIPE® COUNTERSTRIKE® CONDUCTIVE JACKETED CORRUGATED STAINLESS STEEL TUBING

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ANSI Accredited Program PRODUCT CERTIFICATION

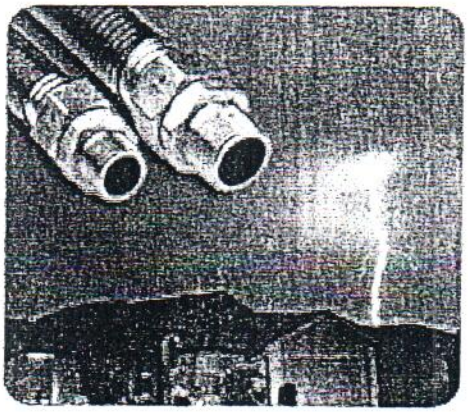
TracPipe CounterStrike
Flexible Gas Piping by OmegaFlex

TracPipe® CounterStrike®

As part of our ongoing process of continuing improvement, Omega Flex has developed an improved version of TracPipe® CounterStrike®. This is a second-generation product that is an effective but affordable tool in increasing the protection

View the TracPipe® CounterStrike® 6-page Product Brochure »

View the TracPipe® CounterStrike® 2-Page Product Brochure »



of CSST gas piping systems from the damage caused by nearby, indirect lightning strikes. This version takes TracPipe® CounterStrike®'s proven capabilities to an even higher level.

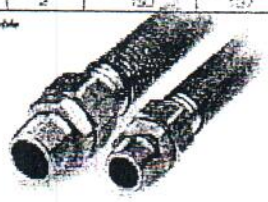
TracPipe® CounterStrike® is a patented CSST innovation based on our existing TracPipe® CounterStrike® CSST product, but that is engineered to significantly decrease the potential for lightning induced damage to fuel gas piping systems. TracPipe® CounterStrike® has been designed with a proprietary jacket material in place of the standard yellow jacket. This black jacket has energy dissipating properties that will help protect the TracPipe® CounterStrike® stainless steel pressure liner as well as other fuel gas system components if the TracPipe® CounterStrike® becomes energized due to lightning.

The improved version of TracPipe® CounterStrike® is designed to withstand significantly higher levels of lightning energy when compared to first generation TracPipe® CounterStrike® and, of course, to conventional TracPipe® CounterStrike® with the yellow jacket. TracPipe® CounterStrike® has been shown to be up to 400 times more resistant to the damaging effects of electrical energy than conventional CSST, and is at least 6 times more resistant to that damage than the previous version of TracPipe® CounterStrike®.

No product, including the improved TracPipe® CounterStrike® is immune to the damage caused by a direct lightning strike. Refer to NFPA 780 for lightning protection systems for buildings and building systems.

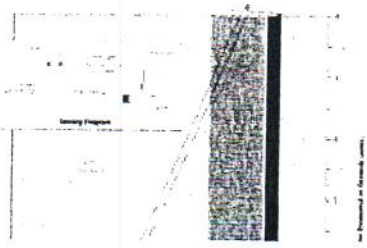
Part Number	Size	Reel Length*	Lb/Reel
FCP-CS-375-250	3/8"	250	37
FCP-CS-500-250	1/2"	250	58
FCP-CS-500-100	1/2"	100	24
FCP-CS-750-250	3/4"	250	70
FCP-CS-750-100	3/4"	100	31
FCP-CS-100-180	1"	180	70
FCP-CS-125-150	11/4"	150	78
FCP-CS-150-150	11/2"	150	100
FCP-CS-200-150	2"	150	137

* Other reel lengths available

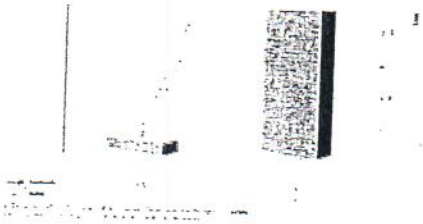


TracPipe® CounterStrike® Advantages

There are no additional bonding requirements for TracPipe® CounterStrike® imposed by the manufacturer's installation instructions. With TracPipe® CounterStrike®'s improved properties, TracPipe® CounterStrike® is to be bonded in accordance with current requirements of the National Electrical Code (NFPA 70), and the National Fuel Gas Code (NFPA 54), and with any local requirements that may be in excess of the national codes. This may result in



the avoidance of additional bonding costs which are required for conventional CSST.



TracPipe® CounterStrike® is listed by CSA to ANSI LC 1. TracPipe® CounterStrike® meets building code requirements (ASTM E84) with respect to flame spread and smoke density. This permits installation in drop ceilings used as return air plenums, and is UL Listed for 1,2, and 4 hour through penetration firestop systems without removal of the jacket. TracPipe® CounterStrike® is also approved by Factory Mutual as a flexible piping system for flammable gases, based upon its ability to withstand stresses caused by earthquakes.

TracPipe® CounterStrike® Performance (Testing)

The capability of TracPipe® CounterStrike® to withstand electrical energy has once again been tested by a leading U.S lightning laboratory. The laboratory duplicated typical field damage attributed to lightning for CSST. The electrical energy level in coulombs (the amount of electricity provided by a current of one ampere flowing for one second) that was known to cause damage to our standard CSST was used as a baseline to determine the performance level of TracPipe® CounterStrike®. When tested against our standard CSST, the latest version of TracPipe® CounterStrike® exceeded the TracPipe® CounterStrike®'s performance by at least 400%.

For an in-depth look at Technical Solutions, download the **TracPipe® CounterStrike® brochure**.

TracPipe® CounterStrike®
Flexible Gas Piping by OmegaFlex

All of the safety, ease and performance you've come to expect from OmegaFlex's flexible gas piping - *only better.*

Since 1975, OmegaFlex has led the piping industry with its high-quality construction and commitment to exceed the industry's product and safety standards. With over 90 patents and counting, the Company's philosophy is not to wait for mandates, but to lead the industry by introducing the best products. In 1997, the Company introduced TracPipe®, the finest CSST system on the market that when properly installed makes likelihood of damage to the system from natural occurrences very small. In 2004, the Company developed CounterStrike®, which contains all of the innovative features of TracPipe® plus a built-in solution to lightning damage that eliminates the need for additional bonding. Now in keeping with our continued commitment to innovation and putting the best product on the market, we proudly are transitioning our traditional CSST products exclusively to TracPipe® CounterStrike®. LEARN MORE ›

Superseded Editions of 90.1

Looking for previous revisions?

ASHRAE offers superseded editions of Standard 90.1 and User's Manuals in the ASHRAE Bookstore. Find previous editions in the 'Document History' section of the 90.1-2013 product page. Browse Now

About Standard 90.1

This standard provides the minimum requirements for energy-efficient design of most buildings, except low-rise residential buildings. It offers, in detail, the minimum energy-efficient requirements for design and construction of new buildings and their systems, new portions of buildings and their systems, and new systems and equipment in existing buildings, as well as criteria for determining compliance with these requirements. It is an indispensable reference for engineers and other professionals involved in design of buildings and building systems.

90.1 Training
Preview 90.1-2013

This 2013 edition has been expanded to include new features and more detailed requirements, as well as incorporating changes from more than 100 addenda.

New for 2013:

- Revised, stricter opaque element and fenestration requirements at a reasonable level of cost-effectiveness
- Improvements to daylighting controls, space-by-space lighting power density limits, and thresholds for toplighting
- Revised equipment efficiencies for heat pumps, packaged terminal air conditioners (PTACs), single package vertical heat pumps and air conditioners (SPVHP and SPVAC), and evaporative condensers
- New provisions for commercial refrigeration equipment and improved controls for heat rejection and boiler equipment
- Improved requirements for expanded use of energy recovery, small-motor efficiencies, and fan power control and credits
- Improved equipment efficiencies for chillers
- Clarifications for the use of prescriptive provisions when performing building energy use modeling, and revisions to enhance capturing daylighting when performing modeling calculations
- A new alternate compliance path to Section 6, "Heating, Ventilating, and Air-Conditioning," for computer room systems, developed with ASHRAE Technical Committee (TC) 9.9.

In addition to offering immediate access to the content, the PDF download of this standard presents selected graphics in color for enhanced readability.

Other Available Resources

90.1-2013 User's Manual

This User's Manual provides detailed instruction for the design of commercial and high-rise residential buildings to ensure their compliance with ANSI/ASHRAE/IES Standard 90.1-2013. It includes measurements and calculations in both I-P and SI units, sample calculations, application examples, forms to demonstrate compliance, and references to helpful resources and websites.

ICC -- Significant Changes to the International Energy Conservation Code and ANSI/ASHRAE/IES Standard 90.1-2010

Gain access to the most critical updates, the real-world application of those changes, and why they originated. Each change analysis features the affected code and Standard sections and identifies the change as added text, a modification of the existing language, or deleted text. Detailed illustrations and examples accompany each change.

CHANGES TO THE 2013 ASHRAE 90.1 (ENERGY CODE - COMMERCIAL BLDGS)

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What's new in ASHRAE 90.1-2013

CODE CHANGES TO 2013 ASHRAE 90.1

Nearly 150 addenda were proposed for ASHRAE Standard 90.1-2013.

Jeff Boldt, PE, LEED AP, HBDP, FPE, KJWW Engineering Consultants, Madison, Wis.
01/19/2014

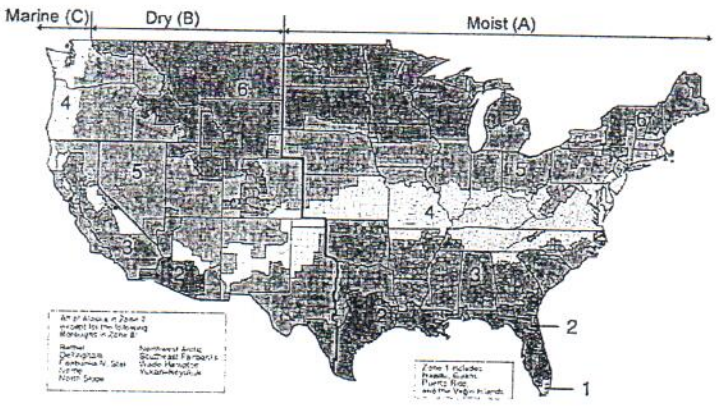
The changes in ASHRAE Standard 90.1-2013 are not as radical as the changes made in 2010, which reduced the energy consumption of minimally compliant designs by approximately 30% compared to 90.1-2004. But while the 2013 edition does not result in as large a drop in energy use as was seen three years ago, the changes in this latest version still are significant.

ANSI/ASHRAE/IES Standard 90.1 is a continuous maintenance standard, which means that the committee meets frequently (usually four times per year in person) to develop and vote on changes (addenda). Changes to ASHRAE standards can be proposed by committee members, subcommittee members, or members of working groups, or can be suggested by anyone through the continuous maintenance proposal (CMP) process. Once a change passes in the committee, it is released for public review. If it successfully completes the public review, it is then part of the next edition of Standard 90.1 and ASHRAE proposes the changes also to be made in the International Energy Conservation Code (IECC). Some of the changes discussed in this article already are incorporated into the 2012 edition of the IECC because of the offset in publication dates between IECC and 90.1.

More than 120 addenda were approved for 90.1-2013. Following are the more significant changes (excluding lighting) for 2013.

Envelope changes

Addendum bb is one of the most significant changes. It increases the insulation values required for most opaque elements in buildings in most climate zones (see Figure 1). For example, in my location (Madison, Wis.), opaque steel-framed nonresidential walls changed from U-0.64 (R13 + R-7.5 continuous insulation) to U-0.049 (R-13 + R-12.5 continuous insulation). This basically changes the requirement from 2 in. of continuous insulation (usually polystyrene or polyisocyanurate board) to 3 or 4 in. of continuous insulation, depending on the product. This addendum also increases the minimum insulation values for roofs and skylights.



Addendum dm limits the size of vestibules to minimize the use of fully conditioned spaces as "vestibules." It also sets a minimum spacing of 16 ft between motorized doors in vestibules in buildings with more than 40,000 sq ft of floor area on the vestibule floor.

Addendum bg requires that storm windows that are added must be low-E if the existing glazing is not low-E. This applies to panels added to either the interior or exterior of existing glazing.

Addendum bw revises the fenestration orientation rules and adds a compliance option. Either:

- East- and west-oriented glazing must each be less than 25% of the total glazing, or
- East- and west-oriented glazing, multiplied by their solar heat gain coefficients (SHGC), must each be less than the total building sum of glazed area multiplied by each area's SHGC.

Several exceptions exist, including one for buildings where the east and west glazing do not exceed 20% of the east and west gross wall area and the SHGC factors are not more than 90% of the criteria in Tables 5.5-1 through 5.5-8. This is basically a passive solar requirement that promotes buildings that are longer east to west than north to south. If your building is planned to be long north to south relative to east to west, it can severely restrict glazing on the east and west facades.

Addendum ca requires that heating for vestibules and air curtains include automatic controls configured to shut off the heating system when outdoor air temperatures are above 45 F. Vestibule heating systems shall also be controlled by a thermostat in the vestibule with a setpoint limited to a maximum of 60 F.

Addendum da relaxes infiltration requirements for high-speed nonswinging doors intended for vehicular access and material transportation, if they have a minimum opening rate of 32 in. per second. It also exempts building products from infiltration rating requirements if the building completes a whole building air leakage test per ASTM E 779 with a leakage of under 0.4 cfm/sq ft at 0.3 in. w.g.

Mechanical changes

Addendum g increases the efficiency requirements for many types of commercial refrigerators and freezers.

Addendum aa requires direct digital control (DDC) for many situations, including:

- New building air handling systems, and zones served by them
- New building chilled water plants and all coils and terminal units served by them
- New building heating water plants and all coils and terminal units served by them
- Alteration or addition to zone terminal units, such as variable air volume (VAV) boxes, when the central system has DDC
- New air handling units (AHUs) or fan-coils when served by air handling, chilled water, or heating water systems with DDC
- Chiller plants over 300 MBH capacity with all new chillers
- Boiler plants over 300 MBH capacity with all new boilers.

Addendum y adds efficiency requirements for small electric motors. These match upcoming Dept. of Energy requirements, and have the same effective date of March 9, 2015.

Addendum af requires multiple-cell heat rejection equipment (cooling towers, dry-coolers, etc.) with variable speed fan drives to operate the maximum number of fans that comply with manufacturer's requirements, and control all fans to the same speed instead of staging them on and off. This allows the maximum heat transfer surface to be used, reducing tower fan power significantly. Also, open-circuit cooling towers used on water-cooled chiller systems that are configured with multiple or variable speed condenser water pumps shall be designed so that all open-circuit cooling tower cells can be run in parallel with the larger of either the flow that is produced by the smallest pump at its minimum expected flow rate, or 50% of the design flow for the cell.

Addendum aj requires that motors for fans that are 1/12 hp or greater and less than 1 hp be electronically commutated motors or have a minimum motor efficiency of 70% when rated in accordance with Dept. of Energy 10 CFR Part 431. These motors also shall have the means to adjust motor speed for either balancing or remote control. Belt-driven fans may use sheave adjustments for airflow balancing in lieu of a varying motor speed.

Addendum am requires that boiler systems comply with minimum turndown ratios at various capacities of:

- ≥ 1,000,000 Btuh = 3 to 1
- > 5,000,000 Btuh = 4 to 1
- > 10,000,000 Btuh = 5 to 1.

The system turndown requirement may be met through the use of: multiple, single-input boilers; one or more modulating boilers; or a combination of single-input and modulating boilers.

Addendum ap permits an alternative compliance path for computer rooms by demonstrating a power usage effectiveness (PUE) below climate-specific values that vary from 1.3 to 1.61, based on ASHRAE 90.1-2013 Appendix G simulation. This allows innovative cooling techniques to be used that may not fit in with the prescriptive requirements for computer rooms.

Addendum aq requires multistage or modulation of direct expansion (DX) cooling systems.

- For systems more than 65,000 Btuh but less than 240,000 Btuh, a minimum of three stages of cooling is required with a maximum first-stage displacement of 35% of total displacement or variable speed reducing capacity to 35% or less.
- For systems with capacity of 240,000 Btuh or greater, a minimum of four stages of cooling is required with a maximum first-stage displacement of 25% of total displacement or variable speed reducing capacity to 25% or less.

Addendum aq prohibits false loading of cooling systems by trimming the economizer or by engaging hot gas bypass when more than the first stage of mechanical cooling is operating. It also requires at least two stages of cooling for systems that are controlled directly by space temperature with capacity greater than 75,000 Btuh, and effective Jan. 1, 2016, 65,000 Btuh. It also requires systems that control cooling capacity based on space temperature to reduce fan speed to less than 66% at low cooling load, and systems that control space temperature by modulating airflow to reduce fan speed to less than or equal to 50% at low cooling load. There are exceptions for units with fan motors less than 1 hp and where more flow is required to comply with ventilation codes.

CODE CHANGES
2013
ASHRAE 90.1

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