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December 3, 2010

VIA ELECTRONIC MAIL AND U.S. MAIL

Linda Roberts
Executive Director
Connecticut Siting Council
10 Franklin Sq.
New Britain, CT 06051

Re: Kleen Energy Systems, LLC Application for a Certificate of Environmental Compatibility and Public Need for an Electric Generating Facility on River Road, Middletown, Connecticut Docket No. 225D

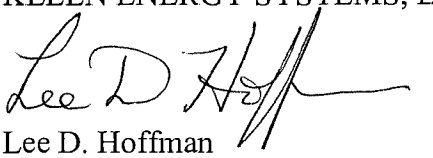
Dear Ms. Roberts:

Please find enclosed an original and twenty copies of the Thielsch Engineering report, entitled "Review of Applicable ASME Pressure Piping Code and NFPA Standards and the Evaluation of Their Effect on the Construction or Modification of the Kleen Energy Project Site, Middletown, Connecticut," dated December 3, 2010 submitted by the certificate holder, Kleen Energy Systems, LLC ("Kleen Energy"). This report is filed as a supplement to the pre-filed testimony of Mr. Richard Audette submitted on November 23, 2010. As you will recall, this report was referenced in both Mr. Corvo's and Mr. Audette's pre-filed testimonies and also in Kleen Energy's interrogatory responses dated November 15, 2010.

In addition, as you will recall, in accordance with Order 9 of Kleen Energy's revised Decision and Order, Kleen Energy submitted its pipe cleaning procedure on December 1, 2010 as part of the Docket 225C proceeding. Please be advised that Kleen Energy also requests that this procedure be included as an additional exhibit in the Docket 225D hearing scheduled for December 7, 2010. This procedure was also both referenced in both Mr. Corvo's and Mr. Audette's pre-filed testimonies and also in Kleen Energy's interrogatory responses dated November 15, 2010. Copies of the procedure have already been sent to all parties and intervenors of record in Docket 225D.

Should you have any questions concerning the foregoing, please contact me at your convenience.

Respectfully submitted
KLEEN ENERGY SYSTEMS, LLC



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December 3, 2010

Mr. Richard E. Audette
Project Director
Kleen Energy Project
O&G Industries, Inc.
1349 River Road
Middletown, CT 06457

SUBJECT: Review of Applicable ASME Pressure Piping Code and NFPA Standards and the Evaluation of Their Effect on the Construction or Modification of the Kleen Energy Project Site, Middletown, Connecticut

Dear Mr. Audette:

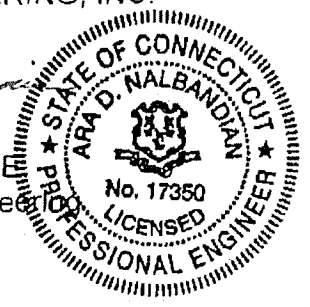
As you had requested, enclosed is our report covering the "Review of Applicable ASME Pressure Piping Code and NFPA Standards and the Evaluation of Their Effect on the Construction or Modification of the Kleen Energy Project Site, Middletown, Connecticut, and the Attachments that are referenced in the report.

I have all of the Codes and Standards that were included in the review. If additional details are required, please let me know.

Very truly yours,

THIELSCH ENGINEERING, INC.

Ara D. Nalbandian, P.E.
Vice President, Engineering



Enclosures

/dcbf

cc: Matthew O. Tobin, O&G w/Encl.

REVIEW OF APPLICABLE ASME PRESSURE PIPING CODE AND NFPA STANDARDS AND THE EVALUATION OF THEIR EFFECT ON THE CONSTRUCTION OR MODIFICATION OF THE KLEEN ENERGY PROJECT SITE, MIDDLETOWN, CONNECTICUT

Thielsch Engineering was requested by O&G Industries, Inc. ("O&G") to review the following Codes and Standards and to determine if and how changes and revisions incorporated into the following Codes and Standards listed below could effect the construction or modification of the Kleen Energy Project Site in Middletown, Connecticut, subsequent to the incident that occurred on February 7, 2010:

A. NFPA 37 (2010 Edition);
B. NFPA 54 (2009 Edition);
C. NFPA 54 Temporary Interim Amendment 09-3 (August 25, 2010);
D. NFPA 850 (2010 Edition);
E. NFPA 853 (2010 Edition);
F. ASME B31; and
G. ASME B31.1 Appendix IV and V.

According to the information provided to Thielsch Engineering, the design and construction of the Kleen Energy Project Site, was based upon the applicable Standards that were in effect in 2007. Consequently, the review conducted by Thielsch Engineering was performed to address the relevant changes and revisions included in the above listed Codes and Standards and to determine if those revisions could effect the reconstruction or modification of the Project Site subsequent to the incident that occurred on February 7, 2010.

The results of Thielsch Engineering's reviews are as follows:

NFPA 37 Standard for Installation and Use of Stationary Combustion Engines and Gas Turbines

The review of NFPA 37 Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines 2006 and 2010 Editions and Tentative Interim Amendment (TIA-10-1) December 5, 2009, indicated that there were no major changes included in the 2010 Edition that could have effected the construction or modification of the Kleen Energy Project Site.

NFPA 54 2009 Edition - National Fuel Gas Code

This Code is a safety code that shall apply to the installation of fuel gas piping systems, appliances, equipment and related accessories. The construction and operation of a piping system covered by the NFPA 54 (ANSI Z223.1) National Fuel Gas Code is limited to a maximum operating pressure of 125 psig. This Code shall not apply to fuel gas piping in electric utility power plants.

The 2006 Edition of this Code, which was in effect in 2007, also stated that NFPA 54 shall not apply to fuel gas piping in power and atomic energy plants.

It is thus evident that the construction and operating fuel gas piping at pressures higher than 125 psig installed at Kleen Energy Project Site, is not covered by the requirements of the NFPA 54 National Code for Fuel Gas Piping.

The review of NFPA 54 2009 Edition (Reference Attachment A) regarding purging of gas piping, refers to Paragraph "8.3.1 Removal from Service." This paragraph states the following: "When gas piping is to be opened for an addition, a modification of service, the section to be worked on shall be turned off from the gas supply at the nearest convenient point and the line pressure vented to the outdoors or to ventilated areas of sufficient size to prevent an accumulation of flammable mixtures. The remaining gas in this section of

pipe shall be displaced with an inert gas."

However, when piping full of air is placed in operation, the air in the piping shall be displaced with fuel gas, except where such piping is to be purged with inert gas prior to the induction of fuel gas, as required by Table 8.3.2 (Reference Attachment A).

The review of NFPA 54 Temporary Interim Amendment TIA-09-3 (Reference Attachment B) indicated that the purging of piping, as described in Paragraph 8.3 of NFPA 54 2009 Edition, is revised and the revised requirements shall be in accordance with Paragraphs 8.3.1 through 8.3.3 (TIA-09-3).

Paragraph 8.3.1 covers Piping Systems required to be purged outdoors and 8.3.3 covers "Purging Appliances and Equipment." Even though purging requirements of piping for "Removal from Service" or "Placing in Operation" are relatively similar to Paragraph 8.3 of NFPA 54 2009 Edition, additional requirements, that are detailed in Paragraphs 8.3.1.3, 8.3.1.4, 8.3.2, 8.3.2.1 and 8.3.2.2, cover piping systems allowed to be purged indoors and outdoors, purging procedures and combustible gas detectors.

Paragraph 8.3.1 also describes the characteristics of gas piping systems that are required to be purged only to the outdoors. The criteria were selected to distinguish between the piping systems located in industrial, large commercial and large multi-family buildings from those located in light commercial and smaller residential buildings. The gas piping systems installed in industrial, large commercial and large multi-family buildings are considered to be larger, more complex systems for the purposes of defining these purging requirements. Because of their layer pipe volumes or potential for higher flow rates, these systems require procedures to ensure that large volumes of fuel gases are not released indoors and that flammable mixtures do not occur within the piping itself.

Based upon the above discussions, it is apparent that NFPA 54 2009 National Fuel Gas Code (2009 Edition) and NFPA 54 Temporary Interim Amendment TIA-09-3 (August 25,

2010) would not effect the construction or modification of the Kleen Energy Project Site.

In fact, NFPA 54 specifically excludes piping in electrical utility power plants that supply gas utilized directly as the fuel in the generation of electricity. These systems typically operate at pressures greater than 125 psig (861.8 kPa) which is beyond the scope of NFPA 54.

NFPA 850 - Recommended Practice for Fire Protection of Electrical Generating Plants and High Voltage Direct Current Converter Stations - 2010 Edition

The review of NFPA 850 - 2010 Edition, indicated that new chapters on wind turbine generating facilities, solar thermal power generation, geothermal power plants and integrated gasification combined cycle (IGCC) generating facilities (Chapters 10-13) have been added. The 2010 Edition also includes recommendations for the fire protection design process and fire protection design basis documentation. Moreover, the use of compressed air foam systems and fast depressurization systems have been reorganized and recommendations for the use of these systems are included.

The review of the Tentative Interim Amendment (TIA-10-1) August 25, 2010, indicated that Paragraph 11.4.1.1 (Chapter 11 - Solar Thermal Power Generation) has been revised. The revised paragraph, provided in Attachment C, indicated that "ANSI/ASME B 31.1 Power Piping Code should be followed in the design of the HTF piping system."

The review of Chapter 8 "which identifies fires and explosion hazards of Combustion Turbines and Internal Combustion Engines and specifies recommended protection criteria," indicated that the installation and operation of combustion turbine internal combustion engine generators should be in accordance with Chapter 11 and NFPA 37 Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines. The recommended practices in NFPA 850 (8.5.1.2) also states that "Site specific design considerations or manufacturer's typical design will govern what equipment has enclosures

or how many separate enclosures will be provided for the combustion turbine." It is further stated in Paragraph 8.5.3.5 that "In order to prevent conditions that could cause a fire while the unit is operating, control packages should include the parameter monitoring and shutdown capabilities described in Chapter 7 of NFPA 37, Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines."

Additionally, the review of Tentative Interim Amendment TIA-10-2, November 9, 2010, provided in Attachment D revealed that Paragraph 7.2 "Fuel Handling - Gas" has been revised and new paragraphs and subparagraphs covering cleaning fuel gas piping, inerting prior to the introduction of fuel gas to the fuel gas piping, gas purging and maintenance and repair of fuel gas piping have been added (see Paragraphs 7.2.4 through 7.2.7.2).

Even though the review of the NFPA 850 2010 Edition would not effect construction or modification of the Project Site at Kleen Energy Project Site, the recommended practices detailed in Tentative Interim Amendment TIA-10-2, November 9, 2010, may effect the cleaning, inerting, purging and/or introduction of fuel gas to the fuel gas piping system.

In view of the above, the Fuel Gas System Pipe Cleaning Procedure which has been prepared by O&G / Kleen Energy addresses the requirements detailed in TIA-10-2. Its implementation should satisfy the NFPA 850 2010 Edition and TIA-10-2, November 9, 2010.

ASME B 31 Code for Pressure Piping

The ASME B31 Code for Pressure Piping has various sections that address the designs of specific piping systems utilized in various industries and commercial applications. The document provided in Attachment E lists the sections of B31 Pressure Piping Code and provides areas of specific application. Except for ASME B 31.1 Power Piping Code, the remaining Codes may not effect the construction or modification of the Kleen Energy Project Site.

ASME B31.1 Code for Power Piping (Appendices IV and V)

According to the information provided to Thielsch Engineering, the design and construction of the piping systems for the electric power generating station were performed in accordance with the requirements of ASME B31.1 Code for Power Piping - 2007 Edition. This code prescribes the requirements for the design materials, fabrication, erection test, inspection, operation and maintenance of piping systems.

This Code covers boilers and high temperature, high pressure water boilers, in which: steam or vapor is generated at a pressure more than 15 psig [100 kPa (gage)]; and, high temperature water is generated at pressures exceeding 160 psig [1103 kPa (gage)]; and/or, temperatures exceeding 250°F (120°C). According to the B 31.3 Code, boiler external piping shall be considered as the piping which begins where the boiler proper terminates (i.e., at the first circumferential joint for welding and connections); or the face of the first flange is bolted flanged connections; or the first threaded joint in that type of connection; and, which extends up to and including the valve or values required by this code. The terminal points themselves are considered part of the boiler external piping.

It should also be mentioned that the B 31.1 Code does not apply to the following:

a. Economizers, heaters, pressure vessels and components covered by sections of the ASME Boiler and Pressure Vessel Code;
b. Building heating and distribution steam and condensate piping designed for 15 psig [100 kPa (gage] or less, or hot water heating systems designed for 30 psig [200 kPa (gage)] or less;
c. Piping for hydraulic or pneumatic tools and their components downstream of the first block or stop valve off the system distribution header; and
d. Towers, building frames, tanks, mechanical equipment, instruments and foundations.

It should also be mentioned that since the 2010 Edition of the B 31.1 Power Piping Code

has not been issued to date, the 2007 Edition with the 2008 and 2009 Addenda would be considered as the Code that would have been applicable during the reconstruction of the Kleen Energy Project Site.

Thielsch Engineering reviewed all of summary of changes detailed in the ASME B 31.1a - 2008 and ASME B 31.1b - 2009, provided in Attachment F.

Most of the changes and/or revisions to this Code were related deletions and/or inclusion of materials (allowable stresses, reclassification by P. Numbers) referenced Standards and specifications (i.e., ASCE/SEI7, ANSI, API, ASME, ASTM, MSS, AWS, NFPA, etc.) and provided clarification to the guidelines for fabrication, assembly and erection of piping systems.

Based upon the review of these Addenda, it is concluded that since the 2010 Edition of the B 31.1 Power Piping Code has not been published to date, the requirements included in the B 31.1 Power Piping Code 2007 Edition and B 31.1a - 2008 and B 31.1b - 2009 Addenda would not effect the reconstruction or modification of the Kleen Energy Project Site.

Regarding the review of Appendices IV and V that were identified as potential areas of interest, it should be noted that both Appendices IV and V are nonmandatory. Appendix IV covers "Corrosion Control for ASME B 31.1 Power Piping Systems" and Appendix V covers "Recommended Practice for Operation, Maintenance and Modification of Power Piping Systems." Both of these nonmandatory Appendices contain guidelines that are applicable to existing operating piping contained in the scope of ASME B 31.1, as well as "new construction."

It should be recognized that during the reconstruction of the electric power generating Project Site in Middletown, CT, many sound corrosion control programs were instituted and inspection of piping and components for external and internal corrosion were performed

by O&G to ensure the acceptability of the piping systems for compliance with the requirements of the applicable Codes and Standards, including ASME B 31.1 Code for Power Piping. In addition to the inspections performed, repair and replacement considerations were incorporated to further ensure the structural integrity and performance reliability of the power piping systems, including the vessels and components.

The review of Appendix IV indicated that the minimum requirements for corrosion control of power piping systems, outlined in Appendix IV, were adequately met during the construction or modification of the Project Site.

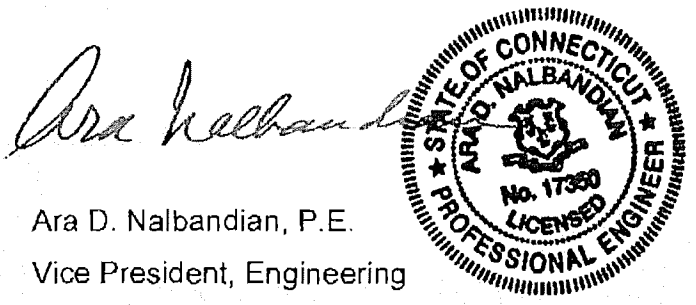
Regarding the practices recommended in Appendix V, it should be noted that the B 31.1 Power Piping Code prescribes minimum requirements for the construction of power and auxiliary service piping within the scope of the B 31.1 Code. The Code; however, does not provide rules or other requirements for a determination of optimum system function, effective plan operations, or other measures necessary to assure the useful life of the piping system. These concerns are the responsibility of the designer and after construction turnover, the Operating Company personnel responsible for plant activities.

Since the purpose of nonmandatory Appendix V is intended for achieving both reliable service and a predictable life in the operation of power piping systems, the implementation of the recommended practices would be applicable to potential modification and not to the operation and/or maintenance of the piping systems because the piping systems are considered to be "new construction or reconstruction."

In view of the above, it should be recognized that during the reconstruction of the damaged piping systems, several inspection programs were prescribed and implemented for analyzing piping system distortions or potential failures. These programs were intended to identify distortions or failures and assure compatibility between the materials and components of existing piping systems with those portions undergoing repair, replacement or modifications.

It should be noted that during the reconstruction of the electric power generating Project Site, the piping systems, including the high energy piping, were thoroughly inspected and subjected to nondestructive examinations to ensure that the general condition of the supports, hangers, guides, anchors and attachments, etc., were in the proper positions in conformance with the piping design. It should also be noted that the inspection programs and procedures were carried out by or under the direction of persons qualified by training or experience in the inspection and construction of the power plants piping and equipment designed in accordance with the applicable Codes and Standards, including ASME B 31.1 Power Piping Code.

THIELSCH ENGINEERING, INC.



Ara D. Nalbandian, P.E.
Vice President, Engineering

ATTACHMENT A

NFPA 54 NATIONAL FUEL GAS CODE - 2009 EDITION

•8.3 PURGING

NFPA® 54

ANSI Z223.1–2009

National Fuel Gas Code

2009 Edition

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8.3* Purging.

8.3.1 Removal from Service. When gas piping is to be opened for an addition, a modification, or service, the section to be worked on shall be turned off from the gas supply at the nearest convenient point and the line pressure vented to the outdoors or to ventilated areas of sufficient size to prevent accumulation of flammable mixtures. The remaining gas in this section of pipe shall be displaced with an inert gas as required by Table 8.3.1.

Table 8.3.1 Length of Piping Requiring Purging with Inert Gas for Servicing or Modification

Nominal Pipe Size (in.)	Length of Piping Requiring Purging (ft)
2½	> 50
3	> 30
4	> 15
6	> 10
8 or larger	Any length

For SI units, 1 ft = 0.305 m.

8.3.2 Placing in Operation. When piping full of air is placed in operation, the air in the piping shall be displaced with fuel gas, except where such piping is required by Table 8.3.2 to be purged with an inert gas prior to introduction of fuel gas. The air can be safely displaced with fuel gas, provided that a moderately rapid and continuous flow of fuel gas is introduced at one end of the line and air is vented out at the other end. The fuel gas flow shall be continued without interruption until the vented gas is free of air. The point of discharge shall not be left unattended during purging. After purging, the vent shall then be closed. Where required by Table 8.3.2, the air in the piping shall first be displaced with an inert gas, and the inert gas shall then be displaced with fuel gas.

Table 8.3.2 Length of Piping Requiring Purging with Inert Gas Before Being Placed in Operation

Nominal Pipe Size (in.)	Length of Piping Requiring Purging (ft)
3	> 30
4	> 15
6	> 10
8 or larger	Any length

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Table 8.3.2 Length of Piping Requiring Purging with Inert Gas Before Being Placed in Operation

Nominal Pipe Size (in.)	Length of Piping Requiring Purging (ft)

For SI units, 1 ft = 0.305 m.

8.3.3 Discharge of Purged Gases. The open end of piping systems being purged shall not discharge into confined spaces or areas where there are sources of ignition unless precautions are taken to perform this operation in a safe manner by ventilation of the space, control of purging rate, and elimination of all hazardous conditions.

8.3.4 Placing Appliances and Equipment in Operation. After the piping system has been placed in operation, all appliances and equipment shall be purged and then placed in operation, as necessary.

Chapter 9 Appliance, Equipment, and Accessory Installation

9.1 General.

9.1.1* Appliances, Equipment, and Accessories to Be Approved. Appliances, equipment, and accessories shall be approved.

9.1.1.1 Approved shall mean "acceptable to the authority having jurisdiction."

9.1.1.2 Listed appliances, equipment, and accessories shall be installed in accordance with Chapter 8 and the manufacturers' installation instructions.

9.1.1.3 Acceptance of unlisted appliances, equipment, and accessories shall be on the basis of a sound engineering evaluation.

9.1.1.4 The unlisted appliance, equipment, or accessory shall be safe and suitable for the proposed service and shall be recommended for the service by the manufacturer.

9.1.2 Added or Converted Appliances. When additional or replacement appliances or equipment is installed or an appliance is converted to gas from another fuel, the location in which the appliances or equipment is to be operated shall be checked to verify the following:

(1) Air for combustion and ventilation is provided where required, in accordance with the provisions of Section 9.3. Where existing facilities are not adequate, they shall be upgraded to meet Section 9.3 specifications.

(2) The installation components and appliances meet the clearances to combustible material

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ATTACHMENT B

NFPA 54 NATIONAL FUEL GAS CODE

•TIA-09-3, AUGUST 25, 2010

Tentative Interim Amendment

NFPA 54
National Fuel Gas Code
2009 Edition

Reference: 8.3
TIA 09-3
(SC 10-8-22/TIA Log #984R)

Pursuant to Section 5 of the NFPA Regulations Governing Committee Projects, the National Fire Protection Association has issued the following Tentative Interim Amendment to NFPA 54, *National Fuel Gas Code*, 2009 edition. The TIA was processed by the Technical Committee on National Fuel Gas Code, and was issued by the Standards Council on August 5, 2010, with an effective date of August 25, 2010.

A Tentative Interim Amendment is tentative because it has not been processed through the entire standards-making procedures. It is interim because it is effective only between editions of the standard. A TIA automatically becomes a proposal of the proponent for the next edition of the standard; as such, it then is subject to all of the procedures of the standards-making process.

1. Revise Section 8.3 to read:

8.3* Purging Requirements. The purging of piping shall be in accordance with 8.3.1 through 8.3.3.

8.3.1* Piping Systems Required to be Purged Outdoors. The purging of piping systems shall be in accordance with the provisions of 8.3.1.1 through 8.3.1.4 where the piping system meets either of the following:
1. The design operating gas pressure is greater than 2 psig (14 kPa).
2. The piping being purged contains one or more sections of pipe or tubing greater than 2 in. and exceeding the lengths in Table 8.3.1.1.

8.3.1.1 Removal from Service. Where existing gas piping is opened, the section that is opened shall be isolated from the gas supply and the line pressure vented in accordance with 8.3.1.3. Where gas piping meeting the criteria of Table 8.3.1.1 is removed from service, the residual fuel gas in the piping shall be displaced with an inert gas.

Table 8.3.1.1 Size and Length of Piping

Nominal Pipe Size (in.)	Length of Piping (ft)
2 ½	> 50
3	> 30
4	> 15
6	> 10
8 or larger	Any length

For SI units: 1 ft =304.8 mm.

8.3.1.2* Placing in Operation. Where gas piping containing air and meeting the criteria of Table 8.3.1.1 is placed in operation, the air in the piping shall first be displaced with an inert gas. The inert gas shall then be displaced with fuel gas in accordance with 8.3.1.3.

8.3.1.3 Outdoor Discharge of Purged Gases. The open end of a piping system being pressure vented or purged shall discharge directly to an outdoor location. Purging operations shall comply with all of the following requirements:
1. The point of discharge shall be controlled with a shutoff valve.
2. The point of discharge shall be located at least 10 ft (3 m) from sources of ignition, at least 10 ft (3 m) from building openings and at least 25 ft (7.6 m) from mechanical air intake openings.
3. During discharge, the open point of discharge shall be continuously attended and monitored with a combustible gas indicator that complies with 8.3.1.4.
4. Purging operations introducing fuel gas shall be stopped when 90% fuel gas by volume is detected within the pipe.
5. Persons not involved in the purging operations shall be evacuated from all areas within 10 ft (3 m) of the point of discharge.

8.3.1.4* Combustible Gas Indicator. The combustible gas indicator used during purging operations shall be listed and shall be calibrated in accordance with the manufacturer's instructions and recommended schedule. The combustible gas indicator used for pipe discharge monitoring shall numerically display a volume scale from 0% to 100% with a resolution of not greater than 1% increments.

Tentative Interim Amendment

NFPA 54
National Fuel Gas Code
2009 Edition

Reference: 8.3
TIA 09-3
(SC 10-8-22/TIA Log #984R)

Pursuant to Section 5 of the NFPA Regulations Governing Committee Projects, the National Fire Protection Association has issued the following Tentative Interim Amendment to NFPA 54, *National Fuel Gas Code*, 2009 edition. The TIA was processed by the Technical Committee on National Fuel Gas Code, and was issued by the Standards Council on August 5, 2010, with an effective date of August 25, 2010.

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1. Revise Section 8.3 to read:

8.3* Purging Requirements. The purging of piping shall be in accordance with 8.3.1 through 8.3.3.

8.3.1* Piping Systems Required to be Purged Outdoors. The purging of piping systems shall be in accordance with the provisions of 8.3.1.1 through 8.3.1.4 where the piping system meets either of the following:
1. The design operating gas pressure is greater than 2 psig (14 kPa).
2. The piping being purged contains one or more sections of pipe or tubing greater than 2 in. and exceeding the lengths in Table 8.3.1.1.

8.3.1.1 Removal from Service. Where existing gas piping is opened, the section that is opened shall be isolated from the gas supply and the line pressure vented in accordance with 8.3.1.3. Where gas piping meeting the criteria of Table 8.3.1.1 is removed from service, the residual fuel gas in the piping shall be displaced with an inert gas.

Table 8.3.1.1 Size and Length of Piping

Nominal Pipe Size (in.)	Length of Piping (ft)
2 ½	> 50
3	> 30
4	> 15
6	> 10
8 or larger	Any length

For SI units: 1 ft =304.8 mm.

8.3.1.2* Placing in Operation. Where gas piping containing air and meeting the criteria of Table 8.3.1.1 is placed in operation, the air in the piping shall first be displaced with an inert gas. The inert gas shall then be displaced with fuel gas in accordance with 8.3.1.3.

8.3.1.3 Outdoor Discharge of Purged Gases. The open end of a piping system being pressure vented or purged shall discharge directly to an outdoor location. Purging operations shall comply with all of the following requirements:
1. The point of discharge shall be controlled with a shutoff valve.
2. The point of discharge shall be located at least 10 ft (3 m) from sources of ignition, at least 10 ft (3 m) from building openings and at least 25 ft (7.6 m) from mechanical air intake openings.
3. During discharge, the open point of discharge shall be continuously attended and monitored with a combustible gas indicator that complies with 8.3.1.4.
4. Purging operations introducing fuel gas shall be stopped when 90% fuel gas by volume is detected within the pipe.
5. Persons not involved in the purging operations shall be evacuated from all areas within 10 ft (3 m) of the point of discharge.

8.3.1.4* Combustible Gas Indicator. The combustible gas indicator used during purging operations shall be listed and shall be calibrated in accordance with the manufacturer's instructions and recommended schedule. The combustible gas indicator used for pipe discharge monitoring shall numerically display a volume scale from 0% to 100% with a resolution of not greater than 1% increments.

8.3.2* Piping Systems Allowed to Be Purged Indoors or Outdoors. The purging of piping systems shall be in accordance with the provisions of 8.3.2.1 where the piping system meets both of the following:

1. The design operating pressure is 2 psig (14 kPa) or less.
2. The piping system being purged is constructed entirely from pipe or tubing of 2-in. nominal size or smaller, or larger pipe or tubing with lengths shorter than specified in Table 8.3.1.1.

8.3.2.1* Purging Procedure. The piping system shall be purged in accordance with one or more of the following:

1. The piping shall be purged with fuel gas and shall discharge to the outdoors.
2. The piping shall be purged with fuel gas and shall discharge to the indoors or outdoors through an appliance burner not located in a combustion chamber. Such burner shall be provided with a continuous source of ignition.
3. The piping shall be purged with fuel gas and shall discharge to the indoors or outdoors through a burner that has a continuous source of ignition and that is designed for such purpose.
4. The piping shall be purged with fuel gas that is discharged to the indoors or outdoors, and the point of discharge shall be monitored with a listed combustible gas detector in accordance with 8.3.2.2. Purging shall be stopped when fuel gas is detected.
5. The piping shall be purged by the gas supplier in accordance with written procedures.

8.3.2.2 Combustible Gas Detector. The combustible gas detector used during purging operations shall be listed and shall be calibrated or tested in accordance with the manufacturer's instructions and recommended schedule. The combustible gas detector used for pipe discharge monitoring shall indicate the presence of fuel gas.

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

2. Revise A.8.3 to read.

A.8.3 The process of purging gas piping of fuel gas or charging gas piping that is full of air with fuel gas must be performed in a manner that will minimize the potential for a flammable mixture to be developed within the piping. Also, a significant amount of flammable gas should not be released within a confined space. Natural gas and propane suppliers add a distinctive odor to their gas to aid in its detection. However, when a new system is brought into service and unodorized gas is detected, the company supplying the gas should be contacted to inform it of the situation and to determine what action should be taken.

A.8.3.1 Paragraph 8.3.1 describes the characteristics of gas piping systems that are required to be purged only to the outdoors. The criteria were selected to distinguish between piping systems located in industrial, large commercial, and large multifamily buildings from those located in light commercial and smaller residential buildings. The gas piping systems installed in industrial, large commercial, and large multifamily buildings are considered to be larger more complex systems for the purposes of defining their purging requirements. Because of their larger pipe volumes or potential for higher flow rates, these systems require procedures to ensure that large volumes of fuel gases are not released indoors and that flammable mixtures do not occur within the piping itself. Installers of these complex systems deal with considerably more variables that may result in a higher potential for discharge of large gas volumes during purging operations.
Specific occupancy categories such as industrial, manufacturing, commercial, and large multifamily were not included in the fuel gas code. U.S. building codes define these occupancies for the purpose of construction and safety requirements. There is no general relation between the occupancy types, as defined by the building codes, and the size of gas piping system to be installed in that occupancy. The gas piping size and operating pressure are based on the nature of the piping system and gas appliances to be installed and are not dependent upon a building's occupancy type or classification.

A.8.3.1.2 It is recommended that the oxygen levels in the piping be monitored during the purging process to determine when sufficient inert gas has been introduced. The manufacturer's instructions for monitoring instruments must be followed when performing purge operations.

A.8.3.1.4 Combustible gas indicators are available with different scales. For purging, it is necessary to use the percent gas in air scale and to follow the manufacturer's operating instructions. The % LEL scale should not be used as it is not relevant to purging.

A.8.3.2 The criteria were selected to describe typical gas piping systems located in light commercial and the smaller residential family buildings. Gas piping systems installed in these buildings are considered to be smaller and less complex systems for the purposes of defining their purging requirements. Installers have familiarity with purging these systems and the potential for discharge of large gas volumes during purging operations is low. Also see A.8.3.1.

A.8.3.2.1 Where small piping systems contain air and are purged to either the indoors or outdoors with fuel gas, a rapid and uninterrupted flow of fuel gas must be introduced into one end of the piping system and vented out of the other end so as to prevent the development of a combustible fuel/air mixture. Purging these systems can be done either using a source of ignition to ignite the fuel gas or by using a listed combustible gas indicator that can detect the presence of fuel gas.

Issue Date: August 5, 2010

Effective Date: August 25, 2010

(Note: For further information on NFPA Codes and Standards, please see www.nfpa.org/codelist)

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ATTACHMENT C

NFPA 850 - RECOMMENDED PRACTICE FOR FIRE PROTECTION FOR ELECTRIC GENERATING PLANTS AND HIGH VOLTAGE DIRECT CURRENT CONVERTER STATIONS - 2010 EDITION

•TIA 10-1, AUGUST 10, 2010

Tentative Interim Amendment

NFPA 850

Recommended Practice for Fire Protection for Electric Generating Plants and High Voltage Direct Current Converter Stations

2010 Edition

Reference: 11.4.1.1
TIA 10-1
(SC 10-8-28/TIA Log #982)

Pursuant to Section 5 of the NFPA Regulations Governing Committee Projects, the National Fire Protection Association has issued the following Tentative Interim Amendment to NFPA 850, *Recommended Practice for Fire Protection for Electric Generating Plants and High Voltage Direct Current Converter Stations*, 2010 edition. The TIA was processed by the Technical Committee on Electric Generating Plants, and was issued by the Standards Council on August 5, 2010, with an effective date of August 25, 2010.

A Tentative Interim Amendment is tentative because it has not been processed through the entire standards-making procedures. It is interim because it is effective only between editions of the standard. A TIA automatically becomes a proposal of the proponent for the next edition of the standard; as such, it then is subject to all of the procedures of the standards-making process.

1. Revise 11.4.1.1 to read as follows.

11.4.1.1* ANSI/ASME B31.1, *Power Piping*, should be followed in the design of HTF piping systems. Piping and fittings should be properly designed to resist an exposure fire until protection can be achieved by water spray. Careful consideration should be given to the design, application, construction, and installation of connections (e.g., rotating ball joint, flexible hose, etc.) employed in areas such as the HTF loop connections of adjacent solar collector assemblies so as to prevent possible sources of HTF leaks. Gaskets and seals should be compatible with HTF. Flanges and piping connections on HTF systems should have guards.

Issue Date: August 5, 2010

Effective Date: August 25, 2010

(Note: For further information on NFPA Codes and Standards, please see www.nfpa.org/codelist)

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ATTACHMENT D

NFPA 850 - RECOMMENDED PRACTICE FOR FIRE PROTECTION FOR ELECTRIC GENERATING PLANTS AND HIGH VOLTAGE DIRECT CURRENT CONVERTER STATIONS - 2010 EDITION

•TIA 10-2, NOVEMBER 9, 2010

Tentative Interim Amendment

NFPA 850

Recommended Practice for Fire Protection for Electric Generating Plants and High Voltage Direct Current Converter Stations

2010 Edition

Reference: 3.3.26, 3.3.27, and 7.2
TIA 10-2
(SC 10-10-8/TIA Log #1004)

Pursuant to Section 5 of the NFPA Regulations Governing Committee Projects, the National Fire Protection Association has issued the following Tentative Interim Amendment to NFPA 850, *Recommended Practice for Fire Protection for Electric Generating Plants and High Voltage Direct Current Converter Stations*, 2010 edition. The TIA was processed by the Technical Committee on Electric Generating Plants, and was issued by the Standards Council on October 20, 2010, with an effective date of November 9, 2010.

A Tentative Interim Amendment is tentative because it has not been processed through the entire standards-making procedures. It is interim because it is effective only between editions of the standard. A TIA automatically becomes a proposal of the proponent for the next edition of the standard; as such, it then is subject to all of the procedures of the standards-making process.

1. Add new definitions as follows:

3.3.26 Gas Purging. The act of replacing air in a fuel gas pipeline with gas by direct replacement so rapidly that a minimum of mixing between the two gases occurs.

3.3.27 Gas Blowing. The act of cleaning a fuel gas pipeline using high pressure/velocity fuel gas.

2. Revise 7.2 to read as follows:

7.2 Fuel Handling — Gas.

7.2.1* General. The storage and associated piping systems for gases in the gaseous or liquefied states should comply with ASME B31.1, *Power Piping*; NFPA 54, *National Fuel Gas Code*; NFPA 55, *Compressed Gases and Cryogenic Fluids Code*; and NFPA 58, *Liquefied Petroleum Gas Code*. For pressures exceeding the scope of the aforementioned documents, refer to ASME B31.8-2010, *Gas Transmission and Distribution Piping Systems*.

A.7.2.1 NFPA 54, *National Fuel Gas Code*, provides guidance for the design, installation, and testing of applications operating at pressures less than 125 psig (861.8 kPa), such as hot water heaters, space heaters, cooking applications, auxiliary boilers and emergency generators, and should be considered a good reference for these type applications in power generating facilities. NFPA 54 specifically excludes piping in electric utility power plants that supplies gas utilized directly as the fuel in the generation of electricity. These systems typically operate at pressures greater than 125 psig (861.8 kPa) which is beyond the scope of NFPA 54.

7.2.2 Shutoff Valve. The plant's main and igniter natural gas shutoff valve should be located near an exterior wall. The valve should be provided with both manual and automatic closing capabilities locally, and remote closing capability from the control room. The valve should be arranged to fail closed on the loss of power or pneumatic control.

7.2.3 Electrical Equipment. Electrical equipment in areas with potentially hazardous atmospheres should be designed and installed in compliance with Articles 500 and 501 of *NFPA 70, National Electrical Code*, and ANSI C2, *National Electrical Safety Code*.

7.2.4 Cleaning. The following cleaning methods should be considered when designing, installing, and testing the fuel gas piping systems:

(1)* Pigging
(2)* Aerated water jets
(3)* High-pressure water jets
(4)* Nonflammable gaseous media

A.7.2.4(1) Pigging is discussed at length in CGA G-5.6 Section 6, which describes mechanical scraping or pigging.

A.7.2.4(2) Aerated water jet flushing is a process where highly aerated water is forced as a slug down a pipe at speeds of 40 to 80 feet per second (12.2 to 24.4 meters per second) to dislodge debris, weld slag, corrosion deposits, and other foreign objects from the pipe.

A.7.2.4(3) High-pressure water jet flushing is a process where high-pressure jets are used to scour debris, weld slag, corrosion deposits, and other foreign objects from the pipe.

A.7.2.4(4) Nonflammable gaseous media methods for clearing debris from the fuel gas piping include the use of air, an inert gas (such as nitrogen), or steam. These methods employ the same principle as a gas blow, with the nonflammable medium substituted for the natural gas. The key to making any of these methods work is to achieve sufficient flow velocity within the piping system to blow any debris that can damage the equipment in operation out of the piping. Guidance regarding recommended flow rates should be provided by the equipment manufacturer.

7.2.4.1 The hazards associated with each type of cleaning media should be considered.

7.2.4.2 Gas blowing for cleaning pipe is inherently dangerous and should be avoided.

7.2.4.3 If gas blowing for cleaning pipe cannot be avoided, a flare stack should be provided for the discharge.

7.2.4.4 If a flare stack is not provided, the precautions listed in 7.2.4.4.1 through 7.2.4.4.12 should be taken.

7.2.4.4.1 Personnel responsible for directing a gas blow operation should be knowledgeable in all aspects of the operation.

7.2.4.4.2 Site specific procedures should be developed that address all aspects of the gas blow operation.

7.2.4.4.2.1 Site specific procedures should take into account guidance and parameters regarding recommended flow rates provided by the equipment manufacturer.

7.2.4.4.3 Site specific gas dispersion analyses should be conducted.

7.2.4.4.4 Potential ignition sources should be eliminated from the area.

7.2.4.4.5 Piping and associated equipment should be grounded.

7.2.4.4.6 Gas detection equipment should be placed in appropriate areas to ensure adequate gas dispersion occurs and to identify gas migration into areas where personnel or property may be at risk.

7.2.4.4.7 On-site personnel should be reduced to only those necessary to support the gas blow operation (e.g., off hours or weekend).

7.2.4.4.8 All on-site personnel should be knowledgeable of the safety protocols associated with gas blow operation.

7.2.4.4.9 Communication protocol should be established for warning personnel on site in the event of an incident, including the appropriate actions to take.

7.2.4.4.10 Discharge vent(s) should be directed upward to safe outdoor area(s) above all equipment and away from all building air intakes.

7.2.4.4.11 Public officials should be notified where interruptions to normal flow of traffic or calls from the public can be anticipated.

7.2.4.4.12 The public in the vicinity of the gas discharge should be notified if it is anticipated the public will be affected by the noise or odor.

7.2.5* Inerting. Prior to the introduction of fuel gas to the fuel gas piping, inerting should be performed.

A.7.2.5 It is often recommended that oxidants like air be diluted by a nonreactive ("inert") gas, such as nitrogen, carbon dioxide, or argon, to levels such that when a flammable gas is introduced a flammable mixture is not generated. The reverse is also true; dilute the fuel before adding air. Flammability ranges for various fuels are noted as part of Table 4.4.2 of NFPA 497. While this addresses fire hazards, the nonreactive gas is an asphyxiant and proper cautions are to be followed. This best practice is discussed in CGA G-5.6 Section 8.11.3.

7.2.6 Gas Purging. Gas purging, whether indoor or outdoor, should be attended, monitored with a combustible gas indicator, and stopped when fuel gas purity indicates completion (e.g. 95% fuel gas).

7.2.6.1 Gas purging at pressures below 125 psig (861.8 kPa) should be performed in accordance with the applicable sections of NFPA 54.

7.2.6.2 Gas purging at pressures exceeding 125 psig (861.8 kPa) should be performed in accordance with 7.2.4.2 or 7.2.4.3.

7.2.7* Maintenance and Repair. The hazards associated with flammable gases and asphyxiants should be considered when performing maintenance and repairs.

A.7.2.7 Maintenance and repair of fuel gas piping should be performed in accordance with Subsection 9.8.2 of CGA G-5.6.

7.2.7.1 Fuel gas piping should be inerted in accordance with 7.2.5 prior to maintenance and repair.

7.2.7.2 When fuel gas piping is being inerted with asphyxiants, the area should be ventilated or considered a confined space as regulated by US Department of Labor OSHA 29 CFR 1910.146, *Permit Required Confined Space Standard.*

Issue Date: October 20, 2010

Effective Date: November 9, 2010

(Note: For further information on NFPA Codes and Standards, please see www.nfpa.org/codelist)
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ATTACHMENT E

ASME B31 CODE
FOR
PRESSURE PIPING

ASME B31 - Standards of Pressure Piping

A survey of one of the most important pressure pipe codes - ASME B31, earlier known as ANSI B31

B31 Code for pressure piping, developed by American Society of Mechanical Engineers - ASME, covers Power Piping, Fuel Gas Piping, Process Piping, Pipeline Transportation Systems for Liquid Hydrocarbons and Other Liquids, Refrigeration Piping and Heat Transfer Components and Building Services Piping. ASME B31 was earlier known as ANSI B31.

B31.1 - 2001 - Power Piping

Piping for industrial plants and marine applications. This code prescribes minimum requirements for the design, materials, fabrication, erection, test, and inspection of power and auxiliary service piping systems for electric generation stations, industrial institutional plants, central and district heating plants.

The code covers boiler external piping for power boilers and high temperature, high pressure water boilers in which steam or vapor is generated at a pressure of more than 15 PSIG; and high temperature water is generated at pressures exceeding 160 PSIG and/or temperatures exceeding 250 degrees F.

B31.2 - 1968 - Fuel Gas Piping

This has been withdrawn as a National Standard and replaced by ANSI/NFPA Z223.1, but B31.2 is still available from ASME and is a good reference for the design of gas piping systems (from the meter to the appliance).

B31.3 - 2002 - Process Piping

Design of chemical and petroleum plants and refineries processing chemicals and hydrocarbons, water and steam. This Code contains rules for piping typically found in petroleum refineries; chemical, pharmaceutical, textile, paper, semiconductor, and cryogenic plants; and related processing plants and terminals.

This Code prescribes requirements for materials and components, design, fabrication, assembly, erection, examination, inspection, and testing of piping. This Code applies to piping for all fluids including: (1) raw, intermediate, and finished chemicals; (2) petroleum products; (3) gas, steam, air and water; (4) fluidized solids; (5) refrigerants; and (6) cryogenic fluids. Also included is piping which interconnects pieces or stages within a packaged equipment assembly.

B31.4 - 2002 - Pipeline Transportation Systems for Liquid Hydrocarbons and Other Liquids

This Code prescribes requirements for the design, materials, construction, assembly, inspection, and testing of piping transporting liquids such as crude oil, condensate, natural gasoline, natural gas liquids, liquefied petroleum gas, carbon

dioxide, liquid alcohol, liquid anhydrous ammonia and liquid petroleum products between producers' lease facilities, tank farms, natural gas processing plants, refineries, stations, ammonia plants, terminals (marine, rail and truck) and other delivery and receiving points.

Piping consists of pipe, flanges, bolting, gaskets, valves, relief devices, fittings and the pressure containing parts of other piping components. It also includes hangers and supports, and other equipment items necessary to prevent overstressing the pressure containing parts. It does not include support structures such as frames of buildings, buildings stanchions or foundations

Requirements for offshore pipelines are found in Chapter IX. Also included within the scope of this Code are:

- (A) Primary and associated auxiliary liquid petroleum and liquid anhydrous ammonia piping at pipeline terminals (marine, rail and truck), tank farms, pump stations, pressure reducing stations and metering stations, including scraper traps, strainers, and prover loop;
- (B) Storage and working tanks including pipe-type storage fabricated from pipe and fittings, and piping interconnecting these facilities;
- (C) Liquid petroleum and liquid anhydrous ammonia piping located on property which has been set aside for such piping within petroleum refinery, natural gasoline, gas processing, ammonia, and bulk plants;
- (D) Those aspects of operation and maintenance of liquid pipeline systems relating to the safety and protection of the general public, operating company personnel, environment, property and the piping systems.

B31.5 - 2001 - Refrigeration Piping and Heat Transfer Components

This Code prescribes requirements for the materials, design, fabrication, assembly, erection, test, and inspection of refrigerant, heat transfer components, and secondary coolant piping for temperatures as low as -320 deg F (-196 deg C), whether erected on the premises or factory assembled, except as specifically excluded in the following paragraphs.

Users are advised that other piping Code Sections may provide requirements for refrigeration piping in their respective jurisdictions.

This Code shall not apply to:

- (a) any self- contained or unit systems subject to the requirements of Underwriters Laboratories or other nationally recognized testing laboratory:
- (b) water piping;
- (c) piping designed for external or internal gage pressure not exceeding 15 psi (105 kPa) regardless of size; or
- (d) pressure vessels, compressors, or pumps,

but does include all connecting refrigerant and secondary coolant piping starting at the first joint adjacent to such apparatus.

B31.8 - 2003 - Gas Transmission and Distribution Piping Systems

This Code covers the design, fabrication, installation, inspection, and testing of pipeline facilities used for the transportation of gas. This Code also covers safety aspects of the operation and maintenance of those facilities.

B31.8S-2001 - 2002 - Managing System Integrity of Gas Pipelines

This Standard applies to on-shore pipeline systems constructed with ferrous materials and that transport gas.

Pipeline system means all parts of physical facilities through which gas is transported, including pipe, valves, appurtenances attached to pipe, compressor units, metering stations, regulator stations, delivery stations, holders and fabricated assemblies.

The principles and processes embodied in integrity management are applicable to all pipeline systems. This Standard is specifically designed to provide the operator (as defined in section 13) with the information necessary to develop and implement an effective integrity management program utilizing proven industry practices and processes.

The processes and approaches within this Standard are applicable to the entire pipeline system.

B31.9 - 1996 - Building Services Piping

This Code Section has rules for the piping in industrial, institutional, commercial and public buildings, and multi-unit residences, which does not require the range of sizes, pressures, and temperatures covered in B31.1.

This Code prescribes requirements for the design, materials, fabrication, installation, inspection, examination and testing of piping systems for building services. It includes piping systems in the building or within the property limits.

B31.11 - 2002 - Slurry Transportation Piping Systems

Design, construction, inspection, security requirements of slurry piping systems.

Covers piping systems that transport aqueous slurries of no hazardous materials, such as coal, mineral ores and other solids between a slurry processing plant and the receiving plant.

B31G - 1991 - Manual for Determining Remaining Strength of Corroded Pipelines

A supplement To B31 Code-Pressure Piping

ATTACHMENT F

ASME B31.1 - 2007 POWER PIPING

•ASME B31.1a - 2008 ADDENDA

•ASME B31.1b - 2009 ADDENDA

ASME B31.1a-2008

Addenda to ASME B31.1-2007

Power Piping

ASME Code for Pressure Piping, B31

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ASME B31.1a-2008

Following approval by the B31 Committee and ASME, and after public review, ASME B31.1a-2008 was approved by the American National Standards Institute on March 3, 2008.

Addenda to ASME B31.1-2007 are issued in the form of replacement pages. Revisions, additions, and deletions are incorporated directly into the affected pages. It is advisable, however, that this page, the Addenda title and copyright pages, and all replaced pages be retained for reference.

SUMMARY OF CHANGES

This is the first Addenda to be published to ASME B31.1-2007.

Replace or insert the pages listed. Changes given below are identified on the pages by a margin note, **(A08)**, placed next to the affected area. Revisions introduced in ASME B31.1-2007 are indicated by **(07)**. The pages not listed are the reverse sides of the listed pages and contain no changes.

Page	*Location*	*Change*
vii–ix	Committee Roster	Updated
3	Fig. 100.1.2(B)	(1) In left half of drawing, near para. 122.1.7(D) callouts, two circles indicating jurisdiction and responsibility corrected by errata to be open (2) In right half of drawing, two references to para. 122.1.7 deleted and new one added by errata
10, 10.1	101.2.5	Added
13	Equation (2)	Equation and its nomenclature revised
16–16.2	102.4.7	Added
	104.1.1	Added
	104.1.2	Title revised
	Table 102.4.7	Added
18, 18.1	104.1.4	Added
19	104.3.1(D.2)	(1) D_o deleted (OD of pipe) (2) D_{ob} and D_{oh} added
23	104.3.1(G.4)	Revised
	104.3.1(G.5)	Revised
24	Fig. 104.3.1(G)	Callouts revised
41, 42	119.10.1	Nomenclature for E_c and E_h revised
50	Fig. 122.1.7(C)	Callouts revised
62, 62.1	123.2.2(C)	Added
	123.4	Added

Page	*Location*	*Change*
	124.4	In text table, for last three entries, cross-references corrected by errata
	124.5	In text table, for last three entries, cross-references corrected by errata
63	124.6(C)	In text table, for sixth through eighth entries, cross-references corrected by errata
67	Table 126.1	(1) Under Forgings, for ASTM B 462, title revised (2) Under Seamless Pipe and Tube, ASTM B 690 added
68	Table 126.1	(1) Under Welded Pipe and Tube, second entry corrected by errata to read B 608 (2) ASTM B 675, B 676, and B 804 added (3) Under Plate, Sheet, and Strip, ASTM B 171 added, B 402 deleted, and B 688 added (4) Under Rods, Bars, and Shapes, ASTM B 691 added
70	Table 126.1	Under National Fire Codes, NFPA 54/ANSI Z223.1 added, NFPA 85 added, NFPA 1963 revised, and NFPA 8503 deleted
75	127.4.3	Revised
80	127.5.3(B)	Last paragraph revised
87–88.1	Table 132	P-No. 5B revised
93	Table 136.4	General Note (f) added
118	Table A-2	Under Electric Fusion Welded Pipe — Filler Metal Added, for both A 691 Grade 91 lines, Note (17) references deleted by errata
132, 133	Table A-3	Under Seamless Pipe and Tube, Ferritic/Austenitic, A 789 and A 790 S32205 and S32750 added
138, 139	Table A-3	Under Welded Pipe and Tube — Without Filler Metal, Ferritic/Austenitic, A 789 and A 790 S32205 and S32750 added
144, 145	Table A-3	Under Plate, Sheet, and Strip, Ferritic/Austenitic, A 240 S32205 and S32750 added
148, 149	Table A-3	Under Forgings, Ferritic/Austenitic, A 182 Grades F60 and F53 added
150, 151	Table A-3	Under Fittings, Ferritic/Austenitic, A 815 S32205 added
154, 155	Table A-3	Under Bolts, Nuts, and Studs, Austenitic, for A 453 Grade 660, stress values for 200°F through 1,000°F added

Page	*Location*	*Change*
158	Table A-3	Note (39) added
160–169	Table A-4	Under Seamless Pipe and Tube, two B 690 N08367 lines revised and two added
	Table A-4	Under Welded Pipe and Tube, two B 675 N08367 lines revised and two added
	Table A-4	Two B 676 N08367 lines revised and two added
	Table A-4	Two B 804 N08367 lines revised and two added
	Table A-4	(1) Under Plate, Sheet, and Strip, first two B 688 N08367 lines deleted (2) For four remaining B 688 N08367 lines, Temper or Condition, Nominal Composition, and Notes revised
	Table A-4	Under Bars, Rods, Shapes, and Forgings, for both B 564 N08367 lines, Temper or Condition, Nominal Composition, and Notes revised
	Table A-4	For both B 691 N08367 lines, Temper or Condition, Nominal Composition, and Notes revised
	Table A-4	Under Seamless Fittings, for both B 462 N08367 lines, Temper or Condition, Nominal Composition, and Notes revised
	Table A-4	Under Welded Fittings, two B 366 N08367 lines added
170	Table A-4	Notes (21) and (22) added
174, 175	Table A-6	Under Seamless Pipe and Tube, for second B 42 line, Size or Thickness revised
	Table A-6	For third B 42 line, Size or Thickness and stress value for 250°F revised
	Table A-6	For B 111 C60800, stress value for 350°F revised
	Table A-6	For B 280 C12200 Annealed, stress value for 200°F revised
	Table A-6	For B 466 C71500, stress values for 650°F and 700°F added
	Table A-6	Under Welded Pipe and Tube, for B 608, stress line revised
176, 177	Table A-6	(1) Under Plate, for C70600 Annealed and both C71500 lines, B 402 replaced by B 171 (2) Line for C70600 Hot rolled added

Page	*Location*	*Change*
		(3) For first C71500 line, stress values for 750°F and 800°F deleted
	Table A-6	Under Rod and Bar, for B 151 C71500, stress values for 650°F and 700°F added
	Table A-6	Under Castings, for B 148 C95200, stress value for 500°F revised, and values for 550°F and 600°F added
	Table A-6	For B 148 C95400, stress values for 550°F and 600°F added
205	Table C-1 (SI)	In column heads, top line revised
208, 209	Table C-2 (SI)	In column heads, top line revised
217–219	Mandatory Appendix F	(1) ASTM A 182/A 182M, A 240/A 240M, A 789/A 789M, A 790/A 790M, A 815, and B 462 revised (2) ASTM B 171, B 675, B 676, B 688, B 690, B 691, and B 804 added (3) NFPA 54/ANSI Z223.1 and NFPA 85 added (4) NFPA 1963 revised (5) NFPA 8503 deleted
220–226	Mandatory Appendix G	(1) Previous second D symbol replaced by d_i (2) For D_o and D_{ob}, references revised (3) For D_{obi}, definition and references revised (4) Previous second d entry deleted (5) For second E, SI units revised (6) Previous first r symbol replaced by q (7) For second R, references revised (8) W added
264	Table III-4.3.1	Revised in its entirety
265	Table III-4.3.2	Revised in its entirety
297	Index	For flexible hose, nonmetallic, entry corrected by errata to read 105.3(D)
298	Index	For pressure, reducing valves, first entry corrected by errata to read 107.1(F)
300	Index	For valves, pressure regulator, entry corrected by errata to read 107.1(F)

SPECIAL NOTE:

The interpretations to ASME B31.1 issued between January 1, 2007 and December 31, 2007 follow the last page of this Addenda as a separate supplement, Interpretations Volume 43. After the Interpretations, a separate supplement, Cases No. 33, follows.

ASME B31.1b-2009

Addenda to ASME B31.1-2007

Power Piping

ASME Code for Pressure Piping, B31

AN AMERICAN NATIONAL STANDARD

A5807B

ASME B31.1b-2009

Following approval by the B31 Committee and ASME, and after public review, ASME B31.1b-2009 was approved by the American National Standards Institute on June 3, 2009.

Addenda to ASME B31.1-2007 are issued in the form of replacement pages. Revisions, additions, and deletions are incorporated directly into the affected pages. It is advisable, however, that this page, the Addenda title and copyright pages, and all replaced pages be retained for reference.

SUMMARY OF CHANGES

This is the second Addenda to be published to ASME B31.1-2007.

Replace or insert the pages listed. Changes given below are identified on the pages by a margin note, **(A09)**, placed next to the affected area. Revisions introduced in ASME B31.1-2007 are indicated by **(07)** and revisions in ASME B31.1a-2008 are indicated by **(A08)**. The pages not listed are the reverse sides of the listed pages and contain no changes.

Page	*Location*	*Change*
vii–ix	Committee Roster	Updated
1	100.1.2(A)	Third paragraph revised
2	Fig. 100.1.2(A.1)	Former Fig. 100.1.2(A) redesignated and title revised
2.1	Fig. 100.1.2(A.2)	Added
5, 6	100.2	Definitions of *capacitor discharge welding* and *creep strength enhanced ferritic steel* added
10–12	101.5.2	Revised
	101.5.3	Revised
43	121.2(G)	Revised
44	121.7.2(A)	First paragraph revised
48, 48.1	122.1.4(A.1)	Revised
62	124.2(D)	Revised
62.1, 63	124.5	In-text table revised
	124.6(C)	In-text table revised
65	Table 126.1	ASCE/SEI 7 added
69	Table 126.1	(1) MSS SP-88 added (2) Title of MSS SP-95 revised
70	Table 126.1	AWS D10.10 added
82	Table 129.3.2	Under Material, fourth entry revised
83–84.1	131.4.9	Added
	131.5	Deleted
	131.6.1(A)	Revised

Page	*Location*	*Change*
	131.6.1(C)	Revised
	131.6.2	Added
	132.1	(1) Existing paragraph designated as 132.1.1 (2) Paragraph 132.1.2 added
	132.3.3	Added
	132.5	Revised
87, 88.2	Table 132	P-No. 5B Gr. No. 2 corrected by errata to read P-No. 15E, Gr. No. 1 in first column and P-No. 15E in General Note (b)
89, 90	132.7	Revised
92	136.4.1	Revised
102, 103	Table A-1	Under Electric Resistance Welded Pipe and Tube, A 226 deleted
110, 111	Table A-1	Under Plate, A 515 Grade 55 deleted
114, 115	Table A-2	Under Seamless Pipe and Tube, for A 213 Grade T91 and A 335 Grade P91, P-No. revised
118, 119	Table A-2	(1) Under Electric Fusion Welded Pipe — Filler Metal Added, for A 691 Grade 91, P-No. revised (2) Under Plate, for A 387 Grade 91, P-No. revised
120, 121	Table A-2	(1) Under Forgings, for A 336 Grade F91, P-No. revised (2) Under Wrought Fittings (Seamless and Welded), for A 234 Grade WP91, P-No. revised
122, 123	Table A-2	Under Castings, for A 217 Grade C12A, P-No. revised
128, 129	Table A-3	Under Seamless Pipe and Tube, Austenitic, for A 312 S31254, Specified Minimum Tensile, Specified Minimum Yield, and all stress values revised
132, 133	Table A-3	Under Centrifugally Cast Pipe, Austenitic, A 452 deleted
136, 137	Table A-3	Under Welded Pipe and Tube — Without Filler Metal, Austenitic, for A 312 S31254, Specified Minimum Tensile, Specified Minimum Yield, and all stress values revised
140, 141	Table A-3	Under Welded Pipe — Filler Metal Added, Austenitic, for A 358 S31254, Specified Minimum Tensile, Specified Minimum Yield, and all stress values revised for existing four lines and four new lines added

Page	*Location*	*Change*
144, 145	Table A-3	Under Plate, Sheet, and Strip, Austenitic, for A 240 S31254, Specified Minimum Tensile, Specified Minimum Yield, and all stress values revised for existing two lines and two new lines added
148, 149	Table A-3	Under Fittings (Seamless and Welded), Austenitic, A 403 WPS31254 added
154, 155	Table A-3	Under Bar, Austenitic, A 479 S31254 added
160, 161	Table A-4	Under Seamless Pipe and Tube, for B 622 R30556, stress values italicized at 1,150°F for second line and at 1,200°F for both lines
162, 163	Table A-4	Under Welded Pipe and Tube, for B 619 R30556, stress values italicized at 1,100°F for second line, and at 1,150°F and 1,200°F for both lines
	Table A-4	For B 626 R30556, stress values italicized at 1,100°F for second line, and at 1,150°F and 1,200°F for both lines
164, 165	Table A-4	Under Plate, Sheet, and Strip, for B 435 R30556, stress values italicized at 1,150°F for second line and at 1,200°F for both lines
166, 167	Table A-4	Under Bars, Rods, Shapes, and Forgings, for B 572 R30556, stress values italicized at 1,150°F for second line and at 1,200°F for both lines
168, 169	Table A-4	(1) Under Seamless Fittings, for B 366 R30556, stress values italicized at 1,150°F for second line and at 1,200°F for both lines (2) Under Welded Fittings, for B 366 R30556, stress values italicized at 1,100°F for second line, and at 1,150°F and 1,200°F for both lines
186, 187	Table A-8	Under Seamless Pipe and Tube, B 622 R30556 added
188–191	Table A-8	(1) Under Welded Pipe and Tube — Without Filler Metal, B 619 R30556 and B 626 R30556 added (2) Plate, Sheet, and Strip heading and B 435 R30556 added (3) Under Bars, Rods, and Shapes, B 572 R30556 added (4) Under Fittings (Seamless and Welded), B 366 R30556 added (5) Notes (6) and (7) added
217	Mandatory Appendix F	(1) ASCE/SEI 7 added

Page	*Location*	*Change*
		(2) ASTM A 182/A 182M, A 312/A 312M, A 358/A 358M, and A 403/A 403M revised
218	Mandatory Appendix F	(1) MSS SP-88 and AWS D10.10 added (2) ASME B16.1, B16.4, B16.5, B16.11, B16.21, B16.22, B16.25, B16.34, B16.48, B36.10M, and B36.19M revised
219, 219.1	Mandatory Appendix F	ASCE and SEI added
220	Mandatory Appendix G	Second *D* definition deleted by errata
295–297	Index	*capacitor discharge welding* added
298	Index	*miniature electronic boiler* and *pressure, reducing valves* revised
300	Index	(1) *valves, diaphragm* added (2) *valves, pressure regulator* revised

SPECIAL NOTE:

The interpretations to ASME B31.1 issued between January 1, 2008 and December 31, 2008 follow the last page of this Addenda as a separate supplement, Interpretations Volume 44. After the Interpretations, a separate supplement, Cases No. 34, follows.