

Department
of Transportation
Research and
Special Programs Administration
400 Seventh Street, S W
Washington, D C. 20590

MAR 13 1998

Mr. Robert F. Smallcomb, Jr.
Director, Pipeline Engineering and Safety Division
Massachusetts Department of Public Utilities
100 Cambridge St.
Boston, MA 02202

Dear Mr. Smallcomb:

We have considered your letter of February 13, 1998, notifying us that the Massachusetts Department of Public Utilities has granted the Boston Gas Company a waiver of compliance with 49 CFR 192.321(a) for plastic pipe across the Assabet River bridge on Pine Street, Concord, Massachusetts. The waiver will permit the installation of 4-inch plastic pipe above ground inside a 6-inch steel casing across the bridge. The steel-encased plastic pipe will be protected against mechanical damage and ultraviolet radiation, and meet all applicable stress limits applicable to plastic pipe.

We have no objection to the waiver. The circumstances are comparable to those of previous waivers we have approved permitting the installation of plastic pipe above ground on bridges.

Sincerely,
Richard B. Felder
Associate Administrator for Pipeline Safety

Massachusetts Department of Public Utilities
100 Cambridge St.
Boston, MA 02202

February 13, 1998

Richard B. Felder
Associate Administrator for Pipeline Safety (DPS-1)
Research and Special Programs Administration
Department of Transportation
400 Seventh Street, SW.
Washington, D.C. 20590

RE: Waiver of Pipeline Safety Regulations Dear Mr. Felder:

Being a certified agent under section 60105, Public Law 103-272, the Massachusetts Department of Public Utilities has approved a waiver to Boston Gas Company from the requirements of Title 49 C.F.R. Part 192, § 192.321(a). The waiver allows Boston Gas Company to install a 4" nominal diameter, SDR 11.5, PE2406 plastic carrier pipe into a new 6" nominal diameter, coated, welded steel casing. Approximately 80 feet of the plastic piping will not meet the burial requirements of § 192.321(a). The installation site is in Concord, Massachusetts.

As required by section 60118(d), Public law 103-272, I am forwarding a copy of the waiver to your office with the understanding that the waiver will be effective within 60 days of notification unless the Secretary objects to the waiver in writing before the effective date. Thank you for your support in this matter.

Very truly yours,
Robert F. Smallcomb, Jr.
Director, Pipeline Engineering and Safety Division

TO: Robert Smallcomb, Director
Pipeline Engineering & Safety Division

FROM: Chris Bourne
Public Utilities Engineer et

RE: DTE 97-34-L:
Plastic Pipe Bridge Crossing Proposal by Boston Gas;
Pine Street/Assabet River Bridge, Concord, MA

DATE: January 8, 1998

I have reviewed the proposal for a plastic pipe bridge crossing submitted by Boston Gas. The bridge is being reconstructed by the Massachusetts Highway Department. The casing would consist of a new 6" O.D. coated steel pipe. A 4" O.D., SDR 11.5, PE 2406 plastic pipe, inserted in the casing, would serve as the gas main. The MAOP of the main is 60 psig.

In order to install plastic pipe on the bridge, Boston Gas needs a waiver from the federal pipeline safety regulations, specifically 49 CFR Part 192.321(a): INSTALLATION OF PLASTIC PIPE. This section prohibits installation of plastic pipe aboveground, where it will be exposed to sunlight. The UV rays in the sunlight cause the plastic to deteriorate. The plastic pipe will be installed in a steel casing to protect it from the sunlight. The casing will be located in the utility bay underneath the bridge. This will minimize the temperature variations caused by exposure to direct sunlight. There are many similar installations in this and other states.

The bridge's span is 74'. The casing will rest on bridge's utility bay beams, which are located at 6' intervals. U-bolts will be installed at every other beam. Cleaning pigs will be run through the pipe to remove debris which might damage the plastic pipe. Fiberglass shields will be spaced on the plastic at 2' to 5' intervals to separate the carrier pipe from the casing. A test section of plastic pipe will be pulled through the casing to see if the shield spacing is adequate to prevent damage to the plastic pipe.

The maximum thermal contraction/expansion for the 4" line will be approximately 4". This will produce a maximum tensile stress of 585 psi; well below the allowable thermal stress. The allowable thermal stress is 72% of the 3,000 psi specified minimum yield strength (SMYS) of the pipe (2,160 psi). The tensile stress would result in a pullout force of 2,920 lbs.. A proper butt fusion can withstand a tensile force of 47,000 lbs.. The combined bending, shear, and pressure stresses on the pipe equal to 610 psi. This is also well below the allowable of 3,000 psi.

The waiver request for this crossing should be approved.

Bostongas

Mr. Robert F. Smallcomb, Director
Massachusetts Department of Public Utilities
Leverett Saltonstall Building
100 Cambridge Street
Boston, MA 02202

December 16, 1997

Dear Mr. Smallcomb:

The Massachusetts Highway Department is planning the reconstruction of one of its bridges, bridge no. C-19-019, located on Pine Street in Concord, Massachusetts. As part of the bridge reconstruction, the existing 2" steel gas main across the bridge will be removed and replaced with a new 4" plastic gas main across the bridge inside a 6" steel casing. Boston Gas is requesting approval for this new 4" plastic gas main.

In accordance with CMR 220, § 101.06 (10), I am providing the following information on the new main:

1. The nominal pipe diameter of the carrier pipe is 4 inches with a wall thickness of 0.391 inches. The material of the carrier pipe is polyethylene PE 2406 with a Specified Minimum Yield Strength (SMYS) of 3,000 psi. The carrier pipe will be housed in a 6 inch diameter steel casing pipe.
2. The maximum operating pressure of the line is 60 psig and the test pressure is 90 psig.
3. Based on the formula presented in CMR 220, § 101.06 (10), the hoop stress is estimated to be 422 psi for a test pressure of 90 psig and 281psi for a maximum operating pressure of 60 psig.
4. It is not necessary in this case to provide for expansion and contraction, since the carrier pipe is laterally restrained and the combined stresses on the pipe are within allowable limits. The thermal movements can be absorbed in the pipe and in the soil behind the bridge abutments.
5. Details for pipe supports, the number of supports and support spacing are noted on the enclosed drawing P-1 15 titled "GENERAL ARRANGEMENT AND DETAILS" for 4" Bridge Crossing, Pine Street, Concord, MA. As indicated, there will be a total of 12 supports on the bridge spaced approximately 6 feet on center.
6. The approximate location of the valves on each side of the bridge are also shown on the enclosed drawing (P-115).

I have also enclosed two copies of a petition to install plastic pipe across this bridge. Please call me at (617) 7235512 ext. 4438 if you have any questions. Thank you.

Sincerely,
Dino Papetti
Project Engineer
Engineering Services

Boston Gas Company
201 Rivermoor Street
West Roxbury, Massachusetts 02132

Mr. Robert F. Smallcornb
Director, Pipeline Engineering and Safety Division
Commonwealth of Massachusetts
Department of Public Utilities
100 Cambridge Street
Boston, MA 02202

December 16, 1997

Subject: Petition for a Waiver to Install Plastic Pipe Across Bridge No. A-2-4, Main Street (Route 27), Acton, Massachusetts

Dear Mr. Smallcornb:

In accordance with 220 CMR 101.02: Application for Exceptions and Waivers from Provisions of the D. P. U. Regulation, Boston Gas Company (the "Company") hereby petitions the Massachusetts Department of Public Utilities (the "Department") for a waiver from the provision of 49 CFR 192.321, Installation .of Plastic Pipe, paragraph (a). Paragraph (a) requires that plastic pipe must be installed below ground level.

The Company proposes to install approximately 100 feet of 4-inch nominal diameter, SDR 11.5, PE 2406, plastic pipe above ground level across the above-captioned bridge. The bridge spans the Boston and Maine Railroad. The pipeline will be a new main that will be inserted in a new casing across a new bridge.

The pipeline will be joined by heat fusion and inserted in an 8-inch nominal diameter, coated, welded, steel casing. The pipeline will be tested in accordance with Massachusetts and federal regulations so that it may be operated at 60 psig.

The specifications for the plastic pipe appear as Table 1 and Table 2 in Exhibit A; and the specifications for the casing appear as Table 1 in Exhibit B. The design of the pipeline installation across the bridge, including, but not limited to, the carrier pipe and casing supports, the number of supports, the distance between supports, and the means for maintaining a separation between the plastic pipe and the metallic casing appears in Exhibit C. In accordance with 220 CMR 101.06(10)(a)6, a 4-inch, plastic valve will be located on each side of the bridge, at the approximate distances shown in Exhibit C.

The stress on the plastic pipe will not exceed the pipe's yield strength of 3,000 psig presented in Exhibit A, Table 1 because the anticipated temperature that the pipe will experience after installation is not less than -20°F, nor greater than 100°F. The anticipated temperature of the plastic pipe at the time of its installation will be between 40°F and 60°F. Therefore, the plastic pipe will not be exposed to excessive thermal stresses, the deteriorating affects of ultraviolet light from the sun, or mechanical damage under normal operating conditions. Consequently, the Company believes that there is no safety hazard associated with the installation of the plastic pipe above ground level across the bridge, as described herein.

If you have any questions or require additional information to be submitted regarding this petition, please contact me at 723-5512, Ext. 4247, or the above address.

Very truly yours,
Peter Calderazzo, P.E. Project Engineer
Engineering Services
Attachments

EXHIBIT A
Plastic Pipe Specifications

TABLE 1
Physical Property Data For UAC 2000 Polyethylene Pipe

Property	Nominal Value
Melt Index	0.2 g/10 min
Density	0.943 g/cc
Thermal Expansion	9×10^{-5} in/in/°F
Yield Strength	3,000 psi
Flexular Modulus	100,000 psi
Thermal Conductivity	1.8 Btu/hr/sq ft/°F/in
Hydrostatic Design Basis @73°F	1,250 psi
Deflection Temperature @ 68 psi	140°F
Vicat Softening Point	248°F
Brittleness Temperature	<-180°F
Hardness, shore D	64
Flammability	1 in/min
Ultimate Elongation	>800%

TABLE 2

Plastic Pipe Data – PE 2406

Nominal Pipe Size (inches)	Standard Dimension Ratio (SDR) ¹	Average Outside Diameter (inches)	Average Inside Diameter (Inches)	Minimum Wall Thickness (Inches)	Design Pressure Rating @ 100°F (psi)
2	11.0	2.375	1.917	0.216	80
3	11.5	3.500	2.856	0.301	76
4	11.5	4.500	3.672	0.391	76
6	11.5	6.625	5.403	0.576	76
8	13.5	8.625	7.270	0.639	64
12	13.5	12.750	10.749	0.945	64

¹ SDR, Standard Dimension Ratio, is calculated by dividing the average outside diameter of the pipe by the minimum wall thickness as described in ASTM D2513.

EXHIBIT B

Casing Specifications

TABLE 1

Specifications for Casing Pipe
TYPE OF PIPE: API 5L, Grade B

Property, Dimension, or Specification

Nominal Pipe Size:	8 in.
Outside Diameter:	8.625 in.
Inside Diameter	8.125 in.
Wall Thickness:	0.250 in.
Schedule Number	20
Weight per foot:	22.36 lb
Coating:	Pritec high molecular polyethylene outer coating with butyl rubber adhesive

EXHIBIT C

Installation Design
Drawing No. P-115

GUIDELINES FOR INFORMATION TO BE INCLUDED IN
APPENDIX C

- Plan and elevation views of the bridge showing the proposed location of the casing pipe.
- Details of the casing supports, the number of supports, and the distance between supports.
- Detail of the casing insulating spacers around the plastic pipe, indicating the location of the spacers closest to the end of the casing and the distance between spacers within the casing. The distance of the first and last spacer within the casing should be no more than two feet (2') from the end of the casing. It may be more beneficial to protect the plastic pipe from potential contact with, and abrasion from, the end of the casing by placing two spacers near each end of the casing. The distance between other spacers within the casing should be such that no abrasion of the pipe will occur during insertion in the casing and by lateral deflection of the pipe during operation caused by temperature changes. In addition, the more flexible the plastic pipe is, the closer the spacers should be placed. Flexibility will depend upon the pipe size and its SDR.
- Detail of the end seals attached to the casing and the plastic pipe. The end seals should be flexible enough to provide for the difference in expansion and contraction between the steel casing and the plastic carrier pipe. The attachment to the plastic pipe should prevent potential scratching or gouging of the pipe.
- Detail of the casing vent piping. Although regulations do not require casings to be vented, at least one vent located near the end of the casing with the highest elevation may be appropriate.
- A drawing indicating the approximate location of each valve that is, or will be located, on each side of the bridge.
- A notation that a specified length of plastic pipe, with the spacers attached to it, will be drawn through the casing as a sample to demonstrate that the plastic pipe will not be damaged (e.g., gouged) when it is inserted in the casing.

Commonwealth of Massachusetts
Department of Public Utilities

February 11, 1998

D.T.E. 97-34-L

Application of Boston Gas Company for approval by the Department of Telecommunications and Energy for a waiver from the requirements in 49 C.F.R. Part 192 which mandates underground installation of plastic pipe pertaining to a bridge crossing to be located in the Town of Concord, Massachusetts.

I. BACKGROUND

On December 16, 1997, Boston Gas Company ("Boston Gas"), an intrastate natural gas distribution company that operates solely in Massachusetts, requested that the Department of Telecommunications and Energy ("Department") grant a waiver of the underground installation requirements for plastic pipe contained in 49 C.F.R. Part 192 ("Part 192"). Boston Gas seeks to install 80 feet of plastic main inside a steel casing across Bridge No. C-19-019, Pine Street, Concord. The bridge spans the Assabet River.

II. REGULATORY REQUIREMENTS

The minimum federal safety standards for transportation of natural gas by pipeline are contained in Part 192. Specifically § 192.321(a) states:

- (a) Plastic pipe must be installed below ground level.

Any waiver of any of the provisions of Part 192, granted by the Department, is subject to the approval of the Secretary of Transportation's Office of Pipeline Safety ("OPS"). The Massachusetts Pipeline Safety Code ("220 C.M.R. 101") and Public Law 103272, formerly the Natural Gas Pipeline Safety Act, require the Department to give OPS notice of any waiver at least 60 days before it becomes effective. The Department regulations at 220 C.M.R. 101.02(2) state:

The D.P.U. may issue a waiver to a gas corporation or municipal gas department from the provisions of Part 192 in title 49 of the federal regulations providing that the waiver pertains to an intrastate facility and the D.P.U. gives notice to the Department of Transportation at least 60 days before the waiver becomes effective.

Public Law 103-272 states in § 60118 Compliance and Waivers:

(d) Waivers by State Authorities. If a certification under section 60105 of this title...is in effect, the state authority may waive compliance with a safety standard to which the certification...applies in the same way and to the same extent the Secretary may waive compliance However, the authority must give the Secretary written notice of the waiver at least 60 days before its effective date. If the Secretary makes, a written objection before the effective date of the waiver, the waiver is stayed...."

III. ANALYSIS AND FINDINGS

Until very recently, part 192 did not allow plastic pipe to be installed aboveground since plastic pipe will deteriorate over time when exposed to ultraviolet radiation or temperature extremes. On June 6, 1996, OPS relaxed its requirements wherein operators are now allowed to temporarily (the lesser of the manufacturer's maximum period of exposure or two years) install uncased plastic pipe above ground provided the operator protects the pipe from external forces, ultraviolet light and extreme temperatures.

The proposed 6-inch nominal diameter plastic pipe is to be permanently installed in a new 8-inch nominal diameter, coated, welded, steel casing under the bridge. The plastic pipe, sheathed within the casing, will not be exposed to ultraviolet radiation. Casings, located in utility bays under bridges, are shielded from sunlight, resulting in smaller temperature variations to the carrier pipe inside the casing. Since 1979, many similar waivers have been granted by states and approved by OPS. OPS has approved similar waivers to the following operators in Massachusetts: Commonwealth Gas Company (1985), Blackstone Gas Company (1994), Bay State Gas Company (1996) and Boston Gas Company (1997). All of these pipelines have operated satisfactorily.

There are advantages to the use of encased plastic pipe at this bridge crossing. First, plastic pipe is not prone to corrosion, and therefore will require less maintenance than a steel pipeline. Second, a steel-encased plastic pipe is less susceptible to damage from vandalism, airborne objects and external loading.

In the expected ambient temperature range, the forces acting on the plastic pipe due to expansion and contraction are well within acceptable limits. The tensile stress due to temperature variation is 1,510 pounds per square inch gauge ("p.s.i.") which is well below 72% of the specified minimum yield strength ("SMYS") which is 3,000 p.s.i. The stresses due to pressure and bending, including the combined stresses are also well below the allowable limits established in the A.S.M.E. B31.8 which is incorporated into Part 192 by reference.

In addition, the following factors support Boston Gas' application. Casing spacers will be placed on the plastic pipe at intervals of 5 feet. These will support the carrier pipe and allow for movement due to expansion and contraction.

The steel casing shall continue past the approach slabs to approximately 7 feet. The plastic pipe will be joined by butt fusion, requiring no fittings over the encased portion of the main. The maximum allowable design pressure for the plastic pipe, determined in accordance with Part 192 § 192.121 is 64 p.s.i. Boston Gas plans to operate the pipe at no greater than 76 p.s.i. after testing it to 90 p.s.i. in accordance with Part 192 requirements. Isolation valves will be installed on the approaches to each side of the bridge in accordance with 220 CMR 101.06(10) (a)6.

IV. ORDER

Accordingly, after due consideration, it is:

ORDERED: Boston Gas Company is hereby exempted from the underground installation requirement in 49 C.F.R. Part 192 for plastic pipe to be installed on Bridge No. C-19-019, Pine Street, Concord, Massachusetts. The foregoing waiver is granted with an effective date of November 25, 1997 provided that the Secretary of Transportation or his designee does not object to the waiver prior to the effective date.

By Order of the Department,
Janet Gail Besser, Acting Chair
John D. Pat one, Commissioner