



U.S. Department of Transportation

**Pipeline and Hazardous Materials
Safety Administration**

1200 New Jersey Ave, S.E.
Washington, D.C. 20590

APR 21 2015

Mr. Christopher J. LeBlanc
Director, Gas Operations
Unitil Corporation
325 West Road
Portsmouth, NH 03801

Dear Mr. LeBlanc:

In a letter to the Pipeline and Hazardous Materials Safety Administration (PHMSA) dated September 5, 2014, on behalf of Northern Utilities, Inc. (Northern), Unitil requested an interpretation on the applicability of the Federal gas pipeline safety regulations at 49 CFR Part 192. Specifically, you asked about the requirements for maximum allowable operating pressure (MAOP) and system pressures during normal operation of a gas distribution system and during a system emergency caused by the failure of pressure regulating equipment.

You explained your system as follows: Northern operates a pressure regulating station at the point on its distribution system where it takes gas from Granite State Gas Interstate transmission pipeline.¹ At the point of interconnection, the Granite State pipeline is operated at a MAOP of 492 psig. The MAOP of Northern's downstream distribution system is 56 psig. Northern's facilities at the station are configured as a dual-run. Run 1 is the primary run. Run 2 serves as a back-up if Run 1 were ever to fail in the closed position (diagram of the line was provided). Each Run is equipped with a "worker" regulator and a "monitor" regulator. On Run 1, the set point on the "worker" regulator is 53 psig. The set point on the "monitor" regulator is 55 psig.

A pressure gage is installed approximately six feet downstream of the pressure regulation equipment. The company's supervisory control and data acquisition (SCADA) system monitors a pressure sensor that is at the end of the distribution system (at the furthest point downstream of the regulator station). Recently, a failure of the worker regulator was simulated to assess the operation of Northern's over pressure protection. As the worker regulator failed the adjacent downstream pressure gauge indicated a gradual increase in pressure to 57.2 psig for approximately one minute, after which the pressure returned to and remained at the 55 psig set point of the monitor regulator. At no point during the simulation did the pressure rise above 57.2 psig. Northern believes that the observed pressure increase to 57.2 psig for approximately one minute resulted from the normal build-up pressure due to the mechanical operation of the monitor regulator. This assessment has been confirmed by the manufacturer of the regulator.

¹ Northern and Granite State are wholly owned subsidiaries of Unitil Corporation.

The Pipeline and Hazardous Materials Safety Administration, Office of Pipeline Safety provides written clarifications of the Regulations (49 CFR Parts 190-199) in the form of interpretation letters. These letters reflect the agency's current application of the regulations to the specific facts presented by the person requesting the clarification. Interpretations do not create legally-enforceable rights or obligations and are provided to help the public understand how to comply with the regulations.

During this simulated failure, the SCADA pressure sensor at the end of the Northern system did not register a pressure increase to 57.2 psig. The SCADA pressure sensor registered a pressure of 53 psig before the failure simulation, and a pressure of 55 psig after the failure simulation until the worker regulator was returned to service at 53 psig.

Based on the above information, Northern requests interpretation on the following two issues:

1. During normal operation (i.e., no system emergency) of a high pressure distribution system with a properly established MAOP of 56 psig, does the operator violate § 192.621(a) if the system is operated above 56 psig?
2. During a system emergency, such as a failed worker regulator, on a high pressure distribution system with a properly established MAOP of 56 psig, does the operator violate § 192.201(a) if the system pressure does not exceed 62 psig?

Section 192.621(a) states:

- (a) No person may operate a segment of a high pressure distribution system at a pressure that exceeds the lowest of the following pressures, as applicable:
- (1) The design pressure of the weakest element in the segment, determined in accordance with subparts C and D of this part.
 - (2) 60 psi (414 kPa) gage, for a segment of a distribution system otherwise designed to operate at over 60 psi (414 kPa) gage, unless the service lines in the segment are equipped with service regulators or other pressure limiting devices in series that meet the requirements of § 192.197(c).
 - (3) 25 psi (172 kPa) gage in segments of cast iron pipe in which there are unreinforced bell and spigot joints.
 - (4) The pressure limits to which a joint could be subjected without the possibility of its parting.
 - (5) The pressure determined by the operator to be the maximum safe pressure after considering the history of the segment, particularly known corrosion and the actual operating pressures.

Response 1 – Yes, the operator violates § 192.621(a) if the MAOP is exceeded during normal operating conditions. Under the regulation, operators must use pipeline pressure control equipment sized for pressure control with pressure sensors, actuators and control or relief valves that react in a timely manner and have pressure settings that do not exceed MAOP in accordance with Part 192.

Section 192.201(a) states:

- (a) Each pressure relief station or pressure limiting station or group of those stations installed to protect a pipeline must have enough capacity, and must be set to operate, to insure the following:

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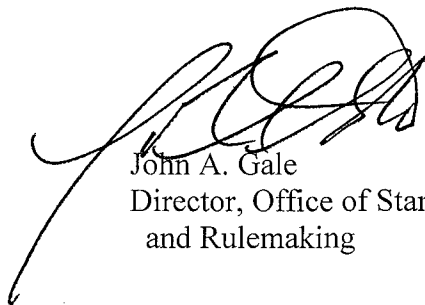
- (1) In a low pressure distribution system, the pressure may not cause the unsafe operation of any connected and properly adjusted gas utilization equipment.
- (2) In pipelines other than a low pressure distribution system:
 - (i) If the maximum allowable operating pressure is 60 psi (414 kPa) gage or more, the pressure may not exceed the maximum allowable operating pressure plus 10 percent, or the pressure that produces a hoop stress of 75 percent of SMYS, whichever is lower;
 - (ii) If the maximum allowable operating pressure is 12 psi (83 kPa) gage or more, but less than 60 psi (414 kPa) gage, the pressure may not exceed the maximum allowable operating pressure plus 6 psi (41 kPa) gage; or
 - (iii) If the maximum allowable operating pressure is less than 12 psi (83 kPa) gage, the pressure may not exceed the maximum allowable operating pressure plus 50 percent.

Response 2 – No, the operator does not violate § 192.201(a) as long as the MAOP limits are met during a system emergency and the pipeline meets the Subpart D - Design of Pipeline Components requirements. In this case, the emergency operating limit is 62 psi (56 + 6 psi). Emergency operating overpressure conditions are only allowed for the time required to activate the overpressure protection device and are not meant for long term or frequently occurring normal operating or periodic maintenance conditions and, therefore, require immediate response by the operator either to shut down or reduce the operating pressure to the normal operating conditions.

Finally, we would note that based upon your actions described in your letter, there may be some confusion about appropriate testing and maintenance of a pressure limiting or regulator station for buildup and set point. Conducting a simulated test on a pressure limiting or regulator station that is not isolated from the system does not constitute a system emergency. It is a normal operation subject to the limitations described above. The pressure limiting or regulator station should be isolated from the system prior to any testing of buildup and set points.

If we can be of further assistance, please contact Tewabe Asebe of my staff at 202-366-5523.

Sincerely,



John A. Gale
Director, Office of Standards
and Rulemaking

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September 5, 2014

SEP 09 2014

Mr. Jeff Wiese
Associate Administrator
U.S. Department of Transportation
Pipeline and Hazardous Materials Safety Administration
East Building, 2nd Floor
1200 New Jersey Ave., SE
Washington, DC 20590

Dear Mr. Wiese:

I am writing on behalf of Northern Utilities, Inc. d/b/a Unitil ("Northern") to request an interpretation from the Pipeline and Hazardous Materials Safety Administration ("PHMSA") on two questions regarding the requirements of 49 C.F.R. Part 192 concerning maximum allowable operating pressure ("MAOP"). Our questions relate to MAOP and system pressures during normal operation of a distribution system and during a system emergency caused by the failure of pressure regulating equipment.

We believe some pertinent background on our distribution system configuration and the results of a recent regulator station failure simulation would be helpful to you.

System Configuration

Northern operates a pressure regulating station at the point on its distribution system where it takes gas from Granite State Gas Transmission, Inc.'s ("Granite State") interstate transmission pipeline.¹ Attachment A is a schematic of the station, which I am providing for your reference.

Granite State's system at the point of interconnection is operated at an MAOP of 492 psig. The MAOP of Northern's downstream distribution system is 56 psig.

Northern's facilities at the station are configured as a dual-run. Run 1 on Attachment A is the primary run. Run 2 serves as a back-up if Run 1 were ever to fail in the closed position.

Each Run is equipped with a "worker" regulator and a "monitor" regulator. On Run 1,

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Christopher J. LeBlanc
Director, Gas Operations
leblanc@unitil.com

325 West Road
Portsmouth, NH 03801

the set point on the "worker" regulator is 53 psig, which is 3 psig below the Northern system MAOP. The set point on the "monitor" regulator is 55 psig, which is 1 psig below the Northern system MAOP.

This configuration is designed to provide over pressure protection as follows: if the "worker" regulator (set at 53 psig) were to ever fail to control downstream system pressure, the "monitor" regulator would limit the downstream system pressure on Northern's system to 55 psig (1 psig below MAOP).

A pressure gage is installed approximately six feet downstream of the pressure regulation equipment. The Company's SCADA system monitors a pressure sensor that is at the end of the distribution system (in other words, at the furthest point downstream of the regulator station).

Failure Simulation

Recently, a failure of the worker regulator was simulated to assess the operation of Northern's over pressure protection. As the worker regulator was failed the following was observed: the adjacent downstream pressure gauge indicated a gradual increase in pressure to a high of 57.2 psig for approximately one minute, after which the pressure returned to, and remained at, the 55 psig set point of the monitor regulator. At no point during the simulation did the pressure rise above 57.2 psig. Northern believes that the observed pressure increase to 57.2 psig for approximately one minute resulted from the normal build-up pressure due to the mechanical operation of the monitor regulator. Unitil's assessment has been confirmed by the manufacturer of the regulator.

During this simulated failure, the SCADA pressure sensor at the end of the Northern system did not register a pressure increase to 57.2 psig. The SCADA pressure sensor registered a pressure of 53 psig before the failure simulation, and a pressure of 55 psig after the failure simulation until the worker regulator was returned to service at 53 psig.

Questions for Interpretation

Northern requests interpretation from PHMSA on two issues:

- (1) During normal operation (i.e., no system emergency) of a high pressure distribution system with a properly established MAOP of 56 psig, does the operator violate 49 C.F.R. § 192.621(a) if the system is operated above 56 psig?
- (2) During a system emergency, such as a failed worker regulator, on a high pressure distribution system with a properly established MAOP of 56 psig, does the operator violate 49 C.F.R. § 192.201(a) if the system pressure does not

exceed 62 psig?

A. Northern's Position.

Northern believes that the answer to Question 1 is "yes," an operator violates the code if during normal operations it purposefully operates the system above its properly determined MAOP. Although Part 192 does not permit a system to be operated above MAOP, the code does allow system pressures that are slightly above MAOP caused by a failure of pressure regulating equipment. For a high pressure distribution system with an MAOP of 56 psig, Section 192.201(a)(2) allows the maximum system pressure during a system emergency to be no greater than 6 psig over MAOP, or 62 psig. Therefore, Northern believes that the answer to Question 2 is "no," there is not a code violation if the system pressure is 62 psig or lower during a system emergency. The rest of this letter explains Northern's position in greater detail.

B. Code Analysis.

MAOP is defined in 49 C.F.R. § 192.3 (Definitions) as "the maximum pressure at which a pipeline or segment of a pipeline may be operated under this part." Section 192.619 provides the means for determining MAOP for plastic and steel pipelines, Section 192.621 provides the means for determining MAOP for high pressure distribution systems and Section 192.623 provides the means for determining MAOP for low pressure distribution systems. Specifically, Section 192.621(a) begins as follows:

(a) No person may operate a segment of a high pressure distribution system at a pressure that exceeds the lowest of the following pressures, as applicable

Section 192.621(a), therefore, prohibits the "operation" of a distribution system at a pressure that exceeds the lowest of several pressures stated in Section 192.621(a). Although "operate" is not defined in Part 192, based on the context in which it is used in Part 192 we believe "operate" refers to the normal day-to-day operation of the system, and is not intended to include a system emergency caused by the failure of a worker regulator. See 49 C.F.R. § 192.605(a) (requiring operators to prepare and follow "a manual of written procedures for conducting operations and maintenance activities and for emergency response"); 49 C.F.R. § 192.605(b) (listing procedures that must be included in the O&M manual for "maintenance and normal operations" of system).

Accordingly, we believe that maximum allowable operating pressure is exactly what it says it is: the maximum pressure at which a system can be operated under normal operating conditions. Therefore, Northern believes that the answer to Question 1 is yes, an operator violates the code if during normal operations it purposefully operates the system above its properly determined MAOP (which is 56 psig in the Northern

example we have given).

Although MAOP addresses normal operating conditions, Part 192 recognizes that events can happen through component failures that the system must be designed to withstand. For example, Subpart D of Part 192 (Design of Pipeline Components) states that it:

Prescribes minimum requirements for the design and installation of pipeline components and facilities . . . In addition, it prescribes requirements relating to protection against accidental over pressuring.

49 C.F.R. § 192.141 (Scope of Subpart D).

One of the provisions in Subpart D that relates to protection against "accidental over pressuring" is Section 192.195:

§192.195 Protection against accidental over pressuring.

(a) *General requirements.* Except as provided in §192.197, each pipeline that is connected to a gas source so that the maximum allowable operating pressure could be exceeded as the result of pressure control failure or of some other type of failure, must have pressure relieving or pressure limiting devices that meet the requirements of §§192.199 and 192.201. . . .

Under Section 192.195, when pressure on a pipeline could exceed MAOP due to failure of a pressure control device, the pipeline must have pressure relieving or pressure limiting devices that meet the requirements of Section 192.201. Section 192.201 states:

§192.201 Required capacity of pressure relieving and limiting stations.

(a) Each pressure relief station or pressure limiting station or group of those stations installed to protect a pipeline must have enough capacity, and must be set to operate, to insure the following:

* * * *

(2) In pipelines other than a low pressure distribution system:

(i) If the maximum allowable operating pressure is 60 p.s.i. (414 kPa) gage or more, the pressure may not

exceed the maximum allowable operating pressure plus 10 percent, or the pressure that produces a hoop stress of 75 percent of SMYS, whichever is lower;

(ii) If the maximum allowable operating pressure is 12 p.s.i. (83 kPa) gage or more, but less than 60 p.s.i. (414 kPa) gage, the pressure may not exceed the maximum allowable operating pressure plus 6 p.s.i. (41 kPa) gage; or

(iii) If the maximum allowable operating pressure is less than 12 p.s.i. (83 kPa) gage, the pressure may not exceed the maximum allowable operating pressure plus 50 percent.

Under Section 192.201(a)(2), pressure relief and pressure limiting stations for the protection of high pressure systems must be set to operate at no more than a specified pressure in excess of MAOP. This pressure difference between MAOP and the maximum pressure is determined based on the system's MAOP. For systems with an MAOP between 12 and 59 psig, the pressure regulator used for pipeline protection can be set to achieve a system pressure that is no more than 6 psig above the system MAOP. For a 56 psig high pressure system, the overpressure protection monitor pressure regulator must be set to a set point no greater than 62 psig.

This 6 psig pressure difference is necessary to allow the system to be operated at its MAOP, while also allowing overpressure protection devices to operate properly without interfering with system pressure regulation. In a worker-monitor configuration such as Northern's, there must be enough separation between the set points of the worker regulator and monitor regulator so they do not "fight" for control of system pressure. This "fighting" results from the typical operation of a pressure regulator, including the normal pressure build-up when a regulator takes control of system pressure.² When the regulators "fight," the result is unstable system operation, pressure surges, and premature wear of the regulator components (such as diaphragms and springs). When

² If the set points for the worker regulator and the monitor regulator are too close, they will fight to control the system pressure due to the normal operating characteristics of pressure regulators. Consider, for example, a system where the set point for the monitor regulator is set only 1 psig higher than the set point for the worker regulator. During normal operation of the worker regulator, it will open and close to maintain pressure at its set point. When the monitor regulator senses the system pressure at its set point, it will begin to close, causing system pressure to decrease and then reopen as it senses the system pressure decrease. The worker, in response to decreasing pressure caused by the monitor closing, will re-open, and the monitor will again begin to close, setting up a cycle where the two regulators alternate back and forth or "fight" for control.

there is sufficient separation between the set points for the worker and monitor, there is no "fighting" between the two regulators. The worker can do its job maintaining system pressure, and the monitor can stand by ready to regulate system pressure if the worker malfunctions such that it fails to regulate downstream pressure.

Section 192.201(a)(2) allows overpressure protection to be effective and avoids "fighting" regulators. The 6 psig difference for 12-59 psig MAOP systems allows the two regulators to each serve their respective function without interference by the other regulator. If the worker regulator fails to regulate downstream system pressure, the monitor regulator will take control and regulate system pressure at a pressure that could exceed MAOP, but not so much greater than MAOP that it would compromise the safety or integrity of the system while the worker regulator is repaired or replaced.

Finally, it is important to understand that the code recognizes that pressure regulators are mechanical devices that naturally experience "build-up" pressure situations. Section 192.605(b) lists the requirements of an operator's O&M manual. Section 192.605(b)(5) requires the O&M manual to include procedures for:

(5) Starting up and shutting down any part of the pipeline in a manner designed to assure operation within the MAOP limits prescribed by this part, plus the build-up allowed for operation of pressure-limiting and control devices.

Section 192.605(b)(5) takes into consideration that pressure limiting and control devices have "allowed" build-up pressures, and during start up and shut down these pressure build-ups may temporarily result in a system pressure that exceeds MAOP. These build-up pressures are exactly what Northern experienced when the failure of the worker regulator was simulated and the monitor regulator set at 55 psig allowed the system pressure to rise to 57.2 psig for about a minute during pressure build-up before returning the system pressure to the monitor regulator's 55 psig set point (which was still below the 56 psig system MAOP). What Northern experienced was simply the acceptable build-up pressure that is normal for a monitor regulator used to prevent system over pressuring. And, in any event, the pressure on the system never exceeded the allowed 62 psig, even at the pressure gauge that is adjacent to the point of regulation.

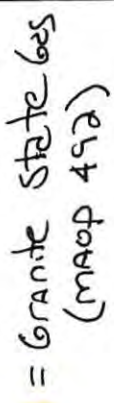
For these reasons, Northern believes that the answer to Question 2 is "no," there is no violation of the Code if during a system emergency (such as the failure of a worker regulator) the pressure on a 56 psig MAOP high-pressure system rises above MAOP but does not exceed 62 psig.

We look forward to your response to the questions we have presented. If you need any further background information, or if anything in this letter needs clarification, I hope you will not hesitate to call me.

Sincerely

A handwritten signature in black ink, reading "Christopher J. LeBlanc". The signature is fluid and cursive, with the first name "Christopher" and last name "LeBlanc" clearly legible.

Christopher J. LeBlanc
Director, Gas Operations



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