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September 28, 2020

VIA ELECTRONIC MAIL

Mark Marini, Secretary
Department of Public Utilities
One South Station, 5th Floor
Boston, MA 02110

Re: Bay State Gas Company d/b/a Columbia Gas of Massachusetts – D.P.U. 19-140
Compliance Agreement Consent Order Requirements (13), (14), (16), and (29)

Dear Mr. Marini:

Pursuant to the Consent Order, and associated Compliance Agreement, dated August 14, 2020, between the Pipeline Safety Division (the "Division") of the Massachusetts Department of Public Utilities and Bay State Gas Company d/b/a Columbia Gas of Massachusetts ("CMA" or the "Company") in the above-captioned matter, the Company hereby provides the following responses to address the requirements of Items 13, 14, 16, and 29 of the Consent Order. Also enclosed is the Company's Motion for Protective Treatment and statement in support of a finding of Critical Energy Infrastructure Information.

Compliance Agreement Requirement (13)
Within 45 days of the effective date of this Order, CMA shall requalify all Meter & Regulator technicians on the following covered tasks:

a. CT38A – Starting Up or Shutting Down Any Part of a Pipeline that Could Cause the MAOP to be Exceeded;

b. CT59 & CT60 – Controlling and Monitoring Gas Pressures and Flows;

c. CT61 – Inspecting a Pressure Recording Gauge;

d. CT62A, CT63A, & CT65A – Inspect and Test Pressure Regulation Station, Including Heating Equipment;

e. CT64 – Inspecting Telemetering Equipment at a Pressure Limiting or Regulating Station;

f. CT66A – Field Interpretation of Pressure Recording Charts and Electronic Devices;

g. CT67 – Inspecting a Pressure Regulating Vault; and

h. CT72A – Installing and Turning Off Residential, Small Commercial, Large Commercial and Industrial Meters and Regulators.

Response:

CMA has requalified all Meter & Regulator technicians on the covered tasks listed in Compliance Agreement Requirement (13), with the exception of three employees who have each failed at least one task listed above. These employees will be re-trained and re-tested in order to requalify. Additionally, these employees will not work alone until they have passed all tests. The Company will provide documentation of these requalifications upon completion. Attachment 19-140-13 contains a list of technicians and the dates on which they were requalified in the tasks.

Compliance Agreement Requirement (14)
Within 45 days of the effective date of this Order, CMA shall documentation to the Department to show that it has complied with Item 13.

Response:

Please see the above response, and Attachment 19-140-13.

Compliance Agreement Requirement (16)
Within 45 days of the effective date of this Order, CMA shall provide documentation to the Department to show that it has completed all action items developed, based on key failures addressed in the incident report with Item 15.

Response:

Please see Table 1, below, and corresponding attachments for completion details of all action items developed, based on key failures addressed in the incident reports filed with Item 15.

Table 1:

Item Identifier	Action Item Developed	Completed Date	Completed Details
South Main St 1	Senior management to reinforce requirement to follow gas standards at all times, and continually remind employees of importance of doing so.	8/26/2019	Employee obligation to follow gas standards is reinforced through enhancement of Standard Operating Procedures and SMS implementation. In 2020 summaries of internal incident reviews have been provided to all employees, to continually remind

Item Identifier	Action Item Developed	Completed Date	Completed Details
			employees of importance of following gas standards.
South Main St 2	QA/QC the M&R technicians to determine if they are following procedure and/or require additional training. Review outcome of Station Audit and items identified for follow-up.	5/3/2019	See Attachment 19-140-16(a) CONFIDENTIAL for findings of the audit on the technician involved with the incident and follow-up actions. The technician was also requalified and trained. Documentation on the requalification is also included in Attachment 19-140-16(a) CONFIDENTIAL. There was a second technician on site at the time, but he was in training at the time and was not performing work.
South Main St 3	1750.010 & 1170.040 Gas Standard Review. Supply Compliance with batch sheets.	6/9/2019	See Attachment 19-140-16(b) CONFIDENTIAL. The individual on leave will review the standards upon returning.
South Main St 4	Submit modification to GS 1750.010 Standards Evaluation & Approval System (SEAS) request needs to be submitted expanding on procedures (gauges).	6/1/2020	See Attachment 19-140-16(c) for revised GS 1750.010. The standard was most recently updated in September 2020, and the modifications related to gauges have been incorporated into GS 1750.010 Section 5.3.
South Main St 5	Submit SEAS to review GS 1750.010, 1170.040, and 1750.210. Correct any conflict between them (Calling Gas Control).	6/1/2020	See Attachment 19-140-16(c) for revised GS 1750.010, 1170.040, and 1750.210.
South Main St 6	GS 1750.010 modified 4/12/2019 removing language about contacting Gas Control when performing work "onsite." Include in SEAS request to restore	6/1/2020	See Attachment 19-140-16(c) for revised GS 1750.010 The modifications related to calling Gas Control have been implemented and incorporated into GS 1750.010 Section 2. The scope of call outs to Gas Control has expanded

Item Identifier	Action Item Developed	Completed Date	Completed Details
	language requiring a call to Gas Control when work is performed on site of a SCADA monitored station. (1) Establish communications between control room representatives, operator's management, and associated field personnel when planning and implementing physical changes to pipeline equipment or configuration; (2) Require field personnel to contact the control room when emergency conditions exist and when making field changes that affect control room operations; and (3) Seek control room or control room management participation in planning prior to implementation of significant pipeline hydraulic or configuration changes.		beyond just stations monitored by SCADA.
South Main St 7	Verify RTs created/dates appropriate/process for turning on and off catalytic heater. Work with Engineering for appropriate times during the year. Review types of work that need specific job order for station work.	9/24/2020	See Attachment 19-140-16(d) for RTs created for each catalytic heater in the territory.

Item Identifier	Action Item Developed	Completed Date	Completed Details
South Main St 8	Create a Pre-Job briefing for M&R work. Require all parties on-site to review risks.	8/5/2019	See Attachment 19-140-16(e) for the pre-job briefing form that is required to be reviewed by all parties on-site.
South Main St 9	Create a checklist for jobs within regulator stations.	8/5/2019	Attachment 19-140-16(e) contains the pre-job briefing as well as the checklist that is used for jobs within regulator stations. The checklist was revised to align with GS 1750.010's recent revision. Attachment 19-140-16(f) for the batch sheet of the recent review of the checklist and pre-job briefing form. There were employees unavailable during this review. The Company will file a supplemental response once all employees have completed the review. The Company will continue to enhance standard operating procedures at the M&R stations and details will be supplied in response to DPU 19-140 Consent Order item 12.
South Main St 10	Tagging of control lines and painting or other visual indicators on valves, so as to more clearly identify the equipment and operations of the equipment within the station.	8/14/2019	See Attachment 19-140-16(g) for photo of visual indicators placed on control line and valves at the South Main Street station.
South Main St 11	Verify and tag catalytic heater valves locations at stations.	7/15/2019	Completed per M&R leader and System Ops Manager.
South Main St 12	Review and modify Training Document CDOPM4H.1 Operating and Maintaining Catalytic Heater	2/21/2020	See Attachment 19-140-16(h). Pages 46 and 47 of the Catalytic Heater Installation, Start-Up and Maintenance

Item Identifier	Action Item Developed	Completed Date	Completed Details
	Installations to include seasonal shut-off steps.		section include the added seasonal shut-off steps.
South Main St 13	Review training material for the proper procedure for proceeding forward on a "DO NOT OPERATE" tag.	9/20/2019	There is no training material for proper procedure related to a "DO NOT OPERATE" tag. M&R leader coached technicians verbally on tag. In addition to verbal coaching, see Attachment 19-140-16(f) CONFIDENTIAL for batch sheet of recent review. The Company will file a supplemental response once all employees have completed the review.
South Main St 14	Review process with Gas Control and notification to Integration Center (Over/Under Pressurization)	7/31/2019	See Attachment 19-140-16(i) for the Communications Matrix document that is utilized by Gas Control and the Integration Center to manage communication during events. Following the South Main Street overpressurization, the notification process was reviewed via email communication, as shown in Attachment 19-140-16(j). No alterations to the matrix were required.
South Main St 15	Educate on municipalities practices on incidents (reverse 911, town notifications)	7/12/2019	See Attachment 19-140-16(k) for the letter template that was sent to each municipality the week of 7/8/2019, requesting practices during incidents.
South Main St 16	Proactive – secure the cell phone numbers for all Fire Chiefs in territory	8/28/2019	See Attachment 19-140-16(l) CONFIDENTIAL for fire chief and police chief contact information by municipality.
South Main St 17	Comprehensive review of station. Reconfigure control system.	9/25/2020	See Attachment 19-140-16(m) for the executed job order associated with the reconfiguration.
South Main St 18	Review 3 additional district stations with same high pressure	9/26/2020	See Attachment 19-140-16(n) for the executed job orders associated with the reconfigurations. Please note there are

Item Identifier	Action Item Developed	Completed Date	Completed Details
	differential and reconfigure them if possible.		only two additional stations that required reconfiguration. The reference to three included the work done at South Main St.
South Main St 19	Develop plan to investigate and remediate if needed any Gate Stations that also may have similar high differentials in pressure.	9/8/2020	See Attachment 19-140-16(o) for a five-year plan of investigating and remediating stations with high pressure differentials. Attachment 19-140-16(p) lists the stations that will be investigated, and Attachment 19-140-16(q) details the potential options for remediation.
Chicopee 1	Create a step-by-step checklist of items to be completed (and consider requiring signoff on each step) for this type of maintenance activity.	03/13/2021	A step-by-step checklist of items to be completed for this type of maintenance activity is expected to be created as part of the site-specific procedures assessment that is currently being led by Eversource and is referenced in DPU 19-140 Consent Order item 10.
Chicopee 2	Create a rigorous field culture of following step-by-step procedures when executing routine maintenance activities.	Ongoing	The culture of following step-by-step procedures when executing routine maintenance activities will be implemented upon completion of the site-specific procedure assessment DPU 19-140 Consent Order item 10.

Compliance Agreement Requirement (29)
Within 45 days of the effective date of this Order, CMA shall revise construction inspector and QA/QC roles to not only correct findings real time, but also create accurate and complete documentation of tasks inspected, findings and resolutions.

Response:

The CMA QA/QC department uses the iAuditor program to document tasks inspected, findings, and resolutions. Use of this program has now been extended to include CMA Construction Inspectors, effective on the date of the Inspectors' training on the program. Training on the expectations and use of this program were completed with all CMA Construction Inspectors

responsible for overseeing construction crews using the guidance provided in Attachment 19-140-29(a). These expectations include creating accurate and complete documentation, as well as correcting findings in real time when possible, escalating findings to leadership if they cannot be corrected at the time of finding, and exercising and documenting the use of "stop work authority" if needed. Leaders of both QA/QC employees and Construction Inspectors shared expectations on the importance of accurate, complete, and thorough documentation of tasks inspected, findings, and corrective actions through the use of the iAudtior program. Documentation of these meetings is provided as Attachment 19-140-29(b) (Construction Inspectors) and Attachment 19-140-29(c) (QA/QC employees). Please note that some Construction Inspectors were not available for these reviews because they were off work due to Short Term Disability. These employees are indicated by "N/A – Short Term Disability." These employees will receive the training upon their return to work.

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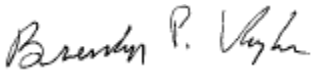
Thank you very much for your attention to this matter. Please contact me with any questions.

Very truly yours,



Brendan P. Vaughan

Enclosures

Cc: Laurie E. Weisman, Esq. – Hearing Officer
Service List, D.P.U. 19-140

COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF PUBLIC UTILITIES

Bay State Gas Company d/b/a Columbia Gas of Massachusetts	)	D.P.U. 19-140

MOTION OF COLUMBIA GAS OF MASSACHUSETTS FOR PROTECTIVE TREATMENT OF CONFIDENTIAL INFORMATION ANDSTATEMENT IN SUPPORT OF A FINDING OF CRITICAL ENERGY INFRASTRUCTURE INFORMATION

I. INTRODUCTION

Bay State Gas Company d/b/a Columbia Gas of Massachusetts ("CMA" or the "Company") hereby requests the Department of Public Utilities (the "Department") grant protection from public disclosure of certain confidential, competitively sensitive and proprietary information submitted in compliance with a Consent Order and Compliance Agreement, dated August 14, 2020, with the Department's Pipeline Safety Division (the "Division") in accordance with G.L. c. 25, § 5D, G.L. c. 4 , §7 cl. 26(f) and (n), and 220 C.M.R. § 1.04(5)(e).

Specifically, the Company requests that the Department protect from public disclosure confidential personal employee information contained in Attachments 19-140-16(b) and (f), internal audit information produced in Attachment 19-140-16(a), and non-public contact information associated with police and fire department chiefs produced as Attachment 19-140-16(l) (together the "Confidential Attachments") and that the Department protect from public disclosure detailed maps, schematics, photographs, and analysis containing Confidential Energy Infrastructure Information ("CEII") produced as Attachment 19-140-16(g), Attachment 19-140-16(p), and Attachment 19-140-16(q) (the "CEII Attachments"). As discussed below, public disclosure of the Confidential Attachments and the CEII Attachments would reveal contidential

and proprietary information, would expose the Company's employees, police and fire chiefs to potential abuse, and would reveal certain CEII-related materials that are protected by statute. Any such disclosure could harm the competitive business position of the Company and impact the safety and security of the Company's system.

The Company is contemporaneously providing redacted versions of the Confidential and CEII Attachments for the public record in this case, and un-redacted versions of the Confidential and CEII Attachments to the Hearing Officer and the Office of the Attorney General via electronic mail.

II. STANDARD OF REVIEW

The Department is authorized to protect from public disclosure "trade secrets, confidential, competitively sensitive or other proprietary information provided in the course of proceedings." G.L. c. 25, § 5D. In interpreting this statute, the Department has held that G.L. c. 25, § 5D, "places the burden of proof on companies requesting confidential treatment." The Berkshire Gas Company et al., D.P.U. 93-187/188/189/190, at 20 (1994).

Accordingly, a party seeking to protect information from public disclosure must demonstrate that: (1) the information for which protection is sought constitutes trade secrets, confidential, competitively sensitive or other proprietary information; and (2) there is a need to ensure nondisclosure of the information. The Berkshire Gas Company et al., D.T.E. 01-41, at 17 (2001); Western Massachusetts Electric Company, D.T.E. 99-56, at 4 (1999). In assessing the need for nondisclosure, the Department will consider the interests at stake, the likely harm that would result from public disclosure of information, and the public policy implications of such disclosure. See, e.g., D.P.U. 93-187/188/189/190, at 20-23; Boston Gas Company, D.P.U. 92-259, at 106 (1993), Essex County Gas Company, D.P.U. 96-105, at 2-3 (1996).

Where a party proves such a need, the Department will protect only so much of the information as is necessary to meet the need for nondisclosure and may limit the length of time that such protection is in effect. D.T.E. 01-41, at 17-18; D.T.E. 99-56, at 4; D.P.U. 93-187/188/189/190, at 20.

Further, G.L. c. 4, § 7, clause 26(f) specifically exempts from the definition of "public records:" "investigatory materials necessarily compiled out of the public view by…other investigatory officials, the disclosure of which would probably so prejudice the possibility of effective law enforcement" such that the disclosure is not in the public interest. Lastly, G.L. c. 4, § 7, cl. 26 sets out the statutory definition for "Public Records," which includes documents, maps, and photographs that are made or received by any officer or employee of any state agency, department, board, commission. G.L. c. 4, § 7, cl. 26(n) exempts CEII from the public records law and thus public disclosure requirements as follows:

> (n) records, including, but not limited to, blueprints, plans, policies, procedures and schematic drawings, which relate to internal layout and structural elements, security measures, emergency preparedness, threat or vulnerability assessments, or any other records relating to the security or safety of persons or buildings, structures, facilities, utilities, transportation or other infrastructure located within the commonwealth, the disclosure of which, in the reasonable judgment of the record custodian, subject to review by the supervisor of public records under subsection (b) of section 10 of chapter 66, is likely to jeopardize public safety.

G.L. c. 4, § 7, cl. 26(n).

III. ARGUMENT

A. The Confidential Attachments Should be Protected from Public Disclosure

Employee and Police and Fire Chief Contact Information

Attachments 19-140-16(b) and (f) and Attachment 19-140-16(l) contain confidential employee identification information, user identification numbers of Company employees and personal contact information for police and fire chiefs in the Company's service territory. All of

this information is protected as confidential and maintained by the Company as such. The Confidential Attachments contain personal information associated with employees and contractors, such as names, contact information, and job qualifications. To the extent an individual is not an officer of the Company, this information is not publicly available and should be treated as confidential for reasons of privacy. Pursuant to G.L. c. 4, § 7(26)(c), materials or data "relating to a specifically named individual, the disclosure of which may constitute an unwarranted invasion of personal privacy" are not public records subject to disclosure.

The Department has previously considered the privacy implications of releasing personally identifying employee information (salary and employee names) to the public and accorded confidential treatment to such information. Aquarion Water Company of Massachusetts, Inc., D.P.U. 11-43, Hearing Officer Ruling on Motion for Confidential Treatment at 5-6 (Nov. 9, 2011) (privacy concerns with releasing identifying non-officer employee information justified confidential treatment).

Moreover, there is no compelling public policy that would mandate the disclosure of this information. Rather, it is sound public policy to ensure the privacy and security of individuals working for the Company or customers taking service from the Company. For these reasons, personal information regarding employees, police and fire chiefs should be protected from public disclosure indefinitely. See also G.L. c. 93H & 201 C.M.R. §§ 17.00 *et seq*. (protecting against disclosure of "personal information"). This provides an exception from the general statutory mandate in G.L. c. 66, § 10 that all documents and data received by an agency of the Commonwealth are to be viewable public records.

Audit Materials

The Company is seeking confidential treatment for the information produced in

Attachments 19-140-16(a) CONFIDENTIAL, which contains the results of an internal audit performed by the Company. Audit results are not disclosed to the public and are maintained for internal use in order to assess and improve the Company's performance. This information should be protected from public disclosure because of the critical importance of encouraging full and robust participation by companies in self-critical analyses and to provide all of the information necessary for these processes to be successful.

To ensure the integrity of the internal analyses reflected in Attachments 19-140-16(a) CONFIDENTIAL, the Company conducts those processes in a manner designed to foster candid disclosure of information within the organization. This approach serves an important role in the Company's ability to obtain and detect information that would otherwise be difficult or impossible to gather. The chilling effect that would be created as a result of public disclosure of the information obtained during an internal analysis or audit would substantially reduce the value and effectiveness of the internal review process. That is, confidentiality is critical to the process of all the Company's internal reviews in order to obtain the highest quality information. The Department has previously held that internal performance audits are confidential. See, e.g., NSTAR Electric Company and Western Massachusetts Electric Company each d/b/a Eversource Energy, D.P.U. 17-05 (Feb. 22, 2017 Stamp Approval of Motion Seeking Confidential Treatment of Audit Reports); Boston Gas Company, D.T.E. 03-40, at 3 (approving all motions for protective treatment of confidential information filed in this proceeding by Boston Gas, including the motion filed on August 11, 2003 related to performance audits); New England Gas Company, D.P.U. 07-46, at 6 (Hearing Officer Ruling on Motions for Confidential Treatment) (August 23, 2007).

B. The CEII Attachments Should be Protected from Public Disclosure.

The Department has plain and unambiguous statutory authority to keep CEII information contained in the CEII Attachments, specifically in Attachment 19-140-16(g), Attachment 19-140-16(p), and Attachment 19-140-16(q), as confidential pursuant to G.L. c. 4, § 7, clause 26(n). The Legislature, which enacted Clause 26(n) in 2002 in response to the events of September 11, 2001, clearly expressed a desire to protect public safety by exempting materials related to a utility's critical infrastructure from the general presumption that certain information is a public record. The Department has noted that its authority to keep materials exempt under G.L. c. 4, § 7, clause 26(n) is "separate and apart" from (and, by implication, broader than) its more narrowly construed authority under G.L. c. 25, § 5D. D.T.E. and Siting Board Rulemaking, D.T.E. 98-84, at 23 (2003) (declining to rule with particularity in the context of a rulemaking regarding the protection of critical energy infrastructure).

The Company recognizes that the Department must balance two competing interests of the public in making its determination whether to keep particular information such as the CEII contained in the CEII Attachments as confidential pursuant to G.L. c. 4, § 7, clause 26(n). The Department must weigh the public's interest in transparency and information and the public's interest in safety, security and the safe and reliable provision of gas service. However, by inserting clause 26(n) as a specific exemption to the general presumption of disclosure, the Legislature has statutorily communicated its belief that the interest in safety, security and the safe and reliable provision of gas service should outweigh the public's interest in transparency and information where disclosure jeopardizes public safety. The Department has performed this balancing in the past and protected information pursuant to G.L. c. 4, § 7, clause 26(n). Verizon New England, Inc. d/b/a Verizon Massachusetts, D.T.E. 02-8, at 11-12 (2005) (granting Verizon's motion to restrict public disclosure of results of internal security reviews).

Based on the language of G.L. c. 4, § 7, cl. 26(n), the Company classifies the CEII Attachments as CEII, as the CEII Attachments contain the maps, schematics, photographs, and analysis of the Company's distribution system, regulator stations, and the Company's planned work on regulator stations, including specific engineering solutions, the public exposure of which could reveal sensitive information to bad actors and jeopardize public safety. Based on this precedent, and the Department's clear statutory authority to protect these diagrams and analyses CEII, the Company respectfully requests that that Department afford protective treatment for the CEII Attachments.

IV. CONCLUSION

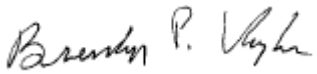
The Company respectfully requests that the Department grant the Company's motion and provide protective treatment for the Confidential Attachments and CEII Attachments. Furthermore, given that the Confidential Attachments and CEII Attachments are not likely to change at any time or to lose their confidential nature, the Company respectfully requests the Confidential Attachments and CEII Attachments be protected from disclosure for an indefinite period of time.

WHEREFORE, the Company respectfully requests that the Department grant its motion for protective treatment of confidential information.

Respectfully submitted by,

Bay State Gas Company d/b/a
Columbia Gas of Massachusetts

By its attorneys,



Brendan P. Vaughan, Esq.
Keegan Werlin LLP
99 High Street, Suite 2900
Boston, Massachusetts 02110
(617) 951-1400

Dated: September 28, 2020

ATTACHMENT DPU 19-140-13

UID	Full Name	38A	59 & 60	61	Written 62/63/65	Hands-on 62/63/65	64	66A	67	72A
470959	Clement, James D	5/22/2020	7/2/2020	9/24/2020	5/1/2020	5/5/2020	9/24/2020	5/22/2020	5/22/2020	5/28/2020
470656	Docherty, Charles	8/20/2020	9/11/2020	7/2/2020	6/19/2020	9/18/2020	7/2/2020	7/14/2020	7/14/2020	7/14/2020
122661	Anderson, Timothy	9/11/2020	8/27/2020	9/9/2020	9/11/2020	8/27/2020	9/9/2020	9/11/2020	9/11/2020	8/27/2020
121711	Carmel, Robert	9/11/2020	8/27/2020	9/9/2020	9/11/2020	8/27/2020	9/9/2020	9/11/2020	9/11/2020	8/27/2020
131106	Dwinells, Stephen M	9/11/2020	8/27/2020	7/23/2020	6/4/2020	5/28/2020	9/11/2020	9/11/2020	9/11/2020	8/27/2020
127898	Pimentel, Brandon M	9/11/2020	8/28/2020	9/9/2020	9/11/2020	9/3/2020	9/9/2020	9/11/2020	9/11/2020	8/28/2020
122540	Nowak, Robert P	8/27/2020	8/20/2020	8/31/2020	8/27/2020	8/27/2020	8/31/2020	8/27/2020	8/27/2020	8/31/2020
122059	Eichstaedt, Anthony	8/27/2020	9/9/2020	9/9/2020	8/27/2020	9/18/2020	9/9/2020	8/27/2020	8/27/2020	9/9/2020
122681	Matthews, David	8/28/2020	9/9/2020	7/2/2020	8/28/2020	8/28/2020	9/9/2020	8/28/2020	8/28/2020	9/9/2020
471885	O'Leary, Brian J	5/18/2020	8/6/2020	8/6/2020	6/19/2020	5/7/2020	8/6/2020	5/18/2020	5/14/2020	9/10/2020
121700	Maher, Timothy A	9/10/2020	7/2/2020	7/2/2020	7/31/2020	9/2/2020	7/2/2020	7/29/2020	7/29/2020	9/10/2020
124884	Fitzgerald, David S	8/28/2020	9/10/2020	9/25/2020	8/28/2020	9/10/2020	9/10/2020	8/28/2020	8/28/2020	9/10/2020
122058	Halket, Glen	9/9/2020	9/10/2020	8/28/2020	9/9/2020	8/26/2020	8/28/2020	9/9/2020	9/9/2020	9/10/2020
470769	Harris, David R	6/19/2020	9/10/2020	8/28/2020	9/9/2020	9/9/2020	8/28/2020	9/9/2020	9/9/2020	9/10/2020
473909	Terroux, Christopher P	9/10/2020	9/10/2020	8/28/2020	9/10/2020	9/10/2020	8/28/2020	9/10/2020	9/10/2020	9/10/2020
470708	Setian, Steven	8/7/2020	8/13/2020	8/21/2020	8/21/2020	Failed 9/25/20	8/13/2020	8/13/2020	8/13/2020	9/11/2020
121736	O'Loughlin, Sean K	9/9/2020	9/11/2020	9/9/2020	9/9/2020	9/3/2020	8/27/2020	9/9/2020	9/9/2020	9/11/2020
471196	Izabel, Mark J	9/9/2020	9/11/2020	9/14/2020	9/9/2020	9/18/2020	9/14/2020	9/9/2020	9/9/2020	9/11/2020
471895	Kaszanek, William J	9/11/2020	8/20/2020	8/20/2020	5/18/2020	5/7/2020	8/20/2020	5/18/2020	9/11/2020	9/11/2020
471224	Gurney, Herbert A	9/2/2020	9/14/2020	Failed 9/25/20	9/2/2020	9/2/2020	9/14/2020	9/2/2020	9/2/2020	9/14/2020
471093	Rocca, Benito G	5/1/2020	9/14/2020	9/11/2020	5/5/2020	9/18/2020	8/27/2020	9/11/2020	9/11/2020	9/14/2020
470868	Pacheco, Jorge M	9/18/2020	9/18/2020	8/27/2020	9/18/2020	9/3/2020	8/27/2020	9/18/2020	6/18/2020	9/18/2020
127853	Silva, Adrian L	8/27/2020	9/18/2020	8/27/2020	8/27/2020	8/28/2020	9/18/2020	8/27/2020	8/27/2020	9/18/2020
471707	Garnett, David L	9/24/2020	9/25/2020	Failed 9/25/20	9/25/2020	Failed 9/23/20	9/24/2020	6/10/2020	9/24/2020	9/25/2020

REDACTED

M&R/LNG/LPG QA (V 2.3)

[redacted]

REDACTED

Disclaimer

The assessors believe the information contained within this risk assessment report to be correct at the time of printing. The assessors do not accept responsibility for any consequences arising from the use of the information herein. The report is based on matters which were observed or came to the attention of the assessors during the day of the assessment and should not be relied upon as an exhaustive record of all possible risks or hazards that may exist or potential improvements that can be made.

Information on the latest workers compensation and OHS / WHS laws can be found at the relevant State WorkCover / WorkSafe Authority.

Confidentiality Statement

In order to maintain the integrity and credibility of the risk assessment processes and to protect the parties involved, it is understood that the assessors will not divulge to unauthorized persons any information obtained during this risk assessment unless legally obligated to do so.

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Table of Contents

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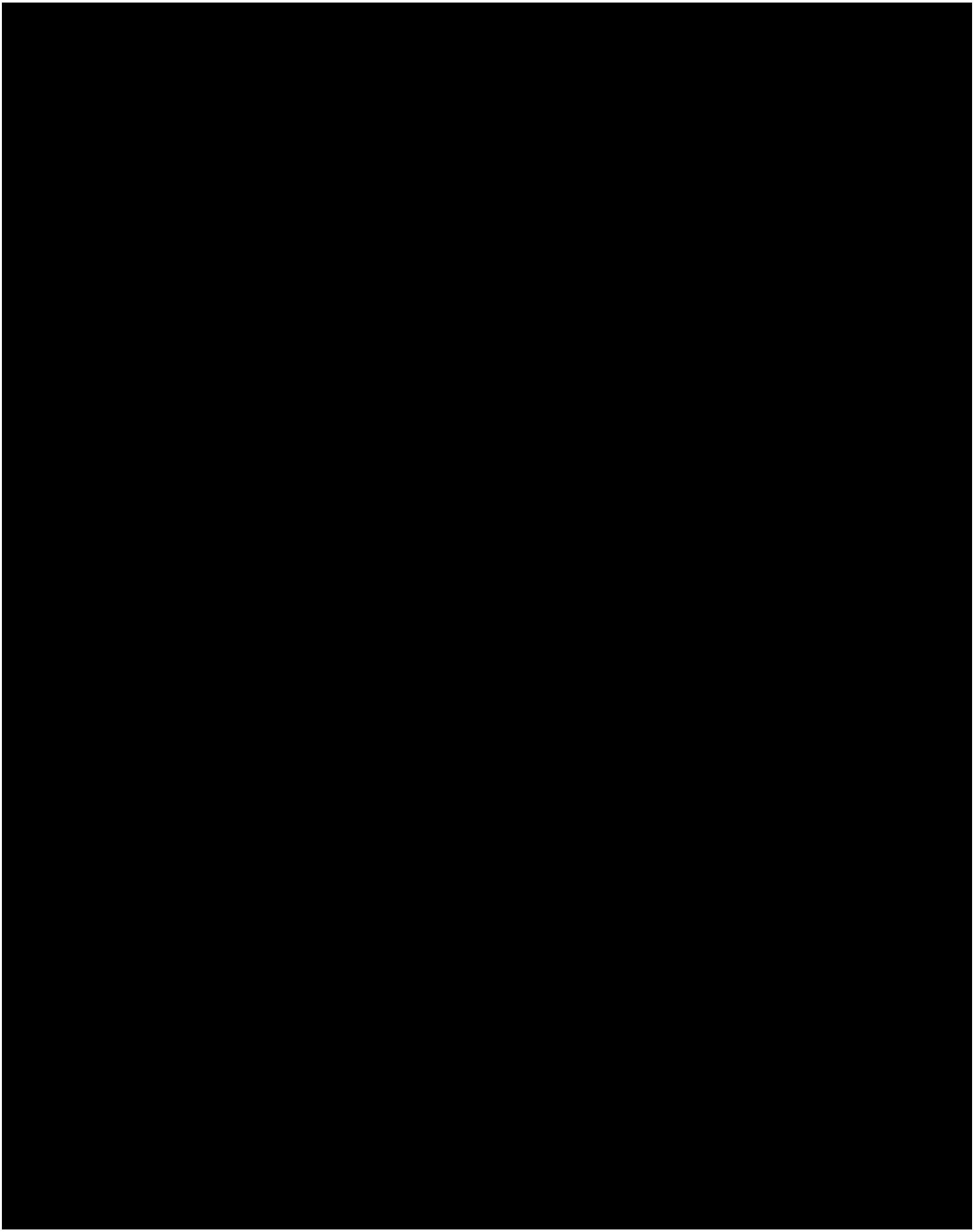
Failed Responses



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Information 2

Question	*Response*	*Details*
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REDACTED

Safety and PPE

Question	*Response*	*Details*
[redacted]		

REDACTED

M&R - [redacted]

Question	*Response*	*Details*
[redacted]		

[redacted]

REDACTED

Question	*Response*	*Details*
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Question	*Response*	*Details*
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Question	*Response*	*Details*
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Question	*Response*	*Details*
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LPG / LNG - 1/1 - 100%

Question	*Response*	*Details*
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Final Page

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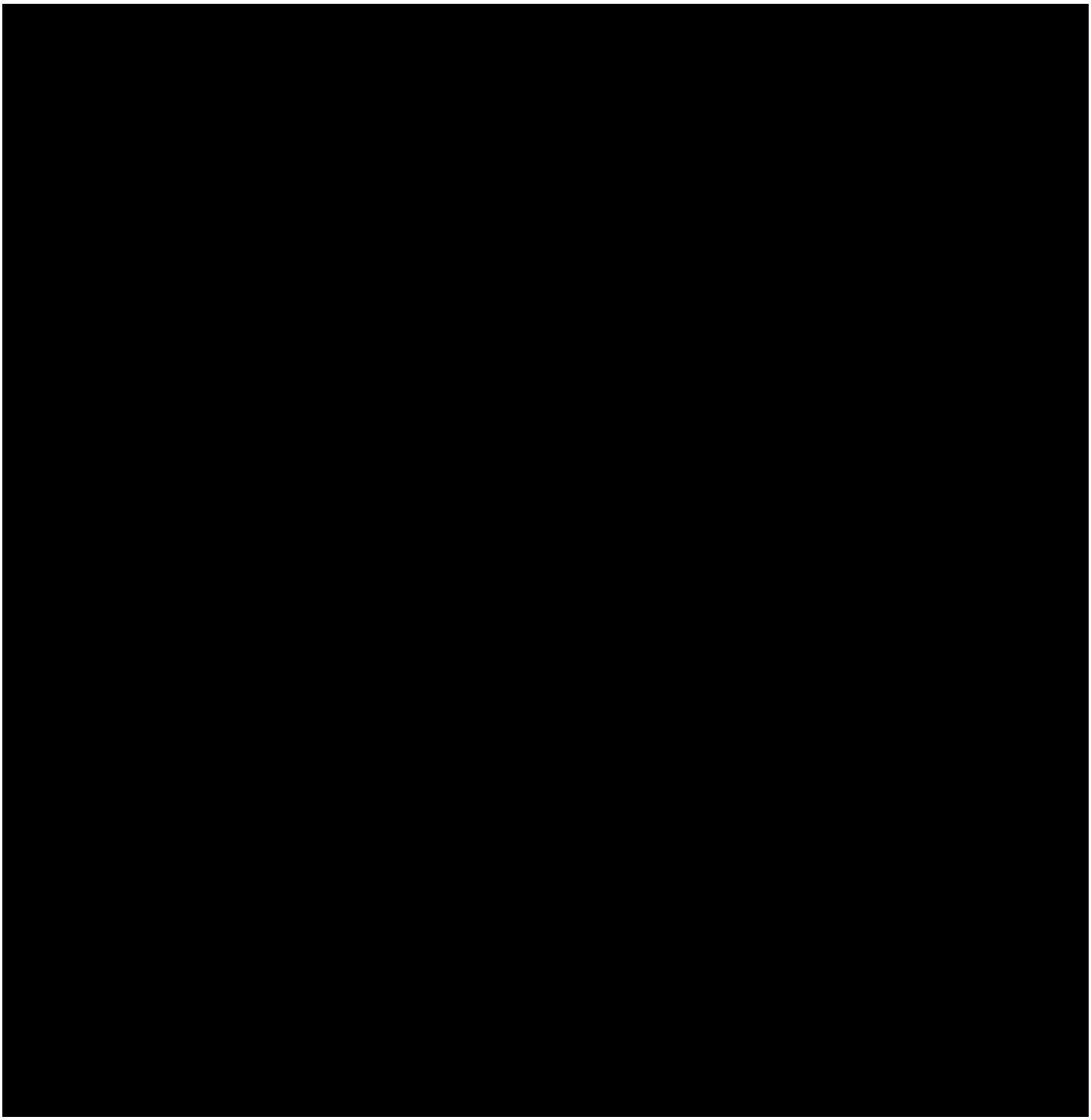

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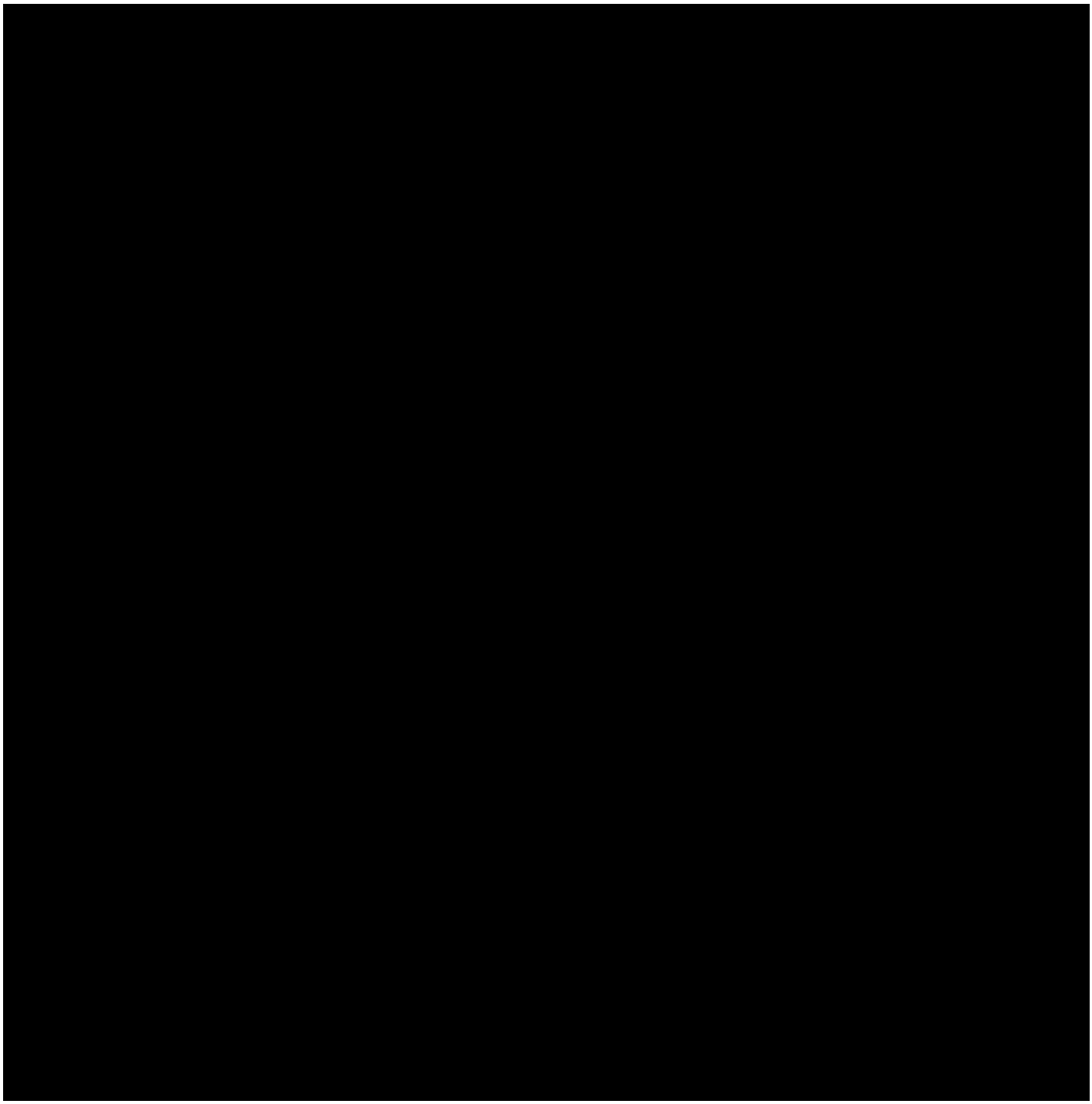

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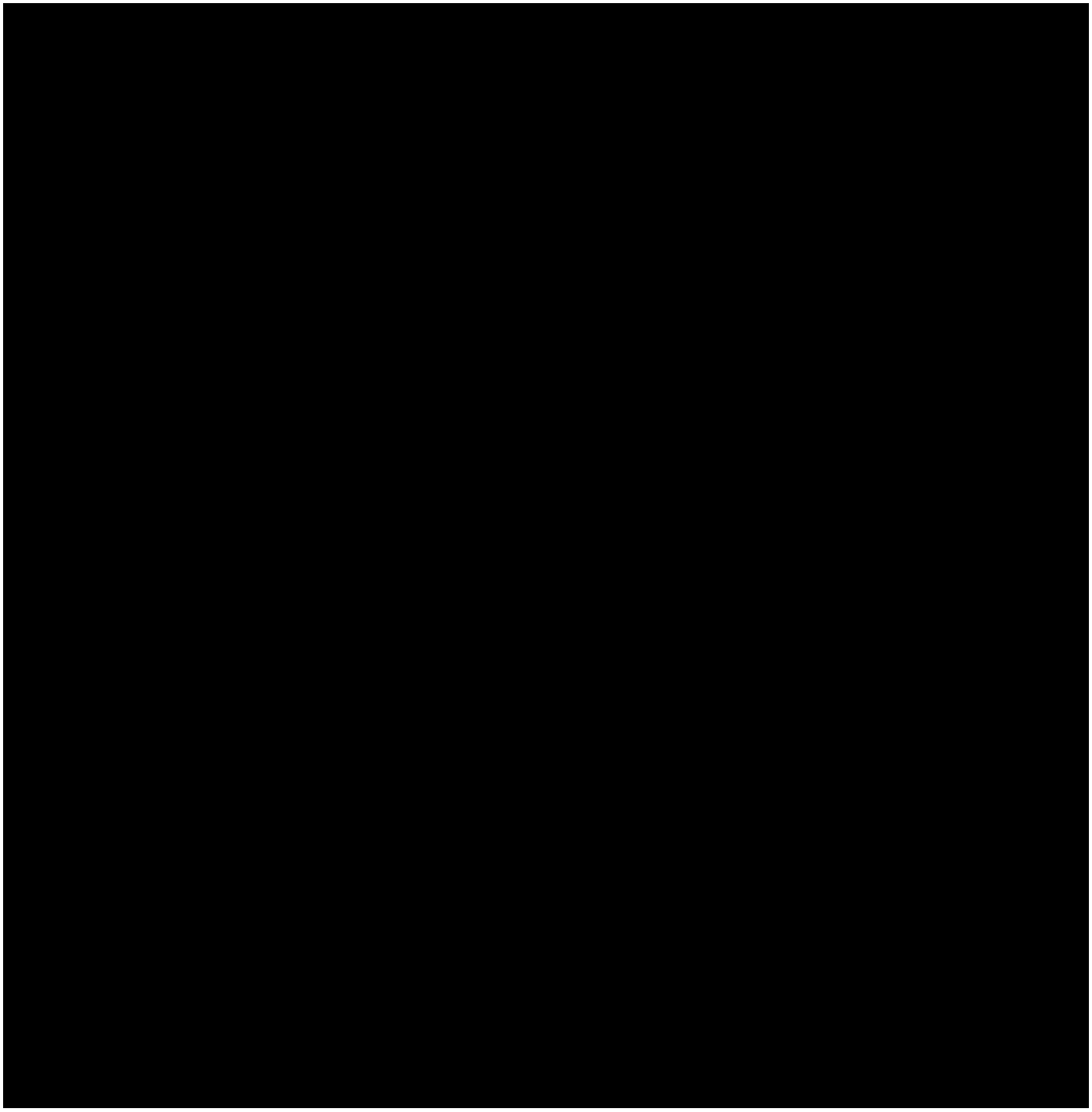

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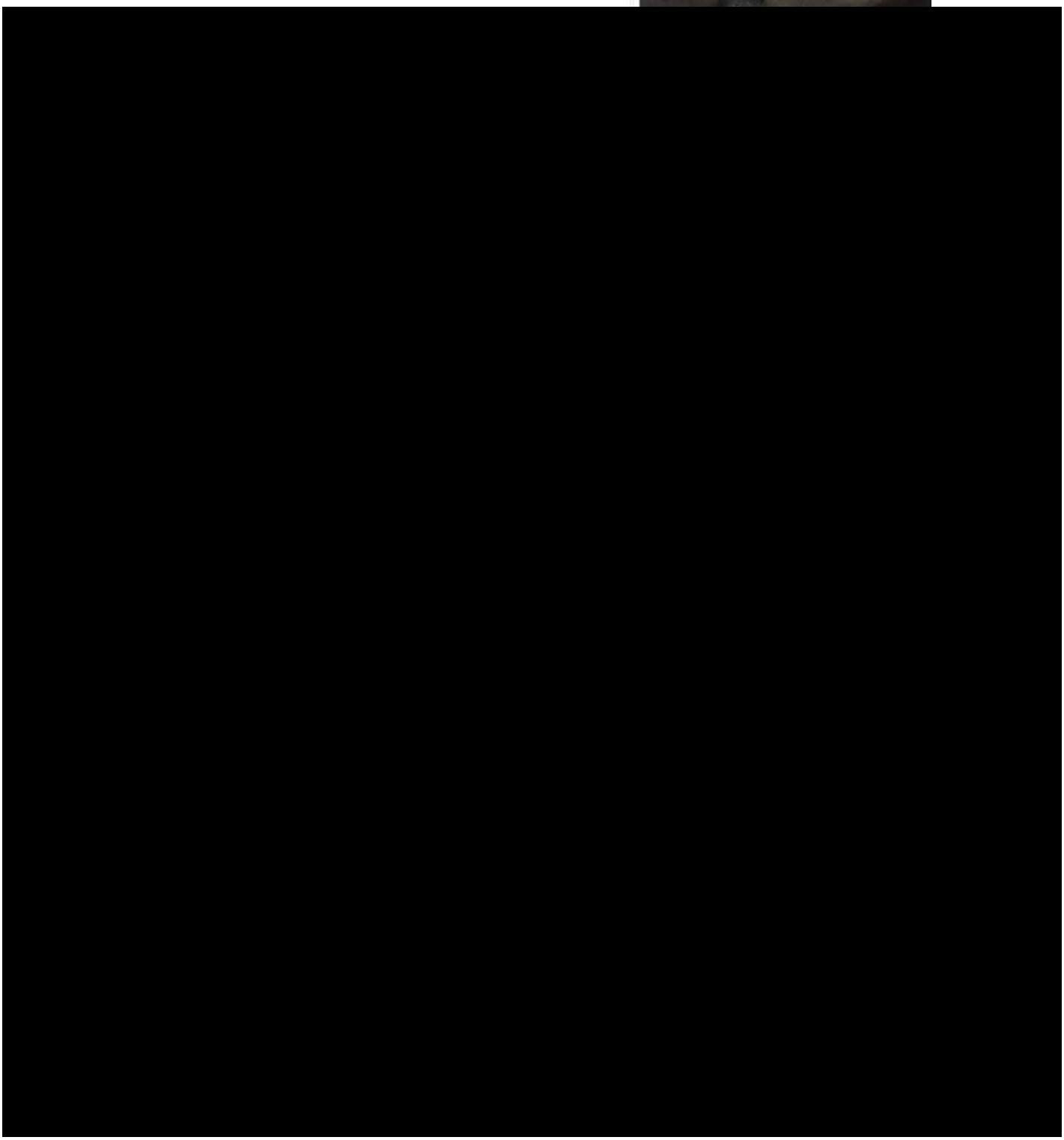

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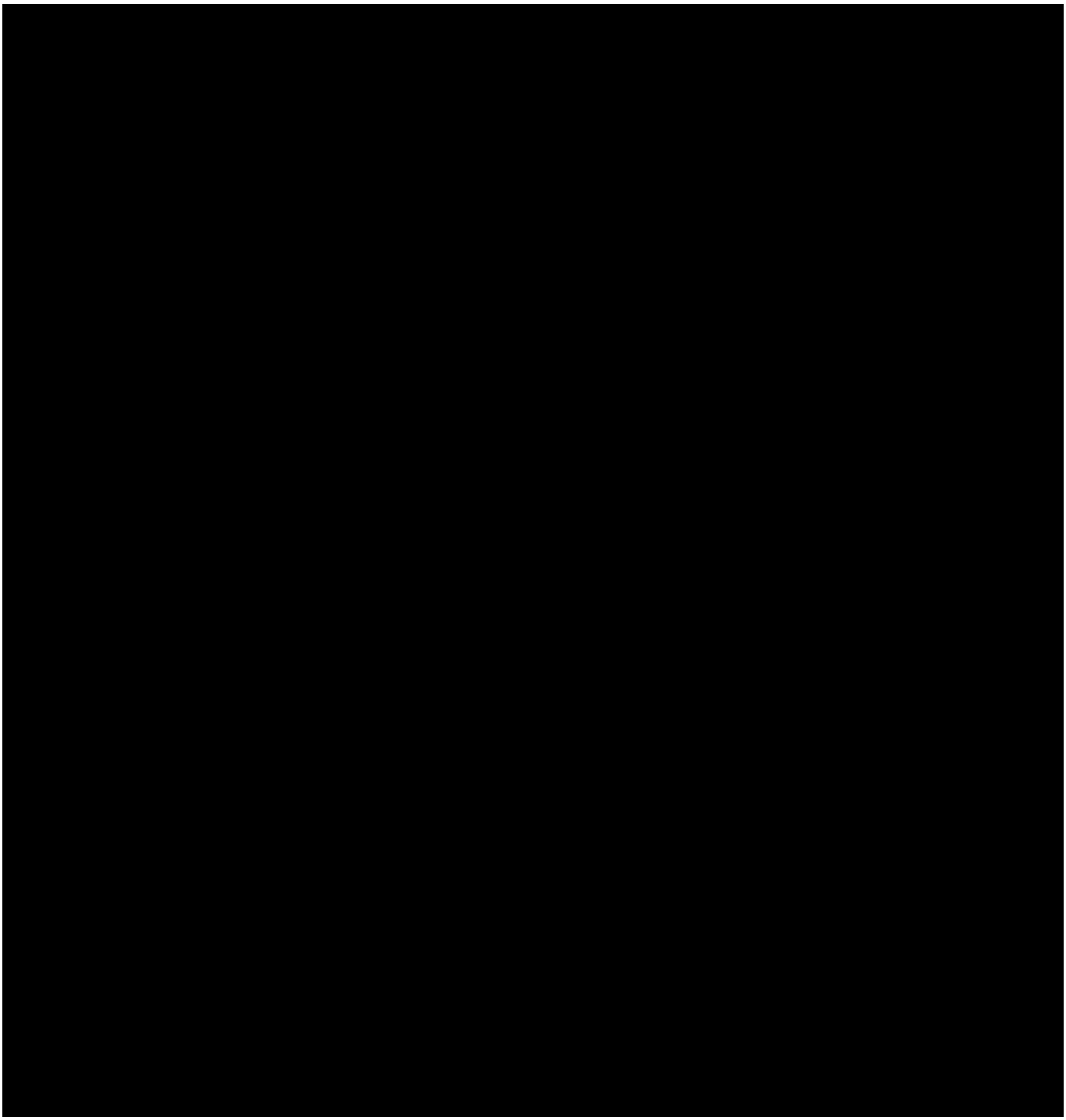


REDACTED

B. Hoerig - Palmer Audit Items 5/3/19

Finding	Resolution
[redacted]	

REDACTED

User Full Name	Skill Code	Skill Name	Date Knowledge Taken	Knowledge Status	Expires
[redacted]					

REDACTED

EMPLOYEE BATCH SHEET

NiSource®

COURSE NAME	LMS NUMBER
1750.010	
Review	

Class Date: 6-9-19

End Date:

Location: Phone Conference

State: MA

Start Time: 07:30

End Time:

Instructor(s): Croke

	EMPLOYEE NAME (Print Only)	EMPLOYEE ID # (Required)
1.	Pacheco	[redacted]
2.	Sylvester	
3.	Fitzgerald	
4.	Anderson	
5.	Gurney OUT on ILLNESS will visit when Back	
6.	Garnett	
7.	Halket	
8.	Carmel	
9.	Docherty	
10.	Clement	
11.	Rocca	
12.	Nowak	
13.	Brunell	
14.	Harris	
15.	Pimental	
16.	Tetreault	
17.	Matthews	
18.	O Loughlin	
19.	IZABEL	
20.		
21.		
22.		

Entered in LMS by: Date Entered:

REDACTED

EMPLOYEE BATCH SHEET

NiSource®

COURSE NAME	LMS NUMBER
1170.040 Review	

Class Date: 6-9-19

End Date:

Location: Conference Call

State: MA

Start Time: 07:30

End Time:

Instructor(s):

	EMPLOYEE NAME (Print Only)	EMPLOYEE ID # (Required)
1.	Pacheco	[redacted]
2.	Sylvester	
3.	Anderson	
4.	Fitzgerald	
5.	Gurney out on medical leave will visit on Retur	
6.	Gornett	
7.	Docherty	
8.	Clement	
9.	Rocco	
10.	Nowak	
11.	Brunell	
12.	Harris	
13.	IZABel	
14.	Pimental	
15.	Matthews	
16.	OLoughLin	
17.	Tenroux	
18.	Carmel	
19.	Halket	
20.		
21.		
22.		

Entered in LMS by:

Date Entered:

NiSource – Columbia Gas of Massachusetts
Gas Standards

Standards Review

The following Standards have been created, modified, or cancelled.

Standards: **GS 1750.010(MA) "Pressure Regulating Station Operation and Maintenance"**

Indicate type of change:

- **X** Modification to company policies or procedures
- ____ Use of new equipment and/or technology
- ____ Change in State or Federal regulations
- ____ New information from equipment or product manufacturer
- ____ Other, explain ____

Job/account number the meeting was charged to ____

The modification or change is described as follows.

This is a communication of change for Gas Standards effective 09/18/2020.
This information is required to be communicated to all individuals (including contractors) that these standards impact. The changes have a minimal impact.

When the revised GS 1750.010(MA) "Pressure Regulating Station Operation and Maintenance" is reviewed with individuals, it becomes the effective operating standard for those individuals. Sidebars have been included on the standard to indicate where the updates have been made. Unless otherwise noted, the previous version will remain in effect until 09/30/2020.

The following document numbers or descriptions indicate revisions or modifications to written procedures.

GS 1750.010(MA) "Pressure Regulating Station Operation and Maintenance"

a. Section 2 "NOTIFICATION OF GAS CONTROL":
   1. This Section has been revised to require personnel to notify Gas Control when on site at any station. The revision removes the condition to only notify Gas Control if the station had SCADA monitoring equipment. Now, personnel are to notify Gas Control when at a station regardless if it has SCADA equipment or not.
   2. The Gas Control phone number has changed to 1-866-358-6595. This number is specific to CMA.

b. Section 5.3 "Annual Regulator Station Inspection," bullet a.: First sentence has been revised to match the requirement in Section 2 for consistency. Note the existing requirement for personnel to notify Gas Control (with or without SCADA monitoring) before and after the inspections are performed.

c. EXHIBIT B "Notification of Planned Upstream Pig Run": As required by Section 5.1 "Notification of Planned Upstream Pig Run," the sample correspondence in EXHIBIT B has been revised to provide the new Gas Control phone number.

d. Minor formatting and/or grammatical changes made throughout the entire document.

e. Review the red-lined version of the Gas Standard on the following pages, showing additions in red and deletions as green text with a ~~strike though~~.

NiSource
Distribution Operations

Gas Standard

Effective Date: ~~06/01/2020~~09/182020	**Pressure Regulating Station Operation and Maintenance**	Standard Number: **GS 1750.010(MA)**
Supersedes: ~~04/12/2019~~06/01/2020		Page 1 of 11

Companies Affected:	☐ NIPSCO	☐ CVA	☐ CMD
		☐ CKY	☐ COH
		☒ CMA	☐ CPA

05/23/2019

REQUIRED

The requirements of ON 19-05 shall also be followed when work is performed in accordance with this standard.

REFERENCE 49 CFR Part 192.201, 192.631, 192.709, 192.739;
D.P.U. 18-PL-03; DPU Notification Directive (June 13, 2018)

1. GENERAL

This gas standard applies to operation and maintenance of transmission and distribution **pressure regulating stations**.

All regulator station inspections shall be planned for completion in one continuous visit to the site. If circumstances dictate that a regulator station must be left unattended with no qualified Measurement & Regulation (M&R) personnel monitoring the downstream pressure of regulator station prior to the completion of the work, M&R Leadership and/or Engineering shall be contacted to discuss the proposed plan and their approval shall be obtained prior to leaving the regulator station unattended.

2. NOTIFICATION OF GAS CONTROL

Anytime field personnel are on site at a station ~~that contains SCADA monitored/controlled equipment~~, Gas Control shall be notified by calling 1-866-358-6595~~800-921-2165~~. The scope of work should be discussed at that time.

If it is determined that a point-to-point (P2P) should be completed, refer to GS 1170.040 “Gas Control Point-to-Point Verification.”

If additional work outside the original scope will be performed, it is the responsibility of the individual in the field to notify Gas Control.

3. PRESSURE LIMITS

3.1 Control Regulator

In no case shall the outlet set pressure exceed the established **maximum allowable operating pressure** (MAOP) of the downstream pipeline.

Low-pressure (LP) systems shall operate within a pressure range that will assure the safe and continuing operation of any connected and properly adjusted low-pressure equipment. The preferred minimum pressure is 7” w.c. and the preferred maximum pressure is 12” w.c. LP systems can be operated outside of the preferred range when

warranted, especially during peak flow periods or for other operational needs. Any LP system that must operate at greater than 12" w.c. during peak periods to meet minimum pressure requirements shall be documented by Engineering in the Winter Operations Plan. Engineering shall evaluate the system for actions (e.g., orifice changes, system improvements) that would be necessary to permit operating the system at or below 12" w.c. at design (peak-day) conditions.

Normal continuous operations of LP systems shall not exceed 14" w.c. The set pressure for control regulators supplying LP systems shall not exceed 14" w.c. However, during abnormal or emergency operations of the control regulator the outlet pressure shall not exceed the maximum normal operating pressure plus allowable build up amount specified in Section 3.2 "Monitoring Regulator and/or Overpressure Devices" or 3.3 "Low Pressure Regulator Stations with Automatic Shut Off Devices."

When establishing the set point of LP regulators, it is expected to have some initial drift in the set point. A drift of 1" w.c. or 2" w.c. is allowed as long as the regulators settle to a set point within the limits described above.

3.2 Monitoring Regulator and/or Overpressure Protection Devices

The monitoring regulator and overpressure protection devices in elevated pressure systems (e.g., primary relief valves) shall not be set above the MAOP of the pipeline they are protecting. These devices should be set as low as possible without affecting the operation of the worker/control regulator. However, during abnormal or emergency operations the outlet pressure of the station shall not exceed the MAOP plus allowable build up as specified in Table 1 below.

For LP stations the preferred set point for primary monitor regulators and overpressure protection devices (e.g. primary relief valves, automatic shutoff valves, etc.) is at or below the maximum stated normal operating pressure. However, the primary overpressure protection device shall not be set above 16" w.c. as shown in Table 2 below.

Table 1

MAOP	Allowable Build Up
Less than 12 psig	MAOP + 50%
12 psig to 60 psig	MAOP + 6 psig
60 psig or more	MAOP + 10%, or 75% of SMYS, whichever is lower

Set monitor regulators and applicable overpressure protection devices (e.g., primary relief valves) as low as possible but high enough to avoid operational issues with the control regulator.

3.3 Low Pressure Regulator Stations with Automatic Shut Off Devices

The following pressure set points to activate the shut off device capability are provided.

a. Overpressure shut off (OPSO) set point is 18 inches w.c., for secondary overpressure protection only as shown in Table 2.

b. Under pressure shut off (UPSO) set point is 5 inches w.c.

Table 2.
Maximum Pressure Settings for Monitor Regulator and/or Overpressure Protection Devices

Overpressure Protection Device	Primary Overpressure Protection Device Setting	Secondary Overpressure Protection Device Setting
Monitor Regulator	16 in. w.c.	------
Monitor Regulator/Automatic Shutoff Combination	16 in. w.c.	18 in. w.c.
SBC Model ASV (slam-shut only)	16 in. w.c.	------

3.4 Pressure Adjustments Based on Seasonal Changes

Adjusting the control and monitor set pressures based on a seasonal basis is not recommended and should only be done on a system needs basis. A change in any set pressure shall be documented on Form GS 1750.810-1 “Regulator Station Inspection Record” (refer to Section 7 “Records”).

4. FREQUENCY OF INSPECTION

All pressure regulating stations shall be inspected once each calendar year at intervals not to exceed 15 months, according to the requirements of Section 5 “Inspection.”

In addition, any time a regulator run is taken out of service for any reason, all regulators in that run shall be tested for lock-up, before being placed into service.

5. INSPECTION

All pressure regulating stations shall be inspected to determine that they meet the following.

a. In good mechanical condition.

b. Set to control or relieve at the correct pressures consistent with the pressure limits in accordance with Section 3.2. “Monitoring Regulator and/or Overpressure Protection Devices”.

c. Properly installed and protected from dirt, liquid, or other conditions that might prevent proper operation.

The purpose of the inspection is to determine conditions that may adversely affect the proper operation of the pressure regulating station, and to make corrections by cleaning, replacement, or adjustment of parts, when necessary.

If the station contains a “Tube Turns” bolted hinged enclosure, consult Operational Notice 18-13 “Tube Turns – Bolted Hinged Enclosures,” before performing any activities at the station.

5.1 Notification of Planned Upstream Pig Run

Each year, the Systems Operations Manager is responsible for ensuring written correspondence is sent to each transmission system operator with pipelines directly upstream of CMA gate stations, requesting that each operator provide the Company, on an annual and continual basis, notification of transmission system flaring and/or pigging operations (Exhibit B provides a sample correspondence).

Upon notification System Operations will inform Gas Control, Compliance, and Operations of the transmission operations activities. Compliance will notify the DPU within 24 hours of receiving the notification from the transmission system operators. In the event that the System Operations Manager cannot be reached the transmission operator can contact Gas Control. Gas Control will provide immediate notification to System Operations.

Upon notification of planned upstream pig runs, Systems Operations shall check stations in the impacted area prior to the pig run as conditions warrant to determine what actions (if any) will be needed to protect the system from unplanned pressure deviations. After each pig run, perform the following.

a. Operational check.

b. Liquid and debris inspection. If liquid or debris are encountered, manage it according to the standards of HSE 4400.050 “Pipeline Liquids Management” and contact the Environmental Coordinator.

5.2 By-passing Requirements

If the station design requires bypassing a second qualified employee shall be present to monitor the bypass operation during the inspection, with the following exception. If the by-pass contains a regulator or the by-pass hose assembly being used includes a regulator, a second qualified employee is not required.

Properly calibrated spring gauges shall be used during all bypassing operations to monitor the pressures. Gauges shall not be liquid filled.

See GS 1754.010(MA) "Operation and Maintenance of Pressure Gauges" for minimum calibration intervals.

5.3 Annual Regulator Station Inspection

Gas transmission and distribution pressure regulating stations shall be inspected in accordance with the following. Before beginning the inspection, the station inventory record card and isometric drawing shall be reviewed to verify the information is accurate and matches the facilities at the site. Any discrepancies found in the information shall be addressed and/or reported to M&R Leadership.

Any time a station is started up, shut down, pressure set points are changed or valves are operated refer to Operational Notice 19-05 "Additional Requirements for Pressure Modifications or Shutdown/Startup Operations at Regulator Stations."

Prior to initial entry into any building or pit/vault, a gas detection device shall be used to check for a hazardous atmosphere. A fire extinguisher shall be placed up-wind and close to the station building or fence, so that is immediately available for use if required.

a. ~~If the pressure in a pressure regulating station is monitored by a SCADA system,~~ Systems Operations shall notify Gas Control **before** and after inspections are performed. A point-to-point verification may be required according to GS 1170.040 "Gas Control Point-to-Point Verification."

b. To reduce the risk of an electric shock, employees shall check the gas piping on both the inlet and outlet side of the setting with a volt meter, or at a minimum, with a non-contact voltage detector prior to any contact with the setting(s). Refer to GS 1750.050 "Bonding Considerations for Pressure Regulating and Point of Delivery Stations."

c. Check inlet and outlet pressure with a calibrated gauge. While taking any component in the station in or out of service, gauges shall be installed upstream and downstream of that component and monitored during the process for an abnormal operating condition (AOC).

NOTE 1: If inlet or outlet pressure is found to be above the MAOP, notify the local Systems Operations leadership. Investigate

and correct the situation as directed by GS 1150.080 "Response to Over Pressure."

NOTE 2: If the inlet or outlet pressure is found to be lower than the **normal operating pressure** (refer to GS 1012.010 "Definitions") typically seen at the pressure regulating station, notify the local System Operations leadership.

d. Blow off pilot filters to ensure they are clear of liquids or dirt. In areas known to have debris in the gas or if blowing off the filter yields contaminants, replace the filter media if necessary.

e. Check all pilot and main regulator diaphragms for leakage through the vent. Replace defective diaphragms, if necessary.

f. Vents and vent lines are to be inspected to see that they are secure, clear, have proper vent caps, and that no leaks are present.

g. Inspect all control, sensing, and supply lines making certain that they are mechanically sound, secure, and protected from damage. All control/sensing, supply and by-pass lines shall be tagged indicating their function.

   1. If they are above ground, visibly ensure each control regulator line and tap is independent of any other device for that run.

   2. If they are below ground, refer to the station isometric drawing to determine location and verify each control regulator line and tap is independent of any other device for that run. If station isometric drawing is unclear or inconclusive, notify M&R leadership and Field Engineering.

   3. Ensure permanent recording and electronic gauges are not tapped off of the regulator bypass outlet piping.

h. All regulators shall be tested to ensure they are in good working order, control at proper set pressure, and operate properly. Where applicable, inspect stem seals for leak through; remove side inspection plates to inspect for debris.

i. Pressure controllers shall be inspected with the associated regulator(s) for response and defects.

j. All regulators shall be tested for lock-up. If a regulator will not achieve lock-up a tear down inspection shall be conducted if applicable (Soft Seats). If the regulator still fails to lock up or is a hard seat regulator it shall be reported immediately to supervision to discuss actions taken, remediation (if necessary) and a time frame for remediation.

k. All automatic shut-off devices shall be tested to ensure that they are in good mechanical working order, control at proper set pressure, operate properly, and shut off within the expected and accepted limits.

l. If a gasket strainer is present, inspect it as per the requirements in ON 19-13 “Gasket Strainer Inspection.” If a gasket strainer is removed from a line, it must be discarded and replaced with a new gasket strainer, installed as per manufacturer’s instructions.

m. Inspect tee-strainers and y-strainers. Open drain plug and collect any fluid in an appropriate container and manage according to the standards of HSE 4400.050 “Pipeline Liquids Management.” Report the amount of sediment, dust or liquids on the regulator inspection report in the comment section. Perform a differential pressure check or internal inspection. An internal (i.e., visual or borescope) inspection is done if needed, but is required during teardown inspections. If differential taps are not present, follow guidelines described in ON 19-13 “Gasket Strainer Inspection.”

n. Station filter differential shall be checked with an accurate gauge. The filter shall be blown clear as needed. The quantity of sediment, dust or liquids, or a high differential shall be reported on the regulator inspection report in the comment section. Filter elements shall be replaced as necessary.

o. Inspect all overpressure protection devices for response and defects. See GS 1750.040(MA) “Relief Devices Inspection and Maintenance” for additional requirements. Relief valves which serve as warning devices shall be tagged with a warning device tag (See Exhibit A).

p. Check entire regulator station above ground piping and components for leaks and signs of atmospheric corrosion.

q. Inspect any associated fences, buildings, vaults, pits, facility identification signs, warning signs, security features, etc. for proper working condition and operation.

r. Inspect station for damage protection. Check the condition of existing protection or the need for protection, notify M&R Leadership of any damage protection issues.

s. Heaters are to be inspected in accordance with GS 1750.210(MA) “Inspection and Maintenance of Heaters”. Heaters may be set up to be inspected on a different schedule than the station equipment.

t. Recording gauges are to be inspected in accordance with GS 1754.010(MA) “Operation and Maintenance of Recording Gauges.” Gauges may be set up to be inspected on a different schedule than the station equipment. Gauges shall have a pressure range that meets or exceeds the MAOP of the line that it is connected to.

u. At the conclusion of the inspection, any additional discrepancies found between the facilities at the site and the Station Inventory record card or any changes that were made to the equipment shall be recorded on the Station Inventory record card. Changes shall also be updated in the work management system and any other permanent record, as soon as practical.

v. Monitor regulators shall be tagged with their function. Refer to Exhibit A "Available Tags" for ordering information.

w. Review the isometric drawing at the station for accuracy and completeness. Compare station drawing to GIS station drawing, if available. Report any discrepancies found to M&R leadership and Engineering. For LP stations, refer to ON 19-02 "Low Pressure Regulator System Work Requirements."

5.4 Tear Down Inspection

Tear down inspections should be done every five (5) years or on an as needed basis either as a result of findings during the annual inspection or predetermined based on special circumstances i.e., dirty gas. All functions outlined below shall be performed during the tear down inspection.

a. Complete all steps required for an annual regulator station inspection.

b. Regulator valve assemblies, molded seats, diaphragms, and orifices shall be visually inspected for good mechanical conditions. Repair or replace all worn and defective parts. Wearable soft surfaces shall be replaced during every tear down inspection. A fiber optic borescope is an acceptable means for visual inspection of ball valve regulators. Pilot regulators require the same internal inspection and part replacement policy as the main regulator body.

c. For all regulators, the spring color shall be checked to ensure it is the correct range and verified with the record card.

6. REMEDIATION

Appropriate action shall be taken to correct deficiencies found during the inspection. Regulator personnel shall not leave the work site until the regulators are in safe operating condition or taken out of service. If any regulator(s) will remain out of service, notify M&R Leadership and/or Engineering prior to leaving the site.

7. RECORDS

Records of each inspection shall be documented in the Company's work management system or other applicable records. At the completion of any work performed at the station (except for a regularly scheduled chart change), the "Regulator Station Inspection Record" (Form GS 1750.810-1) shall be completed listing the date, time, pressures, work performed and any additional comments. See GS 1750.810 "Records and Reports for Regulation."

Inspection records shall be retained for a minimum of ten (10) years, plus the current year.

A copy of the written correspondence from the Company (Exhibit B provides a sample correspondence) and correspondence from the transmission system operator in response to the letter shall be kept by the Systems Operations Manager.

Written correspondence shall be retained for a minimum of three (3) years, plus the current year.

NiSource
Distribution Operations

Gas Standard

Effective Date: 06/01/2020 09/182020	**Pressure Regulating Station Operation and Maintenance**	Standard Number: **GS 1750.010(MA)**
Supersedes: 04/12/2019 06/01/2020		Page 10 of 11

EXHIBIT A

Available Tags:

FOR GAS CO. USE ONLY
SCALE 1" = 1"

MONITOR
SCALE 1" = 1"

WARNING DEVICE
SCALE 1" = 1"

These Tags can be ordered from:

Columbus Meter Shop
Phone: 614-460-5520
Fax: 614-460-5522
metershop@nisource.com

EXHIBIT B

Send via UPS/FedEx and US Mail – Return Receipt Requested
Date

Name
Address
City, State

Transmission Company Representative,

Your Company is a Transmission Operator supplying natural gas to Columbia Gas of Massachusetts ("CMA"). CMA is now required to notify the Massachusetts Department of Public Utilities ("Department") Pipeline Engineering and Safety Division when a Transmission Operator that is our supplier experiences a service interruption to CMA or anticipates performing any gas flaring or pipeline pigging operations. CMA must notify the Department within 24 hours of receiving notification from the Transmission Operator.

Such notifications from Transmission Operators provide CMA with important information about potential operational impacts to our distribution system (e.g., gas odor calls, downstream debris, etc.).

Accordingly, CMA is requesting that your Company provide a schedule to me for these types of planned activities on an annual basis and provide notification to the Company on a continual basis, of such unplanned activities, so any potential operational impacts can be reduced.

In the event you need to speak with someone directly about your scheduled, or non-scheduled work, contact CMA's Gas Control Center at (866) 358-6595.

Your cooperation is very much appreciated.

Sincerely,

Dana C. Argo, Sr.
Manager, Systems Operations
Columbia Gas of Massachusetts ("CMA")
55 Foundation Avenue
Haverhill, MA 01835
(508) 726-7021
dargo@nisource.com

cc: Meggan Birmingham
Maggie Cousineau
Shaela Collins
Elizabeth Foley
Frank Davis

I hereby acknowledge that I have received notification of change to Company standards, and have reviewed the change for impact to my work.

This is a communication of change for Gas Standards. This information is required to be communicated to all individuals (including contractors) that these standards impact.

The following have been notified of the above modification or change(s):

Employee Name	Signature	Employee Number

Notified by: _____ Date: _____

Employee Name	Signature	Employee Number

Notified by: _____ Date: _____

NiSource – Columbia Gas of Massachusetts
Gas Standards

Standards Review

The following Standards have been created, modified, or cancelled.

Standards: **GS 1750.210(MA) "Inspection and Maintenance of Heaters"**

Indicate type of change:

- **X** Modification to company policies or procedures
- ____ Use of new equipment and/or technology
- ____ Change in State or Federal regulations
- ____ New information from equipment or product manufacturer
- ____ Other, explain

Job/account number the meeting was charged to _____

The modification or change is described as follows.

This is a communication of change for Gas Standards effective 09/18/2020.
This information is required to be communicated to all individuals (including contractors) that these standards impact. The changes have a moderate impact.

When the revised GS 1750.210(MA) "Inspection and Maintenance of Heaters" is reviewed with individuals, it becomes the effective operating standard for those individuals. Sidebars have been included on the standard to indicate where the updates have been made. Unless otherwise noted, the previous version will remain in effect until 09/30/2020.

The following document numbers or descriptions indicate revisions or modifications to written procedures.

GS 1750.210(MA) "Inspection and Maintenance of Heaters"

a. This Gas Standard has been established as a specific Columbia Gas of Massachusetts (MA) standard.
b. Section 2 "NOTIFICATION OF GAS CONTROL":
   1. This Section has been revised to require personnel to notify Gas Control when on site at any station. The revision removes the condition to only notify Gas Control if the station has SCADA monitoring equipment. Now, personnel are to notify Gas Control when at a station regardless if it has SCADA equipment or not.
   2. The Gas Control phone number has changed to 1-866-358-6595. This number is specific to CMA.
   3. When notification is being made, personnel at the station are to discuss the scope of work with Gas Control.
c. Minor formatting and/or grammatical changes made throughout the entire document.
d. Review the red-lined version of the Gas Standard on the following pages, showing additions in red and deletions as green text with a ~~strike though~~.

NiSource
Distribution Operations

Gas Standard

Effective Date: 09/18/2020	**Inspection and Maintenance of Heaters**	Standard Number: **GS 1750.210(MA)**
Supersedes: N/A		Page 1 of 13

Companies Affected:

☐ NIPSCO	☐ CVA	☐ CMD
	☐ CKY	☐ COH
	☒ CMA	☐ CPA

05/23/2019

REQUIRED

The requirements of ON 19-05 shall also be followed when work is performed in accordance with this standard.

REFERENCE 49 CFR Part 192.631, 192.739

1. GENERAL

This gas standard applies to the inspection, maintenance and remediation of heaters used in pipeline operations.

Natural gas temperature decreases approximately 1°F for each 15 psi drop. If the pressure drop is significant, internal and external icing conditions may result. When internal or external icing conditions are observed, the person making the observation shall notify the local Field Engineer. When a heater is present at the site, an indication of icing could either be the heater is in need of maintenance or the heater is undersized and needs to be retrofitted or replaced.

This standard applies to the following types of pipeline heaters.

a. Indirect fired water bath.
b. Catalytic.
c. Steam.
d. Kinetic Energy.

Unless otherwise noted in this standard, the maintenance of these heaters shall follow the manufacturer's written operating manual, if available.

2. NOTIFICATION OF GAS CONTROL

Anytime field personnel are on site at a station, Gas Control shall be notified by calling 1-866-358-6595~~If the heater status or gas temperature is monitored by SCADA, Systems Operations or GM&T shall notify Gas Control~~ before and after inspection or maintenance is performed~~ by calling one of the following numbers, as applicable~~. The scope of work should be discussed at that time.

~~Columbia Gas – Gas Control (CKY, CMA, CMD, COH, CPA, CVA): 1-800-921-2165~~

~~NIPSCO Gas Control: 219-853-5612~~

A Point-to-Point Verification may be required according to GS 1170.040 "Gas Control Point-

to-Point Verification."

3. INDIRECT FIRED WATER BATH HEATERS

Indirect water bath pipeline heaters are installed to reduce or prevent freezing of soil surrounding underground piping and resulting ground heaving downstream of regulator stations. In some instances they are installed to prevent hydrate formations internally in regulators, meters and pipelines when the gas contains excessive vapor or liquid phase hydrocarbons and water. Exhibit A pictures a typical water bath heater.

3.1 Accounting for Fuel Consumption

All indirect fired water bath heaters shall be equipped with a fuel meter. Fuel consumption for indirect fired water bath heaters can be significant and shall be accounted for in according to applicable Company procedures. It is important that indirect water bath heaters be shut off when not required.

3.2 Fluids

3.2.1 Water Specifications

Water used for dilution or volumetric make up shall meet ASTM D1193 Type IV Reagent Water. Deionized water, Reverse Osmosis (RO) water or distilled water can meet this standard. Contact the manufacturer for water supply recommendations and specifications.

3.2.2 Heat Transfer Fluids (Glycol)

Automobile antifreeze with aluminum corrosion inhibitors silicone polymers SHALL NOT BE USED IN WATERBATH PIPELINE HEATERS. Industrial grade heat transfer fluids are available from the manufacturer in either concentrated or diluted solutions. The current approved heat transfer fluid for new line heaters is Dow's Norkool LTC. The fluid shall be ordered with a 50/50 mix of approved water and LTC. This fluid shall also be used when replacing the entire fluid in existing heaters.

For existing heaters with Dow Norkool SLH, make up fluid shall be a 50/50 mix of SLH and approved water. Replacement of the entire fluid with a 50/50 mix of LTC and approved water may be undertaken.

Replacement of the entire fluid for heater with neither LTC nor SLH may be undertaken with a 50/50 mix of LTC and approved water.

3.2.3 Fluid Mixture

A water bath mixture of 45% to 55% glycol by volume should be maintained at all times. A -35°F protection level can be obtained with a 50% glycol mixture.

Ratios of glycol greater than 75% will increase the freezing temperature of the mixture, reduce efficiency and can create a potential fire hazard.

If it is necessary to add solution to an operating heater, it is recommended that a 50% glycol mixture be used. If glycol is not readily available, enough water should be added immediately to assure a safe operating level with follow-up testing to determine the quantity of glycol to add. In other cases, check for recommendations in the most recent analysis prior to adding solution.

When adding fluids where the original fluid supplier is known, use the same manufacturer's fluid. If the original fluid supplier is unknown, take fluid sample and have the sample laboratory tested. M&R leaders along with Field Engineering should review the laboratory analysis and make recommendations to adjust water bath solution.

3.2.4 Fluid Testing

The heat exchanger fluid shall be analyzed (tested) each year to determine the pH reserve alkalinity and water to glycol ratio. Additional samples may be submitted for analysis to confirm the effectiveness and accuracy of fluid additions and other fluid maintenance actions.

After analysis, M&R Leaders along with Field Engineering will make recommendations on quantities of water, glycol, and/or inhibitors to be added to restore the mixture to the targeted ratio.

The timing of the annual tests should be shortly after the fall start-up. It is recommended that a WMS Repetitive Task be established to ensure the timely testing of heat exchanger fluids.

Field locations should request the initial heat exchanger fluid sampling kit from the testing laboratory.

3.2.5 Fluid Maintenance Records

The testing laboratory should maintain a record of test results and recommendations given to operating personnel on heat exchanger fluids. Operating personnel should provide information on fluid additions made since the previous analysis when submitting fluid samples for testing. Systems Operations should maintain a record of tests results and recommendations from the testing laboratory.

3.3 Annual Inspections

Heaters shall be inspected at least once each calendar year not to exceed 15 months. It is recommended to perform this inspection just prior to the start of the heating season, as follows.

a. Inspect fire tube, main burner and pilot. Inspections should include corrosion inspection and inspect the fire tube for blockage.

b. Inspect liquid level to ensure it covers the tube bundle, both when the heater is cold and when it is operating.

c. Check for proper combustion.

   1. Flue conditions.
   2. Flame characteristics.
   3. Rated input by clocking the fuel meter.

d. Check water bath temperature controller setting. The high limit controller shall not exceed 180°F. Calibrate if necessary.

   Note: The gas temperature controller located downstream of regulation should be set just above 32°F for good fuel economy.

e. Check insulated shell for condition and repair as required.

f. Inspect the flame arrestor for blockage. If required clean the flame arrestor with compressed air to insure enough air can pass to support combustion.

g. Check all safety and shut down switches and controllers for proper operation.

h. Check the rating of the pressure vessel to ensure it is appropriate for the operating conditions including.

   1. Temperature and pressure ratings.
   2. Ensure the heater is designed for its maximum allowable operating pressure and protected from over-pressuring including the fuel train.
   3. Ensure the discharge from the flue stack is oriented away from any combustible items.

3.4 Remediation

Deficiencies found during the annual inspection program shall be corrected promptly to ensure that the intended function of the heater is being met.

If remedial action cannot be completed promptly, alternative actions must be implemented to ensure the safe and reliable operation of the pressure regulating station until the remedial actions of the heater can be completed.

4. CATALYTIC HEATERS

A catalytic heater is used to prevent internal freezing of regulators or meters. It does not add sufficient heat to the gas stream to prevent pipeline heaving.

Catalytic heaters are normally installed on high pressure cut regulator installations or M & R stations where wet gas conditions exist. Two types of catalytic heaters are available:

a. One (1) or two (2) catalytic heating elements mounted in enclosures that cover the regulator or meter body.

b. Larger, totally enclosed, rectangular “twin pack” heaters, mounted on three (3) inch or larger pipe, normally between regulators.

Where conditions or space permit, catalytic heating elements should be installed in an enclosure or housing. Heater enclosures for both types are used to increase heat transfer efficiency; they are made of stainless steel to reduce maintenance requirements. Catalytic heating elements which are enclosed transfer 50% more heat to the surface than unhoused heating elements. Heater enclosures also provide weather protection for outside installations.

Gas used in catalytic heater operations shall be accounted for on Form GS 1750.810-2 “Estimate of Unmeasured Gas Used for Regulator Operations” in accordance with applicable procedures.

To provide operational flexibility and to reduce fuel consumption during summer operations, a “Fuel Turn Down” valve should be incorporated on all new catalytic heater installations. The “Fuel Turn Down” valve is sized according to the BTU rating of the heater. On existing heaters with dual heating elements, fuel consumption can be reduced by turning of the fuel shut-off valve to one heating element during periods of low demand.

Installation, starting, and maintenance instructions for catalytic heaters are found on the Gas Operation Training page of MySource, under Technical Training “System Ops” and is listed under Student Guides as “Operating and Maintaining Catalytic Heater Installations (CDOPM4H.1).”

Catalytic heaters have no moving parts and the fuel regulators are set at the factory.

Exhibit B illustrates typical examples of the two types of catalytic heater installations.

4.1 Annual Inspections

Catalytic heaters shall be inspected at least once each calendar year not to exceed 15 months. It is recommended to perform this inspection just prior to the start of the heating season, as follows.

a. Inspect the wiring terminals and clean with emery cloth.

b. Inspect the enclosure if equipped for any deficiencies and repair or replace.

c. Visually inspect the piping and regulators for any signs of wear which would require replacement.

d. Inspect the heater face and catalyst pad for debris or water. It may be

necessary to dry heater in oven if water is present. Follow the manufacturer recommendations when drying catalyst pad.

e. Verify that the inlet pressure to the supply regulator has not changed since last use. It may be necessary to add an upstream regulator to the supply lines if pressure has been increased.

4.2 Remediation

If heater does not stay lit follow the steps below.

1. Verify the operating pressure downstream of the final cut regulator (3.5 - 4.5 inches w. c.).
2. Verify all orifices are clear.
3. Verify safety shut-off valve is open by depressing the red reset button.
4. Verify the connections of the thermocouple are tight at the safety valve and heater pan.
5. Verify the heating element for electric continuity.

Deficiencies found during the annual inspection program shall be corrected promptly to ensure that the intended function of the heater is being met.

If remedial action cannot be completed promptly, alternative actions must be implemented to ensure the safe and reliable operation of the pressure regulating station until the remedial actions of the heater can be completed.

If the heater will still not operate, it should be replaced or returned to the manufacturer for repair.

5. STEAM HEATER

Steam heaters use steam from a water / glycol mixture to apply heat to the gas with the gas stream piping. The water mixture is heated in a vacuum which allows the water to boil into a steam at a lower temperature which reduces fuel costs. Exhibit C pictures a steam heater with the boiler and the steam tubes.

5.1 Accounting for Fuel Consumption

All steam heaters shall be equipped with a fuel meter. Fuel consumption for steam heaters can be significant and shall be accounted for in according to applicable Company procedures. It is important that steam heaters be shut off when not required.

5.2 Fluids

5.2.1 Water Specifications

Water used for dilution or volumetric make up shall meet ASTM D1193 Type IV Reagent Water. Deionized water, Reverse Osmosis (RO) water or distilled water can meet this standard. Contact the manufacturer for water supply recommendations and specifications.

5.2.2 Heat Transfer Fluids (Glycol)

Automobile antifreeze with aluminum corrosion inhibitors silicone polymers SHALL NOT BE USED IN STEAM PIPELINE HEATERS. Industrial grade heat transfer fluids are available from the manufacturer in either concentrated or diluted solutions. The current approved fluid for steam heaters is Dowfrost HD manufactured by Dow Chemical.

5.2.3 Fluid Mixture

A water bath mixture of 45% to 55% glycol by volume should be maintained at all times. A -35°F protection level can be obtained with a 50% glycol mixture. Ratios of glycol greater than 75% will increase the freezing temperature of the mixture, reduce efficiency and can create a potential fire hazard.

If it is necessary to add solution to an operating heater, it is recommended that a 50% glycol mixture be used. If glycol is not readily available, enough water should be added immediately to assure a safe operating level with follow-up testing to determine the quantity of glycol to add. In other cases, check for recommendations in the most recent analysis prior to adding solution.

When adding fluids where the original fluid supplier is known, use the same manufacturer's fluid. If the original fluid supplier is unknown, take fluid sample and have the sample laboratory tested. Field Engineers should review the laboratory analysis and make recommendations to adjust water bath solution.

5.2.4 Fluid Testing

The heat exchanger fluid shall be analyzed (tested) after the first year. If analysis indicates no remedial actions required, sampling shall be completed every five (5) years until the sample results indicate remedial actions are required. The sample should be taken before the heater is lit for the year or shut off over night before the sample is taken. Additional samples may be submitted for analysis to confirm the effectiveness and accuracy of fluid additions and other fluid maintenance actions. If after the first three (3) year worth of samples indicates no issue with the fluid, the annual fluid testing can be eliminated.

After analysis, Field Engineering will make recommendations on quantities of water, glycol, and/or inhibitors to be added to restore the mixture to the targeted ratio.

The timing of the annual tests should be shortly before the fall start-up. It is recommended that a WMS Repetitive Task be established to ensure the timely testing of heat exchanger fluids.

Field locations should request the initial heat exchanger fluid sampling kit from the testing laboratory.

5.2.5 Fluid Maintenance Records

The testing laboratory should maintain a record of test results and recommendations given to operating personnel on heat exchanger fluids. Operating personnel should provide information on fluid additions made since the previous analysis when submitting fluid samples for testing. Systems Operations should maintain a record of tests results and recommendations from the testing laboratory.

5.3 Annual Inspections

Heaters shall be inspected at least once each calendar year not to exceed 15 months. It is recommended to perform this inspection just prior to the start of the heating season, as follows.

a. Inspect fire tube, main burner, pressure coil and pilot. Inspections should include corrosion inspection and fire tube blockage inspection.

b. Inspect liquid level to ensure it covers the tube bundle, both when the heater is cold and when it is operating.

c. Check for proper combustion.

   1. Flue conditions.
   2. Flame characteristics.
   3. Rated input by clocking the fuel meter.

d. Check water bath temperature controller setting. Calibrate if necessary.

   Note: The gas temperature controller located downstream of regulation should be set just above 32°F for good fuel economy.

e. Check insulated shell for condition and repair as required.

f. Clean the flame arrestor with compressed air to insure enough air can pass to support combustion.

g. Check all safety and shut down switches and controllers for proper

operation.

h. Inspect the vacuum gauge for proper vacuum pressure. A vacuum pressure of minus 5 to minus 15 inches of mercury during operation or minus 20 to minus 29 inches of mercury during shut down are good indication of proper vacuum pressures.

5.4 Remediation

Deficiencies found during the annual inspection program shall be corrected promptly to ensure that the intended function of the heater is being met.

If remedial action cannot be completed promptly, alternative actions must be implemented to ensure the safe and reliable operation of the pressure regulating station until the remedial actions of the heater can be completed.

6. KINETIC ENERGY HEATERS

Kinetic energy heaters (e.g., VORTEX) rely on the increase in flow rate of the heater's supply gas to provide heat to the gas stream. Exhibit D pictures a heater and a typical installation.

6.1 Annual Inspections and Maintenance

The heater itself has no moving parts. Other maintenance and inspection should be completed before the fall heating season.

a. Inspect and clear if necessary all control, supply and gas stream lines.

b. Inspect and reset the heater supply control valve to the proper pressure.

c. IF so equipped, inspect and reset the flow control regulator to the proper pressure.

d. Inspect, clean or replace if necessary the gas stream filter.

MiSource
Distribution Operations

Gas Standard

Effective Date: 09/18/2020	**Inspection and Maintenance of Heaters**	Standard Number: **GS 1750.210(MA)**
Supersedes: N/A		Page 10 of 13

EXHIBIT A

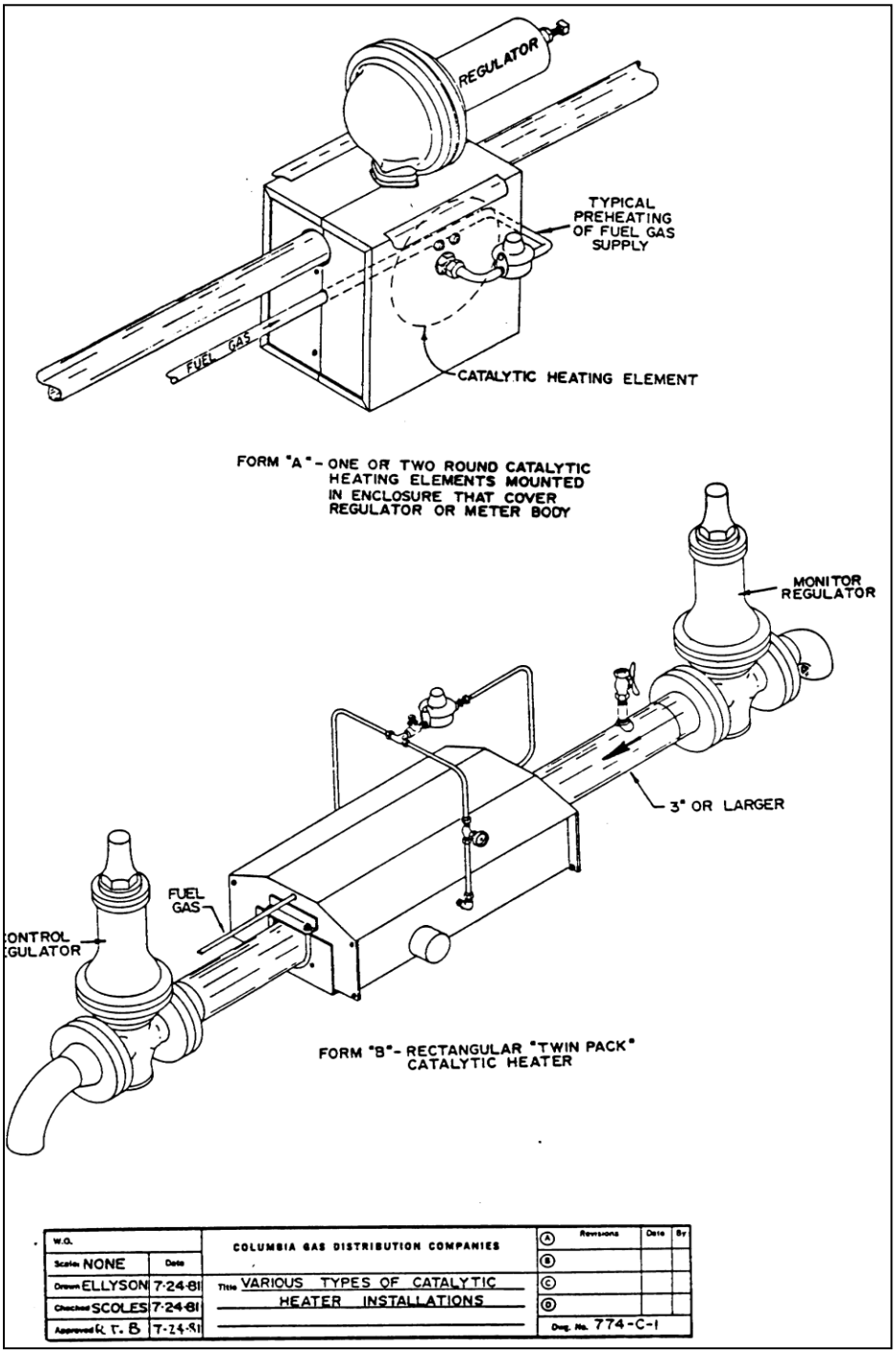
Water Bath Heater

Gas Standard

Distribution Operations

Effective Date: 09/18/2020	**Inspection and Maintenance of Heaters**	Standard Number: **GS 1750.210(MA)**
Supersedes: N/A		Page 11 of 13

EXHIBIT B



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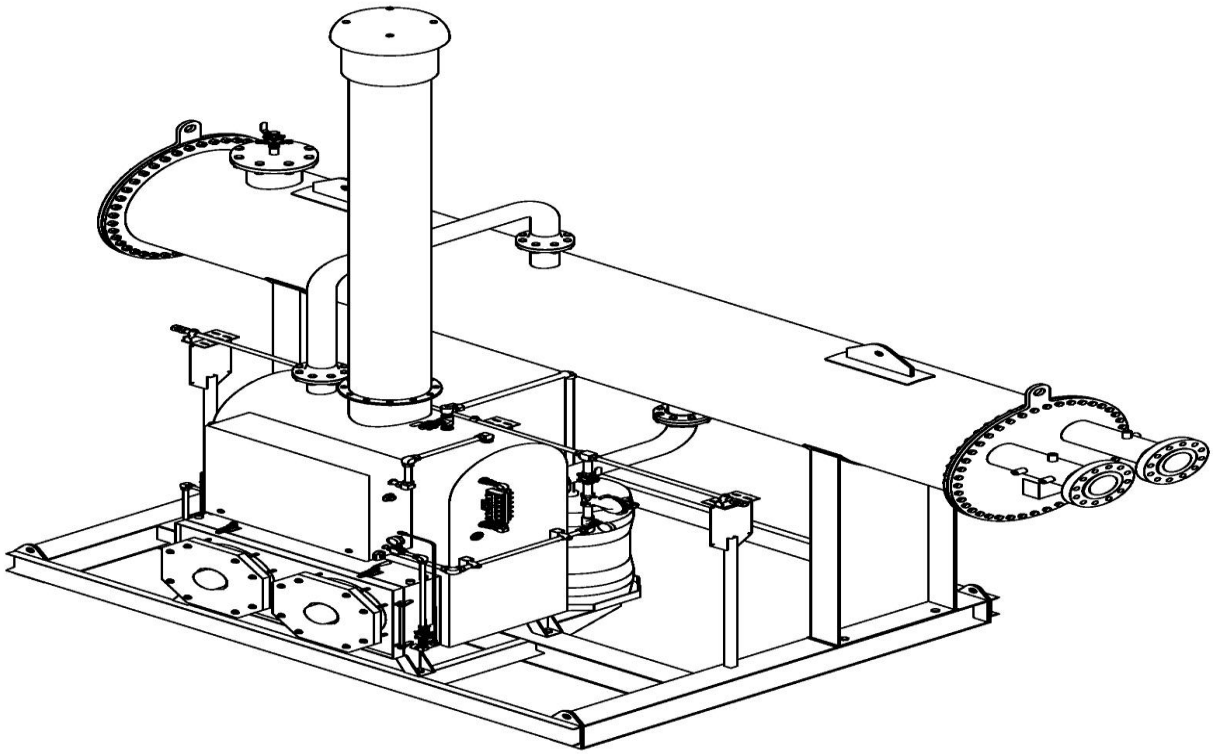
Distribution Operations

Gas Standard

Effective Date: 09/18/2020	**Inspection and Maintenance of Heaters**	Standard Number: **GS 1750.210(MA)**
Supersedes: N/A		Page 12 of 13

EXHIBIT C

Steam Heater



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Gas Standard

Effective Date: 09/18/2020	**Inspection and Maintenance of Heaters**	Standard Number: **GS 1750.210(MA)**
Supersedes: N/A		Page 13 of 13

EXHIBIT D

Kinetic Energy Type Heater

Typical Installation with Downstream Flow Control Regulator

I hereby acknowledge that I have received notification of change to Company standards, and have reviewed the change for impact to my work.

This is a communication of change for Gas Standards. This information is required to be communicated to all individuals (including contractors) that these standards impact.

The following have been notified of the above modification or change(s):

Employee Name	Signature	Employee Number

Notified by: _____ Date: _____

Employee Name	Signature	Employee Number

Notified by: _____ Date: _____

NiSource – Columbia Gas of Massachusetts
Gas Standards

Standards Review

The following Standards have been created, modified, or cancelled.

Standards: **GS 1170.040 "Gas Control Point-to-Point Verification"**

SEAS 19-172
Indicate type of change:

- **X** Modification to company policies or procedures
- ____ Use of new equipment and/or technology
- ____ Change in State or Federal regulations
- ____ New information from equipment or product manufacturer
- ____ Other, explain

WMS job number the meeting was charged to _____

The modification or change is described as follows.

This is a communication of change for GS 1170.040 "Gas Control Point-to-Point Verification" effective 06/15/2020.
This information is required to be communicated to all individuals (including contractors) that these standards impact. The changes have a moderate impact.

When the revised GS 1170.040 "Gas Control Point-to-Point Verification" is reviewed with individuals, it becomes the effective operating standard for those individuals. Sidebars have been included on the standard to indicate where the updates have been made. Unless otherwise noted, the previous version will remain in effect until 10/1/2020.

The following document numbers or descriptions indicate revisions or modifications to written procedures.

GS 1170.040 "Gas Control Point-to-Point Verification"

a. Section 1 General revises the definition of a Point-to-point (P2P) verification.
b. Section 2 Gas Control Notification was revised to add more guidance for the notification to Gas Control from field personnel. This section requires field personnel to notify Gas Control when on site and discuss if a P2P needs to be performed. The guidance also includes direction for field personnel to request assistance from Gas Control if needed to assist in conducting the P2P verification. Also, this section clarifies that it is the responsibility of the field personnel to notify Gas Control if additional work outside of the original scope of work was performed.
c. A new Section 3 P2P Requirements provides the requirements for conducting the P2P verification and includes examples of SCADA monitored devices. This section also simplified the examples of activities that require a P2P verification.
d. Section 4 Safety-Related Points (SRP) is a new section defining SRPs.
e. Section 5 Point-to-Point Verification Process (formerly Section 3) was revised to provide flexibility to allow the P2P to be conducted by the field personnel with or without the assistance from Gas Control.

f. Section 6 Point-to-Point Verification Procedure (formerly Section 4) provides flexibility to allow the P2P to be conducted by the field personnel with or without the assistance from Gas Control. Also describes methods and equipment to be used.

g. Section 7 Records (formerly Section 5) requires Gas Control to ensure all P2P records are maintained electronically.

h. Review the red-lined version of the Gas Standard on the following pages, showing additions in red and deletions as green text with a ~~strike though~~.

NiSource
Distribution Operations

Gas Standard

Effective Date: 06/15/2020	**Gas Control Point-to-Point Verification**	Standard Number: **GS 1170.040**
Supersedes: 01/01/2018		Page 1 of 5

Companies Affected:	☒ NIPSCO	☒ CVA	☒ CMD
		☒ CKY	☒ COH
		☒ CMA	☒ CPA

REFERENCE 49 CFR Part 192.631

1. GENERAL

Point-to-point (P2P) verification is the process of verifying the actual physical location ~~and sequence among~~of installed devices ~~and equipment at a location~~ and verifying ~~that~~ the data, information and ~~any~~ control functions to/from the point are being accurately represented on all Supervisory Control and Data Acquisition (SCADA) display(s) ~~on which it resides~~.

2. GAS CONTROL NOTIFICATION

Gas Control shall be notified when personnel are on site at a facility with equipment monitored by SCADA. The scope of work shall be discussed at that time, including whether a P2P verification needs to be performed.

Field personnel may request assistance from Gas Control personnel to conduct the P2P verification (e.g., issues with connection to SCADAweb, field personnel prefers guidance from Gas Control).

If additional work outside the original scope was performed, it is the responsibility of the individual in the field to notify Gas Control prior to leaving the site.

Gas Control shall be notified by calling the following number, as applicable.

Columbia Gas – Gas Control (CKY, CMA, CMD, COH, CPA, CVA): 1-800-921-2165

NIPSCO – Gas Control: 219-853-5612

3. P2P REQUIREMENTS

~~Gas Control personnel and Company field personnel shall conduct a~~A P2P verification ~~between SCADA displays and related field equipment~~ shall be conducted at a site with SCADA when field equipment is added, replaced, repaired and/or moved and when other changes that affect pipeline safety are made to field equipment or SCADA displays. The minimum requirement is to verify all safety-related points (SRP) in the SCADA system. Other points may require a P2P at Gas Control's discretion.

In addition to verifying the physical location of a SCADA monitored site through standard identification nomenclature, GPS coordinates, and/or physical addresses, the P2P

verification shall also include verifying the physical location of the sensing element (transducer, TC / RTD, etc.) on the gas system.

Examples of SCADA monitored devices are as follows.

a. Pressure transducer location on gas system.
    1. Inlet
    2. Outlet
    3. Measurement run
b. Remote Control or Local Control.
    1. Pressure set-point and feedback
    2. Flow set-point and feedback
    3. Valve position set-point or position feedback

Examples of activities that occur at a station with SCADA which require a P2P to be performed are as follows.

a. Adding, upgrading, or repairing a remote terminal unit (RTU).
b. Adding, repairing, replacing, or relocating any equipment or sensing element which is monitored or controlled remotely in SCADA.
c. Changes made to a SCADA display which may impact how a Safety-Related Point (SRP) is viewed on that display. (See Section 4 “Safety-Related Points (SRP) below.)

Note - Station inspections and transducer calibrations (annual or ad hoc) do not require a P2P unless additional work is identified which will affect SCADA SRPs, such a transducer replacement. However, a P2P for this type work may be requested by any party involved in the process.

~~P2P verifications that are needed for SCADA display or field equipment additions, changes, or removals should be done for the points that are impacted, at a minimum.~~

~~Examples of activities that occur at a station with SCADA monitoring that may require a P2P verification include, but are not limited to the following:~~

~~Performing regulator and/or measurement inspection.~~

~~Adding/removing a remote terminal unit (RTU) or electronic pressure recorder (e.g., ERX).~~

~~Performing calibrations.~~

~~Adding a transducer.~~

~~Adding equipment which is monitored in SCADA (e.g., odorizers, heaters).~~

~~Adding/removing remote control capability.~~

~~Replacement of equipment that impacts safety related points (e.g., regulator).~~

4. SAFETY-RELATED POINTS (SRP)

The Company defines the following points as safety-related points (SRP).

a. Any point classified as “safety-related” in SCADA.
b. Pressure.
c. Security – Remote / Local Switch, RTU Cabinet Door.
d. Fire Status – Smoke, Heat Detection, Fire.
e. Emergency Shut Down or ESD (Peak / Shaving facilities).
f. Gas Detection, Hazardous Gas LEL/UEL.
g. Gas Quality, Moisture.
h. Odorant Rate.
i. Odorizer Equipment – General Fail.
j. Heater Fail.
k. Heater Pilot Fail.
l. Pressure or flow control capabilities.

~~2. GAS CONTROL NOTIFICATION~~

~~Gas Control shall be notified when personnel are on site at a facility with equipment monitored by SCADA. The scope of work shall be discussed at that time, including whether a P2P needs to be performed. If additional work outside the original scope was performed, it is the responsibility of the individual in the field to notify Gas Control prior to leaving the site.~~

~~When field personnel work on-site at a station with SCADA monitoring (includes ERX connected to SCADA), Gas Control shall be notified by calling the following number, as applicable.~~

~~Columbia Gas – Gas Control (CKY, CMA, CMD, COH, CPA, CVA): 1-800-921-2165~~

~~NIPSCO – Gas Control: 219-853-5612~~

~~3.~~5. POINT-TO-POINT VERIFICATION PROCESS

When Gas Control is informed that field personnel are working on-site, the Controller on

duty shall inquire as to what is being done, who is performing the work, and request a return call from field personnel when the work is completed (prior to leaving the site). Should the work performed impact SCADA readings as defined within this gas standard, then a P2P shall be performed ~~when the return call is made by the field representative~~. The P2P may include a full verification of all SCADA points or a modified P2P that includes only key SCADA points relative to the work performed. ~~Gas Control shall determine the extent of the P2P verification.~~

If field personnel fail to place a return call to Gas Control when the job is completed, the controller shall follow up with the field personnel, confirm completion, and request that they return to the site to perform the P2P. A required P2P that is not completed shall be reported to Gas Control leadership and local Field Operations leadership for follow-up.

~~4.~~6. POINT-TO-POINT VERIFICATION PROCEDURE

If requested by the field employee, ~~T~~the Gas Control personnel will guide the field employee through the P2P verification procedure.

When conducting a P2P verification, the field employee will confirm that the input or output of each field instrument (analog or discrete) is accurately and reliably reflected in the associated SCADA display~~information presented to the controller~~. Analog values from instruments in the field such as local gauges, manometers, or other test methods should be used to verify the SCADA display is indicating a similar value not exceeding allowable tolerances per GS 1754.010 “Operation and Maintenance of Pressure Gauges.”

~~Operation of field devices~~End-to-End verification is the preferred method of performing P2P verifications, but may not be practical in some situations. For example, by-passing a station or closing main line valves to verify SCADA position indication might be too disruptive to system operation or may introduce risk into the activity. In such cases, breaking the loop to simulate or receive a signal is allowed at the discretion of the individual performing work in the field~~applying a simulated signal at the field instrumentation might be justified~~. The application of simulated signals should be used sparingly, and be configured as close to the actual field devices as possible.

~~5.~~7. RECORDS

P2P verification documentation shall be recorded in SCADAweb~~completed by the Gas Control personnel~~ and include each of the following.

a. SCADA point name.

b. ~~,~~ U~~u~~pdated time and value or state of associated device as observed by the ~~Gas Control personnel and the Field Representative~~personnel conducting the P2P verification.

c. ~~, and t~~The~~ir respective~~ name(s) of the personnel conducting the P2P verification.

MiSource
Distribution Operations

Gas Standard

Effective Date: 06/15/2020	**Gas Control Point-to-Point Verification**	Standard Number: **GS 1170.040**
Supersedes: 01/01/2018		Page 5 of 5

Gas Control is responsible to ensure all P2P records are maintained electronically in a centralized location for each Company and retained in accordance with the Company records retention policy.

I hereby acknowledge that I have received notification of change to Company standards, and have reviewed the change for impact to my work.

This is a communication of change for Gas Standards. This information is required to be communicated to all individuals (including contractors) that these standards impact.

The following have been notified of the above modification or change(s):

Employee Name	Signature	Employee Number

Notified by: _____ Date: _____

Employee Name	Signature	Employee Number

Notified by: _____ Date: _____

Work Loc	Facility No	RT ID No	RT City Cd	RT County Cd	RT Map Number	RT Job Type Cd	RT Resp Sup	RT Summary	RT Last JO No	RT Current JO No	RT Target Dt	RT Commit Dt	Target Month	Target Year
8100	0000698706	01031894	SHA	019		2611	8110M	ANN INSPECTION CAT HEATERS		20847427300	09-01-2020	04-01-2021	9	2020
8100	0000700161	01031895	EBW	023	754385	2611	8110M	ANN INSPECTION CAT HEATERS		20847427400	09-01-2020	04-01-2021	9	2020
8100	0000700174	01031897	HSN	023	772392X	2611	8110M	ANN INSPECTION CAT HEATERS		20847427500	09-01-2020	04-01-2021	9	2020
8100	0000748447	01031898	TAU	005		2611	8110M	ANN INSPECTION CAT HEATERS		20847427600	09-01-2020	04-01-2021	9	2020
8200	0000689299	01031899	SPR	013	NA	2611	8210M	ANN INSPECTION CAT HEATERS		20847427700	09-01-2020	04-01-2021	9	2020
8200	0000671427	01031900	PAL	013	NA	2611	8210M	ANN INSPECTION CAT HEATERS		20847427800	09-01-2020	04-01-2021	9	2020
8200	0000736997	01031903	AGA	013	022	2611	8210M	ANN INSPECTION CAT HEATERS		20847427900	09-01-2020	04-01-2021	9	2020
8200	0000476857	01031904	ELM	013		2611	8210M	ANN INSPECTION CAT HEATERS		20847428000	09-01-2020	04-01-2021	9	2020
8400	0000735732	01031919	AND	009	AND-131	2611	8410M	ANN INSPECTION CAT HEATERS		20847429100	09-01-2020	04-01-2021	9	2020
8400	0000730044	01031920	LAW	009		2611	8410M	ANN INSPECTION CAT HEATERS		20847429200	09-01-2020	04-01-2021	9	2020
8400	0000735675	01031921	LAW	009	NLAW-002	2611	8410M	ANN INSPECTION CAT HEATERS		20847429300	09-01-2020	04-01-2021	9	2020
8400	0000732211	01031922	MET	009	MET-132	2611	8410M	ANN INSPECTION CAT HEATERS		20847429400	09-01-2020	04-01-2021	9	2020

CHECKLIST TO ASSIST YOU BEFORE ENTERING AND LEAVING A PIT OR STATION

BEFORE ENTERING A STATION OR PIT

1. CALL GAS CONTROL TO DISCUSS SCOPE OF WORK AT SITE ☐
2. BE SURE ALL PERSONEL ARE WEARING ALL REQUIRED PPE ☐
3. PERFORM LEAK SURVEY ☐
4. CHECK TUBE FOR LAST PRESSURE SETTINGS, MAOP AND LAST PERFORMED TASK ☐
5. DOES YOUR JOB REQUIRE A POLICE DETAIL (CALL HEIDI 614-460-7863) ☐
6. TAKE PRESSURE READINGS AT INLET, SPOOL PIECE AND LAST PERFORMED TASK ☐
7. CHECK SIGNAGE AND OR MARKINGS ON OR AROUND YOUR PIT OR STATION ☐
8. MAKE SURE YOUR JOB SITE IS A SAFE PLACE FOR YOU AND OTHER PEOPLE WHILE YOUR WORK IS TAKING PLACE ☐
9. DON'T FORGET TO COMPLETELY FILL OUT REGULATOR STATION INSPECTION RECORD ☐
10. DOUBLE CHECK ALL FITTINGS AND VALVES ARE IN THE CORRECT POSITION ☐
11. MAKE SURE THE DO NOT OPERATE TAGS ARE IN PROPER LOCATION, ARE LEGIBLE AND HAVE EMPLOYEE # ☐
12. IF LOCKS ARE BEING USED, OIL AND MAKE SURE THEY ARE LOCKED ☐
13. PERFORM LEAK CHECK BEFORE LEAVING ☐
14. DON'T FORGET YOUR 360 WALK AROUND ☐
15. DOUBLE & TRIPLE CHECK ALL VALVES FOR PROPER POSITIONS. ☐

Pre – Job Briefing

GAS CONTROL OHIO 1-800-921-2165

Person Conducting Briefing _____ Date _____

Today's task: _____ Location _____

PUT STANDARD ON SCREEN (MDT)

SAFETY PPE THAT IS NEEDED TO PERFORM TASKS SAFELY

- GLOVES
- HARD HAT
- EAR PLUGS
- LONG SLEEVES OR FR CLOTHING
- SAFETY GLASSES
- SAFETY SHOES
- VEST

HAS YOUR JOB SITE BEEN SET UP WITH SAFETY IN MIND

- SAFETY CONES AND SAFETY STICKS
- FLASHERS AND STROBE LIGHTS
- CELL PHONES BEEN PROPERLY STOWED OR OTHER ITEMS

CHECK LIST OF CALIBRATED OR INSPECTED TOOLS OR EQUIPMENT NEEDED FOR JOB

- LEAK DETECTOR
- FIRE EXTINGUISHER
- FIRST AID
- GAUGE CALIBRATION

Potential Hazards _____

Nearest Hospital _____

Employee Signatures:

REDACTED

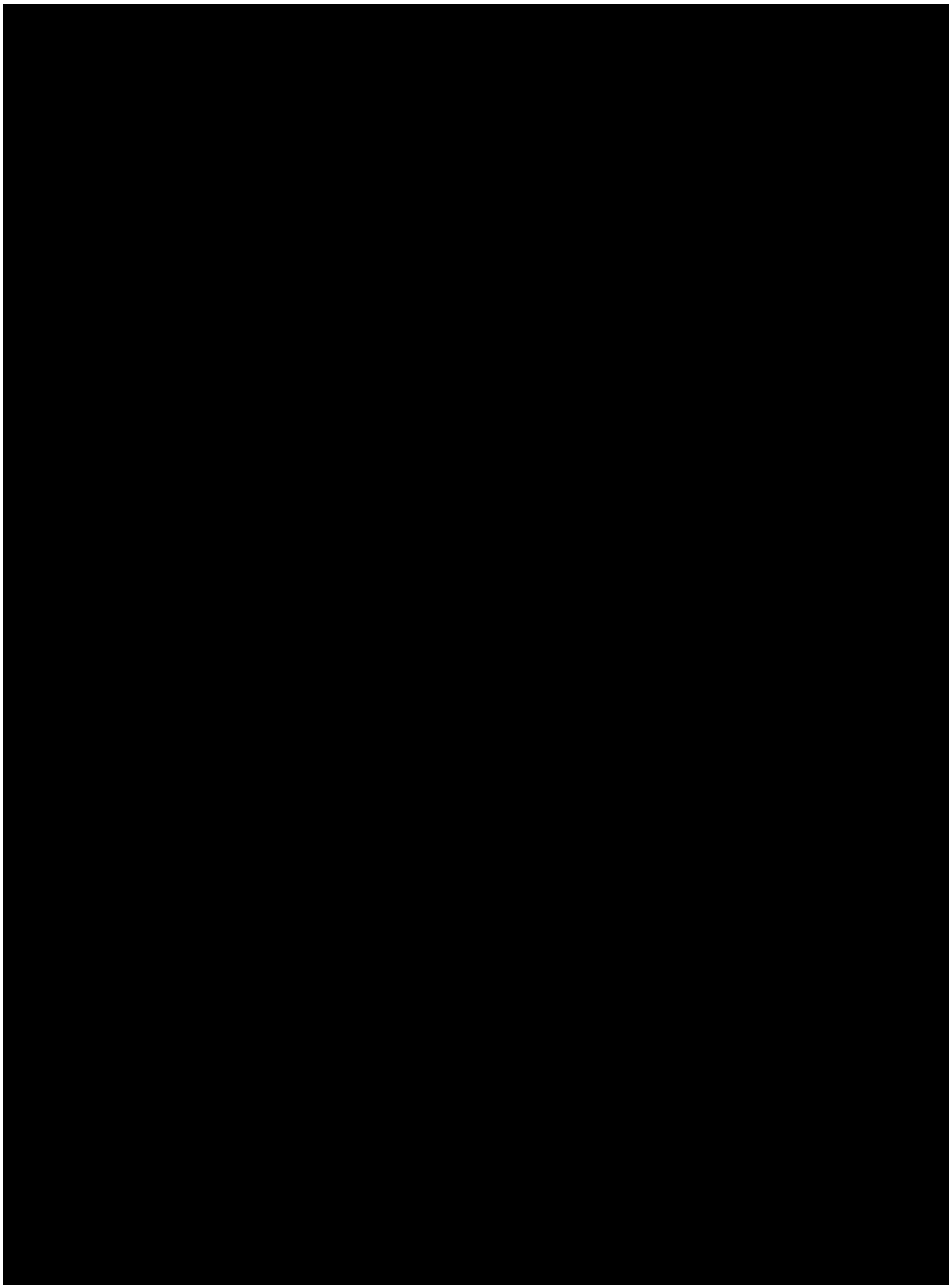
Columbia Gas of Massachusetts
A NiSource Company

COURSE	
Title	Version 2 of M & R Check List and "DO NOT OPERATE" Tags
Review changes to Checklist that are in line with changes to GS 1750.010 (MA)	

Date:	9/25/2020
Location	Virtual Meeting
Start Time	10:30
End Time	10:45
Instructor	Dana Argo

	Name of Employee	U Number	Signaure
1	Adrian Silva	[redacted]	unavailable
2	Brendan Pimentel		
3	Dave Matthews		unavailable
4	Steve Dwinells		
5	Chris Terroux		
6	Sean O'Loughlin		unavailable
7	Chuck Docherty		unavailable
8	Benny Rocca		unavailable
9	Anthony Eichstaedt		unavailable
10	Jim Clement		unavailable
11	Bob Carmel		unavailable
12	Glen Halket		
13	Mark Izabel		unavailable
14	Dave Harris		unavailable
15	Steve Setian		unavailable
16	Dave Fitzgerald		unavailable
17	Jorge Pacheco		unavailable
18	Dave Garnett		unavailable
19	Herb Gurney		unavailable
20	Brian O'Leary		
21	Tim Maher		unavailable
22	Rob Nowak		unavailable
23	Tim Anderson		
24	Bill Kaszanek		
25	Brendan Levesque		
26	Francis Pena		

REDACTED



NiSource®

CDOPM4 GDS6.10

Operating and Maintaining Self-Operated Pressure Regulator Installations

Instructor's Guide

Resource Listing

The following are resources influencing the creation of this training manual:

D.O.T.

192.619	Maximum allowable operating pressure: Steel or plastic pipelines
192.621	Maximum allowable operating pressure: High-pressure distribution systems
192.739	Pressure limiting and regulating stations: Inspection and testing
192.741	Pressure limiting and regulating stations: Telemetering or recording gauges
192.743	Pressure limiting and regulating stations: Capacity of relief devices

Gas Standards

GS 1750.010	Pressure Regulator Station Operation and Maintenance
GS 1750.020	Inspection and Maintenance of Delivery Station Regulators
GS 1750.040	Relief Devices Inspections and Maintenance
GS 1750.050	Bonding Considerations for M&R Settings
GS 1752.010	Pressure Regulating Station Capacity Review
GS 1754.010	OH KY Operation and Maintenance of Pressure Gauges
GS 1756.010	Annual Review of Primary Relief Devices

Course Outline

This course will provide a series of instructions followed by a short content review to check your knowledge. An overall review of the course material will be performed prior to a written exam.

The exam will be 40 questions long and a score of at least 80% (32 out of 40) will be required to pass.

A skill component is also necessary to pass this course. See the Skill Requirement section located in the back of this book for specific requirements.

Classroom Materials

- Student Manuals
- Exam

Table of Contents

Objectives:

- Abnormal Operating Conditions
- Health, Safety & Environmental
- Gauge Calibration Techniques and Schedules
- Catalytic Heater Installation, Start-Up and Maintenance
- Regulator Station Documentation and Verification
- Self-Operated Regulator Station/Setting Installation and Start-Up
- Self-Operated Regulator Station/Setting Inspection and Maintenance
- Self-Operated Regulator Problems

Operating and Maintaining Self-Operated Pressure Regulator Installations

OQ Task M-4 GDS6.7

A pressure regulator is designed to reduce a higher pressure to a lower value by controlling the flow of gas through its valve. It is also used to limit pressure to a predetermined value. In this module, you will learn the basic operating and maintenance practices for the self-operated pressure regulator installation.

In This Section:

Abnormal Operating Conditions

Recognizing and reacting to abnormal operating conditions (AOC) in the workplace can greatly impact your safety and the safety of others. As a natural gas company employee or contractor, a greater responsibility is placed upon you to quickly identify an AOC and to use the proper reaction to protect life and property.

In this section, we will cover recognizing and reacting to abnormal operating conditions, and identify some AOCs common to this OQ Task.

- Recognizing AOCs...

Listed below are some examples of abnormal operating conditions (AOCs) and ways of recognizing them.

CFR 49, Part 192.803

Abnormal operating condition means a condition identified by the operator that may indicate a malfunction of a component or deviation from normal operations that may:

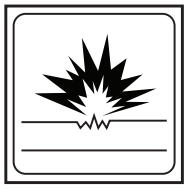
(a) Indicate a condition exceeding design limits; or

(b) Result in a hazard(s) to persons, property, or the environment.

Any unplanned and / or uncontrolled **escape of gas** including:

- Outside leaks aboveground as indicated at meter sets, regulator/gate station, house piping, etc.
- Belowground leaks as indicated at transmission lines, mains, service lines, etc.

Any **fire** involving a pipeline facility as indicated by uncontrolled ignition of gas.



Any **explosion** involving a pipeline as indicated by:

- A sudden and violent release of energy.
- A loud sound that accompanies a sudden release of energy, etc.

Any **pressure that exceeds** the operating limits of the gas system indicated by:

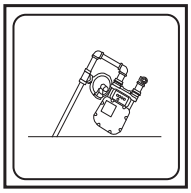
- A relief valve expelling gas.
- Telemetry pressure readings, etc.

Any **pressure that falls below** the normal operating requirements of the gas system as indicated by:

- Pilot at customer appliance is out.
- Telemetry reads are significantly lower than normal, etc.

No Pressure in a Pipeline that was Last Known to Be in Service as indicated by:

- Inadvertent shutdown
- Valve closed (when it should be open)
- Broken line
- Excess flow valve (EFV) activated
- Pressure limiting device activated, etc.



Pipeline Facility Installation that **No Longer Meets Code Requirements and/or Company Policy** as indicated by:

- Bent riser or other aboveground piping
- Pipe and/or coating nicked or gouged during excavation
- Grease stem on valve broken or damaged
- Broken or cut cathodic protection (CP) test point wire
- Valve stuck, unable to turn
- Regulator or meter failure
- Regulator vent too close to a source of ignition, air intake, opening to a building or unsafe electrical source
- Underground pipeline exposed, when it should be buried
- Main or service line too shallow (How shallow? Type of pipe? External loads?)
- Meter/riser enclosed or in an unventilated space
- Main or service under structure (including mobile manufactured home)
- Riser/meter embedded in a wall/stucco
- Service valve buried or not accessible
- Facilities under water (normally above the water line)
- Ground subsidence or movement in proximity of gas system
- Inadequate support, excessive bending or loading on facilities
- Vaults not accessible

- Reacting to AOCs...

If the AOC Presents an Immediate Danger	• Assess the Situation • Make repairs if possible • Replace component(s) at the time of discovery; or • Implement emergency response procedures and make notifications
If the AOC Does **NOT** Pose an Immediate Danger	• Initiate the appropriate action that will ensure a timely repair • Analyze and treat it as if it were a Grade 2+, Grade 2 or Grade 3 leak

- OQ Task Specific AOCs...

The following list contains AOCs related to this OQ Task. Please be advised that this is not a complete listing. Always be aware of safety and hazard recognition in the workplace.

Form GS 1652.010-1 "Facility Failure Report" shall be submitted for failures on components that are part of an in-service pipeline facility.

RECOGNIZE:	REACT:
Uncontrolled escaping gas	Safe shutdown and repair
Accidental Ignition	Control fire and make area safe
Regulator will not lock up or not operating properly	Repair or replace regulator
Relief valve not relieving at appropriate pressure	Reset, repair or replace relief valve
Missing parts or parts show corrosion	Repair or replace parts
Gas odor detected in building	Locate and repair leak
Vent/control/supply lines improperly installed or damaged	Repair or replace lines
Instrument controller or pilot regulator fail to respond	Repair or replace equipment
Irregular chart reading	Check pressure and make repairs

In This Section:

Health, Safety & Environmental

Working safe is our primary daily focus. We constantly monitor to recognize hazards, ensure that proper personal protective equipment is available and used, safe driving practices are followed, and environmental considerations are addressed.

In this section, we will address each of these subjects as it pertains to this OQ task.

- *Job Hazard Awareness...*

Listed below are hazards commonly identified for this OQ Task. Please be aware that this is only a partial list intended to raise safety awareness in the workplace. Always perform a Job Site Hazard Analysis prior to performing any work.

- Contusions, Strain / Sprain
- Slips/Trips Falls
- Hazardous Atmospheric Conditions
- Material Handling
- Excavation Hazards

- *Personal Protective Equipment...*

Listed below are Personal Protective Equipment (PPE) commonly identified for use while performing this OQ Task. Please be aware that this is only a partial list intended to raise safety awareness in the workplace. Always refer to Company Gas Standards (Policy & Procedures) for guidance on PPE.

Appropriate Footwear

Hard Hat

Appropriate Outer Clothing

Gloves

Available SCBA (Air < 19.5% Oxygen)

Oxygen is essential to life and one cannot live for more than a few minutes without it. Normal air contains about 21% oxygen. If the air drops below 19.5% oxygen content, or if it becomes contaminated with toxic substances, such as carbon monoxide, it becomes unfit to breathe and it will not support life.

- Air purifying (only to be used in an oxygen sufficient atmosphere and only if equipped with the proper cartridge to filter out contaminants).
- Supplied air or SCBA (used in any oxygen deficient atmosphere that cannot be made safe by other means).

Ear Protection (when over 85 decibels)

Safety Glasses

- *Safe Driving Practices...*

Driving is a task that many of us perform everyday, between our work and home lives. It is something that is too often taken for granted. Remember, safe driving should always be practiced.

- Being a safe driver is a continual process. We must recognize our own limitations and when our circumstances change, our demands change.
- Be aware of your driving environment. Give yourself enough space and time to make well thought out decisions.
- As a driver you are constantly required to prioritize information while simultaneously having to manage potential distractions both inside and outside of your vehicle.
- The response to those distractions is in your control.

- *Environmental Considerations...*

Working in the Natural Gas industry, we are confronted with unique situations where considerations for the environment need to be addressed. Whether it's handling a spill of boring fluids, or working around nature preserves, each job site should be evaluated prior to commencing work.

Below is a list of things to consider when performing this OQ Task. Please be aware that this is only a partial list intended to raise awareness. You should always refer to Company Gas Standards, Policy & Procedure, and all governing authorities. Consult with the Company's Environmental specialists when needed.

Wetland Areas
- Permitting may be required
- May apply to all bodies of water

Sediment & Erosion Control
- Compliance with Federal, State, and local regulatory requirements
- Control Plan
- Drilling Mud Containment plan

Spill Control
- Spill Prevention Plan
- Spill Containment Plan
- Spotters to identify releases
- Releases shall be contained using accepted methods

Project Specific Training May Be Required

All Fluid Disposals Shall Comply With Federal, State, and local regulations

- Safe Lifting Techniques...

The following points outline good lifting practices and procedures and safe lifting techniques that may be used to minimize the risk of back injury and pain. These practices are written with the lifter in mind. The basics of safe lifting are:

- ***Size up the load.*** Before you lift, size up the load. Test by lifting one of the corners or pushing the load. Change the lifting situation if possible to minimize a lifting hazard:

    1. ***Get help.*** If the load is heavy, long, or feels too clumsy, get a mechanical aid or help from another worker. When in doubt, don't lift alone!

    2. ***Split the load.*** If possible, divide the load into several small ones to achieve manageable lifting weight.

    3. ***Try to avoid lifts from below the knees or above the shoulders, if possible.*** Use mechanical aids for these types of lifts whenever possible so that the object is within acceptable lifting range—between the shoulders and knees.

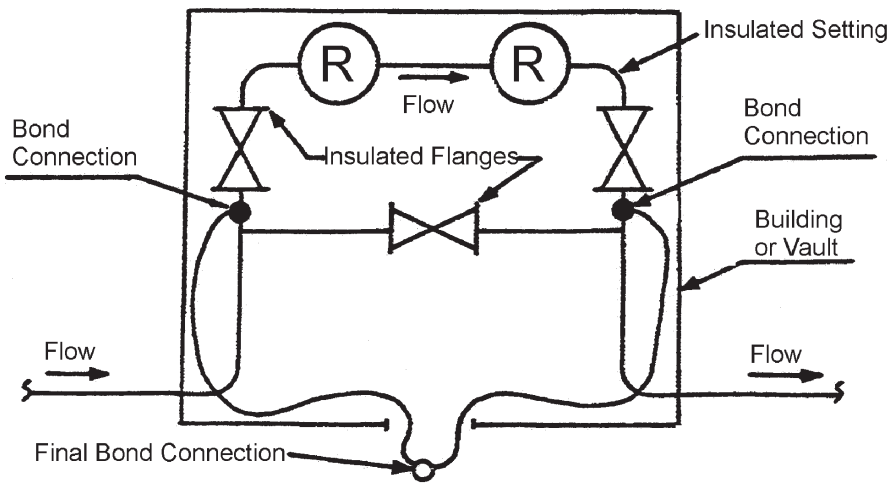
- ***Make sure you have a clear path.*** Before picking up the load, make sure you have a clear path to carry the load.
- ***Bend the knees.*** Bending the knees is the single most important aspect of lifting because it shifts the stress point from the back to the legs, which are more capable of handling the weight.
- ***Place feet close to the object.***
- ***Center yourself over the load.*** Avoid overreaching or stretching to pick up or set down a load.
- ***Get a good handhold.*** Establish a firm grasp and good footing before attempting a lift.

- ***Lift straight up.*** While keeping the body upright, lift with leg and arm muscles—not with the back and stomach muscles. Let your legs do the work, not your back! Do not twist or turn your body once you have made the lift. Test the load first, and then lift gradually while keeping the load close to the body. Take a deep breath and exhale while lifting or lowering a load. Do not shift positions of your feet while lifting. Wait until the load has been lifted before moving feet.
- ***Set the load down in the same manner.***
- ***Always push, not pull, the object when possible.***

- *Preventing Accidental Ignition...*

Appropriate action shall be taken to minimize the danger of accidental ignition of gas in any structure or area where the presence of gas constitutes a hazard of fire or explosion, including the following:

- Prior to introducing any source of ignition in any structure or area, tests shall be conducted to assure that a hazardous atmosphere is not present.
- Gas and electric welding and cutting shall be done in accordance with HSE 4120.010, "Welding and Cutting Safety."
- An insulated meter setting, which is installed inside a building and is insulated above ground, shall have bonding cables installed to provide a path for the current around the insulated portion whenever work performed (breaking continuity of pipe, tube, or fittings by separation) may cause electrical arcing. Each portion of a gas piping system that is likely to become energized shall be electrically continuous and bonded to an effective current path. When a company employee performs work requiring bonding of meter settings or house lines, a #8 AWG flexible wire is the minimum size to be used for bonding. A #2 AWG flexible wire is the minimum size to be used for bonding in stray current areas or in the proximity of high voltage power lines.



Insulated Regulator Setting

- Smoking, matches and open lights shall be prohibited in and around a structure or fenced area containing gas facilities. These areas shall be identified by a sign, as illustrated in the figures below.

Caution Decal for Regulator Buildings

Example of Sign Placed on Plant Regulator Facilities Accessible to the Public

- Flashlights, hand lanterns, cell phones, and pagers used in such locations shall be a type approved for the use in hazardous areas.

- Working in Buried Structures...

The procedures and safety considerations in this section are applicable to buried structures (vaults) housing regulators, valves, meters, etc. that have limited access, normally through manhole covers and/or structures that are deep and could inhibit ventilation and/or ingress and egress. These procedures are not applicable to regulator pits that are characterized as being shallow (less than 4 feet deep) that have "full opening" doors that provide for uninhibited access and ventilation.

Vaults accessed solely through manhole covers should be considered potentially hazardous until proven otherwise. This procedure is provided to maximize employee safety with respect to safe entry, working in, and exiting from regulator vaults having limited ingress/egress.

Respiratory protective equipment shall be used, maintained and stored in accordance with the provisions of Policies and Procedures.

For the purpose of these procedures, an oxygen deficient atmosphere is one that contains less than 19.5% oxygen. (NOTE: Normal air at sea level contains approximately 21% oxygen and 79% nitrogen.) Also, a combustible gas or vapor mixture is the area between the lower and upper explosive limits. Natural gas has a nominal L.E.L. of 5.0% gas-in-air (GIA) and U.E.L. of 15.0% GIA.

Employees shall take the following actions before entering and while working in vaults:

- Prior to removing or opening the cover(s) of any vault/building, a combustible gas indicator (CGI) and oxygen reading shall be taken. If any combustible gas concentration is detected inside the vault, the cover shall be removed or opened in such a way that prevents sparking and the vault allowed to ventilate for a minimum of 5 minutes.

- An approved oxygen monitor shall be worn by one of the employees in the vault.
- Any known or potential source of ignition not directly associated with work to be done is prohibited in a vault that contains or may contain a combustible gas or vapor.
- To ensure that all controllable sources of ignition are eliminated, all operating motorized equipment shall be parked at a safe distance upwind of the work area. Only those engines/equipment necessary for the completion of the project should be running when gaseous conditions are present.
- A fire extinguisher shall be placed in an accessible location upwind of the vault. The extinguisher shall be positioned in such a way that it can be utilized in an emergency situation.

- The aboveground attendant shall be trained in the characteristics, limitations and use of the extinguisher and in vault entry and emergency rescue procedures and equipment.
- Prior to entering a vault, representative oxygen and CGI readings shall be taken of the top and bottom atmosphere. Based on the readings determined in this action, the following operations, actions, or equipment shall also be considered prior to entering a vault:

Reading:	Operation:	Required Action(s) or Equipment:
Oxygen greater than 19.5% **and** L.E.L. read 0%	Chart change, visual inspection or pressure adjustment.	Monitor oxygen content continuously.
	Inspections, regulator disassembly due to malfunction, piping change or valve operation and maintenance.	Monitor oxygen content continuously. Aboveground employee.
	Painting.	Monitor oxygen content continuously. Aboveground employee. Half-mask respirator.
Oxygen greater than 19.5% **and** L.E.L. reading is less than 50% (or 2.5% GIA)	Chart change visual inspection or pressure adjustment.	Monitor oxygen content continuously.
	Inspections, regulator disassembly due to malfunction, piping change or valve operation and maintenance.	Small portable breathing unit (refer to Material Catalog Group ID PU-30). Monitor oxygen content continuously. Aboveground employee. Forced ventilation.
	Painting.	Small portable breathing unit (refer to Material Catalog Group ID PU-30). Monitor oxygen content continuously. Aboveground employee. Forced ventilation. Half-mask respirator.
L.E.L. reading greater than 50% (or 2.5% GIA) **or** oxygen less than 19.5%	None permitted except emergency procedures.	Supervisor required. Aboveground employee for each employee in vault. Life lines with tripod. Flame-retardant entry suit for all employees required to enter vault or to serve on rescue team. Forced ventilation. Continuous O2 monitoring. Respirator units. Low voltage or explosion proof lighting, if needed.

The above precautions, to the extent applicable, shall also be used to ensure the safety of employees who are required to enter tanks, sewers, towers or other confined spaces.

**Review pages only show in Instructor Guides.
Verbally review these questions with the learners.**

Review

AOC & HSE

Use the following bank of answers to best complete the statements below. Note that while an answer may be used twice, some answers may not be used at all.

A. upwind

~~B. downstream~~

C. supplied air or SCBA

D. 19.5

E. combustible gas indicator

~~F. bonding cables~~

G. 85

H. abnormal operating condition

1. **H** A condition that deviates from normal operation that may exceed design limits or result in hazard(s) to persons, property or the environment is referred to as a(n) _____.
2. **G** Employees must wear hearing protection when exposed to sound levels at or above _____ decibels.
3. **D** When air drops below _____% in oxygen content or becomes contaminated with toxic substances, it is necessary to use an approved type of breathing apparatus.
4. **C** The two types of respirators most often used are the air purifying type and the _____ type.
5. **E** Before removing or opening the cover(s) to any vault/buried structure, a _____ should be used as well as taking an oxygen reading.
6. **A** When working in a vault/buried structure, a fire extinguisher shall be placed in an accessible location _____ to the vault.

In This Section:

Gauge Calibration Techniques and Schedules

One of the more important functions of the regulator technician is to ensure that each regulator is set to perform at a specific pressure and maintains that pressure to the best of its ability. In order to accomplish this goal the regulator technician must have devices to accurately measure pressures in the systems that are being controlled. These devices must be checked and calibrated in accordance with state regulations and company Gas Standards.

- *Multiple Pressure Range Charts...*

The devices used by regulator technicians to verify system pressure can typically be categorized as "spring" type pressure gauges and recording pressure gauges. "Spring" type pressure gauges are an indicating device with a needle that points to a location on the gauge scale that corresponds to the system pressure being measured. Recording pressure gauges not only will indicate the current system pressure to the reader, but will make a permanent record on a circular chart over a given time frame. A third type of gauge is now very prevalent in the natural gas industry – the electronic tester/calibrator. All "spring" and recording pressure gauges shall be checked for accuracy according to the following table found in GS 1754.010 "Operation and Maintenance of Pressure Gauges.":

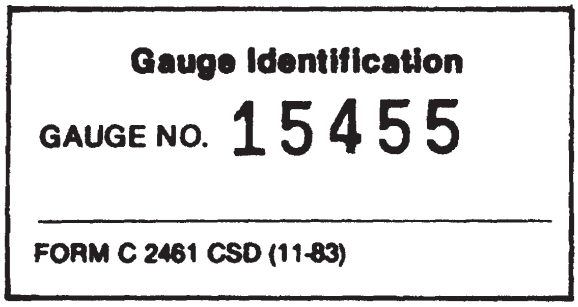
Type Gauge	*Inspection Interval*	*Required Accuracy of Gauge Range*	*Test Points at % Element Range*	*Calibration Device**	*Test Record*
Portable indicating (spring-type) and recording gauges	Once each calendar year	± 2%	Zero, Midpoint, Full scale	A or B	Form C 2461-1
Permanently mounted recording and "spring" type gauges	Once each calendar year but not to exceed 15 months	± 2%	Operating pressure, Midpoint between operating pressure and zero,	B	WMS Job Order Or Form C 2461-1
FPFM recording gauges	Once each calendar year	± 0.5%	20%, 50%, 90%	A or B	Form C 2461-1

*Calibration Device Code: A – Deadweight Tester/Gauge
B – Electronic Testing/Calibration Devices

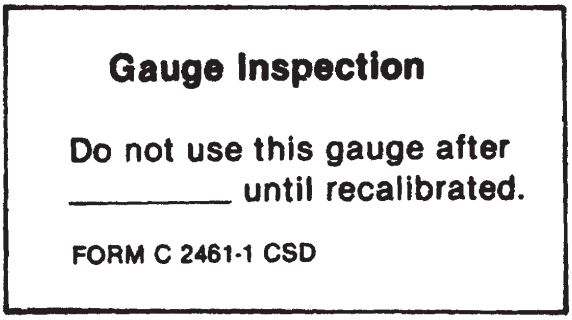
- Test Records...

Form C 2461, "Gauge Identification", (The figure below) or some other comparable identification, shall be affixed to each gauge.

All gauges except those permanently mounted in a regulator station shall have a completed Form C 2461-1, "Gauge Inspection," (the figure below) affixed to the gauge to document inspections. A WMS Repetitive Task (RT) is recommended to initiate the testing activity. Testing of permanently mounted recording and "spring" type gauges located in regulator stations shall be recorded on the WMS Job Order.



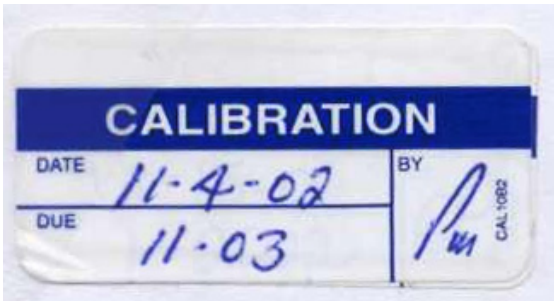
Gauge Identification Form



Gauge Inspection Form

- Deadweight Testers/Gauges and Electronic Testing/Calibration Devices...

Deadweight testers/gauges and electronic testing/calibration devices shall be ***certified*** when received from the manufacturer. Deadweight testers/gauges shall be recertified continuous and every 3 years. Electronic testing/calibration devices (such as the Heise and Druck models) shall be recertified every calendar year. Refer to P&P 724.11 Certification shall be accomplished in accordance with state regulations.



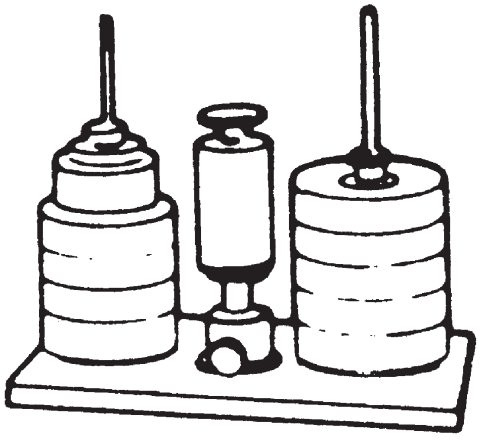
Calibration Tag

Upon completion of the calibration test, the testing facility will provide a record of calibration with a Calibration Tag, illustrated in the figure to the right. The Area shall retain this record until the next certification.

Deadweight Testers/Gauges.

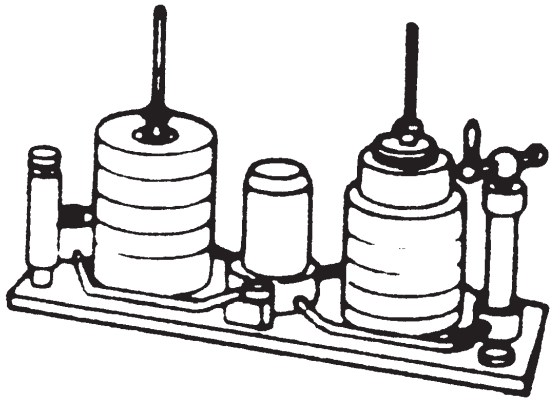
Both a deadweight gauge and a deadweight tester may be used to accurately measure pressure from 15 psig to as high as several thousand psig.

A. Deadweight Gauge. The deadweight gauge, shown in the figure to the right, will measure a pressure that is applied to it by either connecting tubing or high pressure flexible hose to the inlet port on the base of the unit. A deadweight gauge is not capable of generating the pressure on its own. It can only be used to measure an applied pressure from any source.



Deadweight Gauge

B. Deadweight Tester. The deadweight tester's principle of operation is the same as the deadweight gauge but it is designed so that the operator can cause it to generate any constant pressure. This feature allows the deadweight tester to be used to test and verify the accuracy of indicating Bourdon tube pressure gauges, recorder pressure gauge elements, etc. over a range of pressures. A deadweight tester, the figure to the right, is fitted with a screw piston pump, which will displace oil, thus creating a known pressure relative to the mass or weight that is on the deadweight piston.



Deadweight Gauge

In addition to being able to generate a known pressure, a deadweight tester may be used to measure an applied pressure, just as a deadweight gauge does. A deadweight tester is more costly than a deadweight gauge. Therefore, it should only be purchased if it is used as a testing device for other instruments.

C. Use of Deadweight Instruments. Deadweight instruments make possible very accurate pressure measurements by balancing the force exerted by an unknown pressure on a known area with known masses. The area is the piston and the masses are the weights. These components are calibrated in sets and are not interchangeable. The original accuracy of deadweight instruments is typically within 1/10 of 1% indicated pressure.

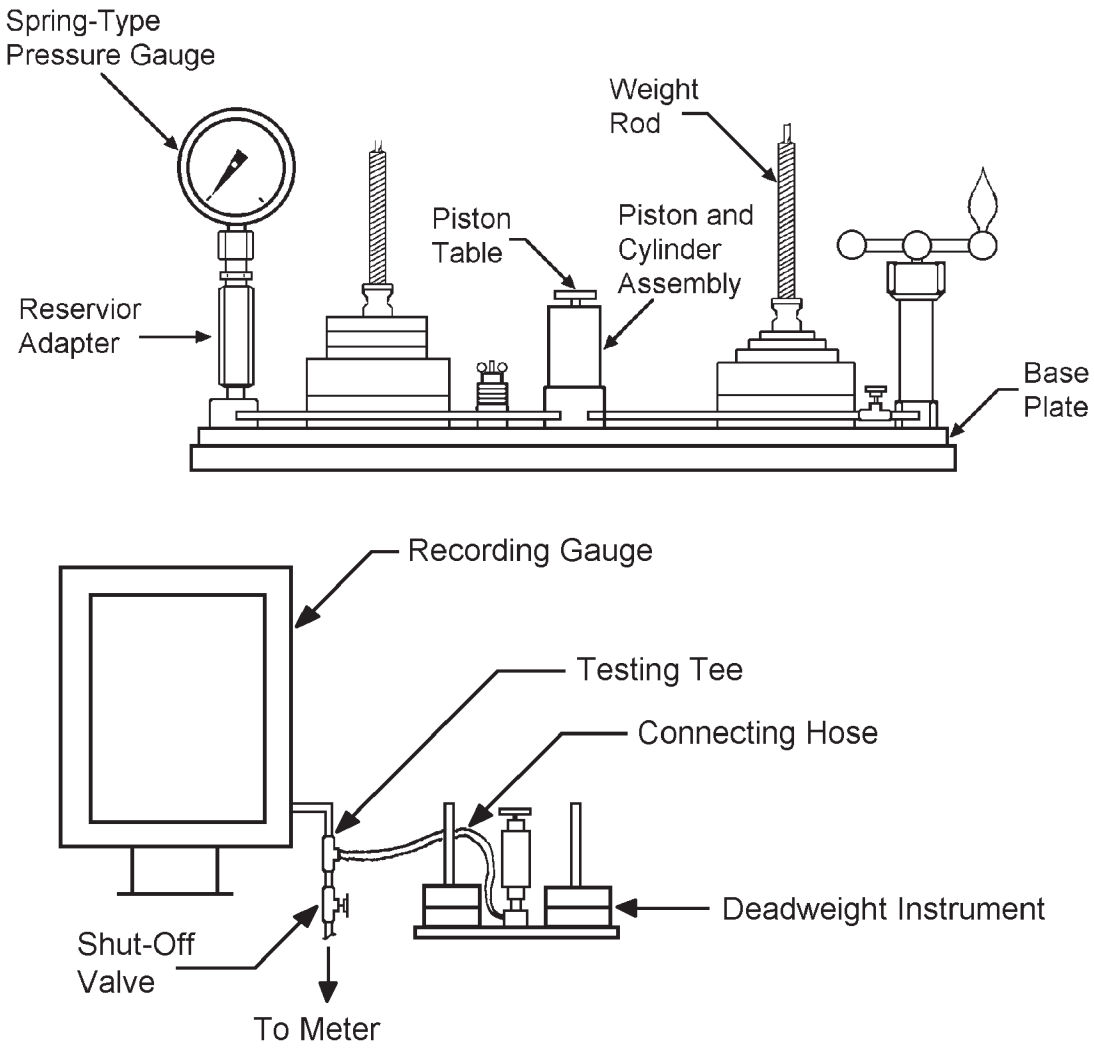
The unknown gas pressure is admitted at the instrument pressure connection where it pushes down on the top surface of the oil in a chamber. This oil then pushes upward on the instrument piston and weight table. A retaining nut on the bottom of the piston prevents blowouts. The oil level must be maintained above the lower end of the cylinder or the gas will bypass. A small amount of oil must pass the piston to act as a lubricant.

Oil may be added through the filling plug. Use SAE 40 motor oil under normal conditions and SAE 30 or 20 motor oil in extremely cold conditions. Do not use shock absorber or brake fluids as these have insufficient lubrication qualities and will cause wear. The gauge should be kept clean and stored in the appropriate carrying case. Dirt and grit around any moving parts can cause rapid wear.

The piston will naturally wear slightly with use and change. This change impairs accuracy and warrants recalibration. Excessive oil leakage is an excellent indicator of this condition. Since the piston and weights are a matched set, the entire deadweight instrument must be returned for calibration.

The piston and cylinder assembly of the deadweight instrument can be removed from the base and screwed into a pressure connection utilizing the ¼" threads on the cylinder bottom. This assembly can also be left attached to the base and the pressure connection made by means of high pressure hose or tubing. The piston and cylinder assembly should always be solidly mounted, level and have a shut-off valve readily available in the pressure line. Many deadweight instruments have optional tripods that form convenient field supports.

Once the deadweight instrument is attached to a source to be measured, slowly apply the gas pressure and the weight table will begin to rise to its upper limit. Place weights on the table until it begins to lower. The weights and table must be kept spinning in a clockwise direction while a reading is being taken. This is done to keep the piston lubricated and deter the effects of friction. When the exact number of weights is added to the table to balance the incoming gas pressure, the table and piston should neither rise nor fall. This may be seen by watching the reference lines on the piston stem just below the weight table. The pressure of the incoming gas is indicated by the total value of the weights and table when balance is obtained. The individual weights and table are marked with the value that corresponds to a given "pounds per square inch" reading. See the figures on the next page for examples of testing hook-ups.



Example of Testing Hook-Ups

Electronic Testers/Calibrators.

Electronic testers/calibrators, as illustrated in the figures on the next page, are highly accurate and powerful portable instruments used for testing, measuring and calibrating. These instruments are used to check pressure, temperature, differential pressure, and 4 – 20 milliampere (mA) signals.

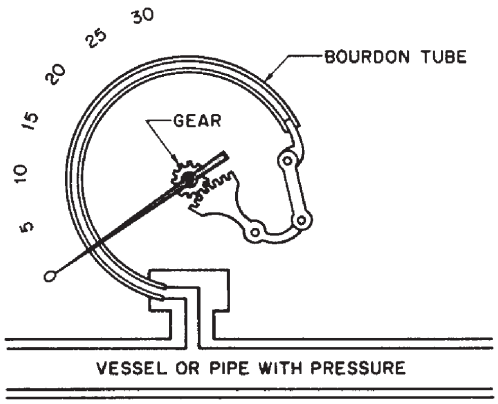
These handheld systems can measure pressure (gauge and absolute), flow, vacuum, leak rate, temperature, voltage, current and change-of-state for switch testing. Many have a port and a data logging/storage option. These devices should be used according to the manufacturer's instructions.

Example of Heise Electronic Calibrator

Example of Druck Electronic Calibrator

- *Spring-Type Gauges...*

"Spring" gauges received their name because initially they employed a type of spring mechanism that allowed indication of pressure. The most common type of operating element used in today's mechanical pressure gauge is a "spring" called a Bourdon tube. The Bourdon tube is made of a thin material, such as brass. It is closed on one end and the other end is fastened to the pressure source being checked. When an increase in pressure occurs, the tube tends to straighten out. When attached to a pointer linkage, pressure changes are indicated, as illustrated in the figure to the right.



Deadweight Gauge

"Spring" type gauges can be tested using deadweight testers, electronic testers. Electronic testers are used at all pressure ranges. The table below shows he various points at which several "spring" type gauges of increasing ranges and uses should be tested.

Test Points and Accuracy Tolerances of Regulator Pressure Check Gauges

Tolerance for all gauges and measurement listed is ±2% of gauge range

Gauge Range	*0% Test Point*	*10% High/Low*	*50% Test Point*	*50%High/Low*	*100%Test Point*	*100% High/Low*
0-30" wc	0.0" wc	.6" wc/-.6" wc	15.0 wc	15.6" wc/14.4" wc	30.0" wc	30.6" wc/29.4" wc
0-100" wc	0.0" wc	2.0" wc/ -2.0" wc	50.0" wc	52.0" wc/48.8" wc	100.0" wc	102.0" wc/98.0" wc
0-15 psig	0.0 psig	.3 psig/ - 3 psig	7.5 psig	7.8 psig/ 7.2 psig	15.0 psig	15.3 psig/ 14.7psig
0-30 psig	0.0 psig	.6 psig/ -.6 psig	15.0 psig	15.6 psig/14.4 psig	30.0 psig	30.6 psig/29.4 psig
0-50 psig	0.0 psig	1.0 psig/-1.0 psig	25.0 psig	26.0 psig/24.0 psig	50.0 psig	51.0 psig/49.0 psig
0-60 psig	0.0 psig	1.2 psig/ -1.2 psig	30.0 psig	31.2 psig/28.8 psig	60.0 psig	61.2 psig/58.8 psig
0-100 psig	0.0 psig	2.0 psig/-2.0 psig	50.0 psig	52.0 psig/48.0 psig	100.0 psig	102.0 psig/98.0 psig
0-200 psig	0.0 psig	4.0 psig/-4.0 psig	100.0 psig	104.0 psig/96.0 psig	200.0 psig	204.0 psig/196.0 psig
0-600 psig	0.0 psig	12 psig/-12 psig	300.0 psig	312.0 psig/288.0 psig	600.0 psig	612.0 psig/588.0 psig

- *Recording Pressure Gauges...*

Recording Mechanism.

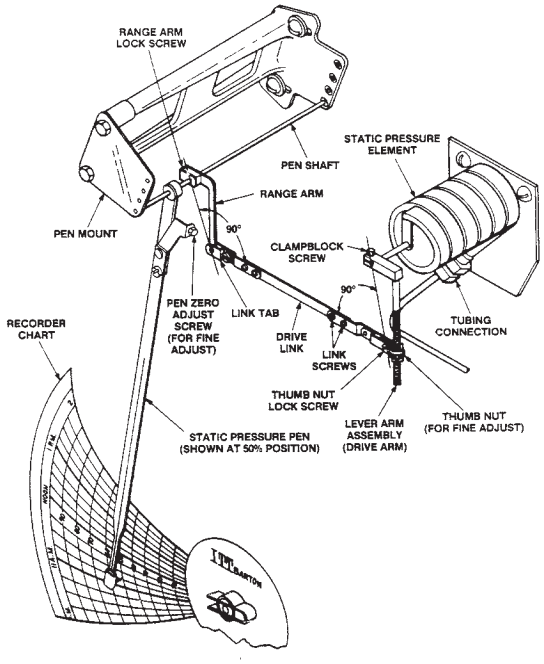
The recording mechanism is a linkage and pen system that converts pneumatic inputs from the static pressure element to ink lines on a revolving chart and permanently record the data. The recording mechanism is housed in a waterproof, weather-resistant case. The working parts are made of stainless steel to withstand tough field conditions. Accurate calibration is made possible with screw adjustments for zero, range, and linearity.

Static Pressure Element.

The static pressure element will measure the static pressure in a piping system from 0 to 25 inches of water column or from 0 to 1,000 psi pressure. Changes in static pressure in the piping system cause the static pressure element to expand or contract. This motion is transmitted through the arm assembly to the pen shaft.

The static element is a bourdon tube with a slightly flattened cross-section of tubing coiled into a helix or flat spiral. The outer end of the tubing is sealed and attached to a drive arm, as illustrated in Figure 11. The open end of the tubing at the base is connected to the tubing connection, which is attached to the static pressure connection. The static pressure connection, which connects the static pressure element to the system, is located on the back of the recorder case.

As static pressure is introduced through the tubing into the static pressure element, the spiral or helix begins to unwind. When there is a reduction in pressure, the tubing will cause the element to wind up more tightly. Sensor elements that are made of different kinds of alloys can be used for different pressure ranges.



Static Pressure Element and Linkage

Chart Drive.

The chart drive mechanism turns the chart at a selected speed to obtain the recorded information. There are a variety of chart drives available to fit different operations (such as spring-wound, electrical, mechanical, and explosion-proof chart drives). All chart drives are interchangeable and fitted with a recorder hub clip or nut. This clip or nut locks the chart into place.

- Calibrating the Pen Arc...

Step 1: Raise the static pressure pen from the chart, remove the recording gauge hub nut and replace the active chart with a test chart.

- Be careful not to make stray marks on the active chart.

Step 2: Reinstall the recording gauge hub nut and lower the static pressure pen.

Step 3: Apply full scale pressure to the recording gauge static pressure element using an external pressure source.

- The static pressure pen should rise to the uppermost reading scale on the chart.

Step 4: Rotate the chart until the pen is on an arc line.

Step 5: Isolate the external pressure source from the recording gauge.

Step 6: Release pressure from the static pressure element to cause the static pressure pen to move downward on the scale.

- The pen will ink an arc on the test chart for comparison with the printed arc.
- If the pen point at zero is above the arc line, move the pen point down on the pen arm to arc line of chart and retighten screws.
- If the pen point at zero is below the arc line, move the pen point up on the pen arm to arc line of chart and retighten screws.
- Repeat steps until the pen follows the arc line.

Step 7: Return the recording gauge to normal operating conditions.

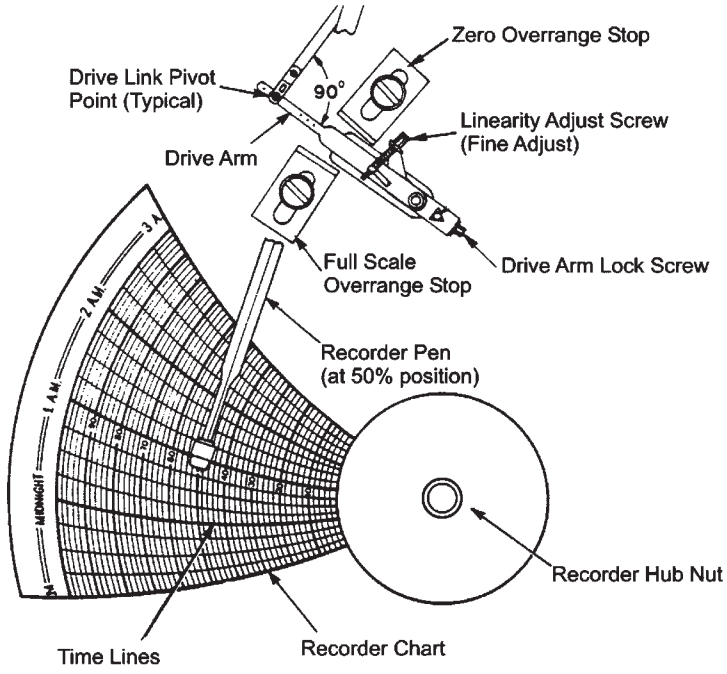
Step 8: Raise the static pressure pen from the chart, remove the recording gauge hub nut and replace the test chart with the active chart.

- Be careful not to make stray marks on the active chart.

Step 9: Reinstall the recording gauge hub nut and lower the static pressure pen.

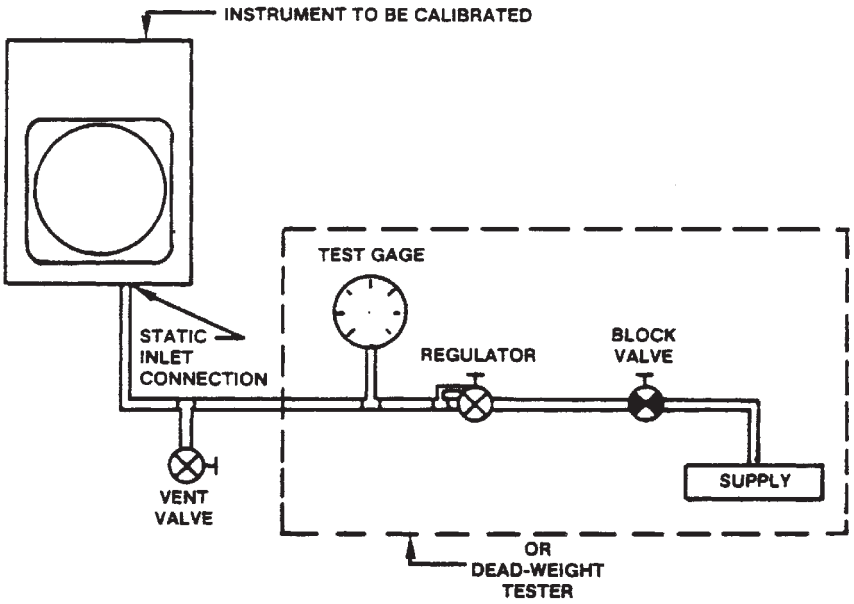
- Calibration Check of Recording Gauge Static Pressure Pen...

A calibration chart should be prepared beforehand by cutting a chart into a wedge shape and gluing it to a piece of similarly shaped cardboard or stiffener, as illustrated in the figure below. This special chart will allow calibration of the pens while permitting access to the recorder mechanism when linkage adjustments are necessary.



Prepared Calibration Chart

Step 1: Connect the static pressure element into the calibration setup, as illustrated in the figure below.



Calibration Setup

Step 2: Release pressure and set pen at zero indicating position using the pen zero adjust screw.

Step 3: Apply 100% pressure and observe position of pen. The pen should be at the 100% indicating position on the chart.

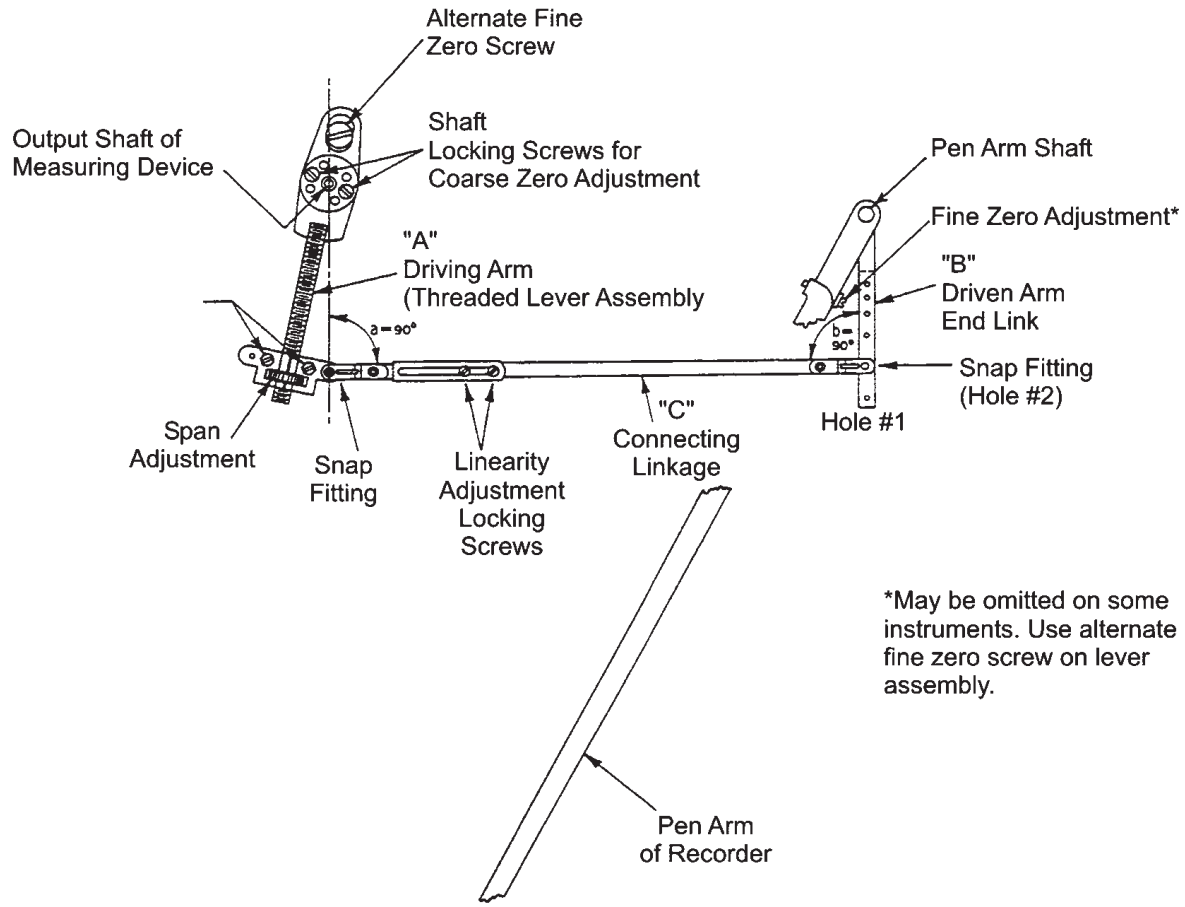
Step 4: Apply 50% pressure and observe position of pen. The pen should be at the 50% indicating position on the chart.

If the pen does not accurately indicate pressure being applied, further adjustments are necessary. Perform the calibration procedure outlined below.

- Calibration of Recording Gauge Static Pressure Pen...

Adjustment Interactions:

- Turning the Zero Adjustment changes the zero and also moves the range up or down having little effect on span or linearity.
- The span changes the span and zero but has no effect on linearity.
- Linearity adjustments not only affect the relationship of the low end and top end half spans with each other, but also the span and zero (see the figure below).



Typical Pen Arm Linkage Arrangement (H-Style)

Calibration Examples			
	Zero	Mid-Point	Max
Input	0	50	100
Zero	2	52	102
Span	0	51	102
Linearity	0	48	104

Review pages only show in Instructor Guides.
Verbally review these questions with the learners.

Review

Gauge Calibration Techniques and Schedules

Use the following bank of answers to best complete the statements below. Note that while an answer may be used twice, some answers may not be used at all.

A. bourdon tube
B. spring
C. permanent record on a circular chart
D. annually

1. **B** An indicating device with a needle that points to a location on the gauge scale that corresponds to the system pressure being measured is called a _____ -type pressure gauge.
2. **C** Recording pressure gauges not only will indicate the current system pressure to the reader, but will make a _____.
3. **D** Spring-type gauges, regulator pressure check gauges (calibration gauges), and portable recording gauges must be inspected _____.
4. **A** The most common type of operating element used in today's mechanical pressure gauge is a "spring" called the _____.

In This Section:

Catalytic Heater Installation, Start-Up and Maintenance

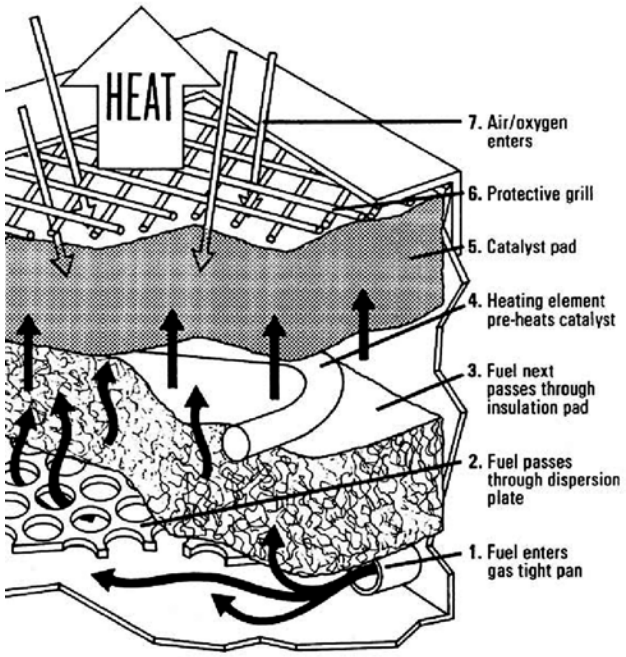
Gas heaters may be required to heat a gas stream and keep its temperature above that of hydrate formation, particularly when pressure reduction occurs. Gathering systems may also require heat to permit transmission to a central separation and dehydration location. Natural gas temperature decreases approximately 1ºF for each 15 psi drop during a pressure regulating operation. If the pressure drop is significant, internal and external icing conditions may result. Two types of heaters may be used in a regulator station—indirect fired water bath heaters and catalytic heaters.

When internal or external icing conditions are observed, the person making the observation shall notify the Operations Engineer.

- Operating Characteristics of Catalytic Heaters...

The flameless catalytic gas heater is the result of intensive research on the effectiveness of catalysts in promoting the reaction of combustible gases with oxygen or air. When natural gas or propane gas is brought into contact with the catalyst at 225ºF, a reaction occurs with sufficient velocity to start a chain reaction. it is oxidized to carbon dioxide and water vapor. Sufficient heat is, therefore, evolved to raise the temperature of the bed of the heater and oxidation will continue as long as gas and oxygen are supplied. Once the reaction has begun, the catalyst temperature stabilizes at approximately 750-850ºF.

No flame is produced under these conditions since the gases are well below the ignition temperature of natural gas (1260ºF). Thus, the thermal efficiency of catalytic heaters is much better than conventional heaters.



Simplified Catalytic Heater Diagram

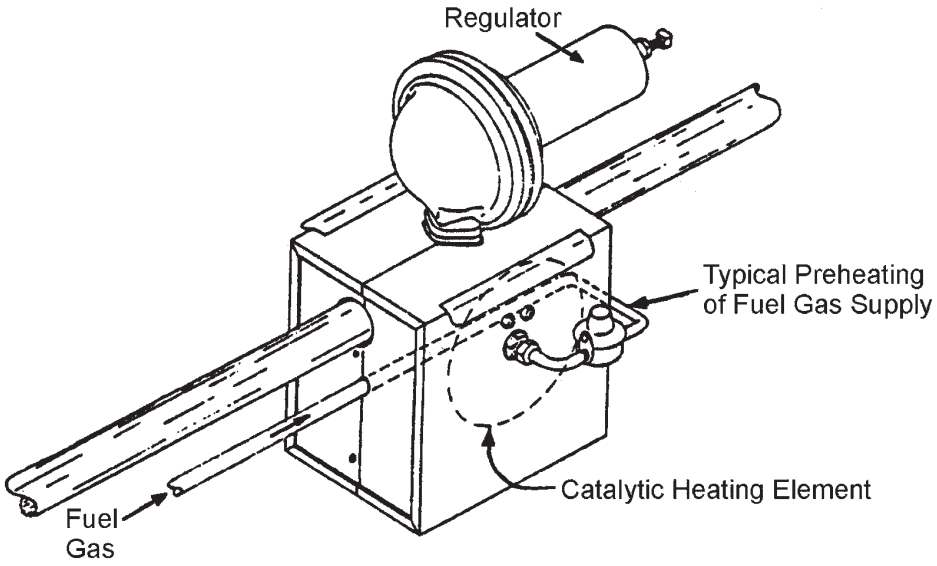
Installation.

The catalytic heater will operate most efficiently when installed in a near-vertical position, but will work effectively when tilted as much as 45º forward or backward from the vertical position.

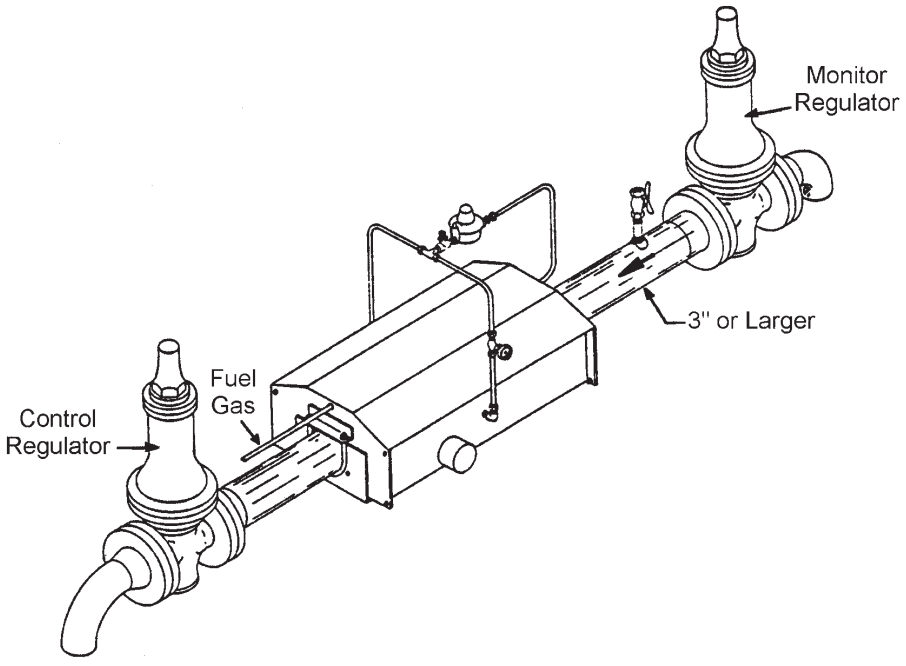
Enclosures are available for a wide variety of valves and regulators. Use of these enclosures ensures proper circulation of combustion air and provides a convenient method for focusing the heat on a piece of equipment. Wall brackets are available when the catalytic heater is used to warm unheated work areas.

Piping.

All gas piping to the catalytic heater should conform to national, local, and industry codes. Two types of catalytic heaters are illustrated in figures below.



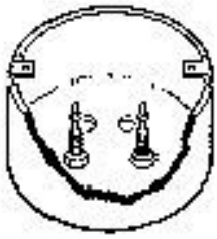
Example of One or Two Round Catalytic Heating Elements Mounted in Enclosure that Covers Regulator or Meter Body



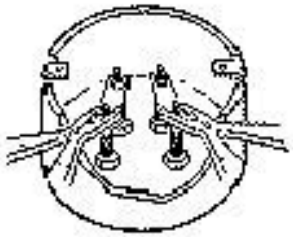
Example of Rectangular "Twin Pack" Catalytic Heater

Wiring.

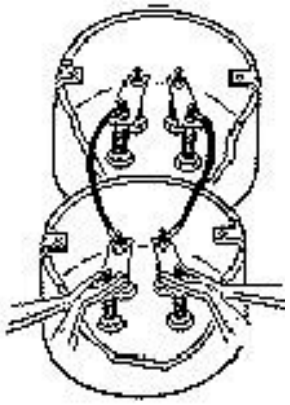
All catalytic heaters use electric heating elements to raise the temperature of the catalyst bed and are available with 12, 24, 120, or 240v elements. The wiring should conform to national and local codes. Figure 3 gives examples for the proper electrical connection for the different models of catalytic heaters.



66, 612, 88, 1012, 1212



624, 1224, 1236



2424, 3636

Electrical Connections

The larger heaters use dual elements for start-up and may draw an excessive amount of amperage. In this case, it is possible to start the heaters in sections.

Temperature Controls.

The temperature at the device being heated can be controlled with the use of a thermostat. The thermostat is plumbed into the gas supply line downstream of the regulator. The temperature sensing bulb must be positioned on the device being heated and a control set on the thermostat for the maximum desired temperature. When the maximum temperature is sensed, the thermostat reduces gas flow to the heater, thus reducing the heat output. A bypass in the thermostat is sized for a specific heater, therefore DO NOT USE THERMOSTATS ON HEATERS FOR WHICH THEY WERE NOT DESIGNED.

Pressure Controls.

Pressure regulators are available to control the proper gas pressure entering the catalytic heater. Natural gas pressure should be at 3.5 to 4.5 inches w.c. {14} Regulators are pre-set at the factory and do not require adjustment in the field.

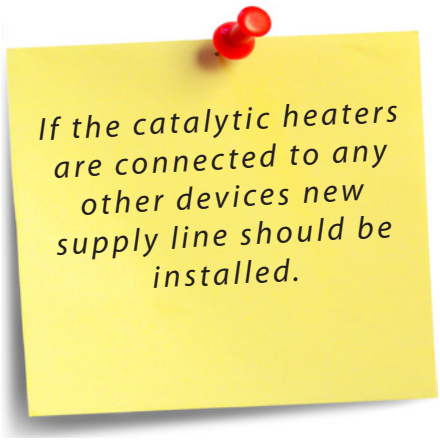
If catalytic heaters are insufficient, indirect water bath pipeline heaters are installed to reduce or prevent freezing of soil surrounding underground piping and resulting ground heaving downstream of regulator stations. In some instances they are installed to prevent hydrate formations internally in regulators, meters and pipelines when the gas contains excessive vapor or liquid phase hydrocarbons and water.

ADDITIONAL HEAT CANNOT BE GAINED BY INCREASING THE PRESSURE ON THE REGULATOR. Increased pressure will cause an imbalance in the oxygen-to-fuel ratio and very inefficient operation. If it becomes necessary to change the source gas from one to the other, contact the factory for the necessary replacement parts.

- *Basic Start-Up and Shut-Down Procedures...*

Two types of catalytic heaters are available and require different start-up procedures. Refer to the manufacturer's operating instructions for the type of heater you are using.

Locate the supply lines and verifying they are coming directly to the catalyctic heater being started. Also confirm the supply lines are not connected to any other devices.



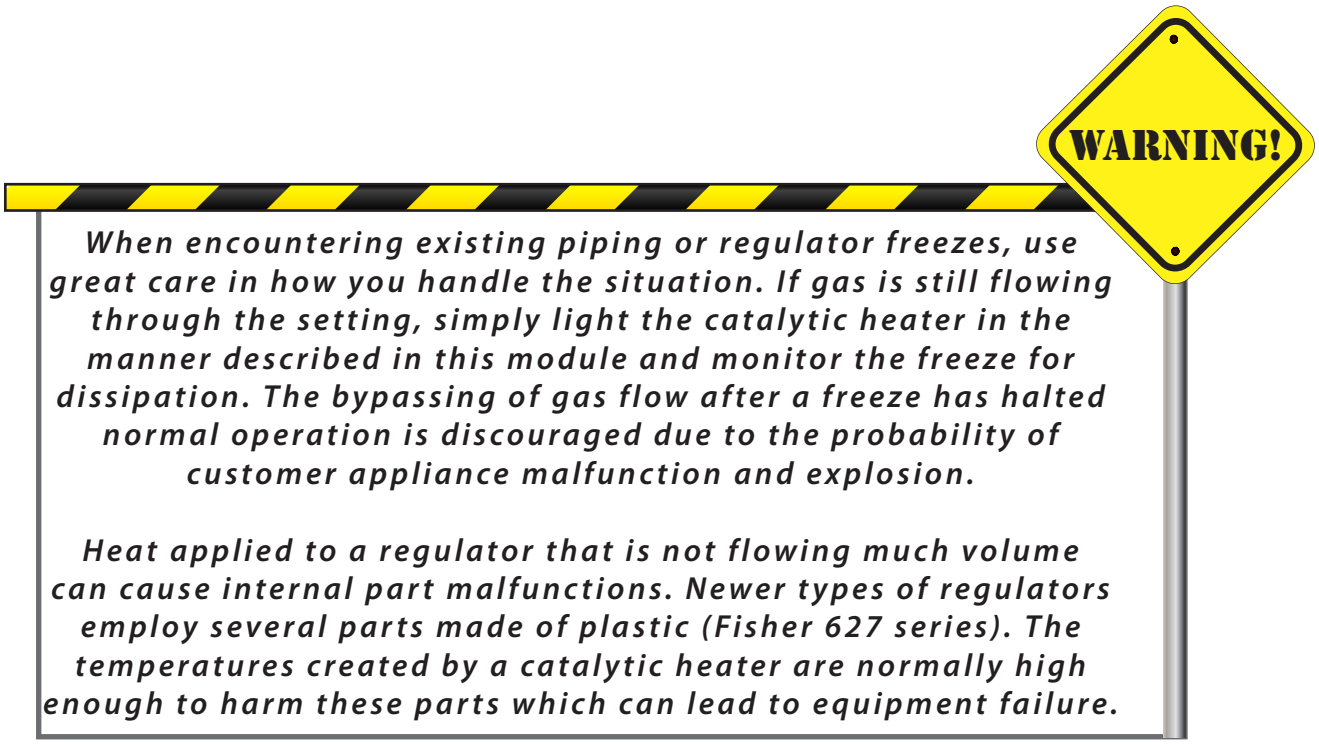
Efforts should be made to make the supply lines as short as possible. Given the opportunity, the shut-off valve should be as close to the catalytic heater as possible.

Pre-Start-Up and Inspection.

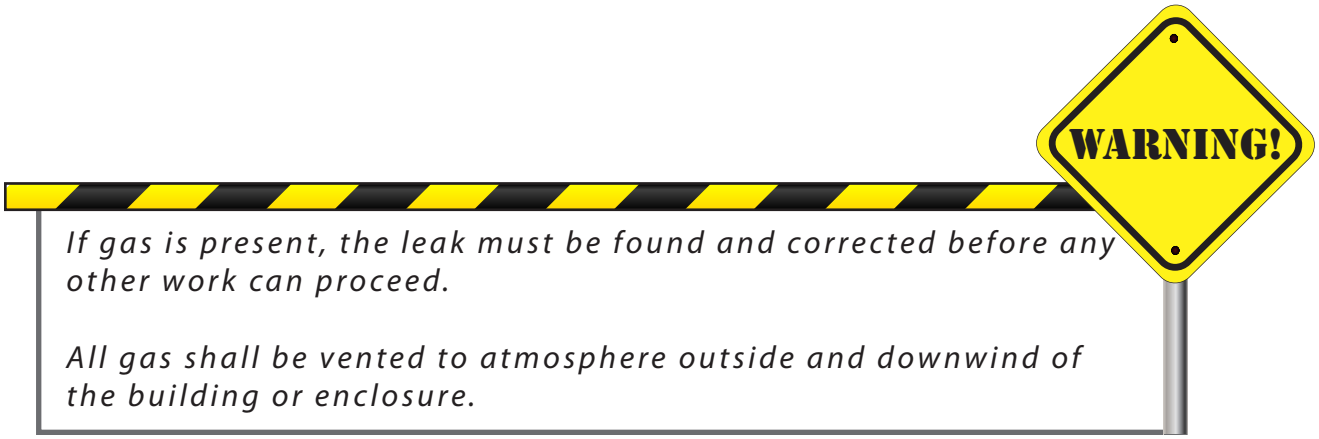
The following pre-inspection steps are to be followed prior to leaving a base of operations to perform the task.

- Ensure familiarity with the locations of facilities that utilize catalytic heaters through the use of pipeline inventory maps and regional road maps.

- Verify that the power source used to energize the catalytic heater for startup is charged and of the correct voltage.
- Acquire necessary tools, materials, personnel and vehicle.
- Contact any landowners, if necessary, for permission to cross any access roads for site ingress/egress.



- Before any task is performed in a building or enclosed area, an approved and certified combustible gas indicator must be used prior to entry to verify that the area is safe in which to work. All windows and doors shall be opened to allow any gas to dissipate.



- Familiarize yourself with the configuration at the specific site. Catalytic heaters are utilized in several different configurations. Some have stainless covers that house one or more heating elements and are designed to wrap around a regulator. Others have the heating element exposed and are mounted beside the equipment to be heated. Safety valves should be found on all catalytic heaters used in hazardous areas. Units may also use a thermostat to regulate the amount of heat applied to the affected equipment.

- The gas pressure required to operate a catalytic heater is typically set at approximately 3.5 – 4.5 inches w.c. Most, if not all, catalytic heaters come from the factory equipped with a supply regulator that has been preset to the desired outlet pressure. It may be necessary at some locations to regulate the inlet pressure to the supply regulator. This is commonly done with the use of a Fisher 1301 regulator, or similar equipment.

- Some catalytic heaters are designed to heat the supply gas used to power pilot or supply regulators. Routing the stainless steel supply lines through the heater housing, thereby transferring the heat to the gas does this. The operation and startup for this type of configuration is the same as for that used to directly heat a regulator.

It is recommended to use a portable gas detector to verify that there are no leaks or gas levels are below the Lower Explosive Limit (4% gas-in-air).

Step 1: Obtain the "Regulator Station Inventory Record Card", Form CS 6-68-P CSD, which should be attached to the setting and determine the operating parameters of the equipment.

Step 2: Visually inspect the setting for signs of abnormal operation and correct or report any abnormalities.

Step 3: Visually inspect the catalytic heater. Take steps to correct any abnormalities.

Step 4: Locate the heater's supply gas source valve and ensure that it is in the OFF position.

Start-Up for Standard Heaters.

Step 1: Make sure the gas valve is turned OFF.

Step 2: Start the electric heating element.

- Hook up the terminals at the heater first.
- Turn the power supply on at the source.

Step 3: Wait 10 to 15 minutes.

Step 4: Turn on the gas supply.

Step 5: Wait approximately 5 minutes.

Step 6: Turn off the power supply.

- Disconnect power at the source first, then at the catalytic heater terminals.

Start-Up With Safety Valve.

Step 1: Make sure the gas valve is turned OFF.

Step 2: Start the electric heating element.
- Hook up the terminals at the heater first.
- Turn the power supply on at the source.

Step 3: Wait 10 to 15 minutes.

Step 4: Turn on the gas supply.

Step 5: Depress the red button on the safety valve.

- If the valve catches open, the button can be depressed again without resistance.

Step 6: Wait 5 minutes.

- If the heater started, the temperature will rise rapidly.

In extremely cold environments it may be necessary to allow more time for Step 3. If the heater requires a greater amperage draw than is available, it will be necessary to start the heater in sections. If so, repeat the appropriate start-up procedure for each section of the heater.

Step 7: Wait 10 to 15 minutes.

- Disconnect power at the source first, then at the catalytic heater terminals.

Seasonal Start-Up.

Step 1: Gain access to the wiring terminals by unscrewing the cover on the conduit housing.

Step 2: Clean the wiring terminals with a piece of emery cloth to remove any scale or dirt that may impede a sound electrical connection.

Step 3: Connect the leads of one end of a set of approved cables to the wiring terminals.

Step 4: Position the power source close enough to the regulator setting to allow the leads on the other end of the cables to be attached to the positive and negative terminals of the power source.

Step 5: Allow the catalyst to achieve the proper temperature (225ºF) provided by the power source current. This takes about ten minutes.

Step 6: Turn ON the gas supply valve.

Step 7: Depress and release the red button on the safety valve.

Step 8: Wait for approximately five minutes.

- The heater should begin to warm.
- Check this by carefully placing your hand on the heater housing.
- CAUTION: This equipment gets very hot rapidly.

Step 9: If the heater does not warm, depress and release the red button on the safety valve again. Troubleshoot the system if the problem persists.

Step 10: Disconnect the leads at the power source first, then at the heater wiring terminals.

Step 11: Replace the terminal housing cover and perform a final inspection of the location prior to departure.

The relight procedure is the same for a catalytic heater that has previously been lit for the season. To shut off a catalytic heater for warm weather, locate the supply gas source valve and turn it to the OFF position.

- Maintenance and Troubleshooting...

Maintenance of Catalytic Heaters.

The catalytic heater has no moving parts, therefore requiring a minimum amount of maintenance. When repair is required, return the heater to the factory – DO NOT DISASSEMBLE IN THE FIELD.

The greatest damage occurs to catalytic heaters when wet or salty source gas is used. Extended heater life can be gained by filtering the source gas.

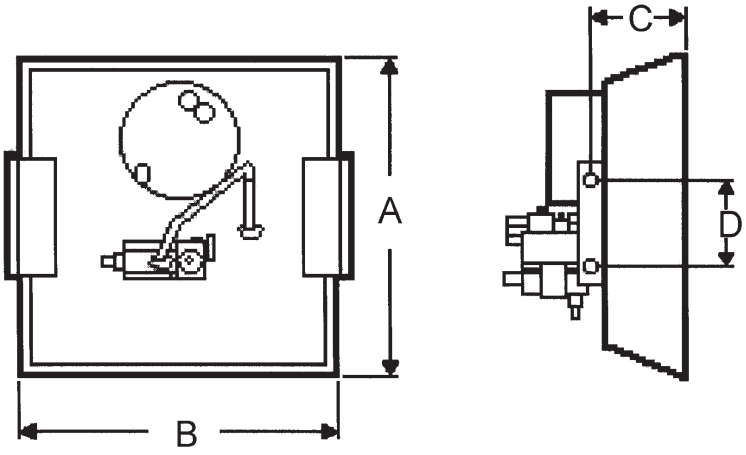
When not in use, take precautions to protect the heater face from damage or exposure to the weather by enclosing it in a plastic bag.

For outdoor locations, enclosures are advised to provide protection against the elements. Stainless steel heaters are also available for outside or offshore locations.

Size	Rating BTU/ HR	Orifice (Drill Size)		Fuel Required			Amps Required		Dimensions (Inches)				Wt. (Lbs)
				Nat.	L.P.	Butane							
		Nat.	L.P.	Cu Ft/Hr		Gal/Hr	12v	120v	A	B	C	D	
66	1500	71	78	1.5	0.6	0.002	8.3	N/A	6-1/8	6-1/8	2	5	3
612	3000	65	75	3.0	1.2	0.04	8.3	.83	6-1/8	12-1/8	2	5	5
624	6000	56	69	6.0	2.4	0.08	8.3	.83	6-1/8	24-1/8	2	5	7
88	2667	59	76	2.7	1.1	0.04	8.3	.83	8-1/8	8-1/8	2	5	5
1012	5000	57	71	5.0	2.0	0.06	8.3	.83	10-1/8	12-1/8	2	5	7
1212	6000	56	69	6.0	2.4	0.08	8.3	.83	12-5/8	12-5/8	2-7/16	5	7.5
1224	12000	2/56	2/69	12.0	4.8	0.16	16.6	1.66	12-1/8	24-1/8	2	5	17
1236	18000	2/53	2/65	18.0	7.2	0.23	30.0	3.0	12-1/8	36-1/8	2	5	25
2424	24000	4/56	4/60	24.0	9.6	0.31	33.2	3.32	24-1/8	24-1/8	2	17-1/4	33
3636	54000	6/56	6/69	54.0	21.6	0.72	49.8	94.98	36-1/8	36-1/8	2	29-1/2	80

Troubleshooting Guidelines.

Once the catalytic heater has been started, it should operate indefinitely as long as clean, dry fuel and fresh air are available. If the heater fails to start or will not maintain temperature, follow these troubleshooting suggestions:



Specifications

- Check for proper operating pressure. This pressure should be measured at the outlet of the final cut regulator.
- Check for plugged orifices.
- Check safety shut-off valve. This valve has a red reset button which will manually open the valve. In some cases a weak latch will allow the valve to close when subjected to vibration. If the safety valve is latched open, the red button can be depressed without resistance.
- If it has been determined that the safety valve is closed, check the thermocouple connection at the safety valve and the heater pan. Both connections should be tight. A corroded connection between the thermocouple and the safety valve will cause a poor electrical connection and will not be able to latch the safety valve when it is open.
- Check the electrical heating element for continuity. An open circuit indicates a defective element. A high resistance reading may also indicate corroded terminals.
- Check the mounting position of the heater. If the heater has been installed with the face up, it is possible that debris and/or water have saturated the catalyst pad. If there are obvious signs of debris on the face of the heater, invert it so that the radiating face is down and tap the heater several times. In cases where the heater has been saturated with water, the catalyst pad must be dried before it will operate. Drying can be accomplished by placing the heater in a conventional oven at 200ºF for about 2 hours.
- If oil or hydrocarbons have been spilled on the face of the heater, it should be returned to the factory for repair.

Review pages only show in Instructor Guides.
Verbally review these questions with the learners.

Review

Catalytic Heater Installation, Start-Up and Maintenance

Use the following bank of answers to best complete the statements below. Note that while an answer may be used twice, some answers may not be used at all.

A. 5.5
B. 1
C. gas heaters
D. 3.5 - 4.5
E. 750 - 850ºF
F. 10
G. electrical heating element
H. outlet
I. 30

1. **C** To prevent hydrate formation, particularly when pressure reduction occurs, it may be necessary to use _____.
2. **B** The temperature of natural gas decreases approximately _____ ºF with each 15 psi drop.
3. **D** The proper gas pressure entering the catalytic heater should be _____ inches water column.
4. **F** Under normal temperatures, when starting a catalytic heater you should start the electric heating element and then wait _____ minutes before turning on the gas supply.
5. **H** If a catalytic heater fails to start or will not maintain temperature, you should check for proper operating pressure measured at the _____ of the final cut regulator.
6. **E** Once the reaction has begun, the catalyst temperature stabilizes at approximately _____.

In This Section:

Regulator Station Documentation and Verification

It is essential for natural gas employees working with self-operated pressure regulator installations to understand and properly use the required Company documentation and record keeping procedures associated with pressure regulator operations.

- *Regulator Station Forms...*

Regulator Station Inventory Record Card.

While all aspects of and information contained within the "Regulator Station Inventory Record" are important to the regulator technician, there are three items on the document that are critical. These items are related to the station and piping MAOP/Minimum Committed Pressure, the critical valve location and the station's regulator design pressures.

A. MAOP/Minimum Committed Pressure. All piping and equipment has a Maximum Allowable Operating Pressure designation. This is enforced so that no pipeline facility or component is over-pressured and caused to rupture. The MAOP of any pipeline system is based on the weakest link in the system. Therefore, it is important that all pipeline segments and components are thoroughly investigated as to maximum pressure usage.

The Minimum Committed Pressure rating applied to each regulator station inlet and outlet line is equally important. These pressure ratings are derived by calculating the pressure necessary to push the needed volume of gas to the last consumer on any given distribution pipeline. This becomes extremely important for peak usage cycles such as during cold weather.

B. Critical Valve Location. Every facility must have at least one valve that when closed is capable of shutting off the source of gas to that facility. It is vital that this valve be readily accessible and that persons working in the vicinity of the facility be aware of its location. The isometric sketch of a M&R facility shall have the critical shut-off valve location depicted, as well as a description of the location in the lower left hand portion of the sketch page. This valve must have annual inspections and maintenance to ensure that it will perform properly in an emergency situation.

C. Regulator Design Pressures. On the second page of the computer generated version of the "Regulator Station Inventory Record" one will find all of the pertinent information about each regulator in a given facility. There are three very important items of information in this section: the "Design Pressure of Body", the "Design Pressure As Assembled", and the "Inner Valve Size".

The "Design Pressure of Body" information pertains to the maximum amount of pressure that can be applied to the regulator body without damaging internal components. This number always remains the same and can be found in manufacturer's specifications.

The "Design Pressure As Assembled" and the "Inner Valve Size" are intertwined. It is a combination the regulator's inner valve size, the allowable differential pressure across the regulator inlet and outlet, and the capacity of the regulator's internal relief that determine the "Design Pressure As Assembled". The manufacturer's literature typically has several tables that are useful in calculating this value.

To further illustrate this point let's take a look at a regulator that is used quite often in the natural gas industry – the Fisher 627R.

- The maximum inlet pressure of the NPT screwed fitting body is 2000 psig ("Design Pressure of Body")
- We will assume that the regulator has a green spring installed that has an outlet pressure range of 15 to 40 psig
- There are six orifice sizes that can be chosen for this regulator from 3/32" to ½"
    - The maximum inlet pressure allowable with the smallest orifice (3/32") is 2000 psig
    - The maximum inlet pressure allowable with the largest orifice (1/2") is 200 psig

Now let's figure in the internal relief device capacity and how it affects the "Design Pressure As Assembled"

- Our desired outlet pressure is 40 psig
- The MAOP of our downstream pipeline is 100 psig
- The maximum inlet pressure allowable considering the internal relief capacity with the smallest orifice (3/32") is 1500 psig
- The maximum inlet pressure allowable considering the internal relief capacity with the largest orifice (1/2") is 108 psig

One can quickly see how the inner valve size plays a major role in how much pressure is allowed to enter the regulator. Regulating natural gas pressure is a matter of restricting the flow through an opening. The smaller the opening, the less volume we permit downstream. The larger the opening, the more volume we permit downstream. The larger the volume and greater the pressure we allow through the regulator valve, the more stresses we apply to the internal components. These stresses can cause damage and even complete failure of the structural integrity.

D. Maintaining the Regulator Station Inventory Record Card. Records of regulator station inventory shall be documented and maintained in the Work Management System (WMS) for each Town border or District Regulator Station. WMS Report No. WLB4210, "Regulator Station Inventory Record Card," as illustrated in Figure 1, shall be generated for each Town Border or District Regulator Station. One copy shall be placed in a protective cover inside the regulator station.

When the station is not housed, provision shall be made to preserve the Regulator Station Inventory Record at the site. This can be by lamination, moisture resistant covers available through the Company, and/or placed in a sealed container.

A legible isometric sketch, as illustrated on the following pages, indicating all functions and facilities of the station shall be maintained at the station and work location of the regulator maintenance personnel or front line leader. The exterior shut off valve(s) shall be included on the isometric sketch or a copy of the critical valve location sketch may be used. If accurate, the isometric cover sheet of the engineering drawing may be reduced and used for this purpose.

COLUMBIA GAS DISTRBUTION COMPANIES — PAGE 1 OF 2
WORK MANAGEMENT SYSTEM — FILE WL84210
REGULATOR STATION INVENTORY RECORD CARD — DATE 09/09/94
REGULATOR STATION NO: 123456 — TIME 10:30

STATION NAME: BEAR RUN DISTRICT STATION — STATION TYPE: DISTRICT
LOCATED NEAR OR AT: 1234 BEAR RUN ROAD
STATE: OHIO — COUNTY: FRANKLIN — TOWNSHIP/MUNICIPALITY: COLUMBUS
TAXING DISTRICT NUMBER: 1234567 — MAP NUMBER: 1234567898
COMPANY PREMISE ID: 1234567

STRUCTURE AND LOT

FACILITY ID: 1234567890
TYPE OF STRUCTURE: BUILDING — BULIDING NUMBER: 123456789
STRUCTURE SIZE: 16 X 16 — STRUCTURE TYPE: PRE-CAST
TYPE AND SIZE VENTILATION: NATURAL - LOUVERS 225 IN.
ELECTRICAL EQUIPEMENT IN BUILDING: N/A
SIZE OF LAND: 123 X 456 X 789 X 123 — LAND OWNED BY: LESSOR
DEAD LEASE OR EASEMENT NUMBER: L-515 — LEASE EXP. DATE: 09/09/96

HEATER/GAS CLEANER

	FAC ID	MANUFACTURE	TYPE	RATE
HEATER	1234567890	ENERTEK	WATER BATH	4MM
GAS CLEANER	1234567890	COLUMBIA	SCRUBBER	150GAL
GAUGE	1234567890	BRISTLE	RECORDING	31DAY

PIPING SYSTEM	LINE NUMBER	DESIGN PRESSURE	MAOP	MIN COMM PRESSURE
INLET LINE	1804	1650	1100	900
OUTLET LINE	CDC	225	150	120
OUTLET LINE	CDC	180	120	100
OUTLET LINE	CDC	180	120	85

FUNCTION ID: 123456789

VALVES

	FAC ID	VALVE NUM	TYPE	PIPE SIZE	SYS NUM	TYPE OF END	BOOK NUM
VLV 1	01234567890	0123456789	BALL	020	34100069	WELD	12345678
VLV 2	01234567890	0123456789	GATE	020	34100069	SCREW	12345678
VLV 3	01234567890	0123456789	BUTTERFLY	030	34100069	FLANGE	12345678
VLV 4	01234567890	0123456789	BALL	030	34100069	SCREW	12345678

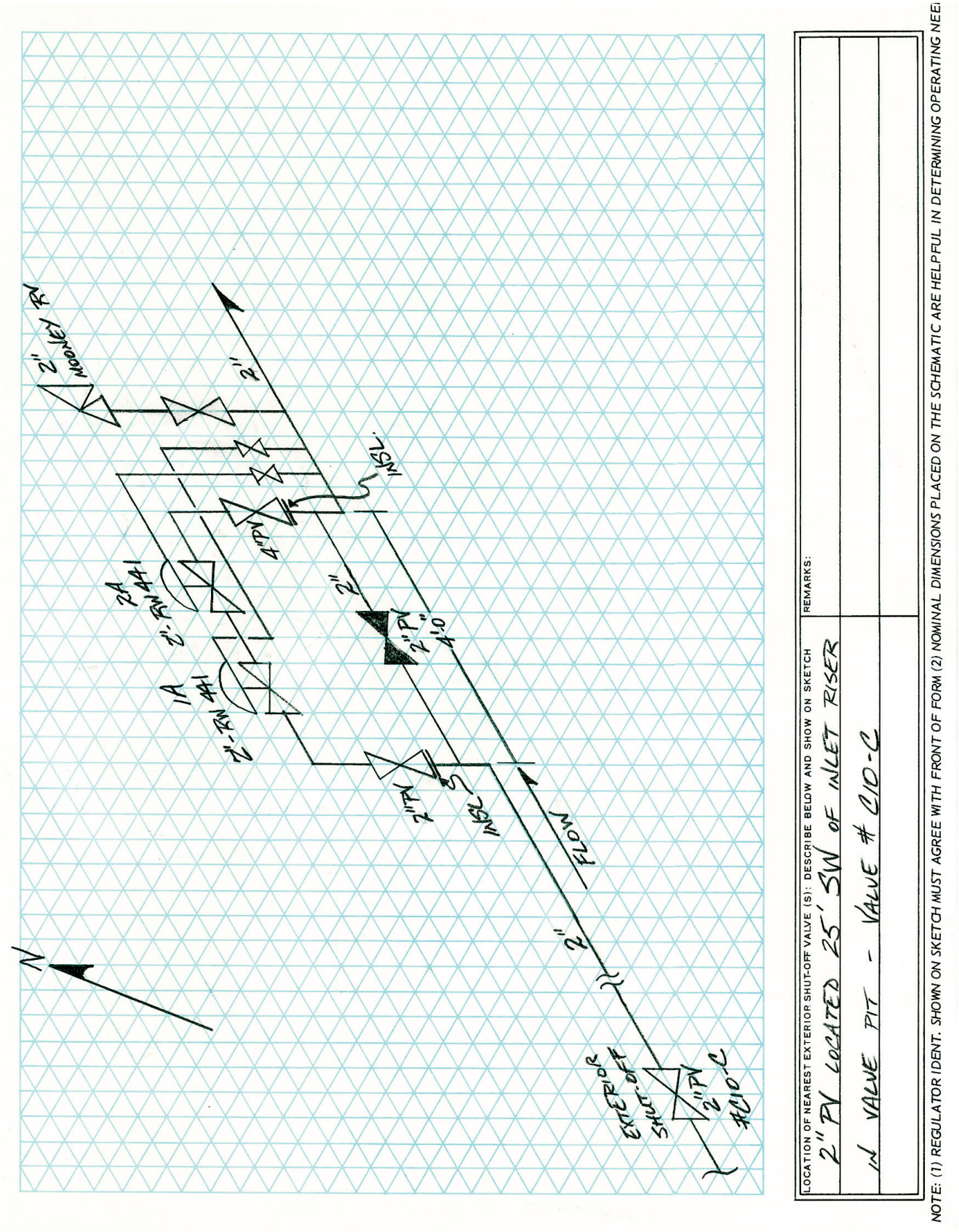
Regulator Station Inventory Record Card (Page 1 of 2)

COLUMBIA GAS DISTRBUTION COMPANIES — PAGE 2 OF 2
WORK MANAGEMENT SYSTEM — FILE WLB4210
REGULATOR STATION INVENTORY RECORD CARD — DATE 09/09/94
REGULATOR STATION NO: 123456 — TIME 10:30

STATION NAME: BEAR RUN DISTRICT STATION — STATION TYPE: DISTRICT
LOCATED NEAR OR AT: 1234 BEAR RUN ROAD
STATE: OHIO — COUNTY: FRANKLIN — TOWNSHIP/MUNICIPALITY: COLUMBUS
TAXING DISTRICT NUMBER: 1234567 — MAP NUMBER: 1234567898
COMPANY PREMISE ID: 1234567

	REG FAC ID / SEQ	REG FAC ID / SEQ
	1234567890 40	1234567890 50
MANUFACTURE	AM	BK
MODEL NUMBER	1234567890789O9	1234567890987
SERIAL NUMBER	1234567890	2345678901
FUNCTION OF REGULATOR	MON	CON
DESIGN PRESSURE OF BODY	175	575
DESIGN PRESSURE AS ASSEMBLED	100	200
INLET TYPE	FLANGE	SCREW
OUTLET TYPE	WELD	SCREW
INLET/OUTLET SIZE	2 X 2	3 X 2
INNER VALVE SIZE	2 1/2	3 1/2
VALVE TYPE	SPQO	SPVP
SEAT TYPE	HARD	SOFT
DIAPHRAGM CASE SIZE	2	4
CONTROL SYSTEM		
TYPE CONTROLS	PIO	LEV
SPRING COLOR	RED	RED
SPRING RANGE	7-16"	7-18"
OPER PRESSURE RANGE		
INLET MAXIMUM	130	135
OUTLET MAXIMUM	120	125

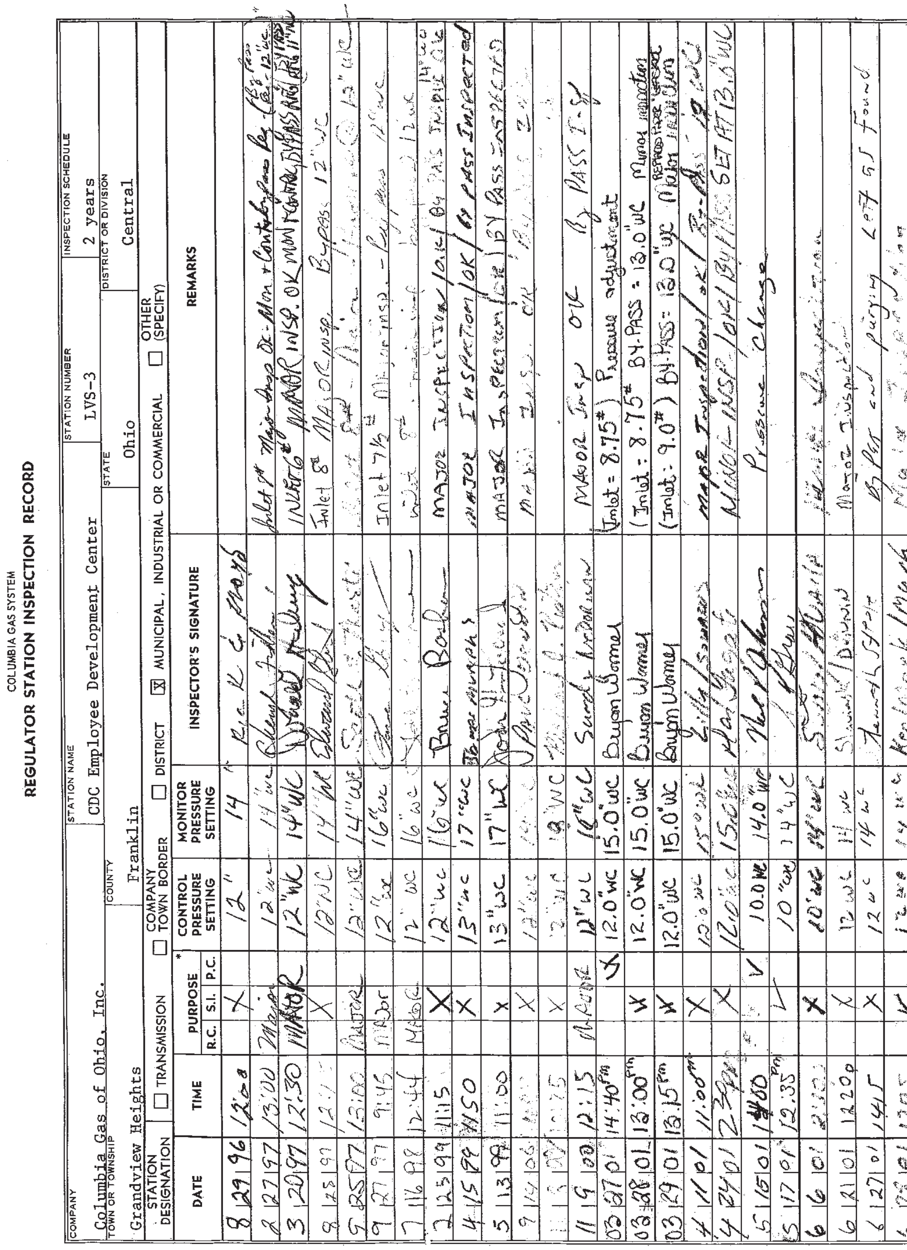
Regulator Station Inventory Record Card (Page 2 of 2)



Example of Isometric Sketch

Regulator Station Inspection Record.

Form CS 6-66, "Regulator Station Inspection Record," as shown in the figure below, shall be prepared and placed in each Town Border and District Regulator Station. This form shall be maintained by the personnel responsible for the operation, maintenance, and inspection of the regulator station and all associated equipment at the site. With the exception of routine chart changing, this record shall reflect all operating and/or unusual conditions, such as routine check, scheduled inspection, and/or pressure check, experienced at the station and any corrective action(s) taken to maintain proper operation of the associated equipment.



FORM CS 6-66 CSD (8-66)

COLUMBIA GAS SYSTEM
REGULATOR STATION INSPECTION RECORD

COMPANY: Columbia Gas of Ohio, Inc. | STATION NAME: CDC Employee Development Center | STATION NUMBER: LVS-3 | INSPECTION SCHEDULE: 2 years

TOWN OR TOWNSHIP: Grandview Heights | COUNTY: Franklin | STATE: Ohio | DISTRICT OR DIVISION: Central

STATION DESIGNATION: ☐ TRANSMISSION ☐ COMPANY TOWN BORDER ☐ DISTRICT ☒ MUNICIPAL, INDUSTRIAL OR COMMERCIAL ☐ OTHER (SPECIFY)

DATE	TIME	PURPOSE* R.C.	PURPOSE* S.I.	PURPOSE* P.C.	CONTROL PRESSURE SETTING	MONITOR PRESSURE SETTING	INSPECTOR'S SIGNATURE	REMARKS
8 29 96	12:00		X		12"	14"	Rick E. [illegible]	
2 27 97	13:00	Major			12" wc	14" wc	Cheryl [illegible]	Inlet 7# Major Insp OK - Mon + Control [illegible] By Pass 12" wc
3 20 97	12:30	MAJOR			12" WC	14" WC	[illegible]	INLET 6# MAJOR INSP. OK MON [illegible] BY PASS [illegible]
8 25 97	12:[illegible]		X		12" WC	14" WC	Edward [illegible]	Inlet 8# MAJOR insp. Bypass 12" WC
9 25 97	13:00	MAJOR			12" WC	14" WC	[illegible]	[illegible] 12" wc
9 27 97	9:45	MAJor			12" wc	16" wc	[illegible]	Inlet 7½# Major insp. - Bypass 12" wc
7 16 98	12:44	MAJOR			12" wc	16" wc	[illegible]	[illegible] 12 wc
2 25 99	11:15		X		12" wc	16" wc	Bruce Bo[illegible]	MAJOR INSPECTION/OK/ BY PASS INSIDE OK 14" wc
4 15 99	11:50		X		13" wc	17" wc	Thomas Murphy	MAJOR INSPECTION/OK/ BY PASS INSPECTED
5 13 99	11:00		X		13" WC	17" WC	[illegible]	MAJOR INSPECTION/OK/ BY PASS INSPECTED
9 14 00	[illegible]		X		12" wc	14" wc	[illegible]	MAJOR INSP. OK [illegible]
11 3 00	10:25		X		12" WC	13" WC	[illegible]	
11 9 00	12:15	MAJOR			12" WC	16" WC	Sandy [illegible]	MAJOR Insp OK By PASS [illegible]
03 27 01	14:40 PM			X	12.0" WC	15.0" WC	Bryan Warner	(Inlet = 8.75#) Pressure adjustment
03 28 01	13:00 PM		X		12.0" WC	15.0" WC	Bryan Warner	(Inlet = 8.75# BY-PASS = 13.0" WC Minor inspection
03 29 01	13:15 PM		X		12.0" WC	15.0" WC	Bryan Warner	(Inlet = 9.0#) BY-PASS = 13.0" WC Major inspection [illegible]
4 11 01	11:00 AM		X		12.0" WC	15" WC	[illegible]	MAJOR Inspection/ OK/ By-Pass 12 WC
4 24 01	2:30 PM		X		12.0" WC	15.0" WC	[illegible]	MINOR INSP./OK/ BY PASS SET AT 13.0" WC
5 15 01	1:00			V	10.0 WC	14.0" WC	[illegible]	Pressure Change
5 17 01	12:35 PM		V		10" WC	14" WC	[illegible]	
6 6 01	[illegible]		X		10" WC	14" WC	[illegible]	[illegible] Inspection
6 21 01	1220		X		12 WC	14 WC	[illegible]	Major Inspection
6 27 01	1415		X		12 WC	14 WC	[illegible]	By Pass and purging LOT GS Found
6 28 01	1205		V		12 WC	14 WC	Ken/Mark/Mark	Major Inspection

* R.C. – ROUTINE CHECK S.I. – SCHEDULE INSPECTION P.C. – PRESSURE CHANGE

Regulator Station Inspection Record

After the last possible entry is made (back and front side) the form shall be filed at the work center and retained for a period of three (3) years from the date of the last entry.

2613 Job Order. The figure below illustrates an example of a 2613 Job Order.

```
jo num: 03-5443402-00   loc num: 0731   supervisor: RWALGAT      PAGE: 01 of 03
       job type: 2613  specific budget:        copy no: 01 on: 08/04/03
    job summary: DR73-D:LORETTA AV.-TORONTO        bad weather (y/n): N
       job desc: ANNUAL INSPECTIONS - REGULATION              status: PE

     cdc map num: 7532476F    system number: 34588002     LP   maop:
      located at: LORETTA AV
begin street num:                          end street num:
         between:
             and:
   also known as: LORETTA & S RIVER AV
            city: TORONTO                              zip: 43964

   originated by: MKRAMER   on: 07/01/03  updated by:            on:
wms related jo num:                       dis related jo num:
      project id:                         project name:
  co/contract cd: A          reimbursable (y/n): N     income tax (y/n): N
       facility type:                        facility id:
       function type: R                      function id: 000002090
       co premise id: 0401145                       psid:
       county name: JEFFERSON
   taxing district: 0410130         mult tax dist (y/n): _
incorporated place: TORONTO                                RT #: 00006648
county subdivision: ISLAND CREEK
 assess district 1: TORONTO CITY (S.D.)
 assess district 2:
permits required:

committed date: 11/26/03      target date  08/11/03       start date: 08/01/03
duration:   3:00               num in crew:    1             manhours:    3.0
dpi ref #:                     leak grade:              mult facility (y/n): N
scheduling:
remarks:

******************************** E X E C U T I O N ********************************
 remarks: ____________________________________________________________________________
 ____________________________________________________________________________
 ____________________________________________________________________________
 ____________________________________________________________________________
 line markers and signs inspected (y/n): _
 facility failures (y/n): _              damages by others (y/n): _
 damages to others (y/n): _              map corrections   (y/n): _

******************** C H A R G E   T O   I N F O R M A T I O N ********************
 34889         02613          0731:100%  ____________________________________:____%

***************** F U R T H E R   A C T I O N   R E Q U I R E D *****************
 job type: _____  job summary: ____________________________________________________
 remarks: ____________________________________________________________________________
 ____________________________________________________________________________

****************************** A T T A C H M E N T S ******************************
        detail:      contracts:      materials: X    execute detail: X
 pipe exposure:       facility: X      f.a.r.:              sketch: _

 I HAVE COMPLETED THIS JOB ORDER IN COMPLIANCE WITH ALL APPLICABLE POLICIES AND
 PROCEDURES. _____ (COMPANY REPRESENTATIVE) _____, 20____
```

Job Order (Page 1 of 3)

jo num: 03-5443402-00 loc num: 0731 supervisor: RWALGAT PAGE: 02 of 03
job type: 2613 job summary:DR73-D:LORETTA AV.-TORONTO specific budget:

********** M A T E R I A L S **********

stock	description	uom	est	net	ord	quantity truck	inst	lost	trans	trans	to/from ssn

********** M & R S T A T I O N I N S P E C T I O N S **********

last update date: 09/18/02 last rt jo num: 02-5106560-00
major inspection scheduled (y/n):
major inspection performed (y/n):
regulation normal (y/n):
inlet pressure: _____ psig 30.0 PSIG
outlet pressure as found: _____ unit: _____ 12.0 "WC
outlet pressure as left: _____ unit: _____ 12.0 "WC
leakage before venting: _____ % lel 0000 % LEL
oxygen: _____ % 0000 %
exterior shut off valve accessible (y/n):

facility id: 0000016874
safety devices: set pressure: _____ unit: _____ 0.0
relieved at: _____ unit: _____ 0.0
function of regulator: MONITOR

	as found			as left		
set point:	_____	_____	17.0 "WC	_____	_____	17.0 "WC
instrument supply pressure:	_____	psig	0.0 PSIG	_____	psig	0.0 PSIG
instrument output pressure:	_____	psig	0.0 PSIG	_____	psig	0.0 PSIG
inner valve position:	___ %		050 %	___ %		050 %

comments: _____

facility id: 0000016875
safety devices: set pressure: _____ unit: _____ 0.0
relieved at: _____ unit: _____ 0.0
function of regulator: CONTROL

	as found			as left		
set point:	_____	_____	12.0 "WC	_____	_____	12.0 "WC
instrument supply pressure:	_____	psig	0.0 PSIG	_____	psig	0.0 PSIG
instrument output pressure:	_____	psig	0.0 PSIG	_____	psig	0.0 PSIG
inner valve position:	___ %		005 %	___ %		005 %

comments: _____

Job Order (Page 2 of 3)

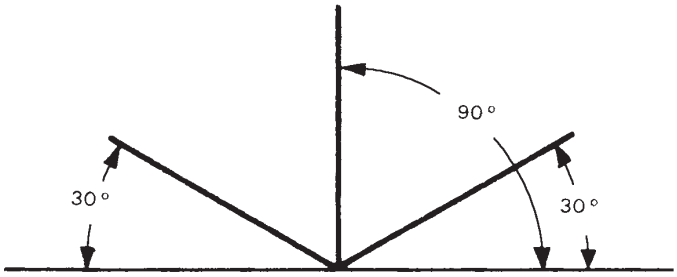
```
jo num: 03-5443402-00   loc num: 0731   supervisor: RWALGAT     PAGE: 03 of 03
job type: 2613 job summary:DR73-D:LORETTA AV.-TORONTO     specific budget:

facility type: REG
facility id: 0000016874   mfg code: RW     mfg model num: 441-S
located at: LORETTA AV
between:
    and:                                          cdc map number: 7532476F
also known as: REG 73-D
city: TORONTO

          serial number: E-21295            function of regulator: MONITOR
          type controls: SPRING                        set point:   17.0 "WC
             inlet type: FLANGE                      inlet size: 020
            outlet type: FLANGE                     outlet size: 020
design pressure of body:  175.0      design pressure as assembled:  100.0
              valve type: DPQO                       valve size: 1 3/4
             spring color: GRAY                     spring range: 14"-1#
    diaphragm case size: 16
                owned by: CDC
            operated by: CDC
           maintained by: CDC

remarks: 2          REGULATOR



facility type: REG
facility id: 0000016875   mfg code: RW     mfg model num: 441-S
located at: LORETTA AV
between:
    and:                                          cdc map number: 7532476F
also known as: REG 73-D
city: TORONTO

          serial number: E-21333            function of regulator: CONTROL
          type controls: SPRING                        set point:   12.0 "WC
             inlet type: FLANGE                      inlet size: 020
            outlet type: FLANGE                     outlet size: 020
design pressure of body:  175.0      design pressure as assembled:  100.0
              valve type: DPQO                       valve size: 1 3/4
             spring color: YELLOW                   spring range: 8.5-15.5"
    diaphragm case size: 16
                owned by: CDC
            operated by: CDC
           maintained by: CDC

remarks: 2          REGULATOR
```

Job Order (Page 3 of 3)

Regulator Station Isometric Sketch.

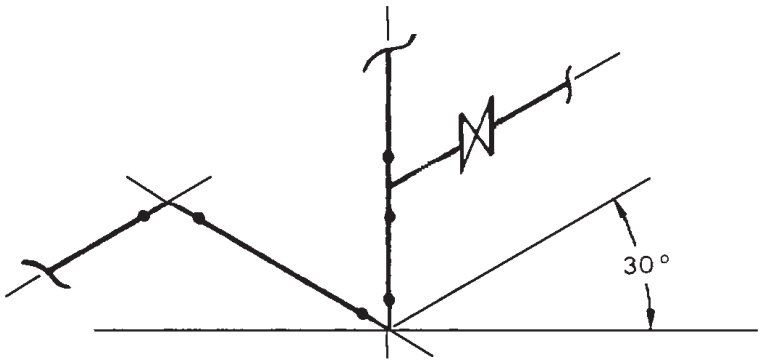
An isometric drawing is one in which three sides of an object can be seen in one view. It is a type of pictorial drawing. Isometrics can be used for fabrication and shop drawings from which the pipe assembly can be constructed.

A. Isometric Layout. The figure to the right is an illustration of an isometric axis. Note the isometric layout is composed of three lines—one vertical line and two lines at 30º from horizontal.



Three Lines Used to Make an Isometric Layout

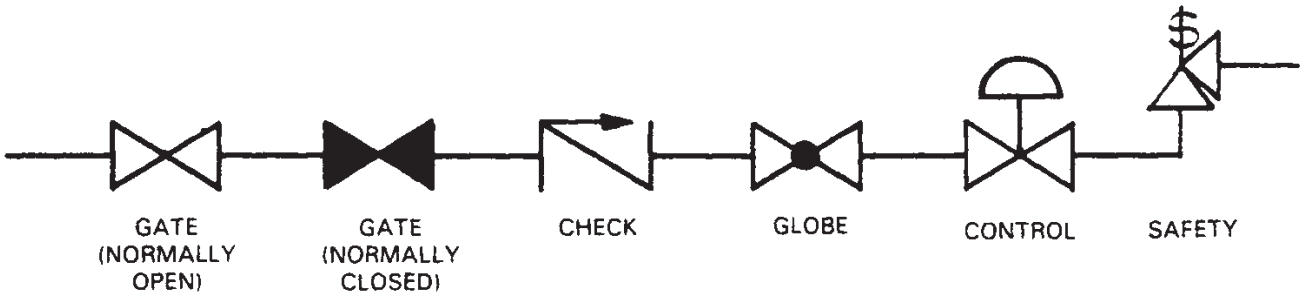
The isometric axis is used to layout all isometric drawings. Notice in "Example of Isometric Sketch" Figure that all directions of the pipe match the three isometric axis lines.



All Piping Parallels the Three Isometric Axis Lines

B. Scale. The isometric is seldom drawn to scale. However, it is important to show the pipe lengths in proportion. For example, a 64 ft. section of pipe would appear longer than a 15 ft. section. Because of the lack of scale, however, it is doubly important that the written dimensions are accurate.

C. Valve Symbols. The basic valve symbol is shaped like a bow tie. Variations of this symbol identify a specific type of valve as illustrated in the figure below.

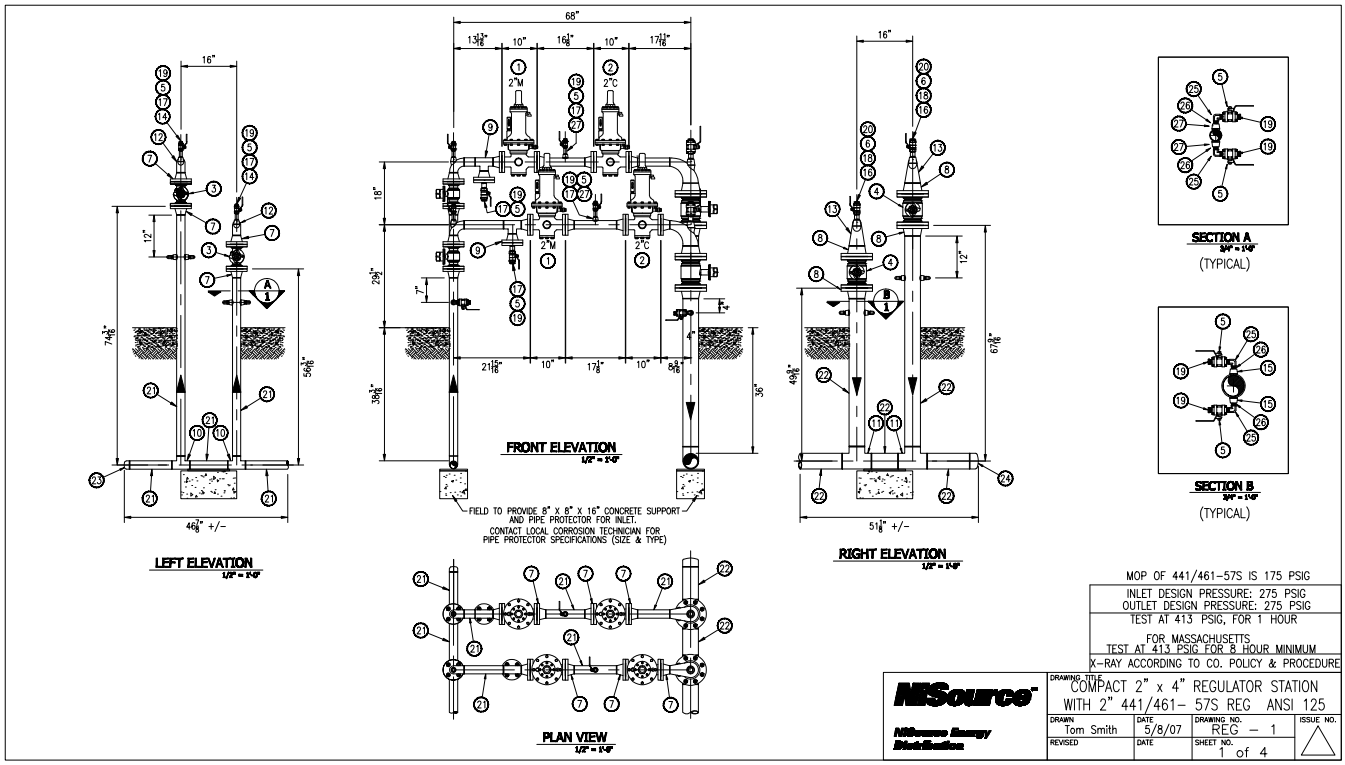


Valve Symbols

- *Standard Drawings...*

Most natural gas operating companies have a large number of standard facility drawings that are used by the engineering department to standardize the physical arrangement of piping and components in a given facility. These drawings typically contain a material list that can be used for ordering the necessary parts.

Regulator technicians can be of great assistance to engineers and construction personnel if they have a sound understanding of these drawings. Constant familiarity with regulator facilities makes the regulator technician the ideal employee to request modifications to and verify the accuracy of settings. The figure below is an example of a standard drawing for a regulation facility. The complete series of standard drawing can be found on the Company Intranet site at. ***http://edg.nisource.net/edg/resources/codes/cgi-bin/gs-page.cgi?name=mr-drawings-ndo&catexp=stand***



Standard Drawing

Review

**Review pages only show in Instructor Guides.
Verbally review these questions with the learners.**

Regulator Station Documentation and Verification

Use the following bank of answers to best complete the statements below. Note that while an answer may be used twice, some answers may not be used at all.

A. Regulator Station Inspection Record
B. ~~bow tie~~
C. ~~semi-circle~~
D. Regulator Station Isometric Sketch
E. ~~dimension~~
F. Regulator Station Inventory Record Card
G. ~~Regulator Station Assembly Layout~~
H. Minimum Committed Pressure
I. Design Pressure of Body
J. critical valve
K. 3 years

1. **J** The three items that are critical to the Regulator Station Inventory Record Card are MAOP/Minimum Committed Pressure, station's regulator design pressures, and the _____ location.
2. **H** The pressure rating derived by calculating the pressure necessary to push the needed volume of gas to the last consumer on any given distribution pipeline is known as the _____.
3. **J** Every facility must have at least one _____ capable of shutting off the source of gas to that facility.
4. **I** The maximum amount of pressure that can be applied to the regulator body without damaging internal components is known as the _____.
5. **F** The document that provides a detailed description of each regulator station facility for each Town Border or District Regulator Station and must be kept protected at the regulator site is the _____.
6. **A** The document that reflects all operating and/or unusual conditions (e.g. routine checks, scheduled inspections, and pressure checks), experienced at the station and any corrective action(s) taken to maintain proper operation of the associated equipment is the _____.
7. **D** A drawing representing three sides of an object from one view and indicating all functions and facilities of the station that must be maintained at the station is known as the _____.
8. **K** After the last possible entry is made (back and front side) on Form CS 6-66 the Regulator Station Inspection Record. The form shall be filed at the work center and retained for a period of _____ years from the date of the last entry.

In This Section:

Self-Operated Regulator Station/ Setting Installation and Start-Up

There are several considerations to be made when installing and initially starting up a regulator station/setting. This instruction sheet will discuss these considerations and the procedures necessary to bring a regulator station/setting online.

- *Design Considerations...*

Each regulator station shall be designed to prevent any single incident from affecting the operations of both the overpressure protective device and the control regulator. Nisource Companies accomplish this goal by always placing the regulator control lines on opposite sides of the settings.

Pressure Regulation.

The pressure-regulating device shall be sized for installation in accordance with the manufacturers' recommendations and NGO Standard M&R Drawing. Any exception to the manual shall be referred to Engineering—Facilities Planning. The pressure-regulating device shall also meet the following conditions:

- Have the required sensitivity to limit the allowable variation in pressure permitted by the type of service
- Operate without pulsation or vibration throughout the anticipated operations range
- Have a soft seat or equivalent inner valve when a positive shut-off characteristic is required

Pressure Regulator Settings.

Pressure regulator settings shall be designed with a device that protects against overpressuring of the downstream system in the event the primary regulator fails. Generally, this overpressure protection is accomplished with a monitor regulator. The pressure regulator settings must be able to withstand the maximum pressure on the inlet of the first-cut regulator when overpressure protective devices are not provided between pressure cuts. Where overpressure protective devices are provided between pressure cuts, all piping, valves, and pressure containing appurtenances shall be selected to withstand the maximum pressure to which they may be subjected with the overpressure protective devices in operation.

The pressure regulator settings must conform to the requirements of Class 1, Division II, Group D of the National Electric Code (NFPA-70, ANSI), when electrical and telecommunications facilities are installed in the building where the setting is housed.

The pressure regulator settings shall also be designed to meet the following conditions:

- Not incorporate any open flame heating equipment
- Installed with a shut-off valve at the inlet and outlet of each regulator or combination of regulators in series
- Installed with a separate pressure sensing line for each regulator equipped with an external control connection. Nisource companies place these connection on opposite sides of the setting for extra protection.

Pressure Testing.

Settings shall be tested in accordance with Gas Standard 1500.010, "Pressure Testing." The pressure test shall include the inlet, outlet and bypass valves while in the open position. A spool piece may be used in place of the regulator.

Pressure Recording.

The installation of pressure recording gauges shall be considered when planning to rebuild or modify an existing regulator station or when constructing a new regulator station.

Temporary recording gauges should be installed at locations in a distribution system at suspected or anticipated low pressure points. These gauges should remain on the system until sufficient information has been obtained.

The installation of pressure recording gauges at large volume M&R installations may be adequate to monitor pressures in the absence of other pressure gauges on the system.

Telemetering/telecontrol devices should be considered where continuous or frequent monitoring or adjustment of pressure is necessary to assure the adequate delivery of natural gas.

A. ***Distribution Systems Supplied by More Than One Regulator Station.*** On distribution systems supplied by more than one regulator station, telemetering or recording pressure gauges shall be installed at points on the system that will best indicate an abnormal operating condition. Such points may include but are not limited to, the inlet and/or outlets of regulator stations feeding the system, or a suspected low pressure point.

B. ***Distribution Systems Supplied by One Regulator Station or Supplied Directly from a Source not Requiring Regulation.*** On distribution systems supplied by one regulator station or supplied directly from a source not requiring regulation, the need for the installation of telemetering or pressure recording gauges shall be determined by the local operations engineer (or equivalent) or designee. Consideration of the number of customers on the system, operating pressure, size and capacity of the system, location of other recording gauges, and other operating conditions will assist in this determination.

In Pennsylvania only, at least one pressure recording gauge is required to be maintained and operated in every low pressure system regardless of the number of regulator stations supplying the system.

Pressure Limiting Devices.

Monitoring regulators are the preferred method of providing overpressure protection. Monitoring regulators shall:

- Have a set point that is sufficiently higher than the controlling regulator so that the monitor will not cause abnormal operation of the primary regulator.
- Be set within the limits of the MAOP plus the allowable overpressure. (Refer to GS 1750.010, "Pressure Regulating Station Operation and Maintenance")
- Have a response time adequate to prevent overpressuring in case of abrupt failure of the primary pressure control regulator.
- Be designed and maintained so that they remain fully operative while in the stand-by position for extended periods of time.

Supplemental Relief Devices.

Relief devices shall be considered for retention as a secondary overpressure protection device when planning to rebuild or modify an existing regulator station, where applicable. Relief devices shall be considered for installation as a secondary overpressure protection device on new and existing small distribution systems serving less than 100 customers.

Inlet and Outlet Piping.

At least 25 feet of welded steel inlet and outlet piping shall be installed from the regulator setting. Where sufficient distance cannot be achieved, an alternate method of supporting the setting shall be provided.

Station Bypass.

Station bypasses shall be considered when:

- A town or city is fed from one source
- Outage time would be extensive
- Restoration of service would be difficult

Filters, Separators and/or Filter/Separators.

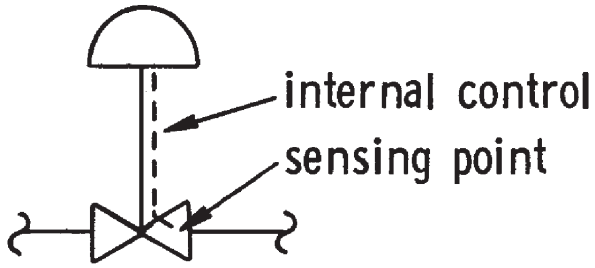
Filters, separators, and/or filter/separators are normally installed at all PODs from a transmission supply pipeline by the supplying pipeline. The regulator technician or local operations engineer shall consult with Engineering—Facilities Planning regarding the need for filters, separators and/or filter separators at District Regulator Stations and at customer M&R Stations.

- Control and Gauge Line Installation...

Control Line.

The control line is also called a sensing line or static line. The control line along with the sensing point are a vital part of a regulator installation. They must be carefully planned and correctly installed if the regulator is to operate satisfactorily and safely.

Some regulators, particularly smaller ones, do not have the control line externally. Instead, it is internal, as represented in the figure to the right. Called "internal control," it is built into the inside in some form of open throat construction or venturi tube.



Internal Control

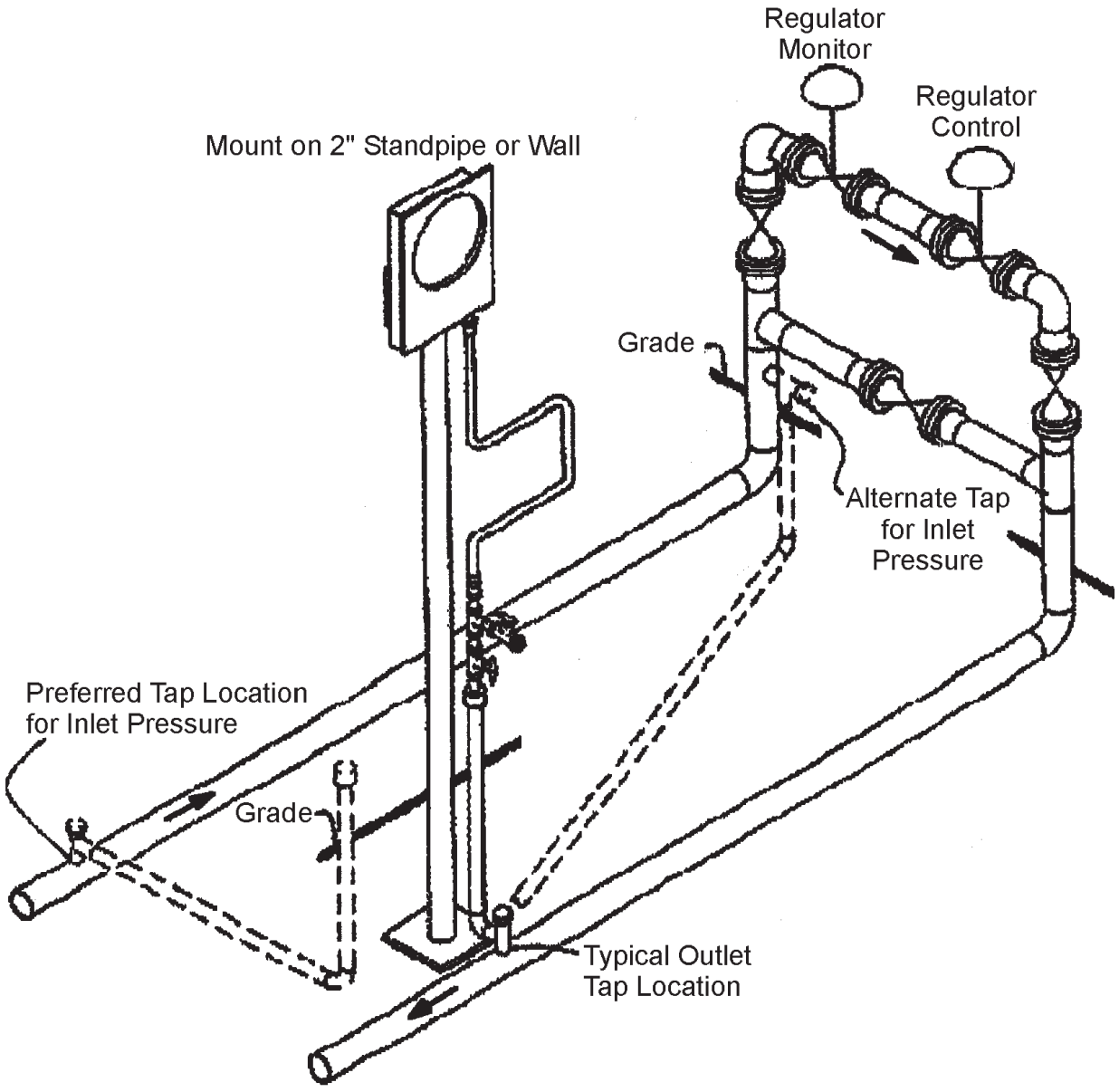
External control lines are typically utilized with pilot-operated regulators or self-operated regulators used in the monitor function. However, there are models that utilize a control line in any configuration, such as the Rockwell 441 and 461 series.

Installation of Control Lines and Recording Gauges.

Regulator control lines shall be installed according to the applicable drawing contained in the NGO Standard M&R Drawing. Always consult the regulator manufacturer's literature for specific downstream distances and sizing considerations.

Each regulator should have its own designated control line and tap location and a means to shut off gas flow. Regulator control line taps should not be located on the setting bypass. While the setting's outlet riser is a common location for a control line tap, the preferred location is farther downstream.

Recording gauges shall be installed, as illustrated in the figure below, and tested in accordance with GS 1754.010 "Operation and Maintenance of Pressure Gauges." The pressure sensing line for pressure recording gauges shall not be connected to the regulator setting bypass line.

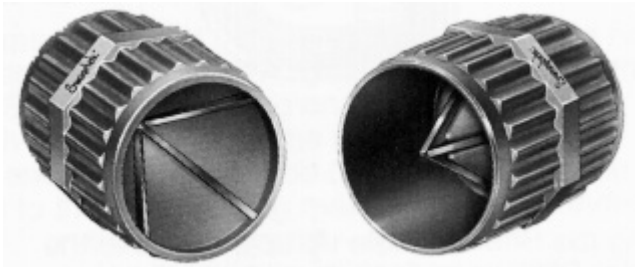


Typical Recording Gauge Installation in Protected Area

Bending Metal Tubing.

Accurately bending metal tubing is an essential procedure in setting up the self-operated regulator station. It is vitally important that all fittings are correctly made to ensure proper and efficient operation of the regulator station. Tubing should be bent so that it does not place a strain on the fittings after it is installed. The tubing, at the bend, should not be reduced in cross-sectional area (kinked). Tubing should remain round throughout the bend area.

A. Preparing the Tubing. When bending and installing stainless tubing in gas measurement assemblies, it is important to use high quality annealed tubing and the proper tools required for the job. The tube is cut square using a roll type tube cutter. The cut with the tube cutter is done very slowly to maintain the shape of the tube walls. After cutting the tube deburr both the inside diameter (ID) and the outside diameter (OD). The tube deburring tool is illustrated in the figure to the right. The deburring tool is composed of three cutters to trim both the inside diameter and outside diameter of the tube.



Inner-Outer Reamer

B. Measuring the Tubing.

Step 1: Measure the center of one tube to the center of the other tube.

- It is important to measure the center of one tube to the center of the other tube accurately. If you don't measure correctly, the tube will not be bent correctly. To get the measurements accurate it may be necessary to use the following tools, especially if your fittings are widely offset:
  - A plumb bob
  - A level
  - A carpenter's string

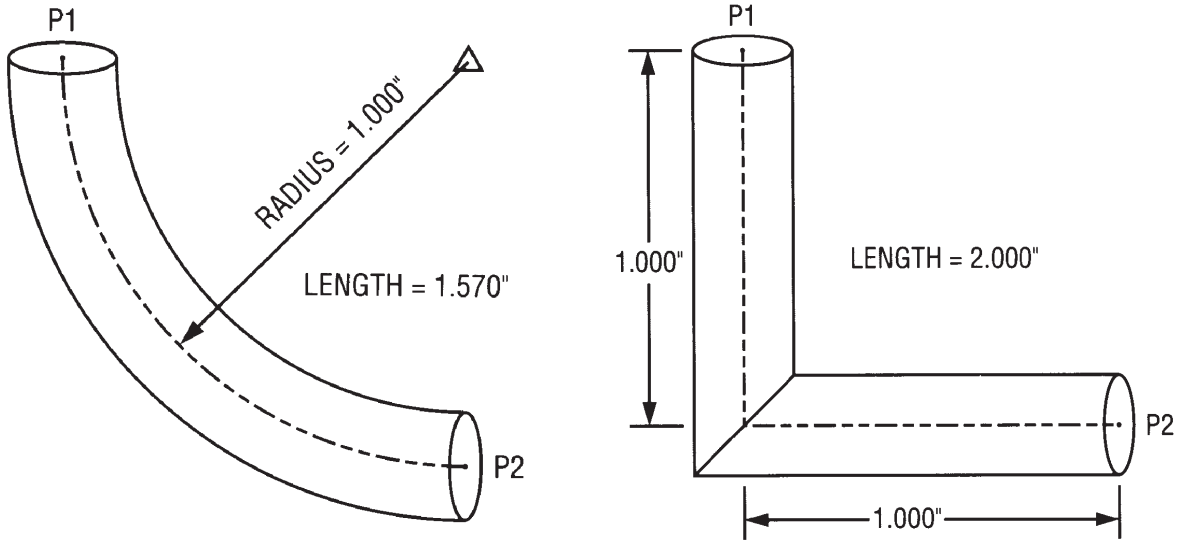
Step 2: Write down an accurate center-to-center measurement
- Sometimes if you have a difficult tubing run to make, it may be easier to draw a sketch and write the measurements for each bend.

Step 3: Measure center-to-center from the lower fitting to the upper fitting.
- This can be done by using the level or carpenter's string and a line level.
  - To use the level, place one end at center of the lower fitting.
  - Now position the level so the bubble is centered.
  - Hold level in position and measure to center of upper fitting.

Step 4: Record this measurement on sketch.

Tube Measurement Adjustment Calculation.

When determining tube bend location, adjustment factors must be considered to achieve proper layout. The illustration below demonstrates the adjustment (gain) between a radiused bend and a sharp bend when measured from P1 to P2.



Radiused Bend (Left) Compared to Sharp Bend (Right)

The adjustment factor is determined by the radius of the tube bender and the number of degrees of the bend. The table below lists the adjustments for selected bend angles (adjustment on angles less than 45º are minimal).

FRACTIONAL ADJUSTMENTS						
Tube O.D.		½"	3/8"	5/16"	¼"	¼"
Bend Radius		1 ½"	15/16"	15/16"	9/16"	¾"
Bend Angle	90º	5/8"	13/32"	13/32"	¼"	5/16"
	85º	½"	11/32"	11/32"	3/16"	¼"
	80º	7/16"	9/32"	9/32"	5/32"	7/32"
	75º	11/32"	7/32"	7/32"	1/8"	3/16"
	70º	9/32"	11/64"	11/64"	3/32"	1/8"
	65º	7/32"	1/8"	1/8"	5/64"	3/32"
	60º	5/32"	3/32"	3/32"	1/16"	5/64"
	55º	1/8"	5/64"	5/64"	3/64"	1/16"
	50º	3/32"	1/16"	1/16"	1/32"	3/64"
	45º	1/16"	1/32"	1/32"	1/32"	1/32"

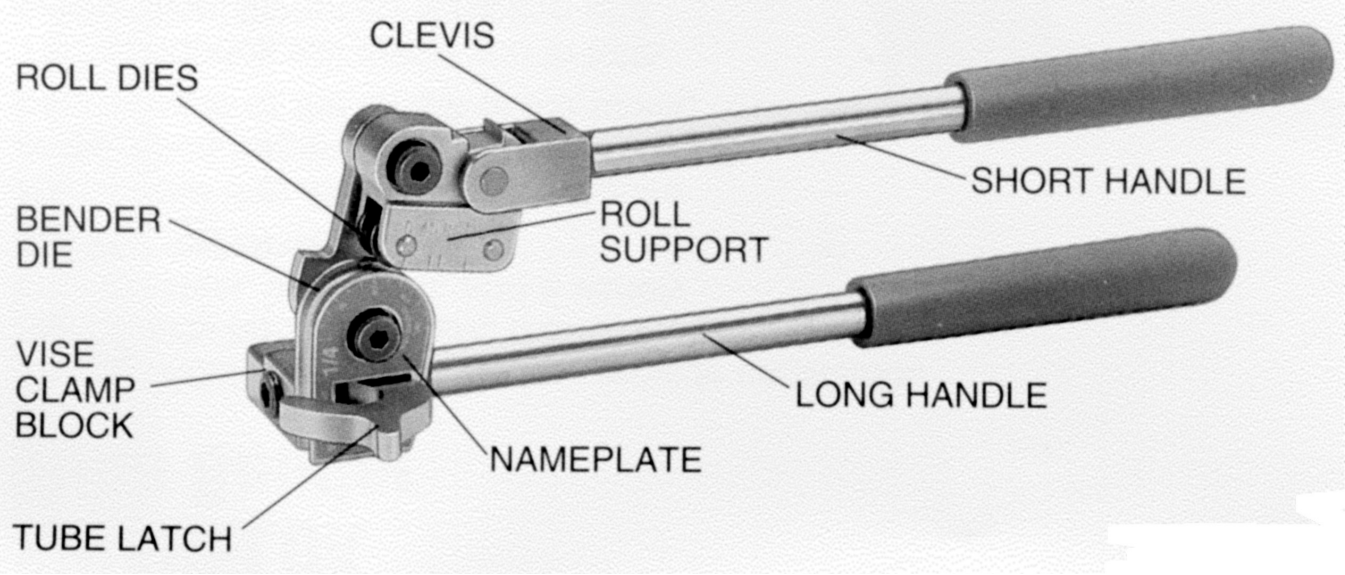
Bending Tubing.

The figure on the next page illustrates the components of a tube bender. These are important to understanding the procedure used to bend tubing.

The tube measurements should be marked before starting the bending procedure.

If possible, use a bender that has "R" and "L" on it. This is the easiest type to use.

It should be noted that tube bending measurements will vary depending on the type of bender used, the accuracy of the marks on the tubing and other factors. All pre-measurements should be considered approximate and final tube bends should be compared with a template whenever possible.



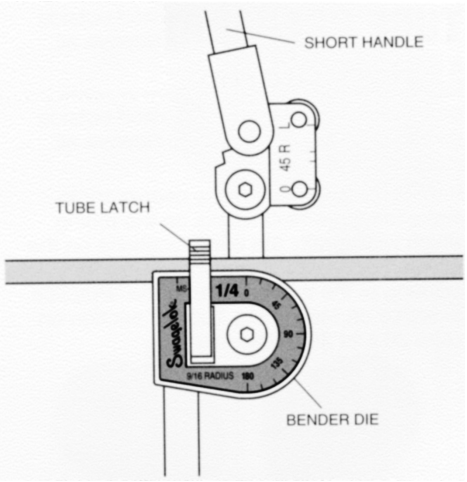
Tube Bender Components

Bending tubing with the tube bender involves the following steps:

Step 1: Mark your first measurement on the tube.

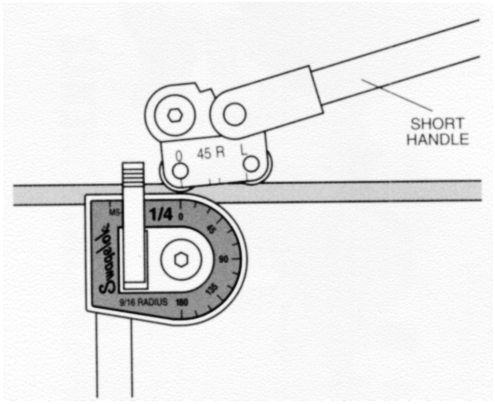
Step 2: Place the tubing in the tube bender.

- Swing the "short handle" up so it is above the "bender die."
- Place the tube in the bender groove and press the "tube latch" forward just enough to retain the tubing in the die.
- This will prevent movement of the tubing during its initial positioning, yet still allows for additional tubing alignment.



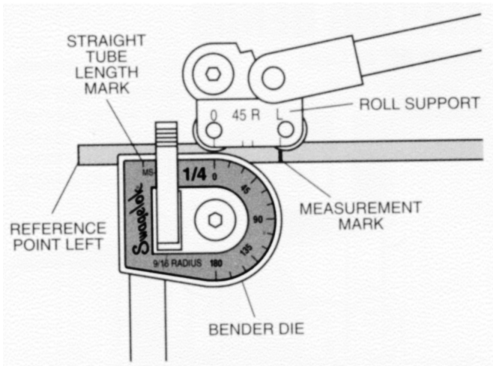
Step 3: Lower the "roll dies" onto the tubing.

- Carefully lower the "short handle" until the "roll dies" rest gently on the tubing.

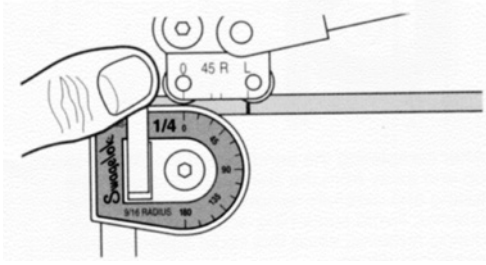


Step 4: Align the tube in the tube bender with reference to the P1 measurement mark.

- The measurement mark on the tubing should be aligned under the "R" (right) or "L" (left) on the roll support. When to align the measurement mark with the "R" or "L" depends on the direction from which the beginning of the measurement or reference point was made. (For example, the reference point is to the left of the measurement mark, therefore, the mark is aligned under the "L" on the roll support).
- When making 45º bends, alignment of the measurement mark on the tubing should be under the "45" on the roll support regardless of the reference point location. At this point, it is also necessary to align the "0" on the roll support and the "0" on the bender die.
- When installing fittings near tube bends, there must be a sufficient length of straight tubing to allow the tube to be bottomed in the tube fitting. The straight tube length mark indicates the length of the tubing required from the end of the tube to the beginning of the bend.

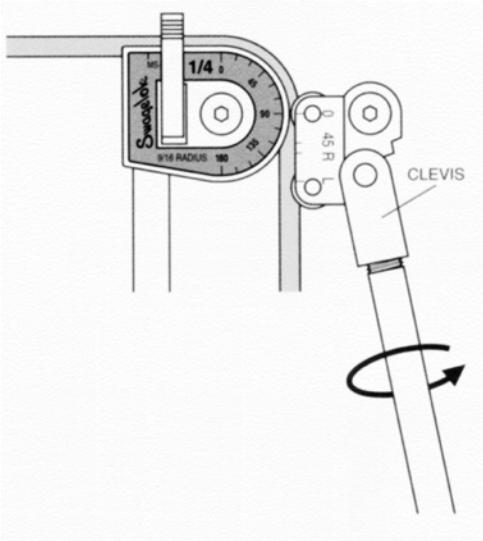


Step 5: Push the tube latch firmly over the tubing, securing the tubing in the bender die.



Making bends 90º or less:

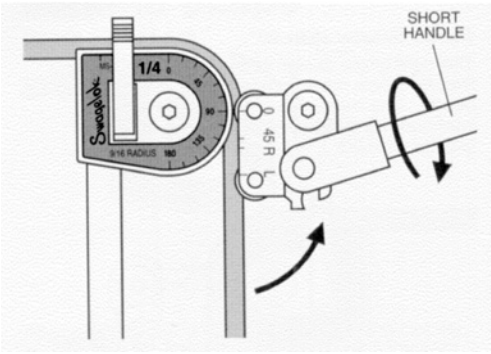
Step 1: Mark your first measurement on the tube.



Step 2: Slowly push the short handle down.

- After properly positioning the tube in the bender, slowly push the short handle until the "0" on the roll support reaches the appropriate degree mark on the bender die.
- With the handle "0" mark and the wheel "0" mark lined up and your measurement mark under the "L," pull the handle around until the handle "0" mark lines up with the 90º mark on the wheel. This is the key to bending tubing—just put your mark under the "L" if measurement mark is from left side of tube clamp.

Step 3: Swing the short handle up and away from the bender die.



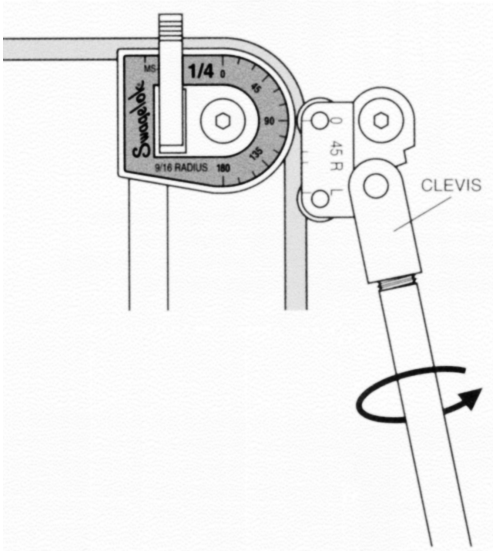
- After completing the bend, swing the short handle up and away from the bender die.
- Unlatch the tubing and carefully remove it from the groove in the bender die.
- Avoid scratching or marring the tubing during removal, since this could adversely affect sealing surface.

If you are bending stainless-steel tubing, it will sometimes spring back and not make a full 90º angle. If this happens, bend tubing a little more until you get a 90º bend.

Making bends greater than 90º:

Step 1: Begin the bend, following the same system used in making bend (90º or less).

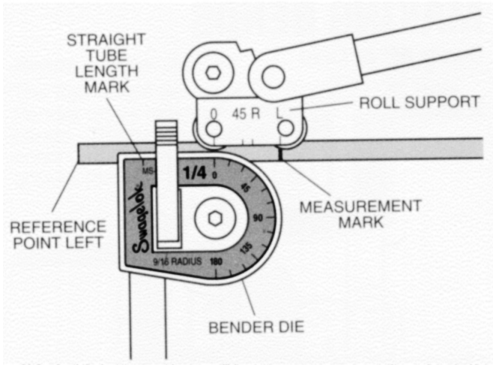
Step 2: Adjust the short handle on the bender when the "0" on the roll support reaches the 90º mark on the bender die. The short handle is loosened from the clevis (approximately 4 times).



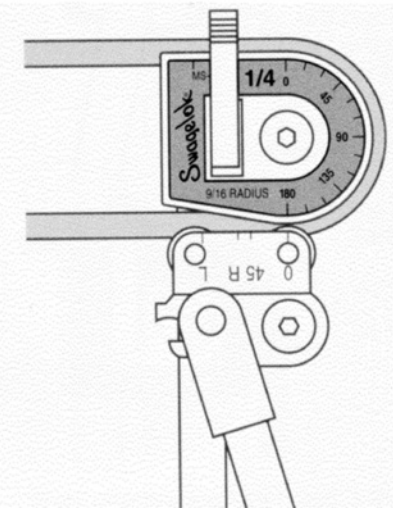
Step 3:

Swing the short handle up counterclockwise.

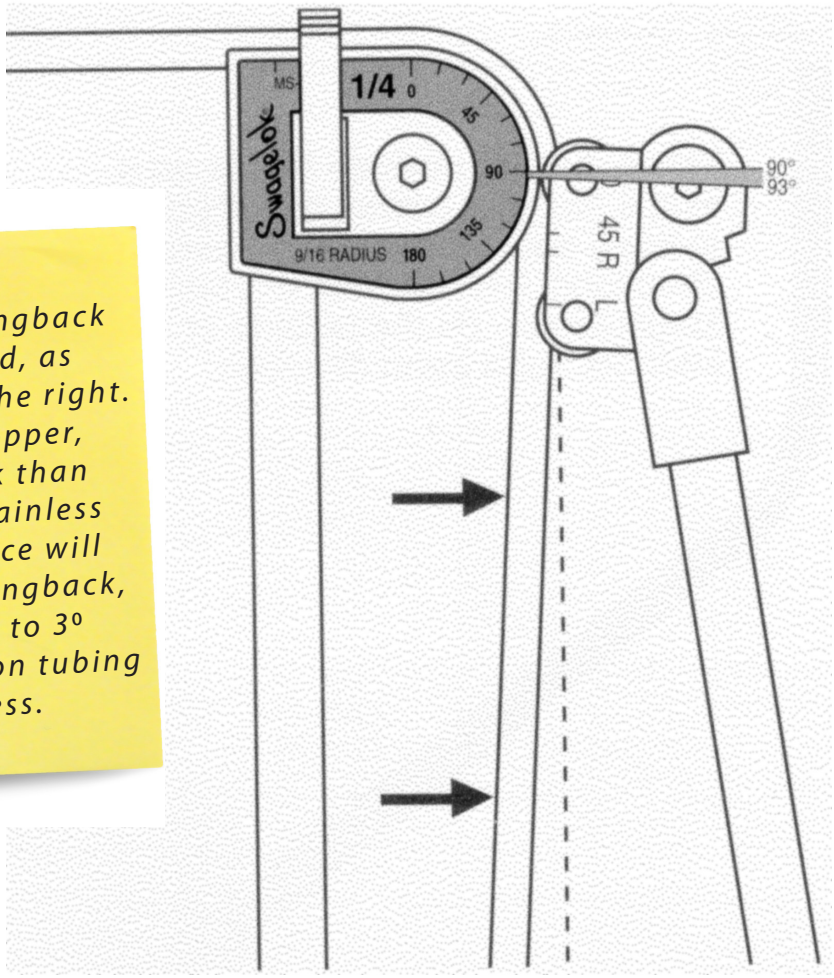
- The short handle is raised slightly above the perpendicular position in relation to the long handle.
- Retighten the short handle.



Step 4: Continue the bend until the "0" on the roll support reaches the appropriate degree mark on the bender die.



All tubing will exhibit springback after a bend is completed, as illustrated in the figure to the right. Softer tubing, such as copper, will have less springback than harder tubing, such as stainless steel. Although experience will dictate the amount of springback, expect to allow from 1º to 3º compensation depending on tubing material and hardness.



Installing the Fitting.

Tube fittings come completely assembled, finger tight and are ready for immediate use. Disassembly before use is unnecessary and can result in dirt or foreign material getting into the fitting causing leaks.

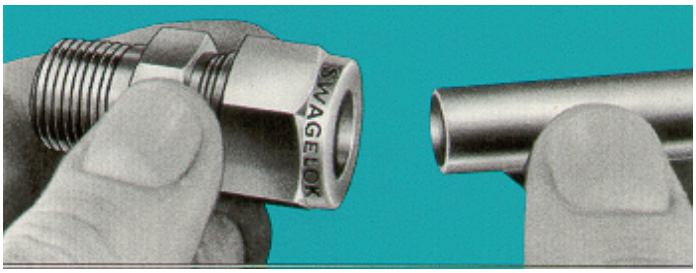
Before placing the tube fitting on the tube, check to ensure the:

- Tube has been cut square
- Tube has been deburred on the inside diameter (ID) and outside (OD)
- Tube is free of scratches

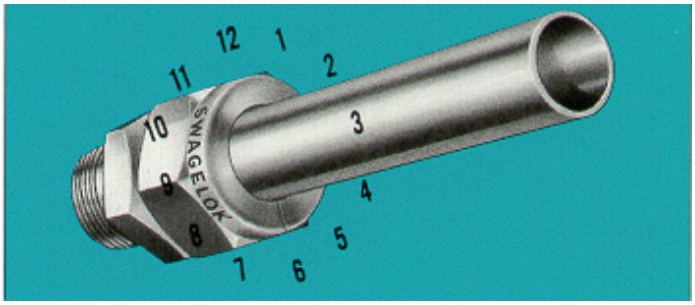
Tube fittings are installed in three steps, as follows:

Step 1: Insert the tubing into the tube fitting.

- Make sure that the tubing rests firmly on the shoulder of fitting and that the nut is finger tight.

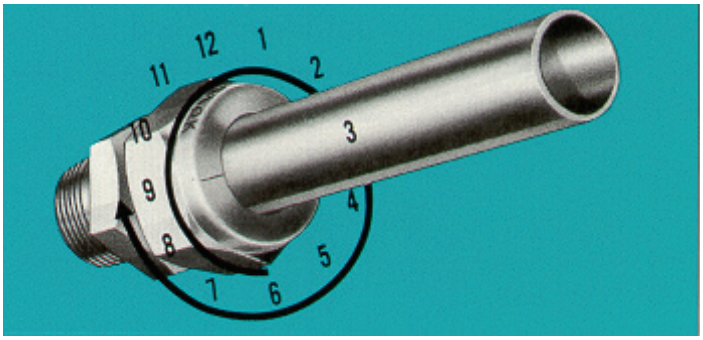


Step 2: Before tightening the fitting nut, scribe the nut at the 6 o'clock position.



Step 3: Tighten the fitting nut.

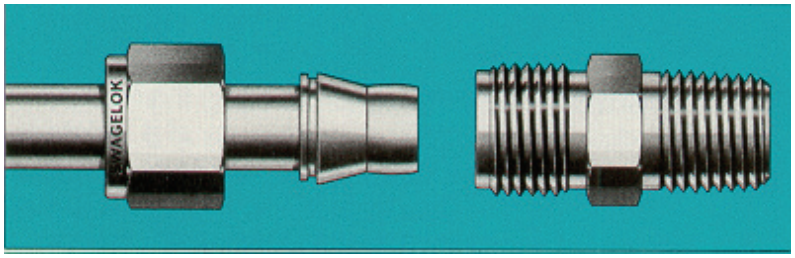
- Hold the fitting body steady with a backup wrench and tighten the nut 1 1/4 times.
- Using the scribe mark as the reference, make one complete revolution and continue until the scribe mark is at the 9 o'clock position



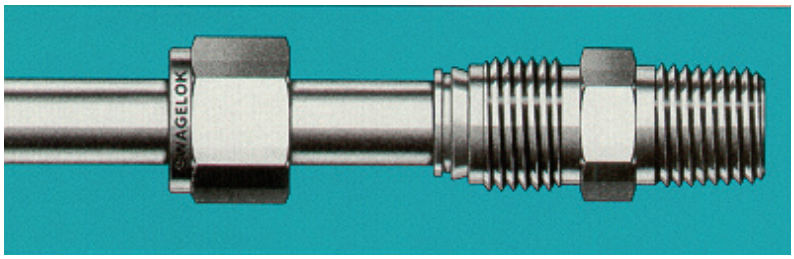
By scribing the nut at the 6 o'clock position as it appears to the installer, there will be no doubt as to the starting position. When the nut is tightened 1 1/4 times to the 9 o'clock position, it can easily be seen the fitting has been properly tightened.

Re-tightening Metal Tubing Connection.

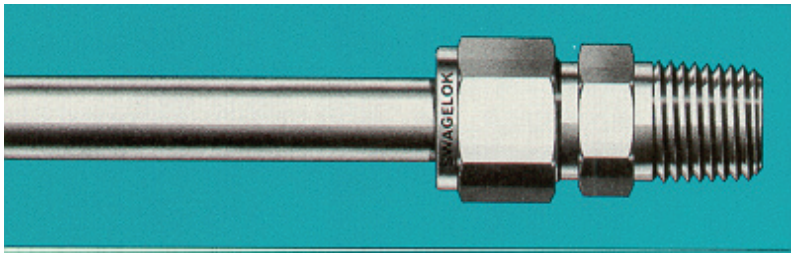
Metal tube connections can be disconnected and re-tightened many times. The same reliable leak proof seal can be obtained every time the connection is remade. The correct procedure for making a reconnect is demonstrated in the following illustrations:



Fitting in Disconnect Position



Tubing with Pre-Swaged Ferrules Inserted into the Fitting Body Until the Front Ferrule Seats



Fitting Nut Tightened by Hand

Rotate the fitting nut to the original position with a wrench. An increase in resistance will be encountered at the original position. Then tighten slightly with the wrench.

Smaller tube sizes will require less tightening to reach the original position, while larger tube sizes will require more tightening. The wall thickness of the tubing will also have an effect on the tightening.

Gap gauge inspections are designed to assure the installer or inspector that a "Swagelock" tube has been sufficiently pulled-up. They are particularly applicable to systems where fittings are installed in difficult or inaccessible locations or where insufficient pull-up could cause potentially dangerous or expensive consequences.

- Exercise in Tube Bending...

Step 1: Mark your first measurement on the tube.

- If your measurement is from the left side of the tube clamp, put your first measurement mark on the tube under the letter "L." Let's use 3 inches for this measurement.

Step 2: With the handle "0" mark and the wheel "0" mark lined up and your measurement mark under the "L," pull the handle around until the handle "0" mark lines up with the 90º mark on the wheel.

- You have now made a 90º bend that is 3" from the end of the tube to the center of the tubing.
- Had your measurement been to the right of the tube clamp, you put your measurement mark under the "R" on the handle.
- If your measurement is to the right of the tube clamp, line your mark up under the "R." If you do this, your center-to-center measurements will always work out.

Step 3: Now that you have made your first bend, measure from the center of the tube for your next measurement mark.

- Make this mark all the way around the tube. The reason you do this is because when you make your next bend you have to position the tube in the bender at a right angle to the first bend.

Step 4: To make your second bend position, mark on the tube under "R" or "L," whichever is more comfortable for you.

- Just make sure if the measurement is from the left of the tube clamp, it is under the "L." If it is from the right of the tube clamp, it is under the "R."

Step 5: Sight down the tube and line up the tube at 90º to the face of the wheel.

- Think about the tube position in the bender and make sure the bend will be in the direction you want it to go. Always check twice to make sure your bend will go in the proper direction.

Step 6: After making sure your tube is in the proper position, make another 90º bend.

Step 7: Measure from the center of the tube to your final bend mark on the tube. Make this mark go all the way around the tube as before.

Step 8: Position the tube in the bender so that the bend will be made in the proper direction.

Step 9: Bend the tube to 90º.

Step 10: Now, make your final measurement mark. In this case, it is 3 inches again.

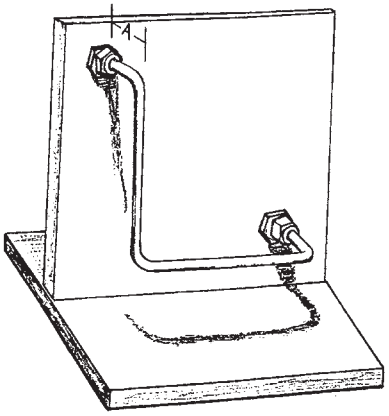
Step 11: Cut the tube on the mark.

- If you have done everything correctly, the tube should fit right into both fittings.

Step 12: After you have checked the fit of the tube, deburr the inside of the tube with the pointed reamer on your tube cutter.

- All burrs should be removed from inside the tube.
- Also, the end of the tube should be square and free of burrs.
- Always use a sharp tube cutter with no nicks in the cutting wheel—this makes the job of preparing the tube much easier.

Step 13: After deburring the tube on both ends, you can now install it (The figure to the right).



If you have an unmarked bender, you may want to mark these measurements:

For ¼ inch tube bender:
"0" to "R" = 5/16 inch
"0" to "L" = 9/16 inch

For 3/8 inch tube bender:
"0" to "R" = 17/32 inch
"0" to "L" = 15/16 inch

For 1/2 inch tube bender:
"0" to "R" = 7/8 inch
"0" to "L" = 1 ½ inch

- Corrosion Considerations...

Always consult with your local corrosion technician prior to performing the actual start-up of any regulator installation. There may be special concerns with a particular regulator station/setting.

Coatings and Paint.

☞ An approved aboveground coating used on buried pipe shall extend above ground and should be a minimum of four (4) inches above grade level. If the riser coating is damaged or deteriorated it shall be repaired by re-coating with an approved aboveground coating.

Coatings shall be applied on a properly prepared surface. Surfaces to be coated shall be cleaned to remove all rust, scale, dirt, dust, oil, grease and moisture. The surface should be free of any paints or lacquers. All slags, burrs and slivers should be removed from weld areas.

Care should be taken to remove loose or poorly bonded coating. The existing coating shall be removed to the extent necessary to ensure the remaining coating is firmly bonded. The existing coating shall be free of dirt and moisture at the areas to be overlapped.

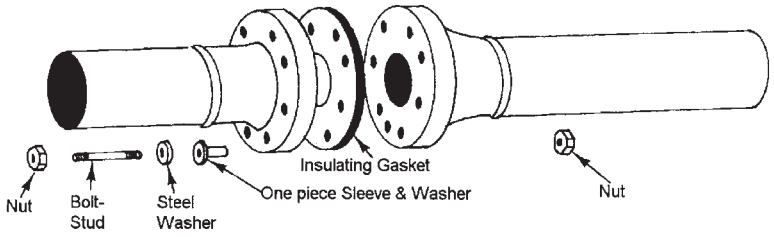
Weld areas, flanges, various fasteners (including bolts, nuts, and their threads) that have crevices and sharp edges have historically been problem areas for paints. High moisture conditions, such as condensation on piping, fittings, and in flange voids; piping close to ground level; and junctions with earth or concrete where piping or supports are entering or exiting grade level, are also problem areas. Piping within unsealed wall sleeves is usually subject to condensation and rain and tends to retain moisture. All of these situations are principle areas for significant corrosion that will create leaks or deteriorate the facilities to the point they require replacement if the conditions are not corrected. Refer to GS 1420.050 "Coating Methods for Fabricated Stations & Settings."

Condensation of pipe presents a serious problem area that frequently results in early paint failure and corrosion. Surface preparation should be performed and maintained according to Policies and Procedures 653-4, "Installation of Corrosion Control Materials" (Exhibit B and C). To prevent condensation during surface preparation and painting:

- During periods of low humidity combined with warm temperatures, the station should be shut down or bypassed.
- When gas cannot be bypassed or shut off, supplemental ventilation can be provided by opening doors and windows and the use of fans.

Insulated Flanges.

Insulated flanges are approved for both aboveground and belowground use. An insulating flange, as illustrated in the figure to the right, is a means of isolating various parts of a pipeline system and developing quality control in the cathodic protection system.

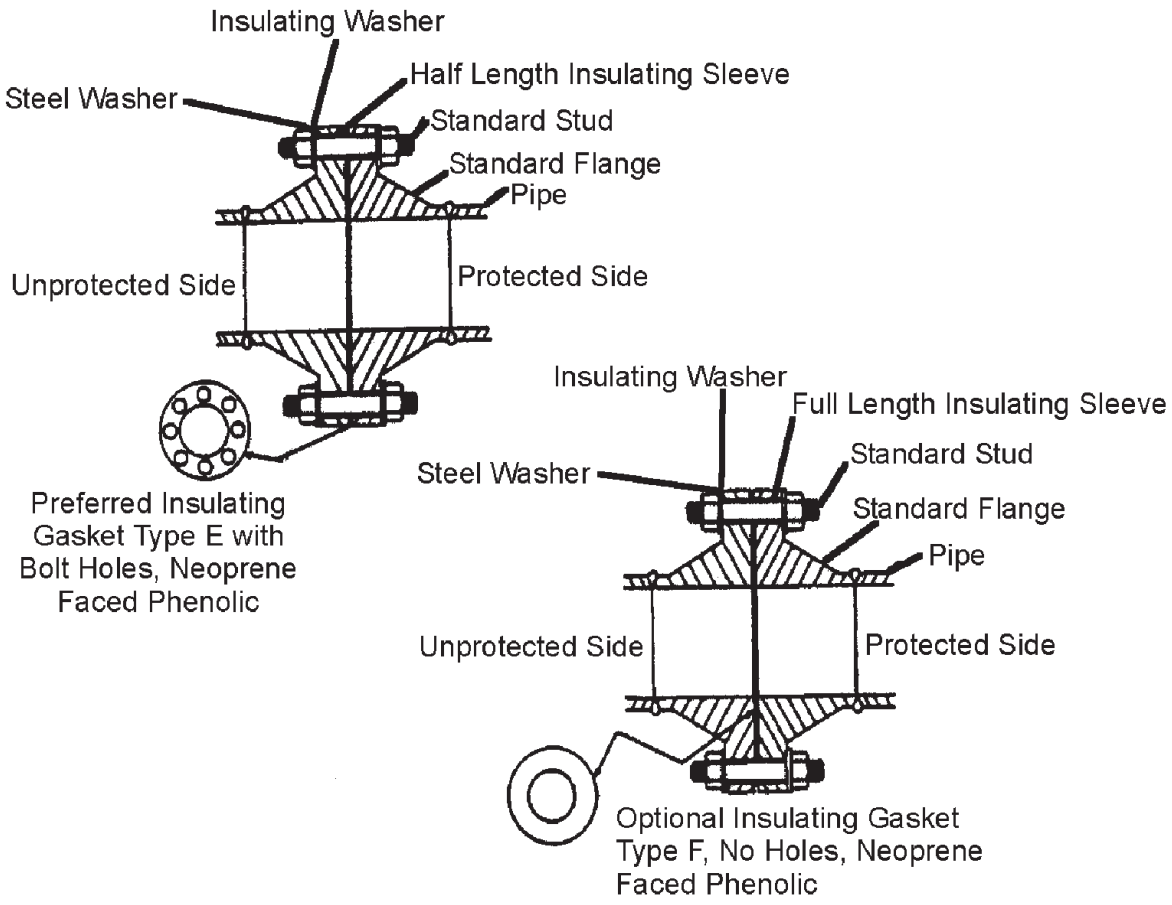


Insulating Flange

Flange insulation requires a gasket of high dielectric strength and flexibility. It must be able to withstand the tightening pressure required to prevent leakage on high-pressure pipeline. The bolts are insulated from the flange by means of plastic, Delrin, or laminated Mylar sleeves and washers. The insulating washer is protected from the twisting action of the nut by a steel washer. Any broken or cracked sleeve or washer should be replaced, as they will eventually short out, rendering the fitting ineffective.

On existing flanged joints, where insulation is required and it is impractical to separate the flanges, bolt sleeves and insulated washers may be sufficient to provide insulation. Sleeves and insulating washers may be installed in an in-service flange by removing one bolt at a time from the flange and replacing with bolt, sleeve and washers. A back-up wrench should be used to ensure that the bolt does not turn during tightening. Turning can destroy an insulated sleeve and make an insulated flange ineffective.

Where the flanges can be separated to remove the existing gasket, insulation can be accomplished as seen in the figure below.



Insulating Flange Installation

- *Start-Up Procedure...*

During the regulator station start-up procedure, you must observe all safety procedures (bonding) and follow a purge plan, if applicable.

Step 1: Inspect setting and confirm regulator setting components are correct (document inspection).

Step 2: Create a temporary Regulator Station Inventory Record Card (drawing).

Step 3: Fill out CS 6-66, Regulator Inspection Record.

Step 4: Notify Gas Control, if necessary.

Step 5: Check system MAOP and MCP.

Step 6: Insure control lines are tapped, if practical.

Step 7: Install gauge of proper range downstream.

Step 8: Insure all station valves are in the CLOSED position.

Step 9: Turn ON critical valve to station.

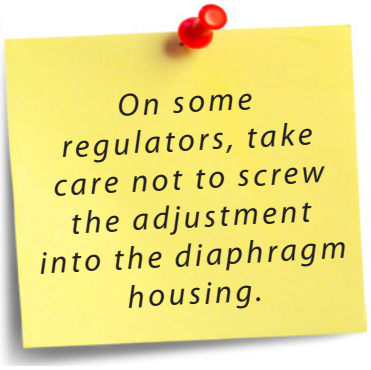
Step 10: Utilize bypass valve to purge system slowly.

Step 11: Raise downstream pressure to mid-point of operating range.

Step 12: Check control lines for pressure.

Step 13: Follow procedure 654-3 (Exhibit G) to purge and lock up station.

Step 14: Screw the control regulator all the way down (wide open).



Step 15: Determine the monitor regulator set-point.

Step 16: Adjust the bypass valve to achieve an outlet pressure setting ***lower*** than the desired monitor regulator set-point.

Step 17: Slowly increase the monitor regulator set-point and have the bypass valve operator start to close the bypass valve as the monitor regulator picks up the load on the system.

Step 18: Verify that the bypass valve is ***fully*** CLOSED.

Step 19: Back-off the control regulator to its desired set-point.

References:
Columbia Gas Policy/Procedure No. 530-16.
Swagelok® Tube Bender. MS-13-43. Swagelok Co., Solon, Ohio.
Swagelok® Tube Fittings. MS-13-59. Swagelok Co., Solon, Ohio.

**Review pages only show in Instructor Guides.
Verbally review these questions with the learners.**

Review

Self-Operated Regulator Station/Setting Installation and Start-Up

Use the following bank of answers to best complete the statements below. Note that while an answer may be used twice, some answers may not be used at all.

A. 25
B. control regulator
C. 4
D. means to shut off gas flow
E. mark
F. springback
G. telemetering
H. regulator setting bypass line

1. **B** Each regulator station shall be designed to prevent any single incident from affecting the operations of both the overpressure protective device and the _____.
2. **G** On distribution systems supplied by more than one regulator station, _____ or recording pressure gauges shall be installed at points on the system that will best indicate an abnormal operation condition.
3. **A** Inlet and outlet piping must be of welded steel and installed at least _____ feet from the regulator setting.
4. **H** When installing a pressure recording gauge, the pressure sensing line shall not be connected to the _____.
5. **D** Each regulator should have its own designated control line and tap location and a _____.
6. **E** Before starting the tube bending procedure, you should _____ the tube measurements.
7. **F** When bending harder tubing, such as stainless steel, you should allow for _____.

**Review pages only show in Instructor Guides.
Verbally review these questions with the learners.**

Review

Self-Operated Regulator Station/Setting Installation and Start-Up

Use the following bank of answers to best complete the statements below. Note that while an answer may be used twice, some answers may not be used at all.

A. deburr
B. insulated flange
C. ~~mark~~
D. 1 1/4
E. condensation on the pipe
F. disassemble
G. 4
H. ~~25~~

8. **F** When using tube fittings, you should ***not*** _____ them prior to installing them.

9. **D** When tightening a tube fitting beyond finger-tight, you should hold the body steady with a backup wrench and tighten the nut by rotating _____ times.

10. **A** After cutting tubing for the control and/or gauge line installation, you must _____ the inside diameter and the outside diameter.

11. **G** For corrosion protection, an approved aboveground coating used on buried pipe shall extend above ground and should be a minimum of _____ inches above grade level.

12. **E** Early paint failure and corrosion is a serious problem caused by _____.

13. **B** A means of isolating various parts of a pipeline system and developing quality control in the cathodic protection system for both aboveground and belowground use is a(n) _____.

In This Section:

Self-Operated Regulator Station/ Setting Inspection and Maintenance

Columbia Gas Distribution Companies GS 1750.020, Inspection and Maintenance of Delivery Station Regulators, describes the required inspections for all regulators. This procedure has been modified here to reflect only those portions that apply to self-operated regulators.

Below is a listing by order of progression of typical activities and tasks included in a regulator inspection.

1. Observation of Safety Procedures
2. Critical Valve Inspection
3. Leak Survey
4. Bypass Setting
5. Inspection Regulators
6. Purge Setting
7. Place Setting in Service
8. Documentation

- *Inspection and Maintenance of Regulators...*

Operating Pressure Ranges.

The maximum allowable operating pressure (MAOP) permitted shall be established by the Operations Engineer.

Low pressure systems shall operate within a pressure range which will assure the safe and continuing operation of any connected and properly adjusted low pressure equipment.

A. ***Control Regulator.*** In no case shall the outlet set pressure exceed the established MAOP. 

B. ***Monitor Regulator and/or Primary Relief Devices.*** In no case shall the outlet pressure of the overpressure protection device be set above the following:

MAOP	*Allowable Setpoint*
12 psig or less	MAOP + 50%
12 psig to 60 psig	MAOP + 6 psig
Over 60 psig	MAOP + 10% or 75% of SMYS, whichever is lower

Inspection of Pressure Regulating and Overpressure Protection Devices.

All regulators shall be inspected to determine that all pressure regulating and overpressure protection devices are:

A. Properly documented in the Work Management System (WMS).

B. In good mechanical condition.

C. Set to function at the correct pressure.

D. Properly installed.

E. Protected as necessary from dirt, liquid or other conditions that might prevent proper operation.

Regulator Inspection Schedule.

WMS shall be used for scheduling purposes, except for regulators inspected at time of meter inspection or change, and kept current by recording each inspection as it is performed. Regulator inspections performed in conjunction with a meter inspection or change, do not require separate RT's in WMS.

The following minimum regulator inspections are required. However, regulators or overpressure protection devices should be inspected more frequently if local knowledge of operating conditions indicates that more frequent inspection is necessary.

Frequency Of Inspection

Pressure regulating stations and overpressure protection devices shall be inspected once each calendar year at intervals not to exceed 15 months. 

Overpressure Protection Devices.

Overpressure protection devices, excluding rupture discs, rupture pins and internal relief type regulators, which are part of a Plant Regulator Station or a Service Regulator Setting, shall be inspected with the same frequency as the controlling regulators.

Relief devices (relief valves, oil seals), if not blind plated, disconnected or deactivated, shall be inspected and inspections recorded as part of the regulator inspection.

Regulator Inspections.

Regulator inspections shall be conducted only by trained personnel. It is always recommended to have access to the appropriate manufacturer’s literature for the regulator under inspection. A selection of various inspection checklists designed for specific regulator types and models is included in Appendix B.

The purpose of an inspection is to discover fouling conditions and worn and/or defective parts that may adversely affect the proper operation of the regulator and to make corrections by cleaning, replacement, or adjustment of parts, when necessary.

Regulator personnel shall not leave the work site until the regulators are in safe operating condition or taken out of service.

A. Plant Regulator Inspection

The regulator inspection shall consist of an operational check. Town Border and District regulator stations shall also have a test for lock-up. If there is leak-through during the lockup test due to the seat material type (e.g., hard seats), then the test can be deemed acceptable if the leak-through is minimal. When excessive leak-through is found, corrective action shall be taken to minimize the leak-through to an acceptable level.

B. Service Regulators. All service regulators shall have lock-up capability under no flow conditions.

- ***CAB & GMB Service Regulators.*** Regulator inspections consist of an operational check and an acceptable shut-off test, if practical. If the regulator fails to function during the inspection, the regulator should be repaired or taken out of service. Refer to GS 6500.100, "Changing Meters - Setting New Meters," for inspection guidance.
- ***Fixed Pressure Factor Metering Pressure Check.*** The measurement accuracy of Fixed Pressure Factor Metering (FPFM), whether by Fixed Pressure Compensation by Computer (FPCC) or Fixed Pressure Compensated Index (FPCI), depends on the service regulator maintaining a constant meter inlet set pressure. Information regarding these inspections can be found in GS 6400.090, "Fixed Pressure Factor Metering (FPFM)."

Critical Valve Inspection.

Every regulator station is required to have a critical valve readily available that can be operated in an emergency situation. It is important that this valve always be inspected to ensure ease of access and operation. Lubrication and maintenance of the valve should be done in accordance with manufacturer's literature.

Liquid Collection and Disposal.

It is not uncommon to discover that liquids have accumulated in regulator station/setting piping and valve bodies. These liquids typically consist of water, oils or hydrocarbons, either alone or in combination. These fluids shall not be allowed to spill onto station ground cover. All liquids shall be absorbed from regulator station/setting components and residues removed from surfaces. Any fluids found in excess of one U.S. quart shall be collected and given to the area Environmental, Health and Safety representative for lab analysis. Naturally, all fluids and cleaning supplies shall be disposed of in approved locations and containers.

- *Instructions for Completing Regulator Station Inspection...*

The following items are steps to complete a inspection on a self-operated regulator setting:

Leakage Before Venting.

Check for leakage with a CGI before entering a structure. Before beginning a regulator inspection, it is recommended that all windows and doors be opened to provide ventilation during blow down and purging.

Locate exterior shut-off or critical valve.

When working in a vault, refer to GS 1762.010 "Maintenance of Vaults." The initial LEL and oxygen readings are to be recorded.

"As Found" Conditions.

A. Check if set pressure is as previously recorded on Form CS 6-66, "Regulator Station Inspection Record," and if the regulators are functioning properly. If not normal, explain under the WMS Job Order "Remarks" section any abnormal conditions, for example, if a monitor is in control, or any regulator is pumping, chattering, or otherwise malfunctioning.

B. Inlet Pressure: Gauge inlet pressure to each regulator.

C. Outlet Pressure: Gauge outlet of each regulator. If inlet pressure is inadequate to verify the outlet set point of the control regulator refer to GS 1750.010 "Pressure Regulator Station Operation and Maintenance."

The "as found" conditions shall be determined and recorded on the WMS Job Order before any changes or repairs are made to the regulator(s) or other equipment.

D. Monitor Set Point: Gauge pressure at which monitor takes over by increasing the control regulator set point. If it is not desirable to raise the station outlet pressure to the monitor set point refer to GS 1750.010 "Pressure Regulator Station Operation and Maintenance."

All Regulators.

All regulators require a response test to verify proper operation. This test can be performed under operating conditions by:

A. Raising the regulator set point by increasing the regulator set adjustment.

B. Verifying, by gauging, that the outlet pressure from the regulator assembly increases correspondingly.

C. Reducing the regulator set point back to the original position by decreasing the regulator set-point.

D. Verifying, by gauging, that the outlet pressure from the regulator assembly returns to the original pressure level.

E. In the event that the regulator outlet pressure does not properly respond to adjustment of the set point bolt, repairs shall be performed as required to assure proper regulator response.

F. Valves and Seats. After taking regulator out of service, disassemble regulator sufficiently to examine parts subject to wear or fouling. Valve components shall be cleaned, adjusted or replaced as necessary to assure good mechanical condition and proper operation of regulator. Inspection shall include the following mechanical condition and proper operation of regulator. Inspection shall include the following: Adjustments of reassembled inner valve(s) to ensure proper operation and lock-up.

Gauges.

Each permanently installed pressure recording and spring type gauge shall be checked for condition and accuracy in accordance with GS 1754.010 "Operation and Maintenance of Pressure Gauges."

Diaphragms.

With the regulator adjusting screw cap in place, use either soap suds or a combustible gas indicator to check for any leakage at the diaphragm case vent opening and around the diaphragm perimeter at the case bolts. 

Visually inspect the exposed portions of the diaphragm for deterioration.

A diaphragm shall be replaced if it is:

A. Leaking; or

B. Deteriorated (cracked or crumbling); or

C. Made of leather or cotton reinforced material.

Vents and Vent Lines.

Inspect vent opening, vent lines, and screen to assure that they are free of any obstruction. Verify vent lines are secure, not smaller than the regulator vent connection, and terminate at a safe location.

Control and Supply Lines.

Inspect control and supply lines for external corrosion and adequate support.

Valves.

Inspect regulator setting inlet, outlet and bypass valves to determine if they turn with acceptable force applied and check for leak through, where practical. Lubrication of plug valves shall be in accordance with GS 1750.010 "Pressure Regulator Station Operation and Maintenance."

Heaters.

Heaters shall be inspected in accordance with GS 1750.210 "Inspection And Maintenance of Heaters."

Cleaners.

This inspection shall include as applicable:

A. An oil (liquid) level check; and

B. A differential pressure check across the device to determine internal resistance to flow.

Relief Devices.

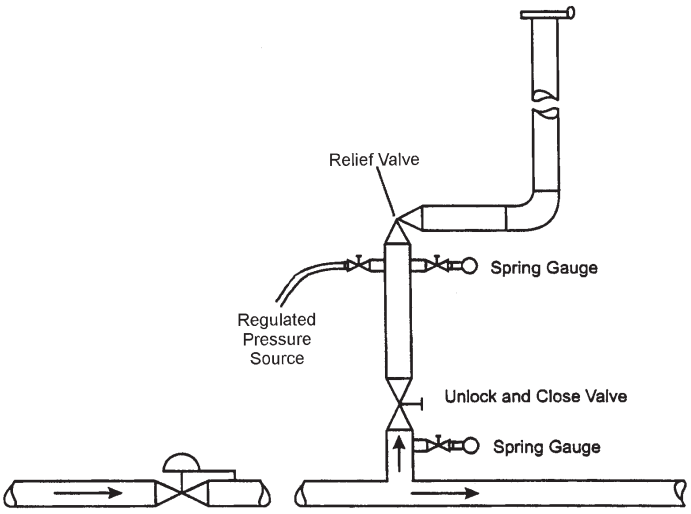
Inspection shall be performed as follows:

A. Close shut-off valve to isolate relief device from piping system.

B. Connect a pressure source to a test point installed between shut-off valve and relief device.

C. Slowly increase pressure until the relief device starts to open. Make adjustments to obtain proper relief point as recorded on the Regulator Station Inventory Record.

D. Remove pressure source and close test point.



E. Open the shut-off valve. When located outside of a locked building the shut-off valve must be locked in the open position.

F. Check to assure that relief device is not leaking through at operating pressure.

G. Check for the presence of water in oil seal. Remove, if found.

Check Valves.

Perform an operational check.

Operational Check "As Left".

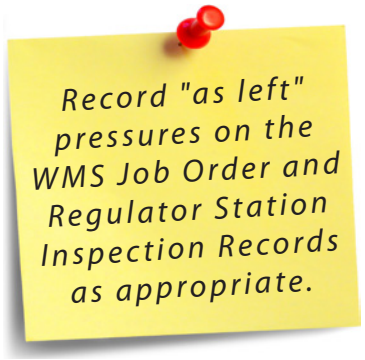
Each regulator and relief device shall be checked to ensure that it:

A. Is in good working order.

B. Operates or strokes smoothly.

C. Shuts off within acceptable limits.

D. Controls at the pressure it is set at.



Fencing, Building, and Lot.

Check condition and note repairs if needed.

Atmospheric Corrosion.

Visually inspect aboveground yard piping, setting piping and equipment for evidence of atmospheric corrosion. Atmospheric corrosion is active scaling and/or pitting on aboveground piping. If atmospheric corrosion is suspected, it shall be indicated on the WMS Job Order that further action is required. If only surface oxidation (rust) exists, the setting should be scheduled for cleaning and painting.

WMS Job Order Remarks.

This area can be used for any information that warrants notation.

Cleaners.

Inspect the internal filtering device.

Leakage.

Check any equipment that was disassembled for leakage after reassembly.

- Placing a Regulator Setting on Bypass...

Manometers shall not be used to monitor pressure during bypass operations.

When inspection or maintenance to a regulator or its setting is required and it is necessary to bypass the regulator(s), the bypassing shall be performed by an assistant who has had bypass training. The bypass training shall include monitoring of the downstream pressure gauge and to operate the bypass valve to maintain a constant pre-determined pressure on the downstream gauge. When a bypass regulator is utilized, an assistant is not required.

Bypassing of a pressure regulator shall be performed with extreme caution to avoid over or under pressurizing the downstream pipeline. During bypassing, an accurate downstream pressure gauge of suitable range shall be monitored constantly. To avoid false readings, the pressure gauge shall not be installed on the regulator setting bypass line. The pressure gauge shall be connected to the downstream piping to assure accurate sensing of the downstream pressure.

Bypassing should be accomplished by slowly opening the bypass valve until the downstream pressure is observed to be slightly higher than the set pressure of the controlling regulator and it is determined that the flow through the regulator has ceased. The downstream system MAOP shall not be exceeded during bypass operations. To isolate regulation, first close the inlet valve and then the outlet valve.

Prior to bypassing large volume sales stations, the customer shall be notified that pressure variations caused by the bypassing operation could adversely affect the customer's operation. The load characteristics and pressure requirements shall be determined prior to bypass operations. Consideration should be given to temporarily disconnecting service to the customer in lieu of bypassing.

The following steps are the recommended method for placing a regulator setting on bypass purging and placement back into service:

Steps to go on bypass:

Step 1: Comply with bonding requirements and personal protective equipment, if any.

Step 2: Attach a gauge of proper range on the downstream system.

Step 3: Check the inlet pressure and move the gauge to the spool piece, center piece, or pup.

Step 4: Determine the bypass range (maximum and minimum pressure).

Step 5: SLOWLY open the bypass valve until the downstream pressure rises above the control regulator set-point.

If the downstream system is operating at the maximum or at the MAOP, the set-point of the control regulator must be lowered.

Step 6: SLOWLY close the inlet block valve.

Step 7: On internally controlled regulators (regulators with no control lines), open the outlet purge valve before closing the outlet block valve.

Step 8: SLOWLY close the outlet block valve.

Step 9: To protect the diaphragms from possible rupture, loosen a connection in the control lines to both regulators and establish a bleed or a leak.

If the inlet block valve, seats, and stem seal would leak through, inlet pressure could build up under the diaphragm.

Step 10: Close the control line valves if they are so equipped.

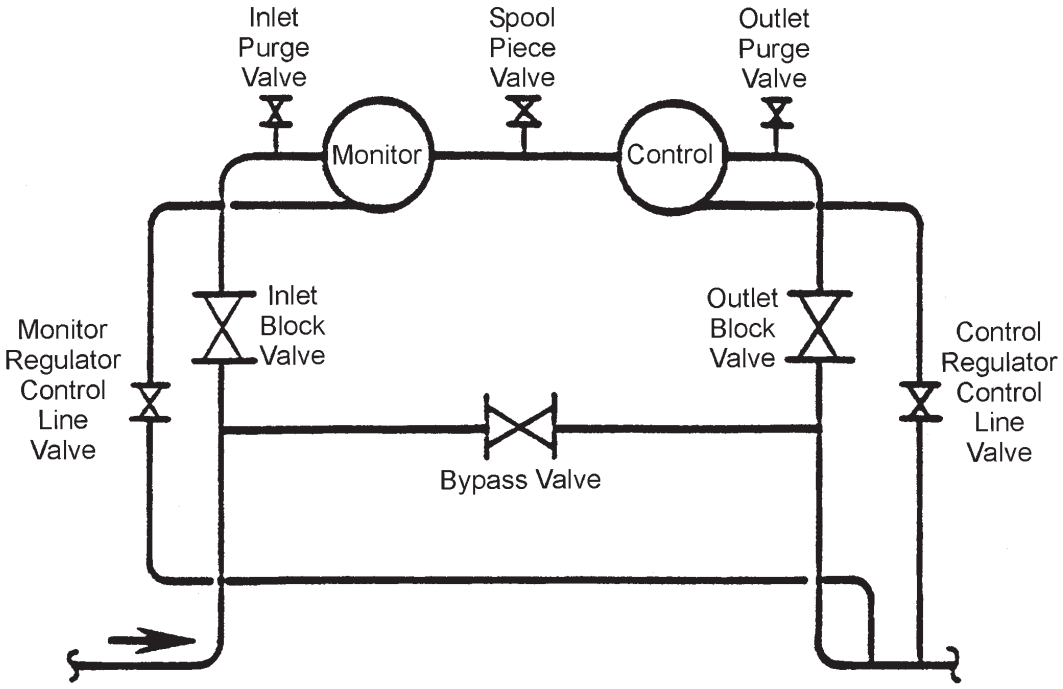
Step 11: While pressure is trapped in the top works, disconnect the control lines and soap test the control line openings at the regulator for any stem seal leakage.

Step 12: Relieve the pressure in the top works through the purge valves.

After the pressure in the top works is relieved, go to the Regulator Inspection Checklist, if applicable.

- *Purging a Regulator Setting...*

Purging is the act of removing a known medium from a piping system. The steps in purging a regulator setting are as follows:



Step 1: Ensure the outlet purge valve is open.

Step 2: Ensure that the following setting valves are closed: inlet block, inlet purge, spool piece, outlet block, and pilot supply line (if equipped).

Step 3: Close the control line valves and disconnect the control lines from the regulators.

Step 4: Back-off all springs fully.

Step 5: SLOWLY open pilot supply line (if so equipped).

Step 6: SLOWLY crack open the inlet block valve until a strong odor of gas is present at the outlet purge valve or monitor with a gas detector.

Step 7: On the monitor regulator, reconnect the control line and open the control line valve. Fully open inlet block valve and perform lock-up test. After test, close spool piece valve.

Step 8: Screw the monitor regulator adjustment down until a strong odor of gas is present at the outlet purge valve or monitor with a gas detector.

Step 9: On the control regulator, reconnect the control line and turn the control line valve on. Perform lock-up test.

Step 10: Back off monitor screw adjustment fully.

Step 11: SLOWLY open outlet block valve to purge remaining section. Close the outlet purge valve and leave the outlet block valve fully open.

Step 12: Purging is complete and setting is ready for set-point adjustment.

- *Placing a Regulator Setting Back into Service...*

The steps for placing a regulator setting back into service are as follows:

Step 1: Screw the control regulator all the way down (wide open).

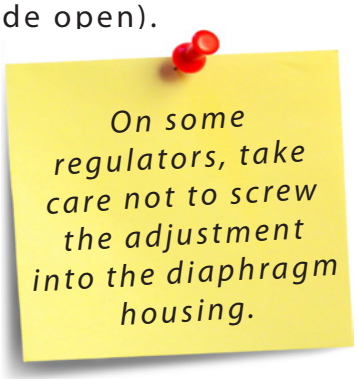
Step 2: Determine the monitor regulator set-point.

Step 3: Adjust the bypass valve to achieve an outlet pressure setting lower than the desired monitor regulator set-point.

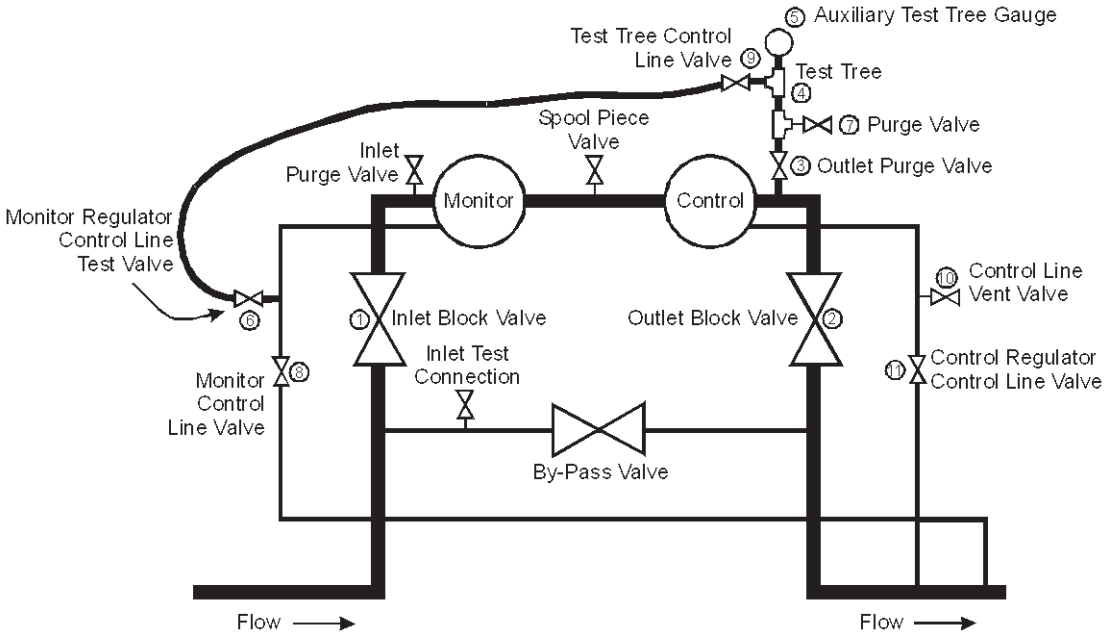
Step 4: Slowly increase the monitor regulator set-point and have the bypass valve operator start to close the bypass valve as the monitor regulator picks up the load on the system.

Step 5: Verify that the bypass valve is ***fully*** closed.

Step 6: Back-off the control regulator to its desired set-point.



- Alternate Regulator Setpoint Method Using Outlet Test Connection...



Alternate Regulator Setpoint Method to Set Monitor Regulator

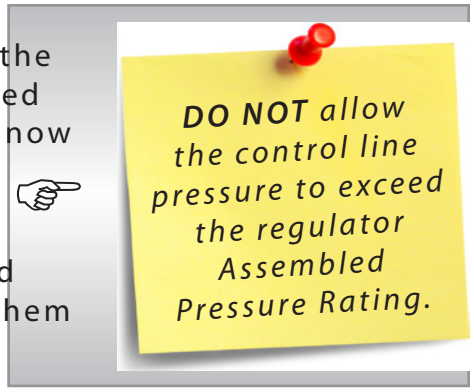
If the regulator setting does not have test tees and vent valves (6 & 10) installed in the control lines, it is recommended that they be installed at the earliest convenience. This modification is typically performed during a major inspection when the setting is on bypass and all gas has been purged from the setting top works. Without vent valves (6 & 10) any blow down of the regulator control lines must be done by loosening of the control line fittings adjacent to the regulator.

1. With the regulator setting on by-pass, the inlet (1) and outlet (2) block valves are closed. Close the monitor control line valve (8).

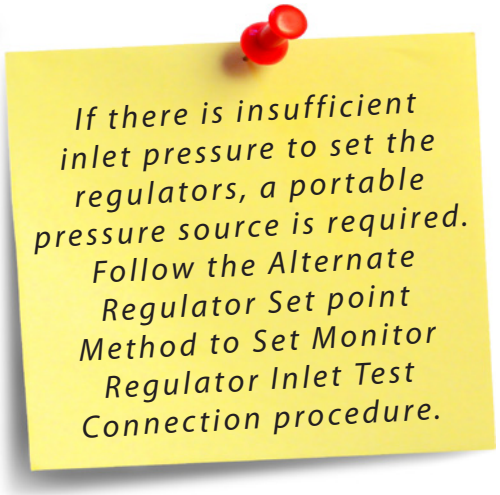
2. Fail the control regulator open by closing the control regulator control line valve (11) and opening the control regulator control line vent valve (10).

3. Install a test tree (4) with a purge valve (7) and auxiliary gauge (5), as shown, to the outlet purge valve (3). The auxiliary gauge (5) should have a range capable of monitoring the inlet pressure. Ensure that the test tree inlet valve (9) is closed.

4. Connect a flexible pressure line from the test tree inlet valve (9) to the monitor regulator control line vent valve (6). If a vent valve (6) is not available, disconnect the control line from the monitor regulator and directly connect the flexible pressure line to the monitor regulator.
5. Completely back off the monitor regulator adjusting screw until there is no tension.
6. Open the outlet purge valve (3).
7. Open the monitor control line vent valve (6), if used, and test tree inlet valve (9).
8. ***SLOWLY*** open the inlet block valve (1) completely and slightly open the test tree purge valve (7).
9. While observing the test tree gauge (5), operate the monitor regulator adjusting screw until the desired set point is maintained. The monitor regulator is now set.
10. Close the outlet purge valve (3) and the monitor control line vent valve (6). Allow the test tree and flexible pressure line to blow down and remove them from the setting.



11. Ensure both regulator control lines are connected and open both regulator control line valves (8 & 11).
12. ***SLOWLY*** open the outlet block valve (2) completely while observing the downstream system pressure gauge.
13. Re-establish control of the downstream system pressure using minor adjustments to the control regulator set point adjustment screw.
14. Close the regulator setting bypass valve.
15. The setting is now back in service.



- *Adjustment of Double Seat Balanced Valves...*

This procedure applies to self-operated double seat balanced regulator valves, such as those found in the Equimeter or Rockwell 461-S, 461-8S or 461-12S. Always ensure that all gas sources have been shut off and pressure removed.

1. Remove the seal cap. Remove the adjustment screw and spring.
2. Remove the bottom inspection plate and unscrew the valve assembly intact from the diaphragm assembly.
3. Unscrew the orifice using a 1 ½" hex deep socket wrench. Remove the orifice and valve assembly intact through the bottom opening.
4. If the valve assembly has no defects, replace it without disturbing the set screw. The valve assembly should be screwed into place until it bottoms out and then backed off ½ to 1 full turn.
5. If the valve assembly needs new parts, disassemble the valve assembly by loosening the set screw, unscrew the female valve stem from the male valve stem, and unscrew the nut from the valve guide.
6. Replace the parts as needed and reassemble the upper and lower halves of the valve assembly.
7. Insert through the bottom opening:
   A. the upper half of the valve assembly – screw onto the diaphragm stud until it bottoms out and then back off ½ to 1 full turn.
   B. the orifice – screw firmly into place.
   C. the lower half of the valve assembly – screw onto the upper half by 3 or 4 turns.
8. To make the valve lock-up adjustment, seat the upper valve against the upper orifice while screwing up the lower half of the valve assembly until the lower valve is seated against the lower orifice.
   A. To seat the upper valve against the orifice, either reach it through the body side opening or remove the diaphragm assembly and pull the top end of the stem upward.

B. Tighten the set screw with a screwdriver or Allen wrench through the body side opening. It may be necessary to turn the entire valve assembly carefully (do not disturb adjustment) so that the set screw is facing the body side opening.

C. The set screw must tighten against the flat area at the top of the female valve stem to correctly lock the adjustment.

9. Screw the entire valve assembly upward until it bottoms out and then back off ½ to 1 full turn.

10. Replace the bottom inspection plate. Be sure to engage the pin in the guide bushing with the slot in the lower end of the valve guide, then rotating the plate until the holes align. Install the cap screws.

11. Replace all parts removed in Step 1.

12. Purge and place setting to normal operation to place back into service.

**Review pages only show in Instructor Guides.
Verbally review these questions with the learners.**

Review

Self-Operated Regulator Station/Setting Inspection and Maintenance

Use the following bank of answers to best complete the statements below. Note that while an answer may be used twice, some answers may not be used at all.

A. MAOP
B. ~~closed~~
C. as found
D. test for lockup
E. once each year
F. MAOP + 50%
G. ~~scaling or pitting~~
H. ~~surface oxidation~~

1. **A** When inspecting operating pressure, the outlet set pressure should never exceed the established _____.
2. **F** The allowable setpoint of overpressure protection devices shall be _____ when the MAOP is 12 psig or less.
3. **E** A typical regulator inspection shall be performed on town border and district regulator stations _____.
4. **C** The _____ conditions shall be determined and recorded on the WMS Job Order before any changes or repairs are made to the regulator(s) or other equipment.
5. **D** A plant regulator inspection consists of an operational check and an _____.

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Review

Self-Operated Regulator Station/Setting Inspection and Maintenance

Use the following bank of answers to best complete the statements below. Note that while an answer may be used twice, some answers may not be used at all.

A. ~~closed~~
B. CGI
C. ~~once each year~~
D. open
E. Assembled Pressure Rating
F. ~~surface oxidation~~
G. scaling or pitting
H. Environmental, Health, and Safety representative

6. **H** Any fluids found in excess of one U.S. quart shall be collected and given to the _____.

7. **D** It is recommended that all windows and doors be _____ during blow down and purging of a plant regulator station inspection.

8. **B** When performing a regulator station inspection, with the regulator adjusting screw cap in place, you should use either soap suds or a _____ to check for any leakage at the diaphragm case vent opening and around the diaphragm perimeter at the case bolts.

9. **G** Atmospheric corrosion consists of active _____ on aboveground piping.

10. **E** During an alternate regulator setpoint method using the outlet test connection, do not allow the control line pressure to exceed the _____.

In This Section:

Self-Operated Regulator Problems

A Gas Company Employee will need to be able to recognize the symptoms of Self-Operated Regulator problems in the field. This section will cover some of the common problems to look for such as noise and freezing.

- *Noise...*

Although the source of noise at regulator stations is dependent upon many conditions which will vary with flow and pressure differential conditions, normal sources of noise are caused by the configuration of regulators and station piping. When a noise problem exists, the Engineering—Facilities Planning Section may be contacted for guidance.

Noise abatement consists of absorption, reflection or dissipation of the noise rather than treating its cause. This includes such measures as sound-proofing buildings and sound-absorbent material used around the piping. Although noise is considered a problem, it should be remembered that noise emanating from a system is an indication of the system's operation, and can indicate the necessity for repair and maintenance. The proper balance between too much noise and an acceptable noise level has to be established prior to determining the best method for reducing the noise level.

- *Freezing...*

Gas Hydrates.

Natural gas hydrates are solids that are a chemical combination of hydrocarbons and water and can form at elevated pressures and possibly at temperatures considerably above the normal freezing point of water (up to 70ºF). Normally the gas encountered in distribution systems is dry and has had the higher hydrocarbons removed. However, natural gas taken from local production or storage may have free water and higher hydrocarbons which, with the right combination of pressure and temperature, can cause hydrate formations.

Cooling Effects.

The expansion of gas as the result of a reduction of pressure through a gas regulator produces a cooling effect. As a general rule the cooling effect will be approximately 1ºF per 15 psi pressure reduction.

Related Problems.

Gas hydrates and cooling effects form the basis for related problems at a regulator station. Freezing problems are classified as either internal or external. Internal problems are gas hydrate blockage and/or ice formation blockage. External problems are ice build-up on regulators and piping aboveground and/or formation of ice around lines belowground causing heaving of piping and buildings. 

Internal Freezing.

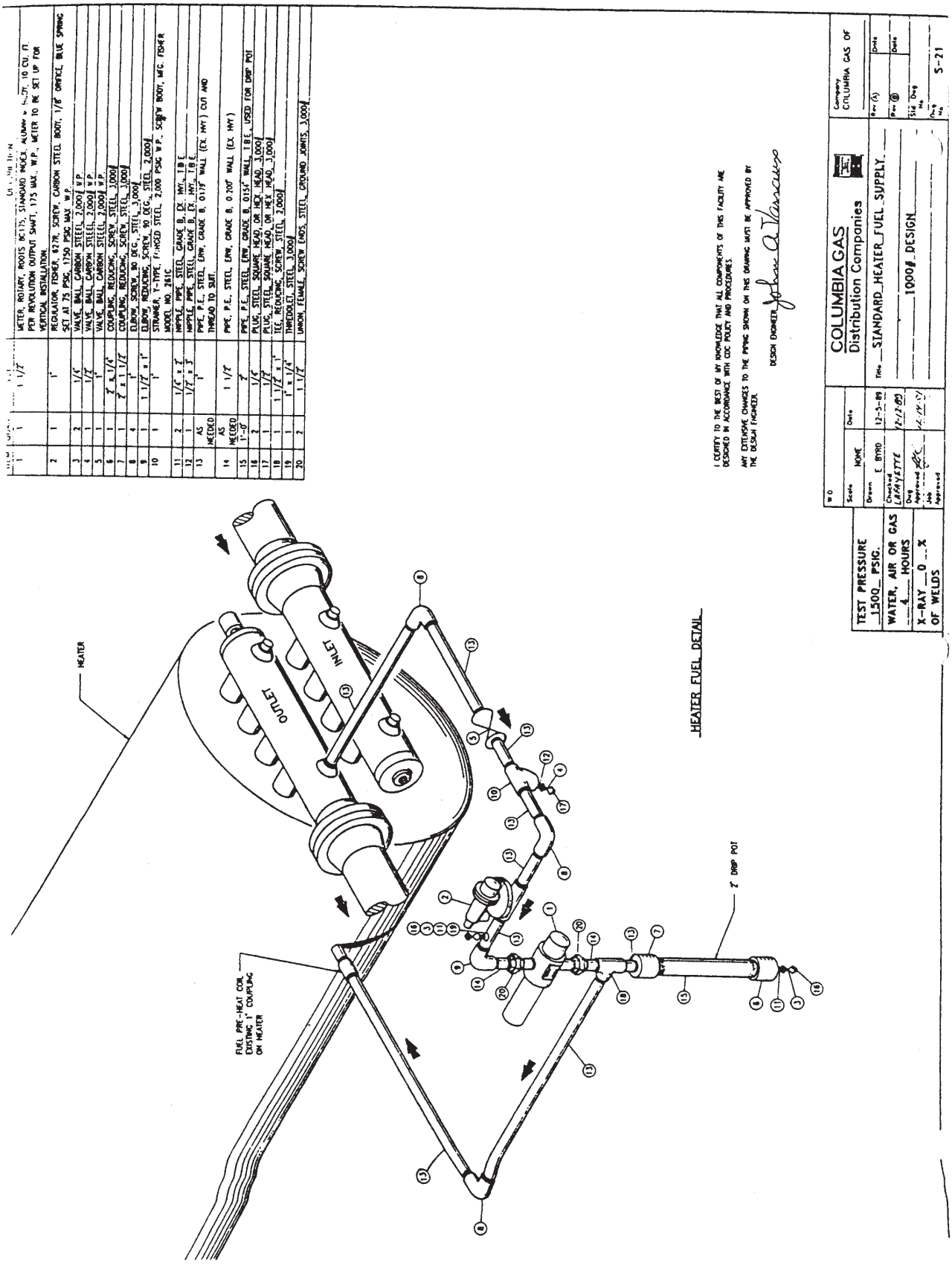
To analyze a regulator and setting for the possibility of internal freezing, it is necessary to investigate the pressure and temperature conditions upstream and downstream and also to consider intermediate conditions at the regulator inner valve. Since internal freezing will not occur without the presence of free moisture, the first step in determining the probability of ice and hydrate formation in a gas is to determine the gas dew point. Once the dew point has been established, the water content of the gas may be found from a water vapor content curve. If the water content exceeds the saturation value for the gas at any point in the gas stream, and if the temperature and pressure conditions are favorable to ice or hydrate formation, corrective measures shall be taken. They may include the following:

- Dehydration (reduction of water content)
- Methanol or glycol (inhibitors injected into gas stream to prevent hydrate and ice formation)
- Application of heat (e.g. water bath heaters, catalytic heaters) 
- Reversing the bodies of double-ported regulators
- Wind breakers and insulation (for aboveground outside piping)
- Coalescing filters, pressure drop piping loops, drips or perk tanks

External Freezing.

Whenever the temperature of the outlet gas is at or below 32ºF, moisture condensed from the air may freeze on the regulator and outlet piping. Moisture in the ground surrounding the pipe may also freeze, causing expansion and heaving of the soil. This heaving action may cause damage to building foundations, highways, railroads, etc., and may impose high stresses and distortion on piping and regulator settings. Methods that have been used to minimize adverse effect of external freezing at regulator stations include the following:

- Gravel fill (provides proper drainage of water away from underground piping)
- Elevating piping
- Insulating piping
- Application of heat



**Review pages only show in Instructor Guides.
Verbally review these questions with the learners.**

Review

Self-Operated Regulator Problems

Use the following bank of answers to best complete the statements below. Note that while an answer may be used twice, some answers may not be used at all.

A. heaving of piping and buildings

B. insulate piping

C. dehydration

D. dew point of the gas

1. **A** A major concern of the formation of ice around pipeline belowground is the _____.
2. **D** The first step in determining the probability for the formation of internal ice and hydrates in a gas is to determine the _____.
3. **C** One method of corrective action for internal freezing is _____.
4. **B** One method used to minimize adverse effects of external freezing at regulator stations is to _____.

Course Review

Directions: Gauge your understanding of this course by how confidently you can state the following before you take the exam.

I know...

1. ...the minimum decibel level for requirement of hearing protection.

2. ...the percentage of oxygen content in air that requires approved breathing apparatus.

3. ...the type of respirator that must be used in an oxygen deficient atmosphere that cannot be made safe by other means.

4. ...the safety procedure you should perform before removing or opening the cover(s) of any vault/buried structure.

5. ...the proper location for a fire extinguisher when working in a vault/buried structure.

6. ...the elements installed to provide a path for current on an insulated regulator setting installed inside a vault/buried structure and is insulated aboveground.

7. ...the type of indicating device with a needle that points to a location on the gauge scale that corresponds to the system pressure being measured.

8. ...the instrument that not only will indicate the current system pressure to the reader, but will make a permanent record on a circular chart over a given time frame.

9. ...the time between regular inspections of spring-type gauges used for testing, regulator pressure check gauges (calibration gauges), and portable recording gauges.

I know...

10. ...the most common type of operating element used in today's mechanical pressure gauge.

11. ...the instrument that is used to heat a gas stream and keep its temperature above that of hydrate formation.

12. ...the amount of degrees Fahrenheit that natural gas decreases for each 15 psi drop.

13. ...the range in degrees, the catalyst temperature stabilizes at is approximately _____.

14. ...the correct gas pressure entering the catalytic heater.

15. ...the proper time to wait after starting the electric heating element and before turning on the gas supply when starting-up a catalytic heater.

16. ...what to check if a catalytic heater fails to start or will not maintain temperature.

17. ...the three critical items listed on the Regulator Station Inventory Record Card.

18. ...the pressure ratings derived by calculating the pressure necessary to push the needed volume of gas to the last consumer on any given distribution pipeline.

19. ...the safety element that must be readily accessible at every regulator station facility to shut off the source of gas.

20. ...the term used to describe the maximum amount of pressure that can be applied to the regulator body without damaging internal components.

21. ...the document that gives a detailed description of each regulator station facility for each Town Border or District Regulator Station and is kept protected at the regulator site.

I know...

22. ...the document that reflects all operating and/or unusual conditions (e.g. routine checks, scheduled inspections, and pressure checks), experienced at the station and any corrective action(s) taken to maintain proper operation of the associated equipment.

23. ...the particular operations that each regulator station shall be designed to prevent any single incident from affecting.

24. ...the device that shall be installed on distribution systems supplied by more than one regulator station at points on the system that will best indicate an abnormal operating condition.

25. ...the minimum distance of welded steel inlet and outlet piping that must be installed from the regulator setting.

26. ...the proper installation of control lines and recording gauges, etc. that each regulator must have.

27. ...the minimum distance above grade level on buried pipe that an approved aboveground coating should extend.

28. ...the serious problem that frequently results in early paint failure and corrosion.

29. ...the proper limits of the outlet set pressure on the control regulator.

30. ...the allowable setpoint for the overpressure protection device on where the MAOP is 12 psig or less.

31. ...the interval for a regulator inspection of a town border and district regulator station.

32. ...the regulator setting information that shall be determined and recorded on the WMS Job Order before any changes or repairs are made to the regulator(s) or other equipment.

I know...

33. ...the typical inspection procedures involved in a plant regulator inspection.

34. ...the proper procedure when more than one U.S. quart of fluids is collected from a regulator station/setting piping and/or valve bodies.

35. ...the recommended safety practice that provides ventilation during blow down and purging of a regulator inspection.

36. ...the proper way to check for any leakage at the diaphragm case vent opening and around the diaphragm perimeter at the case bolts when performing a regulator station inspection.

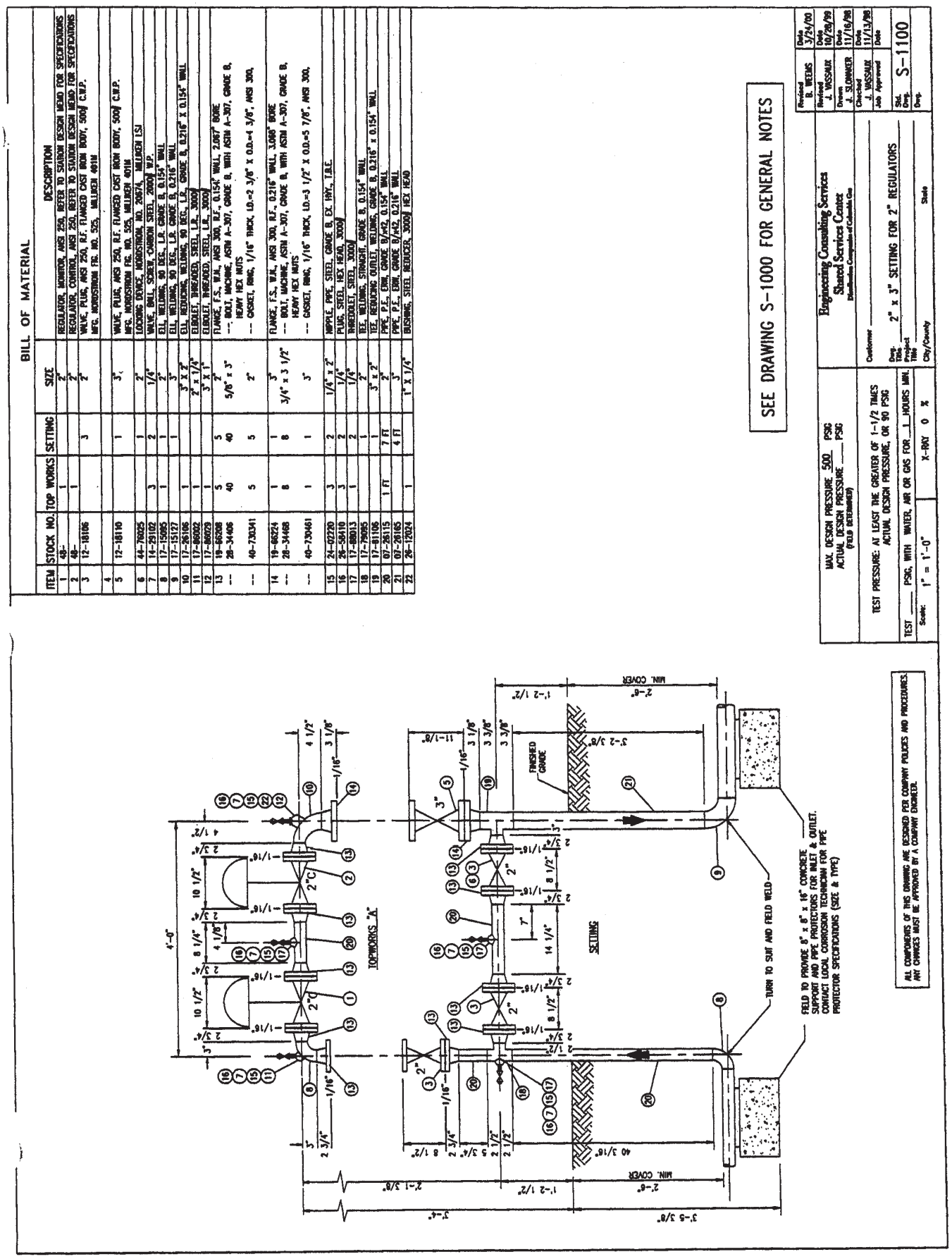
37. ...the evidence of atmospheric corrosion that must be identified when inspecting aboveground piping of a regulator station.

38. ...the proper limits of the control line pressure when performing the alternate regulator setpoint method using outlet test connection.

39. ...a major concern with formation of ice around pipelines belowground.

40. ...the corrective steps taken when there is evidence of internal freezing.

Appendix A - Examples of Standard Drawings



BILL OF MATERIAL

ITEM	STOCK NO.	TOP WORKS	SETTING	SIZE	DESCRIPTION
1	48–	1		2"	REGULATOR, MONITOR, ANSI 250, REFER TO SHARON DESIGN MEMO FOR SPECIFICATIONS
2	48–	1		2"	REGULATOR, CONTROL, ANSI 250, REFER TO SHARON DESIGN MEMO FOR SPECIFICATIONS
3	12–18106		3	2"	VALVE, PLUG, ANSI 250, R.F. FLANGED CAST IRON BODY, 500# C.W.P. MFR. NORDSTROM FIG. NO. 525, MILLIKEN 4918
4					
5	12–18110		1	3"	VALVE, PLUG, ANSI 250, R.F. FLANGED CAST IRON BODY, 500# C.W.P. MFR. NORDSTROM FIG. NO. 525, MILLIKEN 4918
6	44–76025		1	2"	LOCKING DEVICE, NORDSTROM, NO. 2667A, MILLIKEN 1.S.I.
7	14–29102	3	2	1/4"	VALVE, BALL, SCREW, CARBON STEEL, 2000# W.P.
8	17–15085	1	1	2"	ELL, WELDING, 90 DEG., L.R., GRADE B, 0.154" WALL
9	17–15127	1	1	3"	ELL, WELDING, 90 DEG., L.R., GRADE B, 0.216" WALL
10	17–26106	1		3" X 2"	ELL, REDUCING, WELDING, 90 DEG., L.R., GRADE B, 0.216" X 0.154" WALL
11	17–86002	1		2" x 1/4"	ELBOLET, THREADED, STEEL, L.R., 3000#
12	17–86029	1		3" X 1"	ELBOLET, THREADED, STEEL, L.R., 3000#
13	19–66208	5	5	2"	FLANGE, F.S., W.N., ANSI 300, R.F., 0.154" WALL, 2.067" BORE
---	28–34466	40	40	5/8" x 3"	--- BOLT, MACHINE, ASTM A–307, GRADE B, WITH ASTM A–307, GRADE B, HEAVY HEX NUTS
---	40–730341	5	5	2"	--- GASKET, RING, 1/16" THICK, I.D.=2 3/8" x O.D.=4 3/8", ANSI 300.
14	19–66224	1	1	3"	FLANGE, F.S., W.N., ANSI 300, R.F., 0.216" WALL, 3.068" BORE
---	28–34468	8	8	3/4" x 3 1/2"	--- BOLT, MACHINE, ASTM A–307, GRADE B, WITH ASTM A–307, GRADE B, HEAVY HEX NUTS
---	40–730461	1	1	3"	--- GASKET, RING, 1/16" THICK, I.D.=3 1/2" X O.D.=5 7/8", ANSI 300.
15	24–02220	3	2	1/4" x 2"	NIPPLE, PIPE, STEEL, GRADE B, EX. HVY., T.B.E.
16	26–56410	3	2	1/4"	PLUG, STEEL, HEX HEAD, 3000#
17	17–86013	1	2	1/4"	THREDOLET, STEEL, 3000#
18	17–79085		1	2"	TEE, WELDING, STRAIGHT, GRADE B, 0.154" WALL
19	17–81106		1	3" x 2"	TEE, REDUCING OUTLET, WELDING, GRADE B, 0.216" x 0.154" WALL
20	07–26115	1 FT	7 FT	2"	PIPE, P.E., ERW, GRADE B/42, 0.154" WALL
21	07–26165	1 FT	4 FT	3"	PIPE, P.E., ERW, GRADE B/42, 0.216" WALL
22	26–12024	1		1" X 1/4"	BUSHING, STEEL REDUCER, 3000# HEX HEAD

SEE DRAWING S-1000 FOR GENERAL NOTES

MAX. DESIGN PRESSURE 500 PSIG
ACTUAL DESIGN PRESSURE ___ PSIG
(FOR DETERMINATION)

TEST PRESSURE: AT LEAST THE GREATER OF 1-1/2 TIMES ACTUAL DESIGN PRESSURE, OR 90 PSIG

TEST ____ PSIG, WITH WATER, AIR OR GAS FOR 1 HOURS MIN.

Scale: 1" = 1'-0" X-RAY 0 %

Engineering Consulting Services
Shared Services Center
Distribution Companies of Columbia Gas

Customer _____

Dwg. 2" x 3" SETTING FOR 2" REGULATORS
Dwg. Project
Title

City/County State

	Date
Revised R. WEEMS	3/24/00
Revised J. VASSAUR	10/28/99
Drawn J. SLOMINGER	11/16/98
Checked J. VASSAUR	11/13/98
Job Approved	Date

Std. Dwg. S-1100
Dwg.

ALL COMPONENTS OF THIS DRAWING ARE DESIGNED PER COMPANY POLICIES AND PROCEDURES. ANY CHANGES MUST BE APPROVED BY A COMPANY ENGINEER.

FIELD TO PROVIDE 8" x 8" x 16" CONCRETE SUPPORT AND PIPE PROTECTORS FOR INLET & OUTLET. CONTACT LOCAL CORROSION TECHNICIAN FOR PIPE PROTECTOR SPECIFICATIONS (SIZE & TYPE)

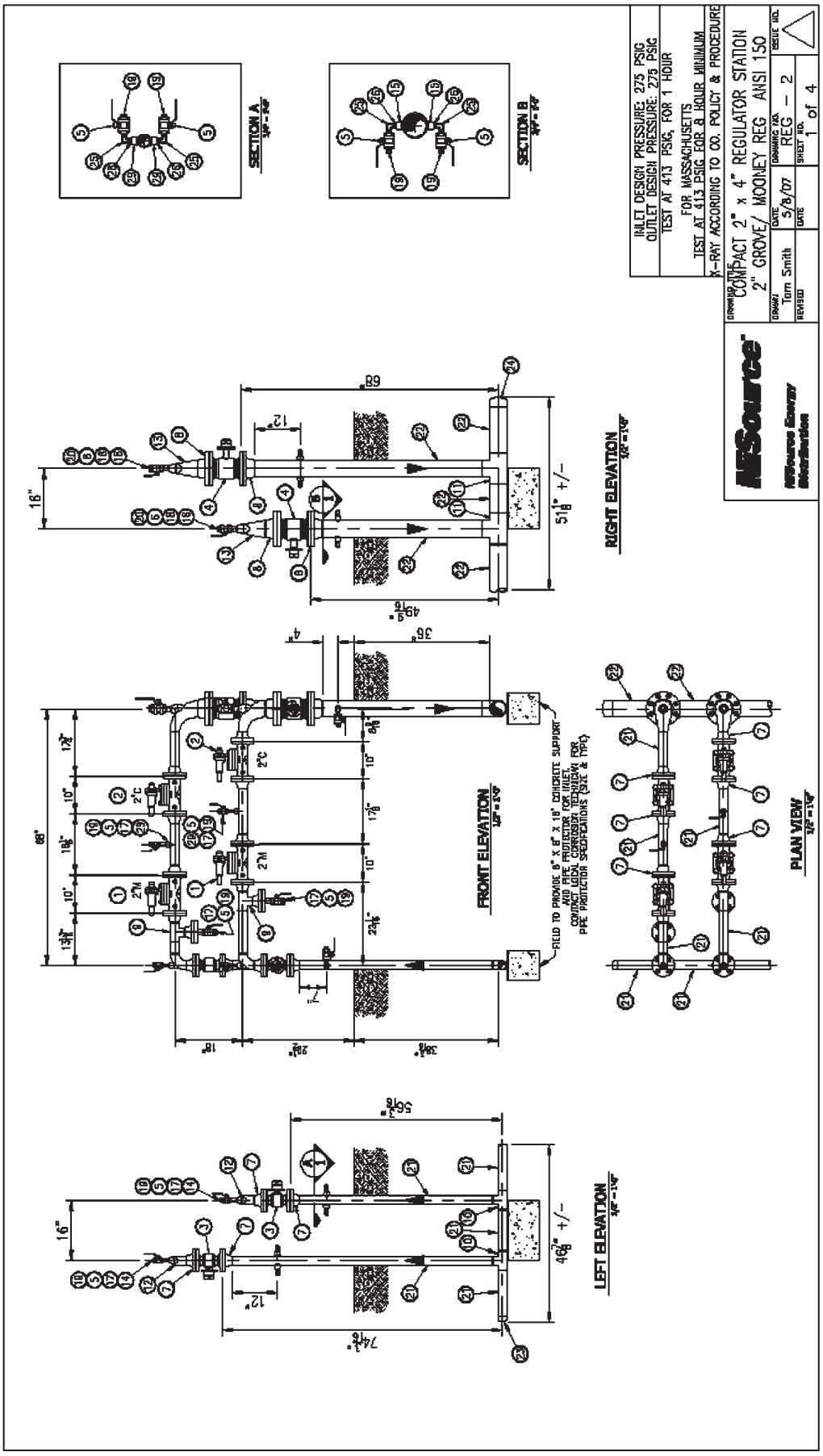
TURN TO SUIT AND FIELD WELD

TOPWORKS "A"

SETTING

FINISHED GRADE

MIN. COVER



Appendix B - Regulator Inspection Checklists and Troubleshooting Guide

Regulator Inspection Check List

Regulator Station Classification ***District (DS-4)***
Monitor (Type & Model) ***EQ 243-8 HP***
Bypass (Type & Model) ***NONE***
Work To Be Performed ***Inspect the seat and orifice.***

		Disassemble	Reassemble
1.	Remove the spring cap.		
2.	Back-off the spring completely.		
3.	Remove the spring and check it for correct range.		
4.	Remove the 4 clamping plate bolts.		
5.	Remove the diaphragm case from the valve body.		
6.	Remove the valve seat and check it.		
7.	Remove the orifice and check it. Lubricate it.		
8.	Re-assemble the regulator.		
9.	Check the regulator for lock-up.		
10.			
11.			
12.			
13.			
14.			
15.			
16.	NOTE: All threads to be cleaned and lubricated.		
17.	All O-rings to be cleaned and lubricated.		
18.			
19.			
20.			
21.			
22.			
23.			
24.			
25.			
26.			
27.			
28.			

Regulator Inspection Check List

Regulator Station Classification ***District (DS-3)***

Monitor (Type & Model) ***EQ 461-8S***

Work To Be Performed ***Inspect the single-port balanced valve.***

		Disassemble	Reassemble
1.	Remove the spring seal cap.		
2.	Back-off the spring adjustment screw.		
3.	Remove the spring housing cover.		
4.	Remove spring and check for correct range-color.		
5.	Remove bottom inspection plate.		
6.	Remove the locknut from the valve seat.		
7.	Slip off the valve seat.		
8.	Slip off the retainer guide.		
9.	Remove orifice with 1½" deep socket.		
10.	Remove bolts from the upper diaphragm case.		
11.	Remove upper diaphragm case.		
12.	Unscrew the diaphragm assembly.		
13.	Remove the cap screws. (8 of them).		
14.	Remove the lower diaphragm case.		
15.	Remove the valve stem.		
16.	Remove the valve guide with a 1½" deep socket.		
17.	Replace all items in reverse order.		
18.	Check the regulator for lock-up.		
19.			
20.			
21.			
22.			
23.			
24.			
25.	NOTE: All threads cleaned and lubricated.		
26.	All O-rings, tetraseals cleaned and lubricated.		
27.			
28.			

Regulator Inspection Check List

Regulator Station Classification ***District (DS-3)***

Monitor (Type & Model) ***EQ 461-8s (Double Port)***

Bypass (Type & Model) ***NONE***

Work To Be Performed ***Inspection of valve seats and both orifices by removing valve assembly and lower orifice.***

		Disassemble	Reassemble
1.	Remove spring seal cap.		
2.	Back-off the adjustment screw completely.		
3.	Remove the spring housing cover.		
4.	Remove spring and check it for correct range-color.		
5.	Remove bottom inspection plate.		
6.	Remove both side inspection plates.		
7.	Back-off seats from the diaphragm assembly.		
8.	Remove the lower orifice with a 1½" deep socket.		
9.	Remove orifice and seats through the lower opening.		
10.	Check the seats and orifices.		
11.	Check out, replace them. Don't touch the set screw.		
12.	Screw the seats onto the diaphragm assembly.		
13.	Start and tighten the lower orifice.		
14.	Tighten the seats snug.		
15.	Back-off the valve assembly ½ to 1 full turn.		
16.	Re-assemble the regulator.		
17.	Check the regulator for lock-up.		
18.			
19.			
20.			
21.			
22.			
23.			
24.			
25.	NOTE: All threads cleaned and lubricated.		
26.	All O-rings and tetraseals cleaned and lubricated.		
27.			
28.			

Regulator Inspection Check List

Regulator Station Classification ***District (DS-1)***
Monitor (Type & Model) ***RW 461-57 S (Single Port)***
Work To Be Performed ***Inspect the single port balanced valve.***

		Disassemble	Reassemble
1.	Remove the spring seal cap.		
2.	Back-off the spring adjustment screw.		
3.	Remove the spring housing cover.		
4.	Remove spring and check it for correct range-color.		
5.	Remove the bottom inspection plate.		
6.	Remove the locknut from the valve seat.		
7.	Slip off the valve seat.		
8.	Slip off the retainer guide.		
9.	Remove the orifice with a 1½" deep socket.		
10.	Remove bolts from the upper diaphragm case.		
11.	Remove the upper diaphragm case.		
12.	Unscrew the diaphragm assembly.		
13.	Remove the cap screws. (8 of them).		
14.	Remove the lower diaphragm case.		
15.	Remove the valve stem.		
16.	Remove the valve guide with a 1½" deep socket.		
17.	Replace all items in reverse order.		
18.	Check the regulator for lock-up.		
19.			
20.			
21.			
22.			
23.			
24.			
25.	NOTE: All threads should be cleaned and lubricated.		
26.	All O-rings and tetraseals cleaned and lubricated.		
27.			
28.			

Regulator Inspection Check List

Regulator Station Classification ***Town Border (TB-4)***

Monitor (Type & Model) ***RW 441-57s (Double Port)***

Bypass (Type & Model) ***NONE***

Work To Be Performed ***Inspect seats and both orifices by removing valve assembly through the lower opening.***

		Disassemble	Reassemble
1.	Remove the spring seal cap.		
2.	Back-off the spring adjustment screw completely.		
3.	Remove the spring housing cover.		
4.	Remove the spring and check it for correct range-color.		
5.	Remove the bottom inspection plate.		
6.	Remove both side inspection plates.		
7.	Back-off the seats from the diaphragm assembly.		
8.	Remove the lower orifice. 8, 7/16" bolts.		
9.	Remove the orifice and seats through the lower opening.		
10.	Check the seats and both orifices.		
11.	Check out, replace them. Don't touch the set screw.		
12.	Start the seats onto the diaphragm assembly.		
13.	Replace the lower orifice. 8, 7/16" bolts.		
14.	Tighten the seats snug.		
15.	Back-off the valve assembly ½ to 1 full turn.		
16.	Reassemble the regulator.		
17.	Check the regulator for lock-up.		
18.			
19.			
20.			
21.			
22.			
23.			
24.			
25.	NOTE: All threads should be cleaned and lubricated.		
26.	All O-rings and tetraseals cleaned and lubricated.		
27.			
28.			

Regulator Inspection Check List

Regulator Station Classification ***District (DS-3)***

Monitor (Type & Model) ***EQ 133H***

Bypass (Type & Model) ***NONE***

Work To Be Performed ***Inspect seat, orifice, capacity collar and balancing diaphragm.***

		Disassemble	Reassemble
1.	Remove the spring cap.		
2.	Back-off the spring completely.		
3.	Remove the spring and check it for correct range-color.		
4.	Remove the 4 bolts at the diaphragm case and valve body.		
5.	Lift the diaphragm case from the valve body.		
6.	Turn the case upside down, place it in the valve body.		
7.	Remove the lock nut from the stem (use back-up wrench).		
8.	Remove washer, registration disc and valve seat.		
9.	Remove the orifice and the gage.		
10.	Remove the anti-rotation pin from top of the stem.		
11.	Loosen the set screw on the capacity collar.		
12.	Remove E-ring and capacity collar.		
13.	Remove outer stem.		
14.	Remove the plastic washer-guide.		
15.	Inspect the balancing diaphragm and re-install it.		
16.	Reassemble the regulator.		
17.	Check the regulator for lock-up.		
18.			
19.			
20.			
21.			
22.			
23.			
24.			
25.	NOTE: All threads should be cleaned and lubricated.		
26.	All O-rings and tetraseals cleaned and lubricated.		
27.			
28.			

- Troubleshooting...

Excessive Outlet Pressure	
Cause:	**Action/Solution:**
Control regulator failure	Determine cause of failure, correct problem.
Bypass valve leaking through	Usually greasing valve corrects leak through. Blind plate if necessary, assure bypass valve is in fully closed position.
Diaphragm rupture	Determine cause. Replace diaphragm. Make sure installed correctly.
Control line failure	Determine cause. Repair or replace. Excessive leakage on control line—broken control line.
Valve seats damaged	Replace seats. Check seat to seat adjustment.
Nicks in the orifice	Replace orifice.
Orifice threads leaking through	Replace gaskets or O-rings. Pipe dope orifice threads.
Liquid in the control line	Find source of liquid and correct problem. Drain and clean regulators and do major inspection. Consider separator installation if problem reoccurs.
Obstruction in regulator	Remove obstruction. Consider cleaner/separator installation if problem reoccurs.
Valve stem stuck in open position	Determine cause. Perform a major inspection. Bushing scored, stem in bind, stem bent, bushing off center in diaphragm case—clean and replace parts as necessary.
Regulator frozen	Thaw. CAUTION: Do this on bypass. Remove liquids and possibly install a catalytic heater.
Control line frozen (while regulator was in the closed position)	Thaw. CAUTION: Do this on bypass. Remove liquids and consider installing drip if problem reoccurs.

No/Low Outlet Pressure	
Cause:	**Action/Solution:**
No inlet pressure	Check upstream pressure. Check that inlet block is fully open; control lines open; check inlet critical valve in full open position; check for obstructions in upstream piping system.
Regulators frozen shut	Thaw. CAUTION: Do this on bypass, if practical. Remove liquids and possibly install a catalytic heater.
Control line frozen (while regulator was in the closed position).	Thaw. CAUTION: Do this on bypass. Remove liquids and consider installing drip if problem reoccurs.
Orifice frozen	Clear orifice of ice.
Valve stem stuck	Determine cause. Do a major inspection; bushing scored, bent stem, stem in bind, bushing off center in diaphragm case. Clean and replace parts as necessary.
Loss of spring compression	Replace spring/broken spring. Do not stretch or shim spring.
Obstruction in regulator	Remove obstruction. Consider cleaner/separator if problem reoccurs.
Insufficient orifice size	Consult engineer; increase or decrease orifice size, as necessary.

Pulsation	
Cause:	**Action/Solution:**
Oversized valve (orifice)	Downsize orifice or install V-ports. Adjust valves.
Spring too light	Install heavier spring, if possible.
Monitor and control setpoint to close	Re-set for wider band on operating setpoint. Check for full or near full inlet pressure on spool piece.
Control setpoint to close on parallels runs	Re-set for wider band on operating setpoint of runs.
Valve stem sticking (excessive friction)	Perform inspection; clean and install anti-friction kit, if possible.
Improperly sized lines or restriction	Too small. Remove restriction and replace with correct model and possibly increase control line size; make sure tapping tee is fully tapped.
Improper control line tap location	Re-install making sure it is far enough downstream and away from any restrictions, etc.

Vibration	
Cause:	**Action/Solution:**
Improperly sized control lines or restriction	Too big. Downsize restriction and/or control line, etc.
Oversized valve (orifice)	Consult engineer; downsize, install V-ports and adjust valves.

Low Pressure Inlet	
Cause:	**Action/Solution:**
Dig in	Repair dig-in and re-check.
Partially closed upstream valve	Re-set for wider band on operating setpoint. Check for full or near full inlet pressure on spool piece.
Restricted upstream pipeline	Find restriction and remove.
Station upstream feed	Check District or POD feeding station.

Sweeping Chart	
Cause:	**Action/Solution:**
Stem sticking wear on stem or stem guide	Perform inspection. Clean and replace parts as necessary; bushing scored, stem bent. May consider installing an anti-friction kit.
Valve unbalanced	Re-adjust and balance valves.
Valve oversized	Consult engineer. Downsize valves or install V-ports; adjust valves.
Liquids in the main on low-pressure systems	Locate source of water. Repair and drain fluid. Consider installing drip. Perform inspection.
Variable inlet pressure	Check upstream feed.
Valves	Make sure inlet and outlet critical valves are in fully open position. Check inlet and outlet block valve is in fully open position.
Liquids in control lines	Clear control line of liquids.
Regulator vent obstructed	Check for dirt or liquids in vent or vent lines.

No Lock-Up	
Cause:	***Action/Solution:***
Bad seats	Replace seats.
Leaking orifice nicks or cuts	Replace orifice.
Orifice leaking past threads	Replace O-rings or gaskets. Pipe dope orifice threads.
Seat-to-seat adjustment	Make sure valves are properly adjusted.
Diaphragm ruptured or leaking	Make sure diaphragm is properly installed; check for leakage.
Obstruction in control line	Check to see if control line valve is open. Check for blockage in control line. Check for obstruction in the control line connection to diaphragm case to bottom of diaphragm.

- Self-Operated Regulator Failure Mode Matrix...

Regulator Type	***Failure Type***		
	Main Diaphragm Rupture	***Main Spring Break***	***Downstream Control Line Rupture***
Self-Operated Basic Design	Opens	Closes	Opens
Self-Operated Service Design	Opens	Closes	N/A

Gas Control - Integration Center Communications Matrix

Event Reference #	*Notification Required From*	*Event/Trigger*	*Notification Required To*	*How*	*Information Required in Communications*	*GC Reporting Priority Notification*
		Callout of M&R Tech				
E-1	**GC**	**M&R Tech Must Physically Respond to Safety Related Alarms (RED), High-High, Low-Low Pressure, etc.**	**IC and GC Mgmt.**	**Phone: None SCADA Email: IC & GC Mgt.**	**Market Area, Location/Station Name, Brief Description, Field Operations Personnel Responding Y/N**	**1**
	IC	**M & R tech must physically respond for safety**	**Gas Control**	**Phone: GC ext. 4939 Email: GMS Controllers**	**State, City Street - Reg #, Station Number, Field Operations Personnel Responding Y/N**	
		Pressure Loss				
E-2	**GC**	**Where Pressures or Loss of Gas Supply have the Potential to Effect a Market Areas and/or Major Customer**	**IC and GC Mgmt.**	**Phone: IC & GC Mgt. SCADA Email: IC & GC Mgt.**	**Market Area, Location/Station Name, Brief Description, Field Operations Personnel Responding Y/N,**	**1**
	IC	**Where Pressures or Loss of Gas Supply have the Potential to Effect a Large Market Area > 100 customers**	**Gas Control**	**Phone: GC ext. 4939 Email: GMS Controllers**	**State, City Street - Reg #, Station Number, Field Operations Personnel Responding Y/N**	
		Gas Quality				
E-3	**GC**	**Gas Quality - High-High / Low-Low Odorization, Moisture (H2O), Air/Nitrogen, Hydrogen Sulfide (H2S) N*ote: Only after event is in alarm for 2 hours and no M&R Tech was dispatched per GC-1***	**IC and GC Mgmt.**	**Phone: IC & GC Mgt. SCADA Email: IC & GC Mgt.**	**Market Area, Location/Station Name, Brief Description, Field Operations Personnel Responding Y/N,**	**1**
	IC	**Odorant Calls - Gas Quality >25 Customers**	**Gas Control**	**Phone: GC ext. 4939 Email: GMS Controllers**	**State, City Street - Reg #, Station Number, Field Operations Personnel Responding Y/N**	
		Relocation to Disaster Recovery Site (DRS) and Recovery From the DRS				
E-4	**GC**	**Planned or Impromptu Relocation to DRS**	**IC and GC Mgmt.**	**Phone: IC SCADA Email: IC & GC Mgt.**	**Date/Time of Return to Arena Dist.**	**2**
	IC	**Planned or Impromptu Relocation to DRS**	**Gas Control**	**Phone: GC ext. 4939 Email: GMS Controllers**	**Date/Time of Return to Arena Dist.**	
	GC	**Return to Arena Dist. from DRS**	**IC and GC Mgmt.**	**Phone: IC SCADA Email: IC & GC Mgt.**	**Date/Time of Return to Arena Dist.**	**2**
	IC	**Return to Arena Dist. from DRS**	**Gas Control**	**Phone: GC ext. 4939 Email: GMS Controllers**	**Date/Time of Return to Arena Dist.**	
		Scheduled or Unscheduled Shutdown of Pipeline Systems or Facilities by CDC's, CPG, or Other Pipeline Companies				
E-5	**GC**	**Unscheduled Shutdown of Pipeline Systems or Facilities By CDC's, CPG, or other Pipeline Companies**	**IC and GC Mgmt.**	**Phone: IC & GC Mgt. SCADA Email: IC & GC Mgt.**	**Market Area, Location/Station Name, Brief Description, Field Operations Personnel Responding Y/N,**	**1**
	IC	**Unscheduled Shutdown of Pipeline Systems, or Facilities by CDC's, TCO, or Other Pipeline Impacting > 100 Customers or Major Account**	**Gas Control**	**Phone: GC ext. 4939 Email: GMS Controllers**	**State, City Street - Reg #, Station Number, Field Operations Personnel Responding Y/N**	
E-6	**GC**	**Scheduled Shutdown or Major Work (Tie-Ins, Bypass, Uprates etc.) of Pipeline Systems by CDC's, CPG, or Other Pipeline Companies**	**IC and GC Mgmt.**	**Phone: IC SCADA Email: IC & GC Mgt.**	**Market Area, Location/Station Name, Brief Description, Field Operations Personnel Responding Y/N,**	**2**
	IC	**Scheduled Shutdown or Planned Pipeline Outages**	**Gas Control**	**Phone: GC ext. 4939 Email: GMS Controllers**	**State, City Street - Reg #, Station Number, Field Operations Personnel Responding Y/N**	
		SCADA Outage				
E-7	**GC**	**Large Scale SCADA Communications Outages , Telemetry Control and Questionable SCADA Data That Has the Potential to Impact Markets**	**IC and GC Mgmt.**	**Phone: IC & GC Mgt. SCADA Email: IC & GC Mgt.**	**Market Area, Location/Station Name, Brief Description, Field Operations Personnel Responding Y/N**	**1**
		Explosion/Fire				
E- 8	**GC**	**Notification to Gas Control of Explosion/Fire**	**IC and GC Mgmt.**	**Phone: IC & GC Mgt. SCADA Email: IC & GC Mgt.**	**Market Area, Location/Station Name, Brief Description, Field Operations Personnel Responding Y/N,**	**1**
	IC	**Notification of Explosion or Fire**	**Gas Control**	**Phone: GC ext. 4939 Email: GMS Controllers**	**State, City Street - Reg #, Station Number, Field Operations Personnel Responding Y/N**	

Gas Control - Integration Center Communications Matrix

		Blowing Gas				
E- 9	**IC**	**Main Line - Blowing Gas - (Required Notification to Gas Control to be Dertmined by IC Team Lead)**	**Gas Control**	**Phone: GC ext. 4939 Email: GMS Controllers**	**State, City Street - Reg #, Station Number, Field Operations Personnel Responding Y/N**	
		Damage to M & R Facilities				
E-10	**GC**	**External Notification to Gas Control of Damage or Potential Threat of Damage to M&R Facilities**	**IC and GC Mgmt.**	**Phone: IC & GC Mgt. SCADA Email: IC & GC Mgt.**	**Market Area, Location/Station Name, Brief Description, Field Operations Personnel Responding Y/N,**	**1**
	IC	**Damage or Potential Threat of Damage to M&R Facilities (TBMS, City Gates, POD)**	**Gas Control**	**Phone: GC ext. 4939 Email: GMS Controllers**	**State, City Street - Reg #, Station Number, Field Operations Personnel Responding Y/N**	
		Field Operations Filling Odorant Tanks				
E-11	**GC**	**External Notification to Gas Control of Field Operations Filling Odorant Tanks**	**IC and GC Mgmt.**	**Phone: IC SCADA Email: IC & GC Mgt.**	**Market Area, Location/Station Name, Brief Description, Field Operations Personnel Responding Y/N,**	**2**
		LNG/Propane Peaking Activities (All Plants)				
E-12	**GC**	**Plant Startup**	**IC and GC Mgmt.**	**Phone: IC SCADA Email: IC & GC Mgt.**	**Market Area, Location/Station Name, Brief Description, Field Operations Personnel Responding Y/N,**	**2**
E-13	**GC**	**Plant Shutdown Recovery Notification**	**IC and GC Mgmt.**	**Phone: IC SCADA Email: IC & GC Mgt.**	**Market Area, Location/Station Name, Brief Description, Field Operations Personnel Responding Y/N,**	**2**
E-14	**GC**	**Commencement of filling/venting Tank Operations Notification**	**IC and GC Mgmt.**	**Phone: IC SCADA Email: IC & GC Mgt.**	**Market Area, Location/Station Name, Brief Description, Field Operations Personnel Responding Y/N,**	**2**
E-15	**GC**	**Completion of filling/venting Tank Operations Notification**	**IC and GC Mgmt.**	**Phone: IC SCADA Email: IC & GC Mgt.**	**Market Area, Location/Station Name, Brief Description, Field Operations Personnel Responding Y/N,**	**2**
		Gas Control Priority Notification				
Controller Response Priority		**Priority 1**	***(1)* - Notification to IC Group only after all Controller task and documentation are completed and Controller is satisfied issues/conditions are being addressed. (2) - Notification to Gas Control Management Group (as described in "How Column") in as timely a manner as practicable and only after all task and documentation are completed and Controller is satisfied issues/conditions are being addressed.**			
Controller Response Priority		**Priority 2**	**Phone notification to IC Group only after all Controller task and documentation are completed and Controller is satisfied issues/conditions are being addressed.**			

		GC - IC Contact Information	
IC		**Integration Center**	**1-800-282-9426**
GC		**Gas Control**	**1- 800-921-2165 or ext. 4939**
		Information Sharing During Phone Communications	
Step 1		**Identify Yourself - Name, Gas Control/Integration Center**	
Step 2		**Identify GC/IC Individual on phone call**	
Step 3		**Identify Event #**	
Step 4 GC		**Identify Location/Station Name/Market Area**	
Step 4 IC		**State, City Street - Reg #, Station Number, Field Operations Personnel Responding**	

Hello, this is NGD Integration Center "Assigner Name "and whom am I speaking with. This is a notification call in reference to "See Event #" and then provide information required. I will be providing you more information in the shared note. Thank You. (Continue with phone communications with critical updates and resolution) **Note: Sametime Conversations allowable for follow-up conversations and only after initial Phone notification**

Hello, this is NGD Gas Control "Controller Name "and whom am I speaking with. This is a notification call in reference to "See Event #" and then provide information required. I will be providing you more information in the shared note. Thank You. **Note: Sametime Conversations allowable for follow-up conversations and only after initial Phone notification**

CONTROLLERS PLEASE NOTE:

This document is specific to those events pertinent to NTSB and PHMSA Safety Recommendations on 911 Emergencies and is therefore intended to supplement those communication requirements outlined in Gas Control Management Policies and Procedures.

GC Mgt - Timely phone communication to one of the following until message receipt is confirmed: Chief, GC Manager, GC Team Lead.

SCADA Email recipients are defined by groups within SCADA Lotus Notes.

Last Revised 12/27/2018

Event	Event Trigger
E-1	Callout of M&R Tech
E-2	Pressure Loss
E-3	Gas Quality
E-4	Relocation to Disaster Recovery Site (DRS) and Recovery From the DRS
E--5, E-6	Scheduled or Unscheduled Shutdown of Pipeline Systems or Facilities by CDC's, CPG, or Other Pipeline Companies
E-7	SCADA Outage
E-8	Explosion/Fire
E-9	Blowing Gas
E-10	Damage to M & R Facilities
E-11	Field Operations Filling Odorant Tanks
E-12 Thru E-15	LNG/Propane Peaking Activities (All Plants)
	Gas Control Priority Notification
	GC - IC Contact Information
	Information Sharing During Phone Communications

From: Adam J Roorda/NCS/Enterprise
To: Jeff Tiffner/COH/Enterprise@NISOURCE
Date: 04/19/2019 03:34 PM
Subject: IC / GC Communications Matrix

Jeff,
As we had discussed, I would like to provide the following clarification to my team around an E1 event in the attached IC / GC Coms matrix with your team's agreement.

"For any Safety Related Alarms: HiHi pressure, LoLo Pressure, LEL, etc. unless Gas Control has been made aware beforehand of work going on at the site which may trigger the alarm, the controller shall dispatch M&R to the site, then provide positive notification to the IC via phone or SameTime to inform them of the situation and the technician who is responding."

Here is the old matrix which has been unaltered:

Regards,
Adam Roorda
Manager of Gas Control
Columbus, OH
O: (614) 460-6839
C: (219) 816-2590

From: William S Bentley/NCS/Enterprise
To: GMS Controllers
Cc: Adam J Roorda/NCS/Enterprise@NiSource
Date: 06/10/2019 10:32 PM
Subject: Fw: IC / GC Communications Matrix

All, to document communications to Controllers and Provide Adequate Information, we have created an Operations CM Ticket for Gas Control - Integration Center, Communications Matrix, providing communications and awareness of what is required for Controller notification to the Integration Center to identified events in the matrix.

Leads, please confirm the attached matrix is hard copied and placed at each SCADA workstation, Arena and Airside

Please read Adam's previous correspondence with Jeff Tiffiner, below.

Date

Chief Name
Department Name
Address Line 1
Address line 2

Dear Chief Name,

We at Columbia Gas are striving to strengthen the way in which we coordinate our emergency communications with you, to best ensure that one consistent and coordinated message is communicated to your residents, and our customers, during critical times. With this goal in mind, we are attempting to gather some critical information from each community in our service area about how you communicate with your residents during an emergency. We hope that you will assist us in this important effort.

Enclosed please find a short questionnaire about your community's communication capabilities, policies, and practices. I am respectfully requesting that you take a few minutes and complete these questions, and return them in the self-addressed stamped envelope. If you prefer, you can scan your answers and email them to Communications Manager Aimee Henderson, at aimeehenderson@nisource.com.

Thank you in advance for your cooperation in assisting us to be better prepared in the event of an emergency. We greatly appreciate and value our partnership.

Sincerely,

Eric H. Madison

Eric H. Madison
Public Awareness Manager/Damage Prevention Leader
Columbia Gas of Massachusetts
2025 Roosevelt Avenue
Springfield, MA 01104
Office (413) 784-2232
Cell (413) 265-7279
Ericmadison@NiSource.com

Columbia Gas®
A NiSource Company

Community Name _____

Does your community have/use an automated calling system to communicate with your residents (sometimes referred to as a reverse 911 system)?

Yes ☐ NO ☐

If yes, who is responsible for message content/distribution?

Name_____

Title _____

Contact Information_____

_____

_____

What other methods do you use to communicate with your residents during an emergency? (Check all the apply)

Facebook ☐ Facebook handle _____

Twitter ☐ Twitter handle _____

Website ☐ If yes, website address_____

Other? (Please explain) _____

_____

Who is responsible for message content/distribution?

Name_____

Title _____

Contact Information_____

_____

_____

Return completed form to:

Aimee Henderson
Manager of Communications and Community relations
Columbia Gas of Massachusetts
2025 Roosevelt Ave
Springfield, MA 01104
aimeehenderson@nisource.com

REDACTED

FIRE CHIEFS

Division	Salutation	First Name	Last Name	Dept.	Address	City	Office Phone	Chiefs Cell Phone	Fax	Email Address
Springfield	Chief	Alan	Sirois	Agawam Fire Department	800 Main Street	Agawam, MA 01001	413-786-2662		413-786-1241	asirois@agawam.ma.us
Springfield	Chief	Daniel	Stamborski	Chicopee Fire Department	80 Church Street	Chicopee, MA 01020	413-594-1630		413-594-1645	dstamborski@chicopeema.gov
Springfield	Chief	David	Mottor	Easthampton Fire Department	32 Payson Avenue	Easthampton, MA 01027	(413) 527-1212		(413) 529-1407	dmottor@easthamptonma.gov
Springfield	Chief	Paul	Morrissette	East Longmeadow Fire Department	150 Somers Road	East Longmeadow, MA 01028	413-525-5430		(413) 525-5414	paul.morrissette@eastlongmeadowma.gov
Springfield	Chief	John	Mitchell	Granby Fire Department	250 State Street	Granby, MA 01033	(413) 467-9696			jmitchell@granbyfire.org
Springfield	Chief	Edward	Poulin	Hampden Fire Department	North Road	Hampden, MA 01036	(413) 566-3314		(413) 566-2010	epoulin8029@charter.net
Springfield	Chief	John	Dearborn	Longmeadow Fire Department	44 Williams Street	Longmeadow, MA 01106	413-567-3357			jdearborn@longmeadow.org
Springfield	Chief	Ryan	Pease	Ludlow Fire Department	574 Center Street	Ludlow, MA 01056	(413) 583-8332			lfdc1@ludlow.ma.us
Springfield	Acting Chief	Brian	Harris	Monson Fire Department	200 Main Street, P.O. Box 335	Monson, MA 01057	(413) 267-3132		(413) 267-4124	bharris@monson-ma.gov
Springfield	Chief	John	Davine	Northampton Fire Department	26 Carlon Drive	Northampton, MA 01060	413-587-1039			jdavine@northamptonma.gov
Springfield	Chief	Alan	Roy	Palmer Fire Department	12 Walnut Street	Palmer, MA 01069	(413) 283-3861		(413) 283-2241	pfdchief16@gmail.com
Springfield	Chief	Robert	Authier	South Hadley Fire District 1	114 Newton Street	South Hadley, MA 01075	413-533-7111		413-533-3367	chiefauthier@shdistrict1.org
Springfield	Chief	Scott	Brady	South Hadley Fire District 2	200 Woodbridge Street	South Hadley, MA 01075	(413) 534-5803			sbrady@shfd2.com
Springfield	Chief	Russell	Anderson	Southwick Fire Department	15 Depot Street	Southwick, MA 01077	(413) 569-6363		413-569-6865	chiefanderson@southwickfire.net
Springfield	Commisioner	Bernard J.	Calvi	Springfield Fire Department	605 Worthington Street	Springfield, MA 01105	(413) 787-6411			bcalvi@springfieldcityhall.com
Springfield	Chief	Michael	Andrews	Wilbraham Fire Department	2770 Boston Road	Wilbraham, MA 01095	413-596-3122		413-596-2632	mandrews@wilbraham-ma.gov
Springfield	Chief	William	Flaherty	West Springfield Fire Department	44 Van Deene Avenue	West Springfield, MA 01089	413-263-3223			wflaherty@townofwestspringfield.org
Lawrence	Chief	Michael	Mansfield	Andover Fire Department	32 North Main Street	Andover, MA 01810	978-475-1281			mman@andoverps.net
Lawrence	Chief	Brian	Moriarty	Lawrence Fire Department	65 Lowell Street	Lawrence, MA 01840	978-620-3400			bmoriarty@cityoflawrence.com
Lawrence	Chief	Tim	Sheehy	Methuen Fire Department	24 Lowell Street	Methuen, MA 01844	(978) 983-8940		(978) 691-5056	jtsheehy@ci.methuen.ma.us
Lawrence	Chief	William	McCarthy	North Andover Fire Department	795 Chickering Road	North Andover, MA 01845	978-688-9590		978-688-9594	wmccarthy@northandoverma.gov
Brockton	Chief	Scott	LaChance	Attleboro Fire Department	100 Union Street	Attleboro, MA 02703	508-222-2325, ext. 114		508-399-6273	chieflachance@cityofattleboro.us
Brockton	Chief	Robert	Spurr	Avon Fire Department	150 Main Street	Avon, MA 02322	(508) 583-5361		(508) 583-0002	rspurr@avonmass.org
Brockton	Chief	Steve	Gentile	Bellingham Fire Department	28 Blackstone Street	Bellingham, MA 02019	(508) 966-1112		(508) 966-5835	sgentile@BellinghamMA.org
Brockton	Chief	Scott	Fournier	Berkley Fire Department	3 North Main Street	Berkley, MA 02779	(508) 822-7516		(508) 828-1451	berkleyfirechief@comcast.net
Brockton	Chief	Thomas	Levy	Bridgewater Fire Department	22 School Street	Bridgewater, MA 02324	508-697-0900		(508) 697-0955	tlevy@bridgewaterma.org
Brockton	Chief	Michael	Williams	Brockton Fire Department	560 West Street	Brockton, MA 02301	(508) 583-4422		(508) 588-0863	fire@cobma.us
Brockton	Chief	Charles	Doody	Canton Fire Department	99 Revere Street	Canton, MA 02021	781-821-5095			cdoody@town.canton.ma.us
Brockton	Chief	Christopher	Maguy	Dighton Fire Department	300 Main Street	Dighton, MA 02715	(508) 669-6611		781-821-0956	cmaguy@dighton-ma.gov
Brockton	Chief	Craig	Hughes	Dover Fire Department	1 Walpole Street	Dover, MA 02030	(508) 785-1130			doverfire@doverma.org
Brockton	Chief	Kevin	Nord	Duxbury Fire Department	668 Tremont Street	Duxbury, MA 02332	(781) 934-5693		(781) 934-6530	nord@town.duxbury.ma.us
Brockton	Chief	Timothy	Harhen	East Bridgewater Fire Department	268 Bedford Street	East Bridgewater, MA 02333	508-378-2071		508-378-1627	tharhen@ebfire.org
Brockton	Chief	Kevin	Partridge	Easton Fire Department	413 Bay Road	Easton, MA 02375	508-230-0750		508-238-2891	kpartridge@easton.ma.us
Brockton	Chief	Michael	Kelleher	Foxborough Fire Department	8 Chestnut Street	Foxborough, MA 02035	(508) 543-1230			mkelleher@foxboroughfire.com
Brockton	Chief	James	McLaughlin	Franklin Fire Department	40 W. Central Street	Franklin, MA 02038	(508) 528-2323		(508) 520-4912	jmclaughlin@franklinma.gov
Brockton	Chief	Jason	Viveiros	Halifax Fire Department	438 Plymouth Street	Halifax, MA 02338	717.896.9029		781-293-6635	chief@fire.halifax.ma.us
Brockton	Chief	Jeffrey	Blanchard	Hanover Fire Department	32 Center Street	Hanover, MA 02339	781-826-3151		781-826-4013	jeffrey.blanchard@hanover-ma.gov
Brockton	Chief	Jerome	Thompson	Hanson Fire Department	505 Liberty Street	Hanson, MA 02341	(781)293-9571			jthompson@hanson-ma.gov
Brockton	Chief	Luke	McFadden	Holbrook Fire Department	300 S. Franklin Street	Holbrook, MA 02343	781-767-2234		781-767-1738	lmcfadden@holbrookfire.com
Brockton	Chief	Michael	O'Brien	Lakeville Fire Department	346 Bedford Street	Lakeville, MA 02347	(508) 947-4121			mobrien@lakevillema.org
Brockton	Chief	Justin	Desrosiers	Mansfield Fire Department	10 Plymouth Street	Mansfield, MA 02348	508-261-7321		508-261-9798	jdesrosiers@mansfieldma.gov
Brockton	Chief	William	Hocking	Marshfield Fire Department	60 South River Street	Marshfield, MA 02050	(781) 536-2500		(781) 834-5579	whocking@marshfieldfire.org
Brockton	Chief	William	Carrico	Medfield Fire Department	114 North Street	Medfield, MA 02052	508-359-2323		508-359-6182	wcarrico@medfield.net
Brockton	Chief	Jeffrey	Lynch	Medway Fire Department	44 Milford Street	Medway, MA 02053	(508) 533-3213		508-321-4851	mfdchief@hotmail.com
Brockton	Chief	William	Kessler	Mendon Fire Department	8 Morrison Drive	Mendon, MA 01756	508-473-5330		508-473-4938	wkessler@mendonma.gov
Brockton	Chief	Lance	Benjamino	Middleborough Fire Department	125 N. Main Street	Middleborough, MA 02346	508-946-2461		508-946-2464	lbenjamino@middleborough.com
Brockton	Chief	Richard	Barrett	Millis Fire Department	885 Main Street	Millis, MA 02054	508-376-2361			rbarrett@millis.net
Brockton	Chief	Pete	Petruchik	Norfolk Fire Department	117 North Main Street	Norfolk, MA 02056	508-528-3207			ppetruchik@norfolk.ma.us
Brockton	Chief	Shawn	Simmons	Norton Fire Department	70 East Main Street	Norton, MA 02766	(508) 285 - 0248			ssimmons@nortonfire.com
Brockton	Chief	T. Andrew	Reardon	Norwell Fire Department	300 Washington Street	Norwell, MA 02061	(781) 659-8158		(781) 659-0010	areardon@norwellfire.org
Brockton	Chief	Michael	Hill	Pembroke Fire Department	172 Center Street	Pembroke, MA 02359	781-293-2300		781-293-9013	mhill@pembrokefire.org
Brockton	Chief	Stephen	Silva	Plympton Fire Department	3 Palmer Road	Plympton, MA 02367	(781) 585-2633			chief@town.plympton.ma.us
Brockton	Chief	Richard	Donovan	Randolph Fire Department	10 Memorial Parkway	Randolph, MA 02368	781-961-0991		781-961-3473	richarddonovan@randolphfire.com
Brockton	Chief	Bryan	Lacivita	Raynham Fire Department	37 Orchard Street	Raynham, MA 02767	508-824-2713		(508) 821-3607	blacivita@raynhamfire.com
Brockton	Chief	John	Murphy	Scituate Fire Department	149 First Parish Road	Scituate, MA 02066	(781) 545-8748		(781) 545-8704	jmurphy@scituatema.gov
Brockton	Chief	Michael	Healy	Seekonk Fire Department	500 Taunton Avenue	Seekonk, MA 02771	508-336-8510		508-336-0820	mhealy@seekonkfd.com
Brockton	Chief	James	Wright	Sharon Fire Department	92 South Main Street	Sharon, MA 02067	(781) 784-1522		(781) 784-1521	jwright@townofsharon.org
Brockton	Chief	Michael	Laracy	Stoughton Fire Department	1550 Central Street	Stoughton, MA 02072	(781) 344-3170			sfdchief@stoughton-ma.gov
Brockton	Chief	Eric	Hadjer	Swansea Fire Department	50 Gardner Neck Road	Swansea, MA 02777	(508) 672-4305		(508) 672-6690	ehadjer@town.swansea-ma.gov
Brockton	Chief	Tim	Bradshaw	Taunton Fire Department	50 School Street	Taunton, MA 02780	(508) 821-1452		(508) 821-1495	tbradshaw@tauntonfd.com
Brockton	Chief	Timothy	Bailey	Walpole Fire Department	20 Stone Street	Walpole, MA 02081	508.668.0260		508.660.7351	tbailey@walpolefire.com
Brockton	Chief	Kenneth	May	West Bridgewater Fire Department	99 West Center Street	West Bridgewater, MA 02379	508-586-3232		508-894-4062	kmay@wbridgewater.com
Brockton	Chief	Antonio	Marino	Wrentham Fire Department	99 South Street	Wrentham, MA 02093	508-384-3131 x. 1100		508-384-7468	amarino@fire.wrentham.ma.us

REDACTED

POLICE CHIEFS

Division	Salutation	First Name	Last Name	Dept.	Address	City	Office Phone	Chief's Cell Phone	Fax	Email Address
Springfield	Chief	Eric	Gillis	Agawam Police Department	681 Springfield Street	Agawam, MA 01030	413-786-4767		413-786-4821	egillis@agawam.ma.us
Springfield	Chief	William	Jebb	Chicopee Police Department	110 Church Street	Chicopee, MA 01020	413-592-6341		413-594-1725	wjebb@chicopeepolice.com
Springfield	Chief	Robert	Alberti	Easthampton Police Department	32 Payson Avenue	Easthampton, MA 01028	(413) 527-1212		(413) 529-1448	ralberti@easthamptonma.gov
Springfield	Chief	Jeffrey	Dalessio	East Longmeadow Police Departmen	160 Somers Road	East Longmeadow, MA 01027	(413) 525-5440		(413) 525-5445	jeffrey.dalessio@eastlongmeadowma.gov
Springfield	Chief	Alan	Wishart	Granby Police Department	194 West State Street	Granby, MA 01033	1-413-467-9222		1-413-467-2621	awishart@granbypd.org
Springfield	Chief	Jeffrey	Farnsworth	Hampden Police Department	625 Main Street	Hampden, MA 01036	(413) 566-2151		(413) 566-2010	chief@hampdenpolice.com
Springfield	Chief	John	Stankiewicz	Longmeadow Police Department	34 Williams Street	Longmeadow, MA 01106	413-567-3311		413-567-1087	jstankiewicz@longmeadow.org
Springfield	Chief	Paul	Madera	Ludlow Police Department	612 Chapin Road	Ludlow, MA 01056	413-583-8305		413-583-8283	pmadera@ludlowpolice.com
Springfield	Chief	Steven	Kozloski	Monson Police Department	110 Main Street	Monson, MA 01057	(413) 893-9500		(413) 267-4162	skozloski@monson-ma.gov
Springfield	Chief	Jody	Kasper	Northampton Police Department	29 Center Street	Northampton, MA 01060	413-587-1100		413-587-1137	jkasper@northamptonma.gov
Springfield	Chief	John	Janulewicz	Palmer Police Department	4417 Main Street	Palmer, MA 01069	(413) 283-8792		(413) 289-1422	j.janulewicz@palmerpolice.org
Springfield	Chief	Jennifer	Gunderson	South Hadley Police Department	41 Bridge Street	South Hadley, MA 01075	413-538-8231		413-533-0697	gundersonj@southhadleypolice.org
Springfield	Chief	Kevin	Bishop	Southwick Police Department	11 Depot Street	Southwick, MA 01077	413-569-5348			
Springfield	Acting Commiss	Cheryl	Clapprood	Springfield Police Department	130 Pearl Street	Springfield, MA 01105	(413)787-6302			
Springfield	Chief	Robert	Zollo	Wilbraham Police Department	26 Central Street	Wilbraham, MA 01089	(413) 596-3837		(413) 596-3189	
Springfield	Chief	Robert	Duffy	West Springfield Police Department	16 Main Street	West Springfield, MA 01095	413-263-3210			rduffy@westspringfieldpolice.org
Lawrence	Chief	Patrick	Keefe	Andover Police Department	32 North Main Street	Andover, MA 01810				pkee@andoverps.net
Lawrence	Chief	Roy	Vasque	Lawrence Police Department	90 Lowell Street	Lawrence, MA 01840	978-794-5900		978-794-5915	rvasque@lawpd.com
Lawrence	Chief	Joseph	Soloman	Methuen Police Department	90 Hampshire Street	Methuen, MA 01844	(978) 983-8698			jsolomon@ci.methuen.ma.us
Lawrence	Chief	Charles	Gray	North Andover Police Department	1475 Osgood Street	North Andover, MA 01845	(978) 683-3168			cgray@napd.us
Brockton	Chief	Kyle	Heagney	Attleboro Police Department	12 Union Street	Attleboro, MA 02703	508-222-1212		508-223-2210	kheagney@attleboropolice.org
Brockton	Chief	Jeffrey	Bukunt	Avon Police Department	150 Main Street	Avon, MA 02322	(508) 583-6677			jbukunt@avon-ma.gov
Brockton	Chief	Gerard	Daigle Jr.	Bellingham Police Department	6 Blackstone St	Bellingham, MA 02019	(508) 966-1515		(508) 966-5840	gdaigle@bellinghamma.org
Brockton	Chief	Scott	Fournier	Berkley Police Department	3 North Main Street	Berkley, MA 02779	(508) 822-7040			berkleychief@comcast.net
Brockton	Chief	Christopher	Delmonte	Bridgewater Police Department	220 Pleasant Street	Bridgewater, MA 02324	508-697-6118			cdelmonte@bridgewaterma.org
Brockton	Chief	John	Crowley	Brockton Police Department	7 Commercial Street	Brockton, MA 02031	508 941-0200			chief@brocktonpolice.com
Brockton	Chief	Kenneth	Berkowitz	Canton Police Department	1492 Washington St.	Canton, MA 02021	781-821-5090		781-821-2549	kberkowitz@town.canton.ma.us
Brockton	Chief	Robert	MacDonald	Dighton Police Department	1551 Somerset Avenue	Dighton, MA 02715	508-669-6711		508-669-1461	dpd@townofdighton.com
Brockton	Chief	Peter	McGowan	Dover Police Department	P.O. Box 192	Dover, MA 02030	508-785-1130		508-785-0683	pamcgowan@dovermapd.com
Brockton	Chief	Matthew	Clancy	Duxbury Police Department	155 Mayflower Street	Duxbury, MA 02332	(781) 934-5656		(781) 934-0688	mclancy@duxburypolice.org
Brockton	Chief	Scott	Allen	East Bridgewater Police Department	153 Central Street	East Bridgewater, MA 02333	508-378-7223		508-378-7225	sallen@ebma.com
Brockton	Chief	Gary	Sullivan	Easton Police Department	46 Lothrop Street	Easton, MA 02375	(508) 230-3322			gsullivan@easton.ma.us
Brockton	Chief	William	Baker	Foxborough Police Department	8 Chestnut Street	Foxborough, MA 02035	(508) 543-4343			wbaker@foxboroughpolice.com
Brockton	Chief	Thomas	Lynch	Franklin Police Department	911 Panther Way	Franklin, MA 02038	508-528-1212		508-520-7950	
Brockton	Chief	Joao	Chaves	Halifax Police Department	540 Plymouth Street	Halifax, MA 02338	781-294-8713		781-293-6317	Chief@police.halifax.ma.us
Brockton	Chief	Walter	Sweeney	Hanover Police Department	129 Rockland Street	Hanover, MA 02339	781-826-3231		781-826-7993	wsweeney@hanoverpolice.org
Brockton	Chief	Michael	Miksch	Hanson Police Department	775 Main Street	Hanson, MA 02341	781-293-4625		781-293-4624	mmiksch@hansonpolice.org
Brockton	Chief	William	Smith	Holbrook Police Department	300 South Franklin Street	Holbrook, MA 02343	781-767-1212		781-767-5320	chief@holbrookpolice.com
Brockton	Chief	Matthew	Perkins	Lakeville Police Department	296 Bedford Street	Lakeville, MA 02347	(508) 947-4422		(508) 946-4422	mperkins@lakevillema.org
Brockton	Chief	Ronald	Sellon	Mansfield Police Department	50 West Street	Mansfield, MA 02048	508-261-7301		508-339-1031	rsellon@mansfieldma.com
Brockton	Chief	Phillip	Tavares	Marshfield Police Department	1639 Ocean Street	Marshfield, MA 02050	781-834-6655		781-834-5591	ptavares@marshfieldpolice.org
Brockton	Chief	Michelle	Guerette	Medfield Police Department	110 North Street	Medfield, MA 02052	508-359-2315		508-359-6926	mgeurette@medfield.net
Brockton	Chief	Allen	Tingley	Medway Police Department	315 Village Street	Medway, MA 02053	(508) 533-3212			amtingley@medwaypolice.com
Brockton	Chief	David	Kurczy	Mendon Police Department	22 Main Street	Mendon, MA 01756	508-478-2737		(508) 473-2741	dkurczy@mendonma.gov
Brockton	Chief	Joseph	Perkins	Middleborough Police Department	99 N. Main Street	Middleborough, MA 02346	508.947.1212		508.947.1009	Jperkins@mpdmail.com
Brockton	Chief	Christopher	Soffayer	Millis Police Department	885 Main Street	Millis, MA 02054	508-376-5112		508-376-6220	csoffayer@millisma.net
Brockton	Chief	Charles	Stone Jr.	Norfolk Police Department	117 Main Street	Norfolk, MA 02056	508-528-3206		508-520-9762	cstone@norfolk.ma.us
Brockton	Chief	Brian	Clark	Norton Police Department	82 East Main Street	Norton, MA 02061	(508) 285-3300		508-285-3338	clark@nortonpolice.com
Brockton	Chief	Theodore	Ross	Norwell Police Department	40 River Street - P.O. Box 541	Norwell, MA 02359	781-659-7979			tross@norwellpolice.com
Brockton	Chief	Richard	Wall	Pembroke Police Department	0 Center Street - P.O. Box 53	Pembroke, MA 02367	781-293-6363		781-293-1380	rwall@pembrokepolice.org
Brockton	Chief	Patrick	Dillon	Plympton Police Department	5 Palmer Rd.	Plympton, MA 02368	781-585-3339		781-585-4008	pdillon@plymptonpd.org
Brockton	Chief	William	Pace	Randolph Police Department	41 South Main Street	Randolph, MA 02767	(781) 963-1212			williampace@randolphpolicema.com
Brockton	Chief	James	Donovan	Raynham Police Department	53 Orchard Street	Raynham, MA 02767	(508) 824-2716			jdonovan@raynhampd.com
Brockton	Chief	James	Trombetta	Rehoboth Police Department	334 Anawan Street	Rehoboth, MA 02769	(508) 252-3722			Jtrombetta@rehobothpd.org
Brockton	Chief	Michael	Stewart	Scituate Police Department	4 Chief Justice Cushing Highw	Scituate, MA 02066	(781) 545-1212		(781) 545-9659	
Brockton	Chief	Frank	John	Seekonk Police Department	500 Taunton Avenue	Seekonk, MA 02772	508-336-8123			johnf@seekonkpd.com
Brockton	Chief	John	Ford	Sharon Police Department	213 South Main Street	Sharon, MA 02067	(781) 784-1587		(781) 784-1592	
Brockton	Chief	Donna	McNamara	Stoughton Police Department	26 Rose Street	Stoughton, MA 02072	(781) 344-2424			dmcnamara@stoughton-ma.gov
Brockton	Chief	George	Arruda	Swansea Police Department	Grand Army of the Republic	Swansea, MA 02777	(508) 674-8464		(508) 674-8463	george.arruda@swanseapolice.com
Brockton	Chief	Edward	Walsh	Taunton Police Department	23 Summer Street	Taunton, MA 02780	508-824-7522			chief@tauntonpd.com
Brockton	Chief	John	Carmichael Jr.	Walpole Police Department	50 South Street	Walpole, MA 02081	508-660-7365		508.668.0531	police@walpolepd.com
Brockton	Chief	Victor	Flaherty	West Bridgewater Police Departmen	99 West Center Street	West Bridgewater, MA 02379	(508) 586-2525			vflaherty@wbpd.com
Brockton	Chief	William	McGrath	Wrentham Police Department	89 South Street	Wrentham, MA 02093	(508) 384-2121		(508) 384-6902	wmcgrath@police.wrentham.ma.us

South Main Street Station – Palmer

```
T683            JOB ORDER EXECUTE - GENERAL HEADER 1 (WMJE1)          09/28/20

 JO NUM: 20-0825639-00      *JOB TYPE: 573      *LOC NUM: 8200  SPEC BUD:
SUMMARY: INSTALL WORKING MONITOR PILOTS              INC TAX (Y/N): N       %
 *REIMB/ADV: N  BASIS:                               JO STATUS: CO COMPLETED
PROJECT ID: 19 - 63155 PROJECT NAME: SOUTH MAIN @ STONE WOR STAT DT: 09/28/20
 COST VAR: 239+ %  *COMMISSION NOTICE: 00           ASSIGNED DATE: 09/28/20
  FACILITY ID:              *FACILITY TYPE:         MULT FAC (Y/N): N
  FUNCTION ID:              *FUNCTION TYPE:             RESP SUPR: 8210M
CO PREMISE ID: 0011464      *FAC DAMAGE CD:
      SITE ID:                      MAP NUM: 132          SYS NUM: 80003050
LOC AT:           - S  - MAIN                    - ST   -     -
*COUNTY CODE: 013   *CITY CODE: PAL  PALMER                  ZIP:
   AKA: S MAIN ST REG VAULT STA#20501               TAX DIST 1: 0000205
BEGIN STREET NUM:              END STREET NUM:          APPRVD BY: U129944
         BETWEEN:    - STONE                  - ST   -     APPRVD DT: 09/11/20
             AND:    -                        -      -
MAP CORRECTIONS(Y/N): N  SKETCH(Y/N): N  *CO/CONTRACT CODE: F  *RET CODE:
GENERATED FROM:                          *ACCT PROJ CD: NA
```

```
T683                JOB ORDER EXECUTE - GENERAL HEADER 2          09/28/20

 JO NUM: 20-0825639-00 *JOB TYPE: 573  *LOC NUM: 8200  JO STATUS: CO COMPLETED
SUMMARY: INSTALL WORKING MONITOR PILOTS             STATUS DATE: 09/28/20
 ACTL START DT:                                   ASSIGNED DATE: 09/28/20
  COMPLETED BY: CU471093                        COMPLETION DATE: 09/25/20
IN/OUT SERV DT:              REL JO NUM: 20-0825684-00     RT NUM:
   NLDS NUMBER:          CHARGE TO (Y/N): N             WORK UNITS:      0.000
                                                           FOOTAGE:

REPORTS COMP(Y/N/BLANK IF N/A)  FAC FAIL:     DAMAGE TO OTH:
  LINE MARKERS AND SIGNS INSPECTED (Y/N):     FCLTY LOC NUM:

   COUNTY CODE: 013  HAMPDEN                   CITY: PAL  PALMER
      TAX DIST: 0000205
 PALMER
```

```
T683                JOB ORDER EXECUTE - EXECUTE COMMENTS          09/28/20

 JO NUM: 20-0825639-00       *JOB TYPE: 573       *LOCATION NUMBER: 8200
SUMMARY: INSTALL WORKING MONITOR PILOTS

                                COMMENTS
   MONITOR JOB
   ASSIST W/INSTALL
   ASSIST W/INSTALL
   I.P.,   ASSIST W/INSTALL
   PALMER PROJECT
   PALMER PROJECT
   FINISHING INSTALLING WORKING MONITOR. CHECKED ALL OPERATIONS AND SETPOINTS.
   SET WORKING MONTIOR AT 120#, MONITOR AT 58#, CONTROL AT 53#
```

Shearer Street Station – Palmer

```
T683            JOB ORDER EXECUTE - GENERAL HEADER 1 (WMJE1)          09/28/20

 JO NUM: 20-0825682-01      *JOB TYPE: 583      *LOC NUM: 8200  SPEC BUD:
SUMMARY: INSTALL WORKING MONITOR REG                  INC TAX (Y/N): N       %
 *REIMB/ADV: N  BASIS:                                 JO STATUS: CO COMPLETED
PROJECT ID: 20 - 70357 PROJECT NAME: SHEARER ST 60# STATION STAT DT: 09/28/20
 COST VAR:  65- %  *COMMISSION NOTICE: 00              ASSIGNED DATE: 09/28/20
  FACILITY ID:              *FACILITY TYPE:          MULT FAC (Y/N): N
  FUNCTION ID:              *FUNCTION TYPE:               RESP SUPR: 8210M
CO PREMISE ID: 0011462      *FAC DAMAGE CD:
      SITE ID:                        MAP NUM: 134          SYS NUM: 80003049
LOC AT:            -     - SHEARER                - ST    -     - EX
*COUNTY CODE: 013   *CITY CODE: PAL  PALMER                    ZIP:
   AKA: SHEARER ST GATE STATION PALMER                TAX DIST 1: 0000205
BEGIN STREET NUM:              END STREET NUM:             APPRVD BY: U129944
         BETWEEN:     -                        -      -     APPRVD DT: 09/09/20
             AND:     -                        -      -
MAP CORRECTIONS(Y/N): N  SKETCH(Y/N): N  *CO/CONTRACT CODE: F  *RET CODE:
GENERATED FROM: 20-0825682-00            *ACCT PROJ CD: NA
```

```
  T683                JOB ORDER EXECUTE - GENERAL HEADER 2          09/28/20

   JO NUM: 20-0825682-01 *JOB TYPE: 583  *LOC NUM: 8200  JO STATUS: CO COMPLETED
  SUMMARY: INSTALL WORKING MONITOR REG                 STATUS DATE: 09/28/20
   ACTL START DT:                                    ASSIGNED DATE: 09/28/20
    COMPLETED BY: CU122059                         COMPLETION DATE: 09/25/20
  IN/OUT SERV DT:              REL JO NUM: 20-0825683-00     RT NUM:
     NLDS NUMBER:          CHARGE TO (Y/N): N             WORK UNITS:      0.000
                                                             FOOTAGE:

  REPORTS COMP(Y/N/BLANK IF N/A)  FAC FAIL:     DAMAGE TO OTH:
    LINE MARKERS AND SIGNS INSPECTED (Y/N):     FCLTY LOC NUM:

     COUNTY CODE: 013  HAMPDEN                   CITY: PAL  PALMER
        TAX DIST: 0000205
   PALMER
```

```
T683                JOB ORDER EXECUTE - EXECUTE COMMENTS                  09/28/20

 JO NUM: 20-0825682-01       *JOB TYPE: 583       *LOCATION NUMBER: 8200
SUMMARY: INSTALL WORKING MONITOR REG

                                  COMMENTS
   INSTALLED WORKING MONITOR , LOCKUP BBL TIGHT,CHKED FILTER CV,CHKED FOR
   LEAKS , SET PRESSURE'S
   ASSIST W/INSTALL
```

Monson Gate Station - Monson

```
T683            JOB ORDER EXECUTE - GENERAL HEADER 1 (WMJE1)          09/28/20

 JO NUM: 20-0825653-02      *JOB TYPE: 583      *LOC NUM: 8200  SPEC BUD:
SUMMARY: INSTALL WORKING MONITOR REG                  INC TAX (Y/N): N       %
 *REIMB/ADV: N  BASIS:                                 JO STATUS: CO COMPLETED
PROJECT ID: 20 - 70234 PROJECT NAME: MONSON GATE 60 PSIG WO STAT DT: 09/28/20
 COST VAR:  17- %  *COMMISSION NOTICE: 00             ASSIGNED DATE: 09/28/20
  FACILITY ID:              *FACILITY TYPE:          MULT FAC (Y/N): N
  FUNCTION ID:              *FUNCTION TYPE:              RESP SUPR: 8210M
CO PREMISE ID: 0011446      *FAC DAMAGE CD:
      SITE ID:                        MAP NUM: 123          SYS NUM: 80003001
LOC AT:            -     - CEDAR SWAMP              - RD    -     -
*COUNTY CODE: 013   *CITY CODE: MON  MONSON                      ZIP:
   AKA: GATE STATION - MONSON                          TAX DIST 1: 0000201
BEGIN STREET NUM:              END STREET NUM:             APPRVD BY: U129944
         BETWEEN:     -                          -       -     APPRVD DT: 09/09/20
             AND:     -                          -       -
MAP CORRECTIONS(Y/N): N  SKETCH(Y/N): N  *CO/CONTRACT CODE: F  *RET CODE:
GENERATED FROM: 20-0825653-01            *ACCT PROJ CD: NA
```

```
 T683                  JOB ORDER EXECUTE - GENERAL HEADER 2          09/28/20

  JO NUM: 20-0825653-02 *JOB TYPE: 583  *LOC NUM: 8200  JO STATUS: CO COMPLETED
 SUMMARY: INSTALL WORKING MONITOR REG                  STATUS DATE: 09/28/20
  ACTL START DT:                                     ASSIGNED DATE: 09/28/20
   COMPLETED BY: CU470656                          COMPLETION DATE: 09/26/20
 IN/OUT SERV DT:              REL JO NUM: 20-0825654-00     RT NUM:
    NLDS NUMBER:          CHARGE TO (Y/N): N            WORK UNITS:      0.000
                                                           FOOTAGE:


 REPORTS COMP(Y/N/BLANK IF N/A)  FAC FAIL:     DAMAGE TO OTH:
   LINE MARKERS AND SIGNS INSPECTED (Y/N):     FCLTY LOC NUM:

    COUNTY CODE: 013  HAMPDEN                   CITY: MON  MONSON
       TAX DIST: 0000201
  MONSON
```

```
T683                JOB ORDER EXECUTE - EXECUTE COMMENTS                09/28/20

 JO NUM: 20-0825653-02       *JOB TYPE: 583       *LOCATION NUMBER: 8200
SUMMARY: INSTALL WORKING MONITOR REG

                                  COMMENTS
   INSTALLED WORKING MONITOR , LOCKUP BBL TIGHT SET REGS , CHKED FOR LEAKS ALL
   OK
   INSTALL WORKING MONITOR PER INSTRUCTIONS, START/CK LOCK UP B.T., CK OPS.
   CK LEAKS 0%, CALL GAS CONTROL W/PT-PT.
```

Regulator Station Over Pressure Protection Assessment and Improvement Plan - High Differential Pressure Stations; Systems Operating at Intermediate Pressure and Above

September 5, 2020

Background

Historically and in compliance with State and Federal regulations, over pressure protection systems at district metering and regulator stations, feeding distribution systems, were designed to protect against a single failure contingency as stated in 49 CFR 192.199(g). Normally, over pressure protection at district regulator stations were more commonly achieved through monitor regulators, followed by relief valves. These devices are installed to provide pressure control redundancy against failure or malfunction of the control regulator in order to protect distribution systems from pressure exceeding the certified MAOP. Moreover, for customers served from elevated pressure distribution systems metering and regulating installations are designed in conformance with 49 CFR 192.197(c)(3) limiting the maximum design pressure of a single regulator and relief device to 125 psig. In effect this type of source to customer pressure protection approach, taken in total, provides multiple layers of protection from over pressurization of customer natural gas piping and equipment.

Analysis

After investigating and analyzing recent events involving exceedance of distribution system MAOP, the resultant evidence suggests that appreciable risk still exists under certain types of over pressure protection configurations and inlet/outlet pressure characteristics. It was determined, that in cases where the inlet pressure to the station exceeds the maximum design pressure of the customer service regulator (125 psig), protection against a single failure at the regulator station provides only partial risk protection. Moreover, in cases where the operating mode of the control and over pressure protection device, such as a control monitor have the same operating characteristics, the potential for common mode failure increases the remaining risk. Therefore, CMA is implementing a plan to review the

pressure and control characteristics of all the elevated pressure stations operated within the CMA territory and implement plans to reduce the cause of risk as previously described.

Plan

The review and remediation plan takes on 3 distinct actions as follows:

1. Pressure and Station Control Review:

   Review and document the control and pressure characteristics of the elevated pressure regulator stations connected to the CMA distribution system. Identify those stations with a single source of overpressure protection that have an inlet pressure greater than 125 psig and connected to a distribution system with an MAOP of less than 100 psig.

   Attach a spreadsheet of the review with this plan in Appendix A.

   Assigned: Field Engineering Due Date: 09/29/2020.

2. Remedial Design and Consideration Concepts:

   Develop typical remedial regulator control measures and/or system designs to provide at least an additional layer of over pressure protection. Examples of acceptable remedial solutions are as follows:

   - Supplemental monitor regulator that operates asymmetrical to the control and/or monitor regulator. (Appendix B-1; regulator upstream of the outlet)
   - Working "super monitor" configuration (Drawing not shown; added pilot to convert monitor to double as 1st cut regulator; maximum set point working pilot 125 psig; monitor pilot set at MAOP or less.)
   - Supplemental relief valve to the monitor regulator. (Appendix B-2; not shown the relief can be internal to the monitor regulator)
   - Supplemental automatic shutoff valve to primary over pressure protection device.
   - Addition of 1st cut regulator upstream of control regulator, such that the control inlet does not exceed 125 psig. (Appendix B-1; substitute outlet regulator with inlet regulator set to 125 psig max.)
   - Combination automatic shutoff valve and relief valve. (Appendix B-4)

   Design considerations and final designs may evolve over the duration of the remediation plan in order to adapt to various system and station configurations encountered. All solutions must

meet the basic criteria identified in the "Analysis" section. Revision to remedial design concepts and considerations is due each year prior to the following year in the capital execution planning horizon.
Assigned: Field Engineering/Design Engineering Due Date: 12/31/2020

Initial design concepts are provided in Appendix B. Note that outlet pressure in examples is for a distribution system MAOP of 60 psig. The outlet MAOP of the stations are adjusted to the MAOP of the system under design consideration.

3. Plan Duration, Prioritization and Execution

- The plan execution duration is a maximum of 5 years starting in 2021.
- Proposed project plan is developed for budget approval and resource planning each year of plan.
- Prioritization for annual remedial plans include and are not limited to the following considerations:
    - Maximize the number of stations remediated each year,
    - Coordinate station remediation with other planned maintenance, reconstruction, or reconfiguration plans for a given year,
    - Coordinate station remediation with the implementation of the PHMSA Mega-Rule affecting regulations under 49 CFR 192 for Transmission Pipelines as provided in publication PHMSA-2011-0023,
    - Align remediation with prioritization results from annual regulator risk model results,
    - Pursuant to the recommendation of the Company's distribution and transmission integrity management plans (DIMP and TRIMP).

Plan Controls:

The Compliance team will track progress and key milestones of the plan execution for the organization as a part of the company dashboard reporting compliance with the consent order.

Engineering will develop the budget proposals and designs for execution in each of the plan years until the plan is completed.

Measurement and Regulation will complete the projects produced each year as required to execute the plan.

REDACTED

Station Information												
Location	Comp Premise	Address	City Code	Comp Prem AKA	Outlet Set Point	Unit Field	Inlet Pressure	Inlet System Number	Monitor	Control	Secondary Over pressure protection	# of Runs
[redacted]												

REDACTED

HP OPP – Design Considerations

Joseph Miller

REDACTED

Background Information

- [redacted]
- [redacted]
- [redacted]

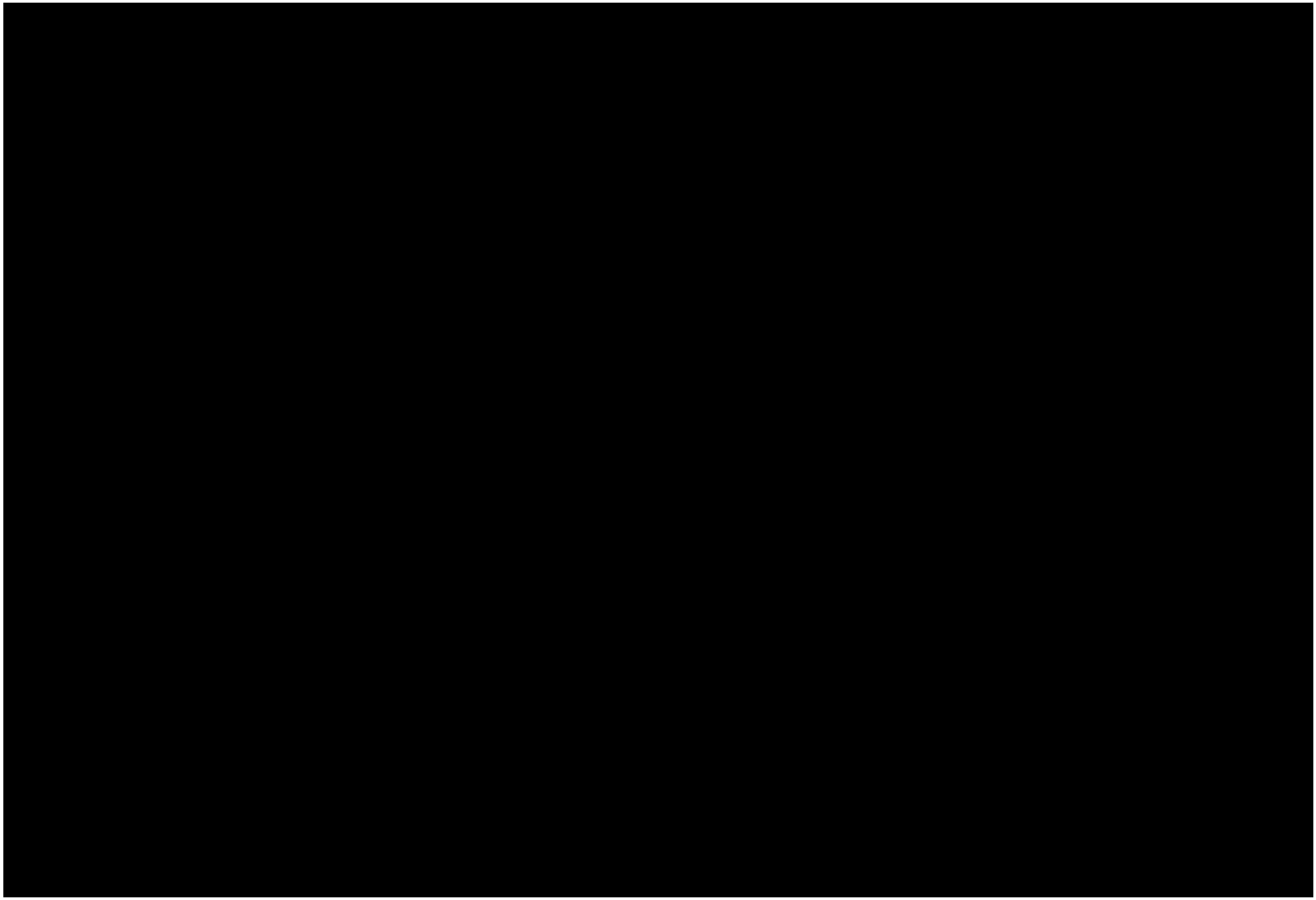
REDACTED

[redacted]

REDACTED

[redacted]

REDACTED



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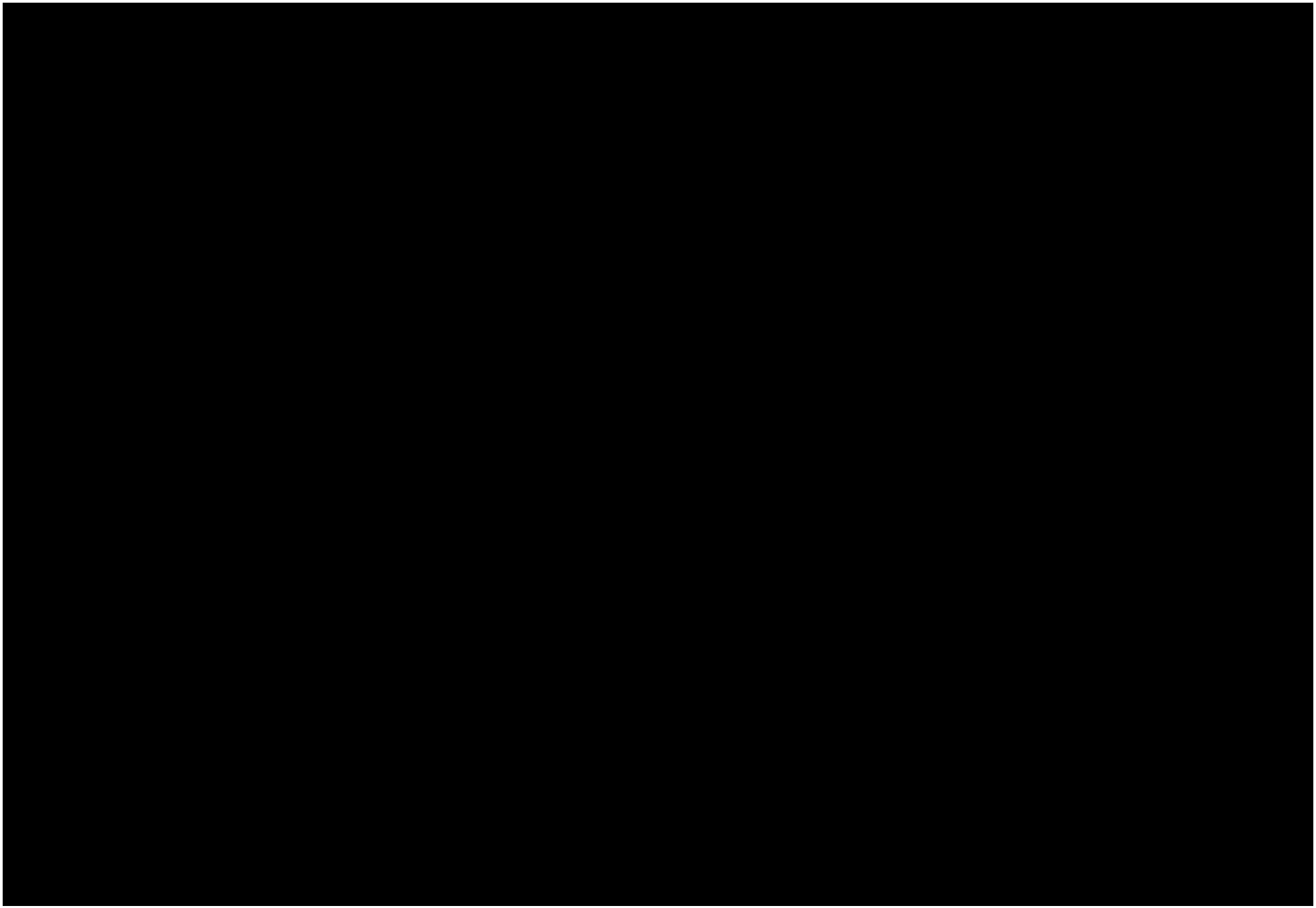

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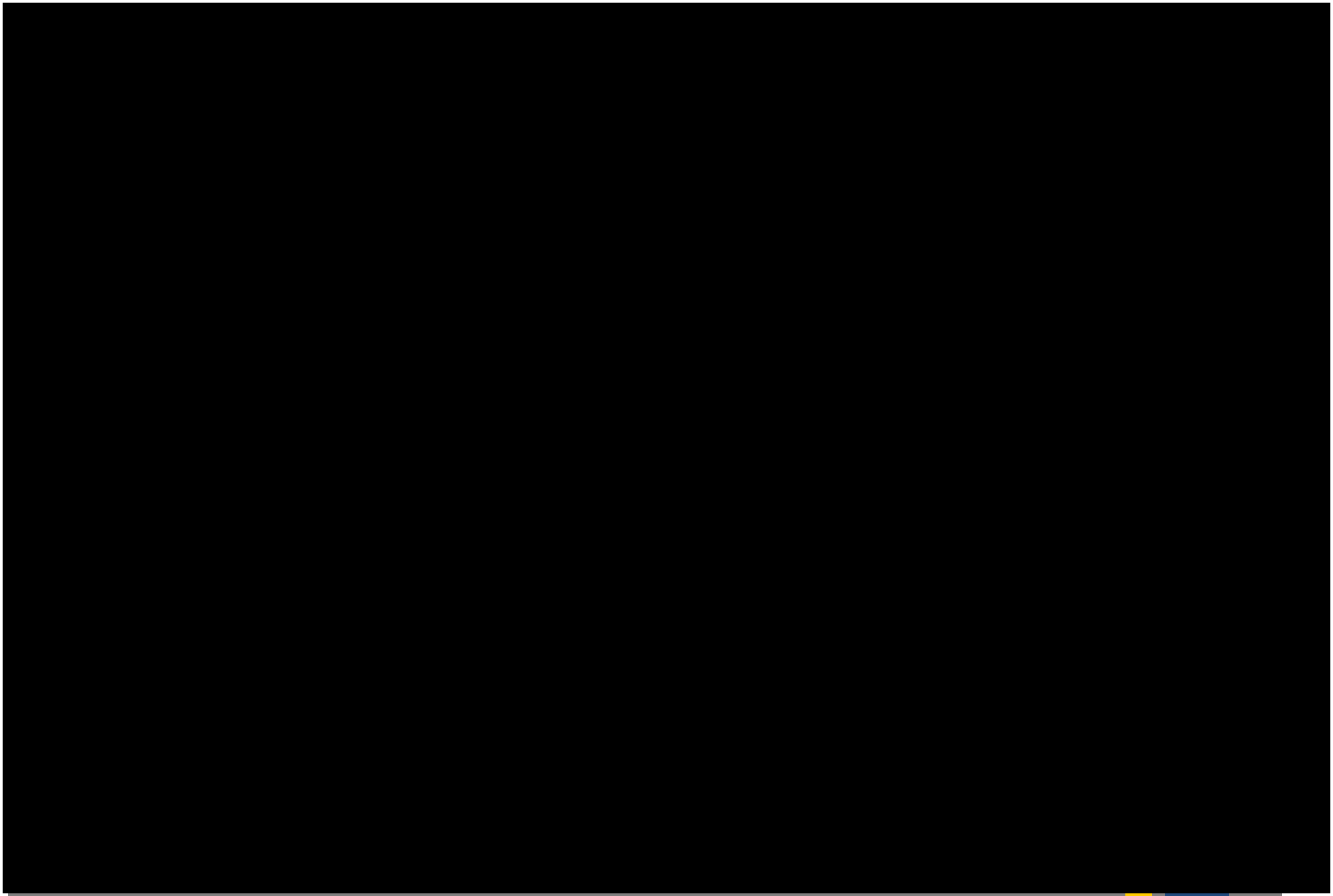

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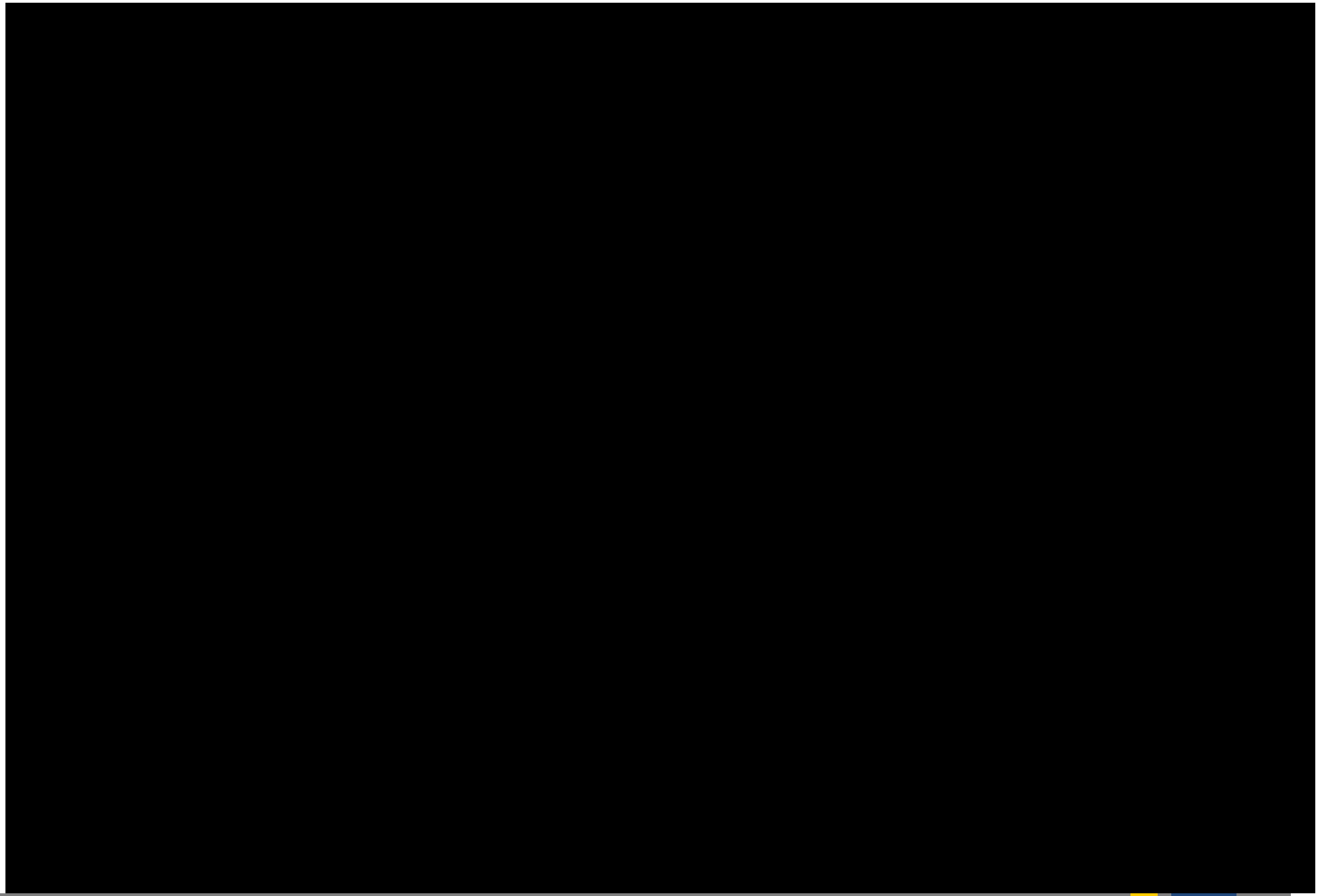
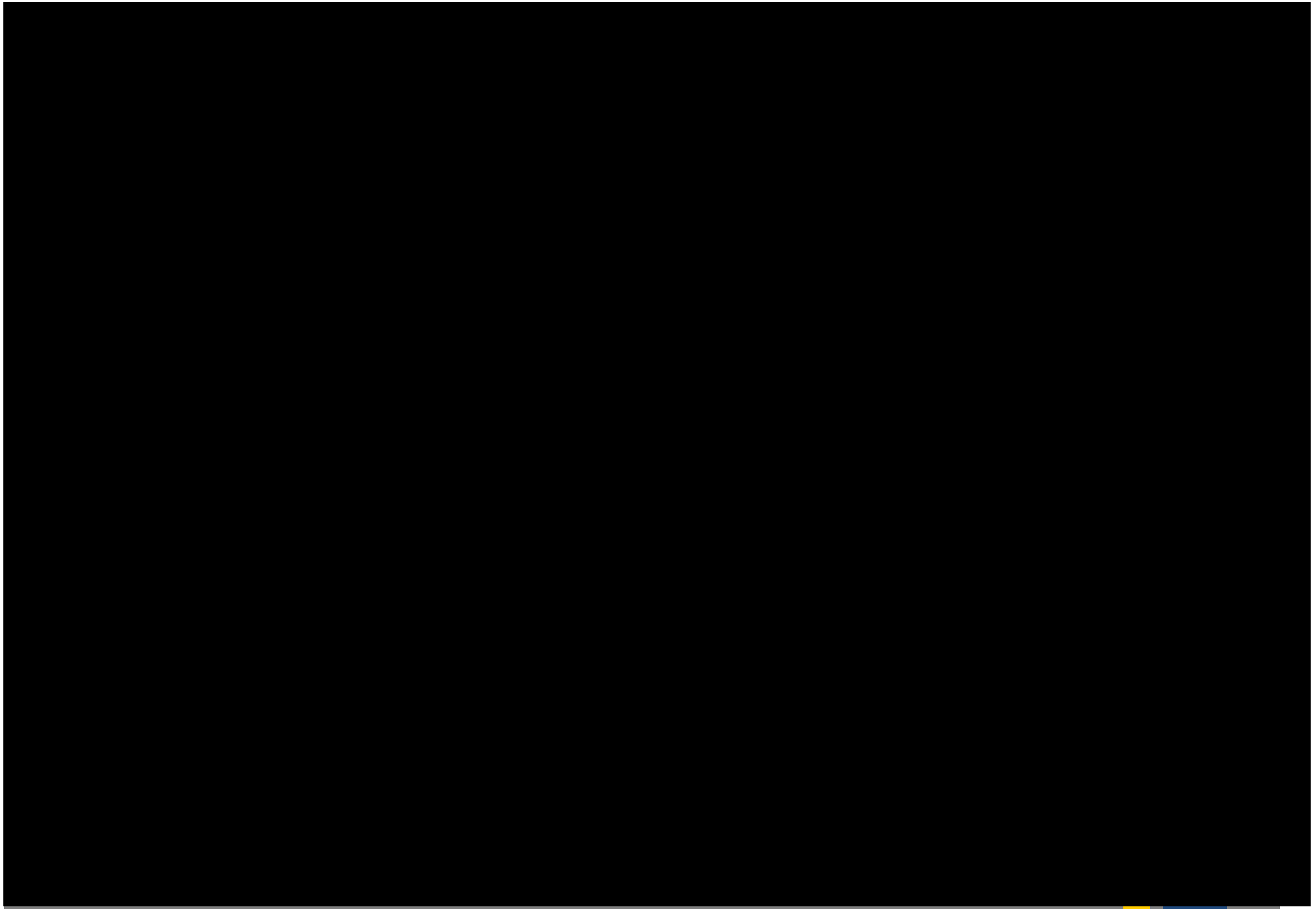


REDACTED



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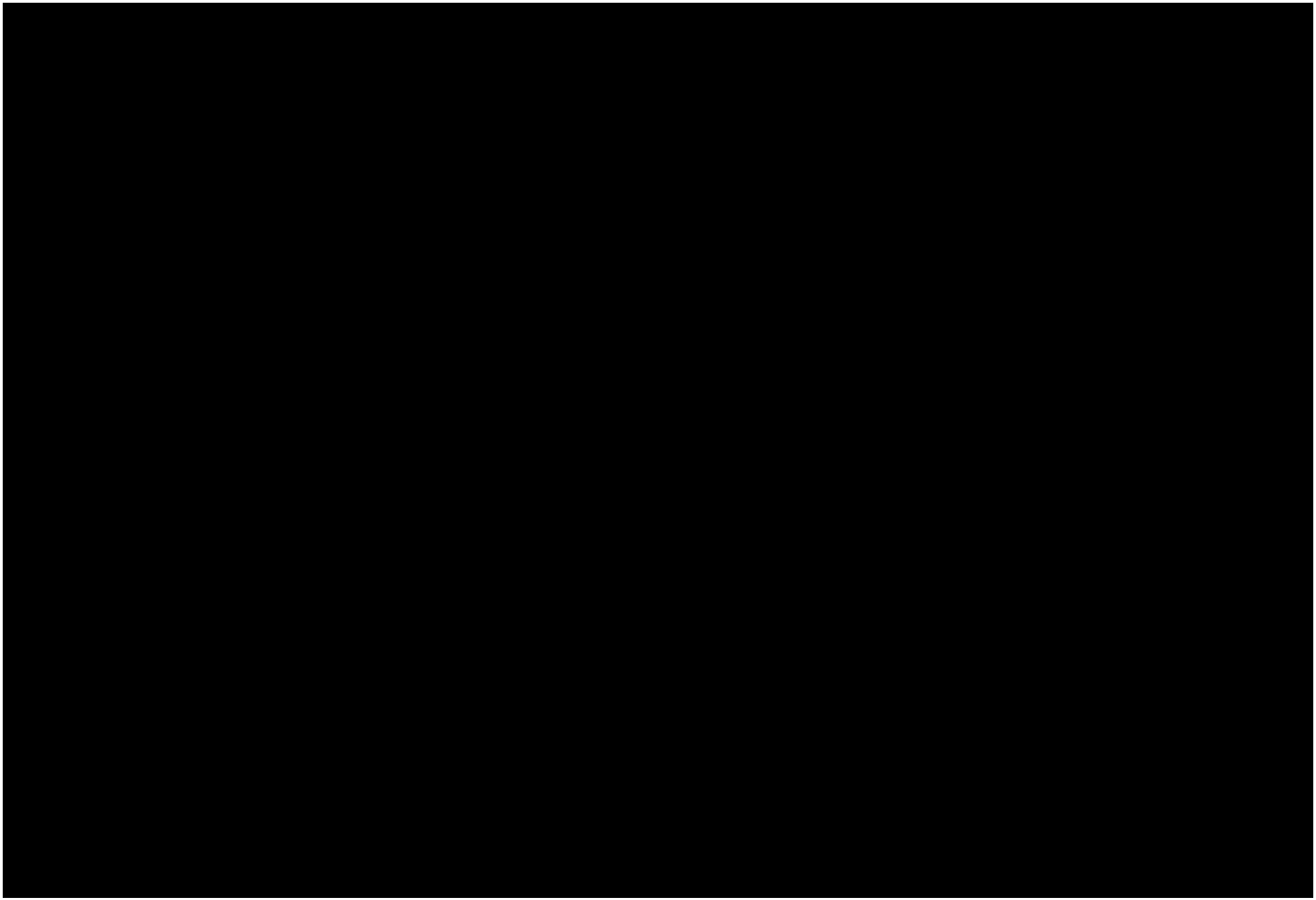


REDACTED

Next Steps

- **Implementation**

[redacted]

- **Training**

[redacted]

- **Revised Drawings / Standards**

[redacted]

REDACTED

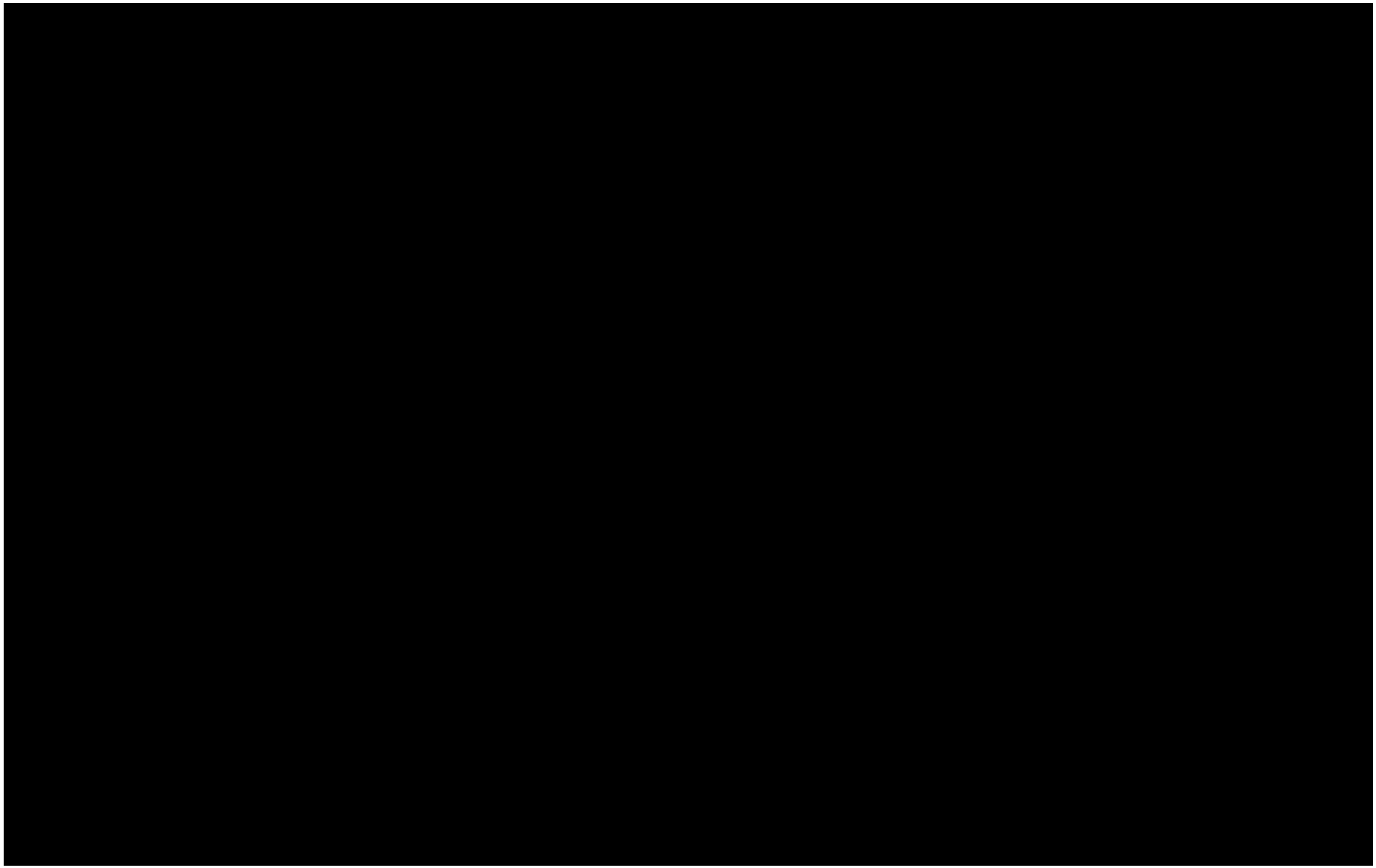
Questions?

REDACTED

Appendix

REDACTED

REDACTED



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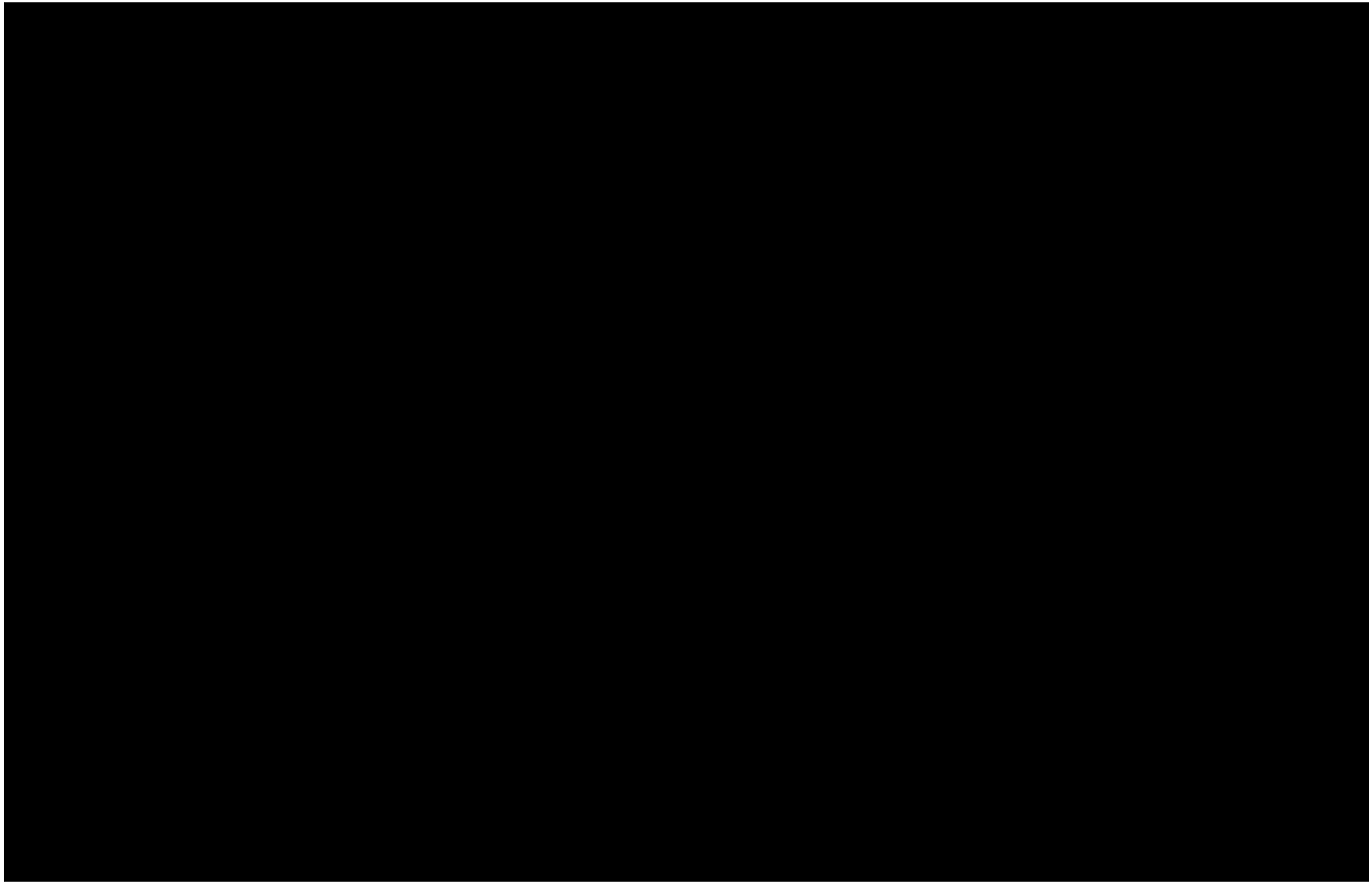

Audience: Construction Inspectors

Expectations of utilizing iAuditor for construction job site audits:

The Company's expectation is for each inspector to complete one audit in iAuditor per day for each crew working in the field.

For the task being observed, the inspector's responsibility is to utilize iAuditor to ensure that all manufacturer's instructions and standards are being followed (Gas Standards, Federal Standards, State Standards & OSHA standards). It is key that all observations, whether they are marked as "Safe" or "At Risk", must be captured for the section of the audit that is being performed.

All "At Risk" findings must be documented on the audit checklist. Any actions marked "At Risk" that are corrected on site must be accompanied by comments that describe the action taken to correct the issue on site. Follow up actions that cannot be corrected on site will be the responsibility of construction leadership

Why are we making a change to iAuditor for inspections?

- iAuditor is the most comprehensive and detailed auditing tool that is available for our use. iAuditor also has follow up capabilities within the tool to ensure that all "At Risk" items are investigated, corrected, and closed by construction leadership.
- As part of the sale of the company, Columbia Gas has committed to improving job site inspections and documentation of these inspections.
- Performing and documenting job site inspections is an important component of the construction group's safety and compliance plan. It is directly related to our Safety Management System (SMS) 4 core responsibilities.

Follow our processes and procedures – *ensure that the field workers are following process/procedure and document*

Identify and report risks – *document at risk items*

Continue to improve processes and procedures – *follow up on at risk items to determine where improvement is needed*

Identify and proactively take action to prevent things that can go wrong – *utilize & document "stop work authority"*

Training related to the use of this app will come from your leader or a construction specialist in your area.

Points of Inspection Available on Template 1.8

Work Zone Safety Checklists	**Backfilling**	**Leakage Pinpointing**	**Tracer Wire Installation**
Welding	**Apply & Monitoring Corrosion Control**	**Repair Steel Gas Main**	**Temporary Bonding**
Plastic Fusion	**Tapping Pipelines**	**Install/Replace Main Lines**	**Backfilling**
Compression/ Bolted Type Fittings	**Purging Pipeline**	**Casing**	**Anchors and Supports**
Install/Replace/Repair Meter & Regulator Sets	**Locate and Mark Underground Facilities**	**Insertion**	**Repair/Protect Cast Iron Pipe**
Trenchless Technology	**Pressure Testing Pipelines**	**Steel Pipe Bending**	**Abandon/Deactivate Gas Piping**
Install/Replace/Repair Gas Service Lines	**Valves (New Installation)**	**Main Components**	**Squeeze Off (Plastic Pipe)**
			Squeeze Off (Steel Pipe)

ATTACHMENT DPU 19-140-29(B)

TOPIC:	Review use of iAuditor app and expectations for use according to Guidance Document with Construction Inspectors who oversee construction crews	
Employee Name	Date of Review	Instructor(s)
Jim Gardner	8/17/2020	Brian Gillis, Patrick Hannon, Charles Vanada, Timothy Sullivan
Dave Reed	8/17/2020	Brian Gillis, Patrick Hannon, Charles Vanada, Timothy Sullivan
Bill Macomber	8/17/2020	Brian Gillis, Patrick Hannon, Charles Vanada, Timothy Sullivan
Tom Sylvester	8/17/2020	Brian Gillis, Patrick Hannon, Charles Vanada, Timothy Sullivan
Leslie Porter	8/17/2020	Brian Gillis, Patrick Hannon, Charles Vanada, Timothy Sullivan
Matt Crehan	8/17/2020	Brian Gillis, Patrick Hannon, Charles Vanada, Timothy Sullivan
Mike Omara	8/17/2020	Brian Gillis, Patrick Hannon, Charles Vanada, Timothy Sullivan
Sean Kelly	8/17/2020	Brian Gillis, Patrick Hannon, Charles Vanada, Timothy Sullivan
Adam Ahlstedt	8/17/2020	Brian Gillis, Patrick Hannon, Charles Vanada, Timothy Sullivan
Timothy Fitzpatrick	8/27/2020	Ken Wells, Jen Angelari
Joe Souza	8/27/2020	Ken Wells, Jen Angelari
Brandon Ceglanski	8/27/2020	Ken Wells, Jen Angelari
Steve Bezemes	8/27/2020	Ken Wells, Jen Angelari
William Broderick	8/27/2020	Ken Wells, Jen Angelari
Dennis Matthews	8/27/2020	Ken Wells, Jen Angelari
David Murphy*	N/A - Short Term Disability	Ken Wells, Jen Angelari
Mike Johnson	8/27/2020	Ken Wells, Jen Angelari
James Samowski	8/27/2020	Ken Wells, Jen Angelari
David Williams	8/27/2020	Ken Wells, Jen Angelari
Steve Malenfant	8/27/2020	Ken Wells, Jen Angelari
Robert Forester	8/27/2020	Ken Wells, Jen Angelari
Lisa Broderick	8/27/2020	Ken Wells, Jen Angelari
Sharon Sumner	8/27/2020	Ken Wells, Jen Angelari
Rick Bedard*	N/A - Short Term Disability	Ken Wells, Jen Angelari
Larry Bezemes	8/20/2020	Ken Wells, Jen Angelari
Chelsea Slates	8/20/2020	Ken Wells, Jen Angelari
Jamie Buiso	9/15/2020	Eric Shepard, Justin Violette
Emmett Callahan	9/15/2020	Eric Shepard, Justin Violette
Robert Caron	9/15/2020	Eric Shepard, Justin Violette
Adam Christensen	9/15/2020	Eric Shepard, Justin Violette
Jared Cousineau	9/15/2020	Eric Shepard, Justin Violette

TOPIC:	Review use of iAuditor app and expectations for use according to Guidance Document with Construction Inspectors who oversee construction crews	
Employee Name	Date of Review	Instructor(s)
Michael Downie	9/15/2020	Eric Shepard, Justin Violette
Artur Formejster	9/15/2020	Eric Shepard, Justin Violette
Nicholas Hedge	9/15/2020	Eric Shepard, Justin Violette
Kenneth Hodge	9/15/2020	Eric Shepard, Justin Violette
Edward Kopyscinski	9/15/2020	Eric Shepard, Justin Violette
Anthony Manzi	9/15/2020	Eric Shepard, Justin Violette
Thomas Mehlich	9/15/2020	Eric Shepard, Justin Violette
Henry Proko	9/15/2020	Eric Shepard, Justin Violette
William Richardson	9/15/2020	Eric Shepard, Justin Violette
Fernando Rodriguez	9/15/2020	Eric Shepard, Justin Violette
Thomas Saloio	9/15/2020	Eric Shepard, Justin Violette
Geoffrey Simpson	9/15/2020	Eric Shepard, Justin Violette
Donald Veilleux	9/15/2020	Eric Shepard, Justin Violette
Rene Lafleche	9/15/2020	Eric Shepard, Justin Violette
James Ramage	9/15/2020	Eric Shepard, Justin Violette

TOPIC:	Review use of iAuditor app with QA/QC employees to reinforce expectation for complete documentation of tasks inspected, findings, and corrective actions/resolutions	
Employee Name	Date of Review	Instructor
Paul Baker	9/2/2020	Dan Levesque
Daniel Bower	9/2/2020	Dan Levesque
Michael Cerniglia	9/2/2020	Dan Levesque
Eric Corsaro	9/2/2020	Dan Levesque
Ronald Felmlee	9/2/2020	Dan Levesque
Rodney Jalbert	9/2/2020	Dan Levesque
Eric Kerns	9/2/2020	Dan Levesque
Robert Partin	9/2/2020	Dan Levesque
Richard Saraney	9/2/2020	Dan Levesque
Bruce Doyle	9/2/2020	Dan Levesque
Oliver Hardman	9/2/2020	Dan Levesque
Keith Hawkins	9/2/2020	Dan Levesque
Louie Hendrix	9/2/2020	Dan Levesque
Brad Hoerig	9/2/2020	Dan Levesque
Ricky Johnson	9/2/2020	Dan Levesque
Christoper Kidd	9/2/2020	Dan Levesque
Nicole Mesarch	9/2/2020	Dan Levesque
John Rooker	9/2/2020	Dan Levesque
Donald Smith	9/2/2020	Dan Levesque
Gilbert Zanni	9/2/2020	Dan Levesque
Mark Donelson	9/2/2020	Dan Levesque
Carl Montgomery	9/2/2020	Dan Levesque
Tommy Parker	9/2/2020	Dan Levesque
Kevin Wright	9/2/2020	Dan Levesque