The Commonwealth of Massachusetts

DEPARTMENT OF PUBLIC UTILITIES

PIPELINE ENGINEERING AND SAFETY DIVISION

INCIDENT REPORT

Primary Valve Incident
Hildreth Street, Dracut, Massachusetts
April 16, 2009

PIPELINE ENGINEERING AND SAFETY DIVISION

Accident File

Primary Valve Incident

Location: Dracut, Massachusetts

Date of Accident: April 16, 2009

Gas Company: National Grid

Report Issued – April 14, 2011

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I. INTRODUCTION

A. Scope of the Investigation

The Massachusetts Department of Public Utilities ("Department"), Pipeline Engineering and Safety Division ("Division"), pursuant to G.L. c. 164, § 105A and a Federal Certification Agreement as provided for in 49 U.S.C. § 60105, has investigated a natural gas ("gas") release at Hildreth Street, Dracut, on April 16, 2009 ("Incident").[1] The release of gas resulted in two employees being hospitalized. The operator of the gas system is Boston Gas Company, Essex Gas Company, and Colonial Gas Company, each d/b/a National Grid ("National Grid" or "Operator").

As part of the Department's annual certification process by the United States Department of Transportation ("U.S. DOT"), the Department must report to the U.S. DOT

> each accident or incident . . . involving a fatality, personal injury requiring hospitalization, or property damage or loss of more than an amount the Secretary establishes... and any other accident the [Department] considers significant, and a summary of the investigation by the [Department] of the cause and circumstances surrounding the accident or incident. 49 U.S.C. § 60105(c).

The purpose of this report is to inform the U.S. DOT as to the cause and circumstances surrounding the Incident.

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[1] Incident means any of the following events:

(1) An event that involves a release of gas from a pipeline or of liquefied natural gas or gas from an LNG Facility and
  (i) A death, or personal injury necessitating in-patient hospitalization; or
  (ii) Estimated property damage, including cost of gas lost, of the operator or others, or both, of $50,000 or more.
(2) An event that results in an emergency shutdown of an LNG facility.
(3) An event that is significant, in the judgment of the operator, even though it did not meet the criteria of paragraphs (1) or (2). 49 C.F.R. Part 191, § 191.3.

The Department has established procedures for determining the nature and extent of violations of codes and regulations pertaining to safety of pipeline facilities and the transportation of gas, including but not limited to, 220 C.M.R. §§ 101.00 through 113.00. See 220 C.M.R. § 69.00 et seq. The Division also enforces the U.S. DOT safety standards for gas pipeline systems as set forth in 49 C.F.R. Part 192 ("Part 192"). G.L. c. 164, § 105A.

B. Overview of Incident

On April 16, 2009, at approximately 10:00 a.m., National Grid was performing scheduled maintenance on a four-inch primary valve at the intersection of Pleasant and Hildreth Streets, Dracut, Massachusetts (Exh. 1). This maintenance involved exposing the primary valve, and attempting to operate the valve by loosening the valve cover bolts (id.). During a prior inspection of the valve, the crew attempted to grease the valve and was unsuccessful (id.).

National Grid reported that the primary valve cover on its 60 pounds per square inch gauge ("PSIG")[2] distribution system blew off during this maintenance activity (Exh. 1). The incident caused injuries to two employees that required hospitalization and the evacuation of 100 -150 people from 11 buildings (Exh. 2). National Grid stated that it installed a new primary valve and returned service to customers at 9:45 p.m. (id).

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2 PSIG refers to the pressure expressed in pounds exerted on one square inch of surface area. The designation "gauge," indicates the readings are already adjusted to ignore the surrounding atmospheric pressure, which is 14.7 psi at sea level. If psig gauge were not connected to any pressure source, it would read zero even though it is actually sensing 14.7 psi at sea level.

National Grid had previously visited the site and was unable to grease the valve (Exh. 1). The crew returned the day of the Incident to excavate the valve and operate the valve by loosening the valve cover bolts (id.). Upon inspection of the exposed valve, the crew discovered that the button head fitting was corroded (id.). The crew did not have a plug onsite to plug off the valve once the button head fitting was removed (id.). While waiting for the button head fitting to be delivered, they loosened the bolts (id.). Once loosened, the crew struck the valve with a three pound sledge hammer (id.). When the crew struck the valve, the cover blew off releasing uncontrolled gas into the atmosphere (id.).

At approximately 10:00 a.m., the Dracut Fire Department ("Dracut FD") received a call from the police reporting a gas related incident (Exh. 3). The Dracut FD reported the Incident to National Grid and a company representative was onsite at 10:30 a.m. (id.). The Dracut FD evacuated all residents within a 500 foot radius of the incident (id.).

National Grid shut down the main at 12:36 p.m. (Exh. 4). The Operator replaced the valve and completed repairs by 6:47 p.m. (id.). At 9:45 p.m., the Operator restored mostly all accounts except for locations that National Grid could not gain access to (id.).

II. THE DIVISION'S INVESTIGATION

A. Background

Pleasant Street and Hildreth Street are located in a business and residential area of Dracut. In 1985, the Operator installed under Hildreth Street a four-inch coated steel gas main (Exh. 5). In 1999, the Operator installed a transition to a four-inch plastic main (id.). The maximum operating pressure of the main is 60 PSIG (id.). The operating pressure of the main was approximate 58 PSIG (Exh. 6). The four-inch Nordstrom, quarter turn plug valve manufactured in 1953 by the Flow Control Division of Rockwell International, and has a working pressure rating of 200 PSIG (Exh. 2). The valve consists of a steel body with an iron plug (id.).

B. Primary Valve Maintenance History

Part 192, § 192.747, requires operators to perform maintenance of its primary valves once each calendar year not to exceed 15 months. Over the last three years, the Operator inspected the four-inch primary valve involved in the Incident on August 18, 2006, January 4, 2007, and January 24, 2008 (Exhs. 7, 8). The valve was due to be inspected no later than April 24, 2009.

C. Routine Primary Valve Maintenance

On April 16, 2009, National Grid performed routine maintenance on its four-inch primary valve (Exh. 1). Routine maintenance requires the primary valve to be lubricated by injecting a sealant through a button head fitting located on the stem of the valve (id.). The sealant is injected under pressure by a hand or hyper gun supplied by the valve manufacturer

(id.). During sealant injection, the pressure gauge on the gun is used as a diagnostic tool. If there is no build up of pressure, that is an indication that the button head fitting is clogged or the residual sealant inside the valve is hardened (id.). The old button head fitting is replaced with a new fitting and the valve is injected with valve purging compound to purge out the residual sealant and debris (id.). It may take up to twenty four hours to work and dissolve blockage due to the hardened sealant. The valve is then injected with sealant and then operated (Exh. 1).

The manufacturer states that after lubricating the valve, it is still found to be inoperable, tthat is an indication of a seized plug in the bottom of the valve (Exh. 1). Under this condition, the manufacturer recommends that the cover bolt be loosened one eighth turn to release the seized plug (id.). If the valve remains inoperable then the manufacturer is to be consulted or the valve should be removed and isolated for maintenance (id.).

National Grid's employees performing the maintenance on the valve did not replace the button head fitting that they found to be corroded prior to loosening the bolts on the valve (Exh. 1). National Grid states that this was inconsistent with company procedures and manufacturer recommendations which require a series of steps to be taken prior to loosening the valve cover (id.).

D. Training

Gas company personnel must be qualified to perform valve maintenance activity. Part 192, § 192.805. The qualifying training is hands on, and reviews the use of, setup, and breakdown of the equipment simulated on live pipelines that are pressurized with air (Exh. 9).

The training provided to the employees also addressed the removal of valve covers (id.). Employees are taught never to remove the bolts on a valve while the valve is under pressure (id.). The instructor also covers the key components of the valve inspection (id.).

In addition, personnel are required to take tests to ensure their knowledge of the task (Exh. 10). The two employees involved in the incident were both qualified in 2008 in the following tasks: Task 41 – Inspect and Operate Valves; Task 42 – Repair and Maintain Distribution Line Valves; and Task 43 – Lubricate Distribution Line Valves. The employees' requalification date is in 2013 (id.). The qualification test only has one question that addresses the lubrication of a valve (id.). The question addressed what information is important when lubricating a valve (id.). The training did not address what actions to take when a valve is found to be inoperable, and the hazards associated with the repair.

E. Failure Analysis of Valve

Massachusetts Materials Research, Inc ("MMR") conducted failure analysis of the four-inch plug valve involved in the incident on Hildreth Street, Dracut, and issued a report[3] ("MMR Report").[4] The Operator provided MMR with the following items for testing, two bonnet bolts, a Sealweld Super Gun and associated grease and purging compounds. The fittings were provided because neither of the bolts nor the original rotten button fitting were

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3 National Grid performed an examination of the valve, which included a leak test and disassembly of the valve, in its New York testing facility prior to the MMR testing (Exh. 1).

4 To obtain a copy of the MMR Report contact Veda-Anne Ulcickas, MMR, Inc. 1500 Century Drive, P.O. Box 810, West Boylston, MA 01583

recovered after the Incident. The purpose of the failure analysis is to document the condition of the evidence and to determine the cause of the Incident.

MMR conducted a visual examination, leak test, and microscope examination. Its analysis and testing found:

- The cleaned plug and valve body were lightly greased with a hand-applied film of fresh grease and reassembled for leak testing. The majority of the dried grease in the valve bottom well was left in-situ. The bolts and button fitting were re-inserted as before.

- The valve was plumbed to a nitrogen source, immersed in water and leak tested at 60 PSIG. The valve exhibited no leaks.

(MMR Report at 3).

Based on the analysis, MMR concluded the following:

> The most likely reason for the failure of the valve to actuate in the field is the sticky grease plus purging compound residue in the grease channels of the body and plug, in addition to hardened dried grease in the well region at the bottom of the valve. Some minor scoring on the plug, if present prior to the incident, would have contributed slightly to elevated starting torque on this valve, but would not have been sufficient to prevent actuation by itself.
>
> No debris was observed in the bonnet bolt hole threads that would indicate that the bolts present in the field stripped out of the holes. The condition of these threads indicates that it is more likely the incident bolts were unscrewed. Note that this observation and others made during the investigation would have been affected by the examination and testing activities of National Grid.
>
> The results of the investigation indicated no flaws in the valve that would have prevented actuation if purging compound had been injected and allowed to work.
>
> (id.).

III. FINDINGS AND CONCLUSIONS

A. Findings

1. A four-inch coated steel gas main, installed in 1985 that transitions to a four-inch plastic main, installed in 1999, underlies Hildreth Street.

2. The maximum operating pressure of the Hildreth Street main is 60 PSIG. The operating pressure of the main on the day of the incident was approximately 58 PSIG.

3. The Hildreth Street primary valve is a four-inch Nordstrom, quarter turn plug valve manufactured in 1953. The valve has a pressure rating of 200 PSIG. The valve consists of a steel body with an iron plug.

4. The Hildreth Street primary valve, was previously maintained on the following dates: August 18, 2006, January 4, 2007 and January 24, 2008.

5. On April 16, 2009, National Grid performed maintenance on a four-inch primary valve at the intersection of Pleasant and Hildreth Streets, Dracut, MA.

6. Prior to this maintenance activity on April 16, 2009, National Grid visited the site to perform the scheduled maintenance and was unable to grease the valve.

7. The crew excavated the primary valve and discovered that the grease stem was rotted. Prior to replacing the rotted grease stem, National Grid loosened the valve cover bolts and hit it with a three pound sledge hammer. The valve the cover blew off releasing uncontrolled gas into the atmosphere.

8. The incident caused injury to two National Grid employees, and the evacuation of 100 -150 people from 11 buildings.

9. On April 16, 2009, at approximately 10:00 a.m., the Dracut Fire Department received a call from the police reporting a gas related incident.

10. National Grid shutdown the main at 12:36 p.m. The valve was replaced and repairs were complete by 6:47 p.m. At 9:45 p.m., all accounts were restored except for the locations that they could not gain access to at that time.

11. Routine maintenance requires the primary valves to be lubricated by injecting a sealant through a button head fitting located on the stem of the valve. If the button head fitting is clogged, or the residual sealant inside the valve is hardened, the old

button head fitting must be replaced with a new fitting and the valve is injected with valve purging compound to purge out the residual sealant and debris.

12. The button head fitting on the four-inch primary valve was corroded.

13. National Grid did not replace the button head fitting prior to loosening the bolts on the valve.

14. National Grid installed a new primary valve and placed it into service at 9:45 p.m.

15. National Grid's employees received training for the maintenance of primary valves.

16. The training program states that the bolts on a valve should never be removed while the valve is under pressure.

17. National Grid's employees were qualified to inspect the primary valve involved in the incident.

B. Conclusions

The National Grid crew failed to follow manufacturer and company procedures, which required the crew to replace the corroded button head fitting and inject purging compound into the valve. The crew was to wait 24 hours after injecting purging compound into the valve and before operating the valve. The manufacturer only allows the bolts on the valve to be loosened after those steps have been followed. The crew's failure to follow company and manufacturer procedures resulted in the release of gas, and two National Grid employees being injured and sent to the hospital.

The analysis in the MMR Report was based upon substantial evidence and the report's conclusions are reasonable.

IV. NATIONAL GRID ACTIONS

On February 28, 2011, pursuant to G.L. c. 164, § 105A and 220 C.M.R. §§ 69.00 et seq., the Department concluded an enforcement action with National Grid. National Grid, D.P.U. 09-PL-12. National Grid agreed to: (1) stop the practice of loosening valve covers bolts to release seized plugs; (2) review its training and qualification procedures for its primary valves maintenance program; (3) introduce a valve recognition program; (4) utilize skilled personnel for valve maintenance; (5) ensure that all trucks carry proper button head fittings; (6) review maintenance procedures for sealant injection; (7) re-train personnel for sealant injection; (8) train crews to check for corrosion before proceeding to any maintenance; and (9) use DVD resources for valve maintenance.

EXHIBIT LIST

1. Root Cause Failure Analysis of 4" Nordstrom Plug Valve
2. National Grid Incident Report to D.P.U.
3. Dracut Fire Department Report
4. Sequence of Events
5. Main Information
6. Pressure Chart Readings of Nearest Regulator Station Servicing the Area
7. Primary valve Maintenance Report
8. Work Order
9. Segments of Training Program
10. National Grid Employee Qualifications

EXHIBIT 1

Root Cause Failure Analysis of 4" Nordstrom Plug Valve

REPORT TO:

Vice President Gas Operations

New England

Attn: Mr. Daniel Saad

Root Cause Failure Analysis of 4" Nordstrom Plug Valve – Pleasant Street and Hildreth Street Dracut, MA

Materials & Testing Laboratory Report No. 052009-05

May 8, 2009

Perry Sheth, P.E
Manager, Materials & Standards

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Executive Summary:

On 4/16/2009 at approximately 10:15 a.m., while performing maintenance on a 4" quarter turn metal plug valve at Pleasant Street and Hildreth Street Dracut, MA, two of our gas employees were injured and hospitalized.

The crew was in the excavation attempting to operate the valve by loosening the valve cover bolts to free the seized valve plug. During this process, the valve top cover suddenly blew off releasing gust of 60 PSIG gas pressure and caused injuries to two employees to their face and legs. The primary injuries were caused by blowing gas, dirt and debris in the excavation. The injuries were non life threatening.

Normally, before operating plug valve during routine maintenance, the valve is lubricated by injecting a sealant through a button head fitting located on the stem of the valve. This sealant is injected under pressure by a hand or hyper gun supplied by the valve manufacturer. During sealant injection, the pressure gauge on the gun is used as a diagnostic tool. If there is no build up of pressure than it indicates that the button head fitting is clogged or the residual sealant inside the valve is hardened. The next step is to replace the old button head fitting with a new fitting and inject valve purging compound to purge out the residual hardened sealant and debris. Sometimes it takes twelve to twenty four hours for purging compound to work and dissolve blockage due to hardened sealant. Subsequently, inject the sealant lubrication and operate the valve. Nordstrom valve maintenance procedure recommends that all the above steps must be followed for the two bolts adjustable cover design valve. After following all the steps listed above, if the valve is found inoperable than it is an indication of seized plug in the bottom of the valve body. Under this scenario, Nordstrom valve maintenance procedure recommends that the cover bolt can be loosened one eight turn to release the seized plug. After doing so, if the valve is not operable than consult valve manufacturer for trouble shooting or remove pressure and isolate valve for maintenance.

Unfortunately, the investigation of this incident revealed that the button head fitting was rotted and was not replaced for injecting sealant lubrication. **The materials & testing laboratory in Hicksville did not receive rotted button head fitting and bolts with the valve and therefore unable to verify the condition and provide any failure analysis report for bolts and button head fitting.** Since these were the key components, we followed up with the NE operations manager for the missing bolts and button head fitting. Unfortunately, we were informed that the bolts and button head fittings were not traceable.

The threads on the valve cover and body were examined and checked with the plug gauge for damage and corrosion. There was no evidence of either thread damage or corrosion. The valve was disassembled to examine the plug and body for the presence of lubrication sealant or purge compound. There was no evidence of any purge compound or new sealant on any part of the plug or body. The valve was reassembled using new two ¾" 10 UNC by 2" long bolts per ASTM A307 grade A, specified by Nordstrom. A new button head fitting was installed and lubricated using Nordstrom 1033 sealant material. After the injection of the sealant, the valve was operated with the wrench without any difficulty. The valve was disassembled to check the presence of sealant on the plug groves and bottom.

The incident was simulated to determine how many turns of bolt threads would cause a leakage between cover and body and potentially lead to an ultimate plug blow out. This simulation was performed by the hydro test utilizing 60 PSIG water pressure. The test revealed that when the body bolts were loosened one half turn the water started leaking between cover and body. The bolts were gradually loosened to a point where the entire lengths of the bolts were unscrewed under water pressure and the valve plug popped out.

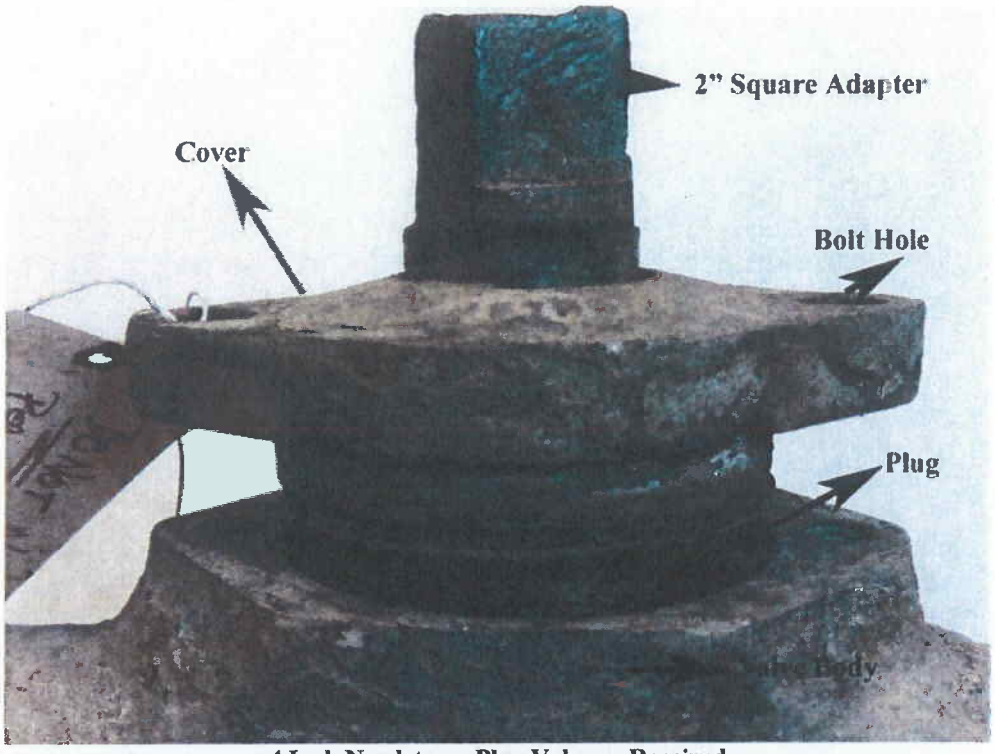
Conclusion:

Based on the examination of the valve body, plug, cover and the simulation tests performed, it was evident that the crew failed to follow the proper valve maintenance procedures. The crew did not recognize the hazard associated with loosening the cover bolts of the valve that was operating at 60 PSIG gas pressure. The crew failed to recognize the difference between the two bolts adjustable cover design and bolted gland design valves. The crew interview revealed that they were under the impression that the valve plug was designed with a retainer to prevent blow out of the plug. The crew should have replaced the button head fitting, purge the valve to dissolve hardened sealant and than lubricated the valve with the sealant before loosening the cover bolts.

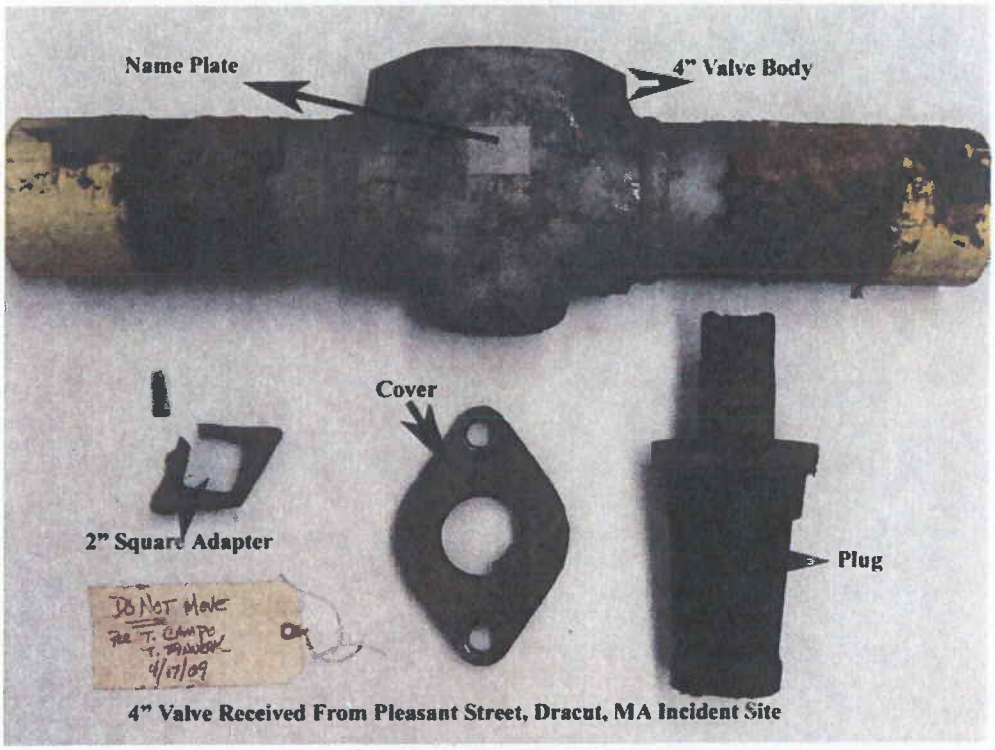
Recommendations:

1. Immediately stop the practice of loosening the valve cover bolts to release the seized plug during routine maintenance of in-service valve.
2. Review training and qualification procedure for personnel involved in valve maintenance program
3. Introduce valves recognition program and identify the hazards associated with the in-service maintenance of valves.
4. Utilize dedicated and skilled personnel for the valve maintenance program.
5. Ensure that the button head fittings are stock items and all valve maintenance crew trucks carry different fittings utilized on various types of valves.
6. Review maintenance procedure for the Nordstrom 400D hand gun and Hyper Gun used for sealant injection.
7. Re-train personnel for sealant injection while utilizing the pressure gauge of the injection gun as a diagnostic tool for valve condition.
8. Since Nordstrom two bolt adjustable cover, quarter turn, plug valves were manufactured in 1920-1986 they are more prone to corrosion due to the gap between the valve stem and cover. This corrosion is caused by water migration from the gap. All crews should be trained to check the corrosion between the stem and cover before proceeding to any maintenance steps.
9. Utilize Flowserve (Nordstrom) DVD resources for Nordstrom valves maintenance guide for training and refresher training.

Protocol 1 – Photographs & Visual Inspection: 4"Nordstorm, quarter turn, plug valve, two bolts adjustable cover type, steel body, iron plug, Figure number A 1943 ½, manufactured in 1953, 200 # Pressure Rating.

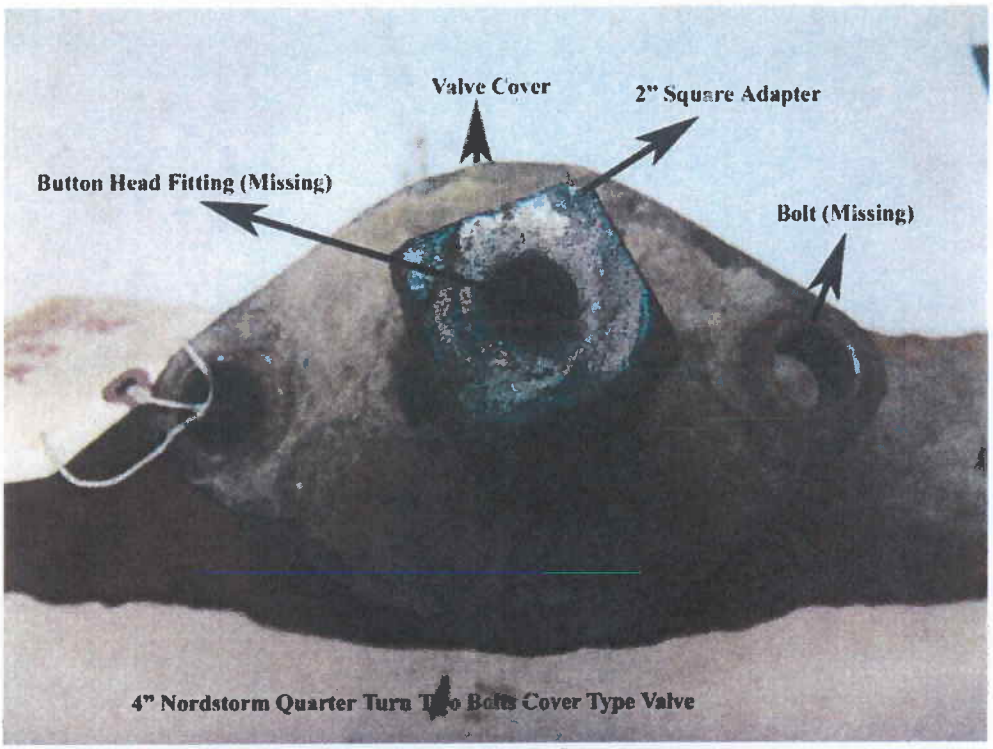


4 Inch Nordstrom Plug Valve as Received



4 Inch Valve Internal Parts

Protocol 2- Inspection of internal parts – There was a mild corrosion noticed between cover and valve body. The hardened sealant and debris were presence between the plug bottom and the valve body. There was no wear on the plug and the groves for the sealant cavities. The valve was disassembled to examine the plug and body for the presence of lubrication sealant or purge compound. There was no evidence of any purge compound or new sealant on any part of plug or body. The bolts & button head fitting were missing.

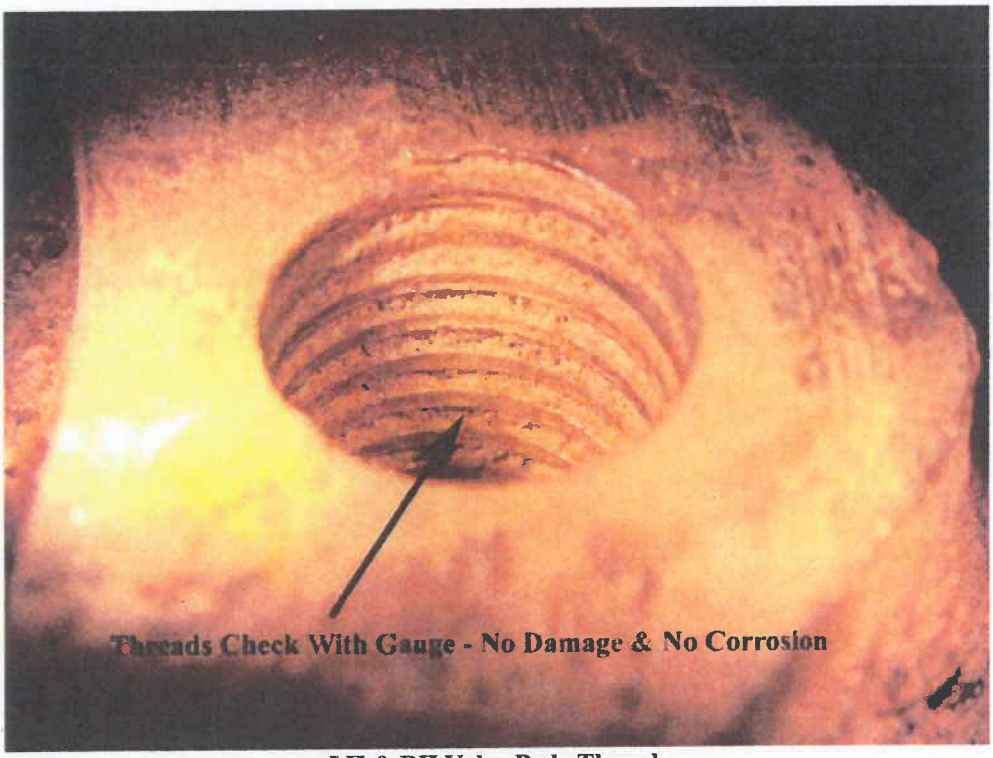


Missing Bolts & Button Head Fitting

Hardened Sealant (555) & Debris at Bottom

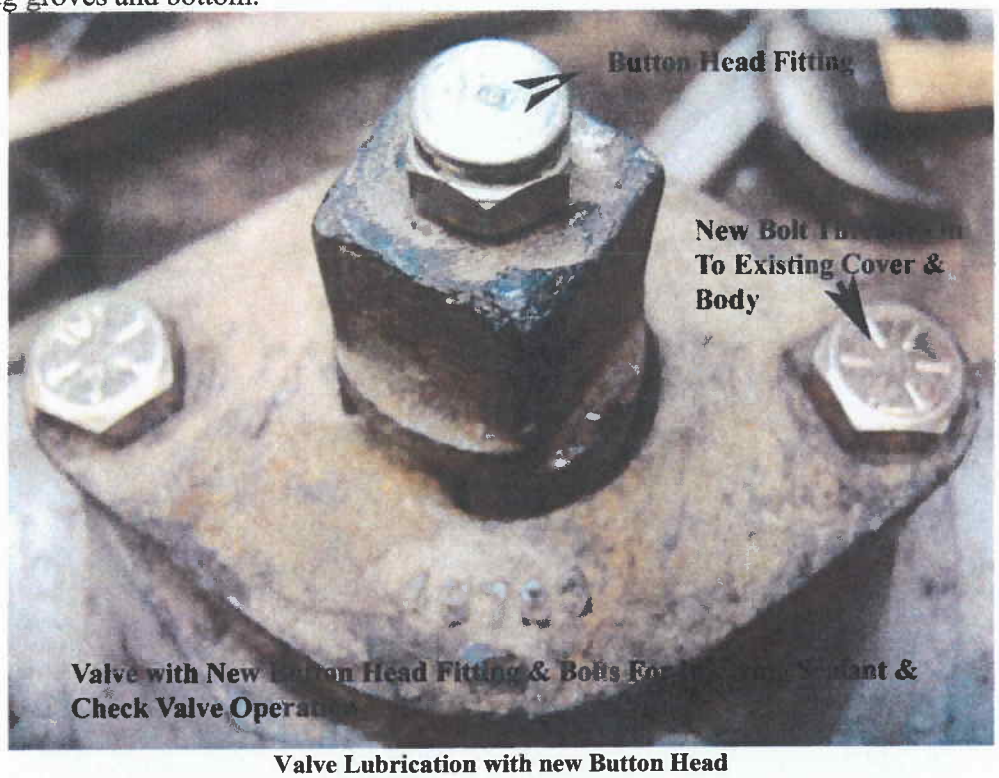
Hardened 555 Sealant & Debris in Bottom

Protocol 3: Inspection of the valve body threads – The threads on the valve cover and body were examined and checked with the gauge for thread damage and corrosion. There was no evidence of the thread damage or corrosion.



LH & RH Valve Body Threads

Protocol 4: Lubrication Simulation - The valve was reassembled using new bolts. A new button head fitting was installed and lubricated using Nordstrom 1033 sealant material. After the injection of sealant, valve was operated with the wrench without any difficulty. The valve was disassembled to check the presence of sealant on plug groves and bottom.



Valve Lubrication with new Button Head

Protocol 5: Failure Simulation Test for Plug Blow Out:

The incident was simulated to determine how many turns of bolt threads would cause a leakage between cover and body and potentially lead to an ultimate plug blow out. This simulation was performed by the hydro test utilizing 60 PSIG water pressure. The test revealed that when the body bolts were loosened one half turn the water started leaking between cover and body. The bolts were gradually loosened to a point where the entire lengths of the bolts were unscrewed under water pressure and the valve plug popped out.

A DVD for the protocol test 5 is available for view. If interested in viewing the DVD, please contact Materials & Testing Laboratory in Hicksville @516-545-2508.

Conclusion:

Based on the examination of the valve body, plug, cover and the simulation tests performed, it was evident that the crew failed to follow the proper valve maintenance procedures. The crew did not recognize the hazard associated with loosening the cover bolts of the valve that was operating at 60 PSIG gas pressure. The crew failed to recognize the difference between the two bolts adjustable cover design and bolted gland design valves. The crew interview revealed that they were under the impression that the valve plug was designed with a retainer to prevent blow out of the plug. The crew should have replaced the button head fitting, purge the valve to dissolve hardened sealant and than lubricated the valve with the sealant before loosening the cover bolts.

Recommendations:

1. Immediately stop the practice of loosening the valve cover bolts to release the seized plug during routine maintenance of in-service valve.
2. Review training and qualification procedure for personnel involved in valve maintenance program
3. Introduce valves recognition program and identify the hazards associated with the in-service maintenance of valves.
4. Utilize dedicated and skilled personnel for the valve maintenance program.
5. Ensure that the button head fittings are stock items and all valve maintenance crew trucks carry different fittings utilized on various types of valves.
6. Review maintenance procedure for the Nordstrom 400D hand gun and Hyper Gun used for sealant injection.
7. Re-train personnel for sealant injection while utilizing the pressure gauge of the injection gun as a diagnostic tool for valve condition.
8. Since Nordstrom two bolt adjustable cover, quarter turn, plug valves were manufactured in 1920-1986 they are more prone to corrosion due to the gap between the valve stem and cover. This corrosion is caused by water migration from the gap. All crews should be trained to check the corrosion between the stem and cover before proceeding to any maintenance steps.
9. Utilize Flowserve (Nordstrom) DVD resources for Nordstrom valves maintenance guide for training and refresher training.

Appendix – 1

4/27/09 Interview with Robert Devito

4/27/09 Interview with Robert Devito

Present at interview: Tom Marr (Safety), Tony Campo (Supervisor), Tom Finneral (Acting Manager), Robert Devito (A-Tech – 12012) and Lenny Nutter (Shop Stuart – 12012)

The following is a list of questions that were asked and the answers provided by Robert Devito:

In your own words describe incident:
Previously tried to grease valve on separate occasion and grease would not go in, would not build up pressure. Returned on a second occasion to dig the valve to free it. Noticed ¾" grease stem rotted out. Didn't have a plug to plug off valve if grease stem removed. Called for a grease stem to be delivered. In the meantime, decided to loosen the bolts. Once loose, hit bonnet with a 3lb. sledge slammer to loosen, and valve plug blew out of main. Not sure if he had blacked out for a few seconds, but through the dust and debris, saw the coveralls of Paul Tremblay moving up the ladder and made his way toward ladder and out of hole.

Who was performing work on the valve at time of incident?
Bob Devito was performing the work on the valve. Paul Tremblay was assisting within the excavation and Frank Puppo was bringing over tools and equipment from outside the hole.

What was the condition of the valve?
Grease stem rotten out, but the valve itself didn't look in bad condition.

Did you loosen or remove the bolts?
Yes, the bolts were loosened, but not removed.

How far and how many turns?
Doesn't remember how many turns on the ratchet to remove the bolts. Did mention that it got easier then harder, easier then harder to a point were he could wiggle the bolts by hand.

Was there a gas leak as a result of loosening the bolts?
No, no sign of gas leak at bonnet.

How long were the bolts?
Bob had no idea how long the bolts were, also mentioned he didn't know if they were consistent in size and if they were the original bolts?

What tools were you using to free valve?
Chipping hammer, 3 lb. sledge hammer and ratchet.

What PPE was utilized?

FR coveralls (loosely secured at ankle), hard hat, safety glasses, gauntlet work gloves.

Was any lubricant used?
Yes, used penetrating oil on top of bonnet, stem and bolts and did help free the bolts.

Was valve tried prior to performing this work?
Yes, once they exposed the valve, they removed valve riser and tried to operate valve with valve wrench and no persuader.

What direction was given to Paul Tremblay?
Only directions were for tools and assistance.

Did you flush the valve?
Could not flush the valve, since grease stem was rotted.

How do you typically grease a valve?
Remove grease stem, clean out in truck and replace, and then apply the grease.

Was a job brief performed?
Pretty sure he performed one, and would have been in the truck.

Did anything change that would require an additional job brief or tailgate talk?
No, nothing out of the ordinary until valve released.

When was last time you performed this task?
The day before, he repaired a valve on Lakeview Ave, Dracut. Used the same process – removed and replaced grease stem, greased valve and valve operated. This was a 2" plug valve with 2 bolts.

In your opinion, what was the cause of this incident?
Possibly the condition of the bolts, this was the weakest part of equation.

What is your experience in working in the street department?
Approx. 12 years in the street department and approx. 5 years as an A-Tech.

How often do you perform this type of repair work on a valve?
Not often at all.

Would you do anything differently as a result of this incident?
Replace grease stem, grease and operate. If it did not operate, he would put in for a cut out. He would not loosen bolts again.

Describe training that you've received on working on valves?
Very vague information, reviewed policy mostly, nothing specific to freeing a stuck valve. Learned by hands on out in the field.

What type of information did you have on this particular valve?
He knew the pressure and size of main. Assumed it was a ¼ turn valve, but didn't know until it was excavated. No knowledge of type of valve prior to excavating.

Did you know that the plug would come out if bolts were loosened or removed?
Bob indicated that he didn't know that if bolts were loosened or removed that the plug would come out. Stated that he thought there would be a retainer ring under the bonnet to keep the plug secure.

Recommendations provided by Robert Devito

- Recommended employees tuck in the fire suit to the boot or a drawstring be made available to better secure the cuffs to your ankles.
- Recommended not touching the bolts and cut in a new valve in similar cases.

5/11/09 Follow up Interview with Robert Devito

Present at interview: Tom Marr (Safety), Tom Finneral (Acting Manager), Robert Devito (A-Tech – 12012) and Lenny Nutter (Shop Stuart – 12012)

The following is a list of questions that were asked and the answers provided by Robert Devito:

Once exposed, explain what was done with the grease stem:
While digging valve, the grease stem was laying sideways in the trench. Completely rotten out at the bottom. Noticed it was a 3/8" riser and doesn't carry any 3/8" stock on truck. Called Rich Lefebvre (Dump Truck Driver) to bring out 3/8" stock. Didn't have a 3/8" plug or pipe.

Did Rich give you an estimated time of arrival?
Thought it was about 20 minutes.

What size was the grease stem you replaced the previous day?
1/2" grease riser the day before on Lakeview Ave, Dracut.

Were you rushing to move to another job, were you assigned any additional jobs?
Was not sitting on any Grade 1's, wasn't rushing to get to another site. This was their scheduled job for the day.

Why didn't you wait until the new grease stem arrived before loosening bolts?
The valve was stuck solid and thought if he would loosen the bolts, it would free the plug to allow the grease to get around it when the fittings arrived.

Have you done this process in the past?
Did the same process the day before on Lakeview Ave, Dracut. Was not concerned loosening these bolts prior to the fittings arriving.

Was there anything different about loosening the bolts?
The bolts at Lakeview Ave loosened evenly, whereas these bolts were tight, then loose, then tight and loose again.

Did you loosen the bolts more than the previous one?
No, they loosened differently, but about the same amount.

Did you work late the night before, where you fatigued or tired?
Bob didn't recall working an extended shift the day prior and doesn't recall being overly tired or fatigued.

Having tried this valve before, what were your expectations on repairing the valve?
Replace the grease stem, grease valve and loosen the valve bolts to free it.

EXHIBIT 2

National Grid Incident Report to D.P.U.

nationalgrid

D.P.U. INCIDENT REPORT

TODAY'S DATE: April 23, 2009
DATE/TIME OF INCIDENT: 04/16/09 @ 10:29

Mr. Christopher Bourne
Department of Public Utilities
Pipeline Safety and Engineering Division
One South Station
Boston, MA 02110

INCIDENT LOCATION	TYPE OF INCIDENT	# PEOPLE AFFECTED	DATE/TIME CALLED	DOT NOTIFIED
Pleasant St @ Hildreth St. Dracut, MA Dispatched @ 10:29 On Site @ 10:31	**Leak:** **Outage:** **Evacuation: X** **Time Out: 10:29** **Time In: 13:00**	**100 - 150**	**To Dispatch: 10:11** **To D.P.U.: 11:56**	**Yes _____** **Time __ _** **No.: X**

PROBABLE CAUSE: MSF Crew working on 4 inch intermediate pressure value (doing critical value inspection) had operating plug blow off injuring 2 employees. Both employees were hospitalized. Fire Department and National Grid evacuated 100-150 people from 11 buildings. Customers were allowed back in at approximately 13:00. 93 accounts affected while repairs were being made. Repairs consisted of cutting and welding in new valve. Valve was reopened at approximately 19:00 and gas restored to all customers by 21:45.

PERSON(S) INJURED	TYPE OF EMERGENCY CARE
DeVito & Tremblay sent to hospital	Hospitalized for injuries

PROPERTY DAMAGES:

LOCATION OF DAMAGE	TYPE OF DAMAGE
N/A	N/A

TOTAL DURATION EVACUATION: 2.5 Hours
TOTAL DURATION OUTAGE:

NATIONAL GRID PERSONNEL RESPONSE:

EVACUATED BY:
FIRE DEPT. ___X___
POLICE _____
SELF _____
NATIONAL GRID ___X___

NATIONAL GRID
LEGAL SERVICES
(781) 907-1854

EXHIBIT 3

Dracut Fire Department Report

7079	MA	04/16/2009	1	22145	0	NFIRS - 1
DID	State	Incident Date	Station	Incident Number	Exposure	Notes

Notes Notes Page 1

COPY

Type of Call: High Pressure Gas Leak
Location: Intersection of Pleasant St/Hildreth St

Alarm Time: 1003

Owner: National Grid
Cause: Nat Grid workers performing maintenance on valve.
Equipment: CGI Meters, SCBA'S,

Received a call from the police for a gas explosion with injuries at the above location. Car 2 arrived on scene and reported a major gas leak with injuries. Further update reported a four inch high pressure gas main leaking. A first alarm was dispatched. All residents within a 500' radius were evacuated. Two National Grid employees were injured and treated by Patriot Amb and Lowell Paramedics and were transported to Lowell General Hospital. Both patients were transported from Lowell General to Brigham and Womans in Boston for further evaluation. Dracut Fire had no patient contact with either patients.A command post was set up on the D side of Hannafords Market.

The door to 475 Hildreth St was forced open and checked with National Grid personnel. A chain was cut on a gate to gain entrance to the rear of the Trend Setters Salon.Dracut Fire personnel evacuated homes on Hovey St, Pleasant St and Hildreth St. per National Grid.

E-3 blocked Hildreth St @ Tobey Rd
E-2 monitored the inside air of Hannafords Market for gas.
E-1 blocked PleasantSt @ Hannafords entrance.
R-1 blocked Hovey and Hildreth St.
Command - Dep Ralls
EMS Command- Ben Podsiebio of Saints Paramedics
Emerg Mngt- Dep Patterson
Info Officer- Chief Gaudette, Town Manager Dennis Piendak

Patient #1- Paul Trembly 69 Linden St Salem N.H.
Patient #2- Robert Devito 176 Varnum Rd Dracut Mass.

Last two units were called back for Station coverage.

Michael Ralls D.C.

Attention: John Gatherun

FDID	State	Incident Date	Station	Incident Number	Exposure	Civ. Casualty
17079	MA	04/16/2009	1	22145	U	

Injured Person

[X] Male [ ] Female

Paul (First Name) M Trembly (Last Name) Suffix

COPY

Casualty Number 1

Age or Date of Birth

25 Age [ ] Months (infants)

OR

Date of Birth

Race

Race code

Affiliation

0 Other

Affiliation code

Ethnicity

[ ] Hispanic

Date & Time of Injury

4/16/2009 10:03:00AM

Severity

2 Moderate

Severity code

Cause of Injury

7 Struck by or contact with object

Cause code

Human Factors Contributing to Injury

[ ] None
[ ] Asleep
[ ] Unconscious
[ ] Possibly impaired/alcohol
[ ] Possibly impaired/other drug
[ ] Possibly mentally disabled
[ ] Physically disabled
[ ] Physically restrained
[ ] Unattended person

Factors Contributing to Injury

[ ] None

UU Undetermined

Contributing factor (1)

Contributing factor (2)

Contributing factor (3)

Activity When Injured

0 Other activity

Activity code

Location at Time of Incident

0 Other location

Location code

General Loc. at Time of Injury

1 In area of origin

Location code

Story at Start Of Incident

0 [ ] below grade

Story Where Injury Occurred

0 [ ] below grade

Specific Location at Time of Injury

Specific location code

Primary Apparent Symptom

24 Contusion/bruise: minor trauma

Primary apparent symptom code

Primary Area of Body Injured

1 Head

Primary area of body code

Disposition

[X] Transported to Emerg. care facility

Remarks

National Grid worker was injured when doing maintenance work on natural gas line valve. The pt was treated by Greater Lowell Paramedics and Patriot ambulance. The pt. was transported to Lowell General Hospital by Patriot Ambulance then to Brigham and Womans in Boston. Dracut Fire had no patient contact.

FDID	State	Incident Date	Station	Incident Number	Exposure	Civ. Casualty
17079	MA	04/16/2009	1	22145	0	

Injured Person

[X] Male [ ] Female

Casualty Number: 2

Robert (First Name) | MI | Devito (Last Name) | Suffix

Age or Date of Birth

37 Age [ ] Months (infants)

OR

Date of Birth

Race

Race code

Affiliation

0 Other

Affiliation code

Ethnicity

[ ] Hispanic

Date & Time of Injury

4/16/2009 10:03:00AM

Severity

2 Moderate

Severity code

Cause of Injury

7 Struck by or contact with object

Cause code

Human Factors Contributing to Injury

[ ] None
[ ] Asleep
[ ] Unconscious
[ ] Possibly impaired/alcohol
[ ] Possibly impaired/other drug
[ ] Possibly mentally disabled
[ ] Physically disabled
[ ] Physically restrained
[ ] Unattended person

Factors Contributing to Injury

[ ] None

UU Undetermined

Contributing factor (1)

Contributing factor (2)

Contributing factor (3)

Activity When Injured

0 Other activity

Activity code

Location at Time of Incident

0 Other location

Location code

General Loc. at Time of Injury

1 In area of origin

Location code

Story at Start Of Incident

0 [ ] below grade

Story Where Injury Occurred

0 [ ] below grade

Specific Location at Time of Injury

Specific location code

Primary Apparent Symptom

24 Contusion/bruise: minor trauma

Primary apparent symptom code

Primary Area of Body Injured

1 Head

Primary area of body code

Disposition

[X] Transported to Emerg. care facility

Remarks

National Grid worker was injured when doing maintenance work on natural gas line valve. The pt. was treated by Greater Lowell Paramedics and Patriot ambulance. The pt. was transported to Lowell General Hospital by Patriot Ambulance then to Brigham and Womans in Boston. Dracut Fire had no patient contact.

EXHIBIT 4

Sequence of Events

Information Request PL 1-1

Respondent: Thomas Finneral

Request: Describe in detail the sequence of events. Include in your response a description of the incident, the reason the crew was working at this location, what the individual crew members were doing at the time the Incident occurred, the cause of the gas to ignite and the actions the crew members took to make the area safe. Your response should include, but not be limited to, all records that demonstrate: (1) the time National Grid was notified of the Incident; (2) when Dispatch notified the leak responder, crew and supervisor(s) to report to Dracut; and (3) when National Grid first notified the Pipeline Engineering and Safety Division of the Incident. Include in your response documentation of the National Grid gas employee(s) arrival times; and when National Grid initiated an Emergency Notification to staff.

Response:

On Thursday, April 16, 2009 at approximately 10:10 a.m., a Maintain crew was performing scheduled valve maintenance on Pleasant Street, Dracut, Ma. The crew had a 4" (60 PSIG) value head unexpectedly open up on them creating an uncontrolled escape of gas injuring 2 crew members. The fire department reported the incident and a leak order was generated and dispatched at approximately 10:29 a.m. to a first responder who arrived on site at approximately 10:31 a.m. The fire department evacuated 100-150 people from approximately 100 buildings. The incident resulted in the shut down of a main (off and safe at 12:36 p.m) at which time those that were excavated were allowed back into buildings. The resulting outage affected 148 customers. National Grid is adjusting the number that was initially reported to the Pipeline and Safety Division since it has discovered that 204 Pleasant Street which had it had initially counted as 11 accounts, in fact supplied 66 ranges and thus has adjusted number accordingly. The main valve was replaced and repairs were completed at 6:47 p.m and relight process started with service restored to all but 12 accounts (C.G.I.'s) by 9:45 p.m. National Grid first notified the Pipeline Engineering and Safety Division at 11:56 a.m.

EXHIBIT 5

Main Information

Information Request PL 1-4

Respondent: Thomas Finneral/Eileen Ormand/James Hughes

Request: Provide all records for the mains on Hildreth and Pleasant Streets affected by the shutdown at the Incident location, including but not limited to, installation date, cathodic protection, maximum allowable operating pressure ("MAOP") and operating pressure at the time of the Incident. Include in your response a description of any maintenance or replacement work performed on the main within the last five years.

Response: On Hildreth Street there is a 4 inch coated steel main that was installed in 1985 that transitions to a 4 inch plastic main that was installed in 1999. On Pleasant Street there is an 8 inch coated steel main installed in approximately 1959 that transitions to a 8 inch plastic main that was installed in 1994. The MAOP for these mains is 60 P.S.I.G. and the operating pressure at the time of the incident was approximately 57 P.S.I.G (see Exhibit IR PL 1-13). Attached as Exhibit IR PL 1-4 are records for all work performed on mains on Hildreth and Pleasant Streets affected by the incident for the past 5 years.

On the coated steel main in Hildreth St from Pleasant Street to the north (MDRA0102 - A001):
- 04/23/2009 = - 1.00 V
- 04/21/2009 = - 1.13 V
- 07/02/2008 = - 1.00 V
- 07/03/2007 = - 0.95 V

On the coated steel main in Pleasant St from Hildreth St to the east and west (IDRA0132 - A010):
- 06/27/2008 = - 1.16 V
- 08/08/2007 = - 1.10 V

All of the readings indicate adequate levels of cathodic protection

EXHIBIT 6

Pressure Chart Readings of Nearest
Regulator Station Servicing the Area

04/16/09 09:36	58.1901
04/16/09 09:37	58.1901
04/16/09 09:38	58.2170
04/16/09 09:39	58.2438
04/16/09 09:40	58.2707
04/16/09 09:41	58.2975
04/16/09 09:42	58.3244
04/16/09 09:43	58.3244
04/16/09 09:44	58.3781
04/16/09 09:45	58.3781
04/16/09 09:46	58.3781
04/16/09 09:47	58.3781
04/16/09 09:48	58.3781
04/16/09 09:49	58.3781
04/16/09 09:50	58.3244
04/16/09 09:51	58.2975
04/16/09 09:52	58.2707
04/16/09 09:53	58.2707
04/16/09 09:54	58.2438
04/16/09 09:55	58.2170
04/16/09 09:56	58.2438
04/16/09 09:57	58.2438
04/16/09 09:58	58.2438
04/16/09 09:59	58.2707
04/16/09 10:00	58.2707
04/16/09 10:01	58.2707
04/16/09 10:02	58.2707
04/16/09 10:03	58.0559
04/16/09 10:04	57.9216
04/16/09 10:05	57.8410
04/16/09 10:06	57.7873
04/16/09 10:07	57.7605
04/16/09 10:08	57.7605
04/16/09 10:09	57.7605
04/16/09 10:10	57.7605
04/16/09 10:11	57.7605
04/16/09 10:12	57.7336
04/16/09 10:13	57.7605
04/16/09 10:14	57.7605
04/16/09 10:15	57.7605
04/16/09 10:16	57.7336
04/16/09 10:17	57.7605
04/16/09 10:18	57.7873
04/16/09 10:19	57.7605
04/16/09 10:20	57.7873
04/16/09 10:21	57.7605
04/16/09 10:22	57.7873
04/16/09 10:23	57.7873
04/16/09 10:24	57.7873

EXHIBIT 7

Primary Valve Maintenance Report

Work Order 363258 Region/Company NEGCLW Work Type IV Status CASBUILT

Location 454698 HILDRETH ST,DRA Status Due Date

Direction From Int. Street 1 PLEASANT ST Date Received 3/19/2004 4

Int. Street 2 Town DRA

Belongs To Location Priority

Equipment WO Priority

Contact Information | Violation/Delay | Notifications | CUE | Damages | Diary

Location Detail

Requestor

Customer

Phone Role MANDATED PR

Parking Reg

Svc Seq # Circuit # Map/Grid

Billing Unit Tax District DRA

Problem | Classification | Responsibility

Failure Class		Job Plan		Own. Org.	MSFLOW	Scheduler	CH4
Problem Code		Program	PVIP	Perf. Org.	MSFLOW	Crew Leader	
Leak Reading%		Safety Plan		Proj. Mgr.	KLC	Contr. Company	
Upgraded Date		PM		Designer		Contr. Contact	

Associated Project/ Work Order Detail | Scheduling Information | Follow-up Work

		Start	Completion		
Oracle Project #	LOW003	Target	12/31/2004 12:00	Originating WO	
FWMS Project #		Scheduled		Has Follow-up Work?	N
LMS #		Actual	10/10/2004 5:34 A	10/10/2004 5:36 A	
Ext Ref #	VDRA003H	Customer Need/Appt. Date		Modified	
Status 1703		Est. Dur. 0:00	Rem. Dur.	Ping./Sched?	By CH4
					Date 10/10/2004

Work Order 363258 WorkType IV Status CASBUILT

Location 454698 HILDRETH ST,DRA Town DRA

Operation 10 Standard Unit Count 1

Loc 454698 HILDRETH ST,DRA Completion Date 9/29/200

Repairs

Work Action	NONLK	Paving Code		# Main FT Inspected		Repair sent to LMS?	N
		Joint Seal Replaced?		Type of Joint Replaced		Reason for Failure	
Facility Type	MAIN	Size	04	Material	CS	Pressure	I
Where Leak		Leak Cause		Contributing Factor		Depth	
Comments						Construction Type	

Relights

RGO Performed?		House Heaters		Water Heaters	
Standby?		Ranges		Other	
Reconnect?		Comments			

Pressure Test

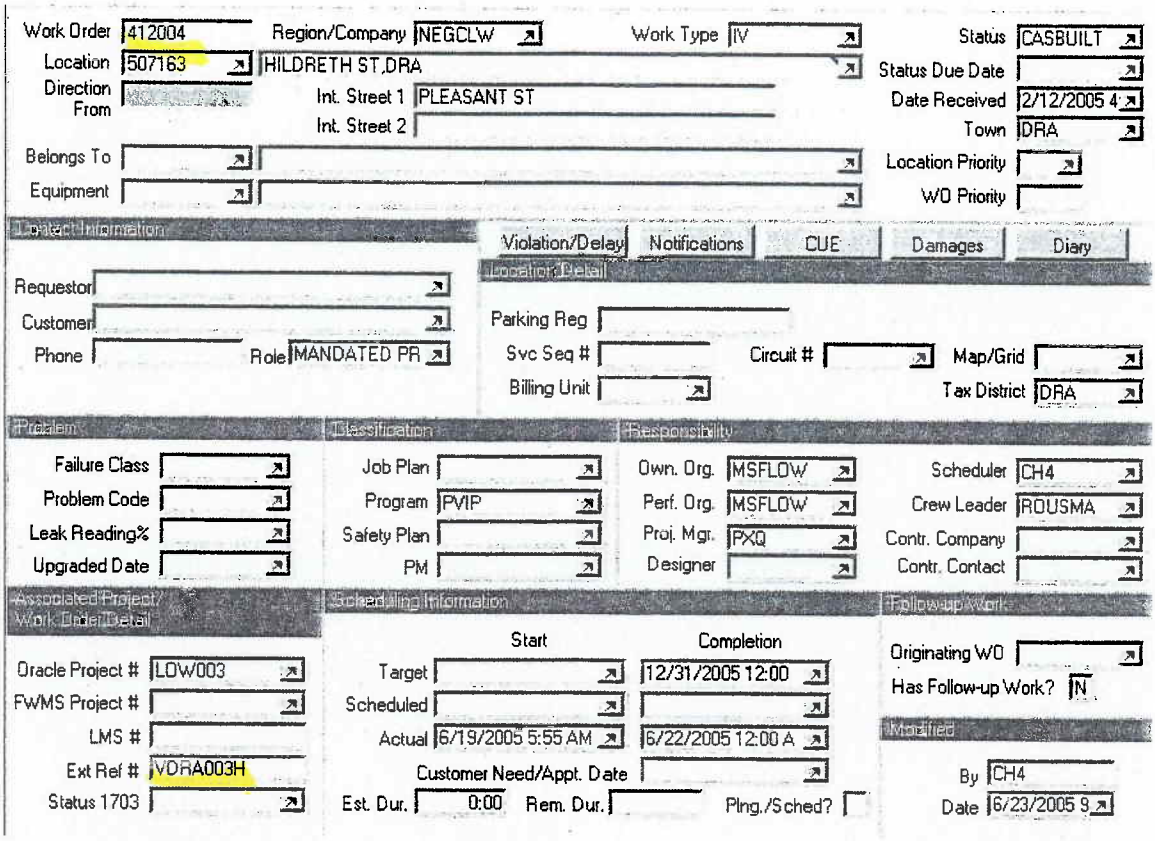
Pressure Medium

Duration Chart?

Valve Inspections

Primary Valve?	Y	Location Verified ?	Y	Valve Greased	R
Valve Box Cleaned	2	Valve Operability?		CGI Reading (% Gas)	0

Comments operated



Work Order 412004 Region/Company NEGCLW Work Type IV Status CASBUILT
Location 507163 HILDRETH ST,DRA Status Due Date
Direction From Int. Street 1 PLEASANT ST Date Received 2/12/2005 4
Int. Street 2 Town DRA
Belongs To Location Priority
Equipment WO Priority

Project Information | Violation/Delay | Notifications | CUE | Damages | Diary

Requestor
Customer
Phone Role MANDATED PR

Location Detail
Parking Reg
Svc Seq # Circuit # Map/Grid
Billing Unit Tax District DRA

Problem
Failure Class
Problem Code
Leak Reading%
Upgraded Date

Classification
Job Plan
Program PVIP
Safety Plan
PM

Responsibility
Own. Org. MSFLOW Scheduler CH4
Perf. Org. MSFLOW Crew Leader ROUSMA
Proj. Mgr. PXQ Contr. Company
Designer Contr. Contact

Associated Project/ Work Order Detail
Oracle Project # LOW003
FWMS Project #
LMS #
Ext Ref # VDRA003H
Status 1703

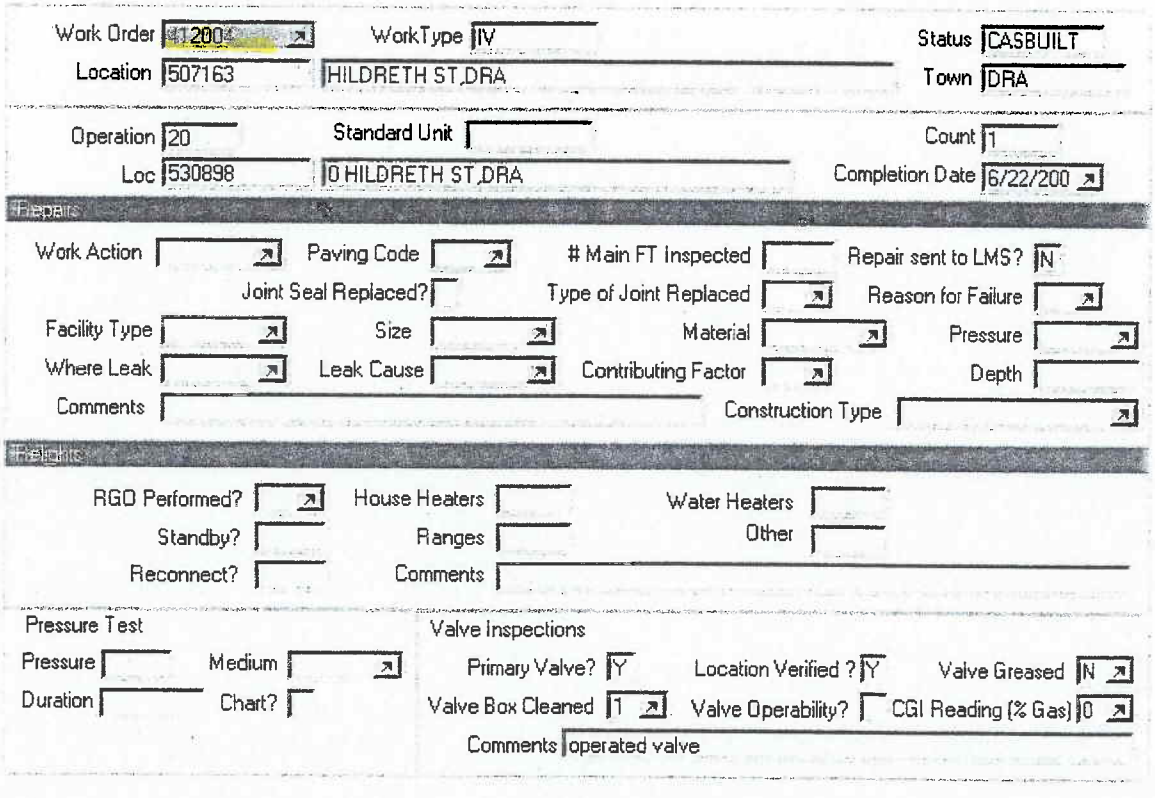
Scheduling Information

	Start	Completion
Target		12/31/2005 12:00
Scheduled		
Actual	6/19/2005 5:55 AM	6/22/2005 12:00 A
Customer Need/Appt. Date		

Est. Dur. 0:00 Rem. Dur. Plng./Sched?

Follow-up Work
Originating WO
Has Follow-up Work? N

Modified
By CH4
Date 6/23/2005 9



Work Order 412004 WorkType IV Status CASBUILT
Location 507163 HILDRETH ST,DRA Town DRA
Operation 20 Standard Unit Count 1
Loc 530898 0 HILDRETH ST,DRA Completion Date 6/22/200

Repairs
Work Action Paving Code # Main FT Inspected Repair sent to LMS? N
Joint Seal Replaced? Type of Joint Replaced Reason for Failure
Facility Type Size Material Pressure
Where Leak Leak Cause Contributing Factor Depth
Comments Construction Type

Freights
RGO Performed? House Heaters Water Heaters
Standby? Ranges Other
Reconnect? Comments

Pressure Test
Pressure Medium
Duration Chart?

Valve Inspections
Primary Valve? Y Location Verified ? Y Valve Greased N
Valve Box Cleaned 1 Valve Operability? CGI Reading (% Gas) 0
Comments operated valve

Work Order 471658 | Region/Company NEGCLW | Work Type IV | Status CASBUILT

Location 571003 | HILDRETH ST,DRA | Status Due Date

Direction From | Int. Street 1 PLEASANT ST | Date Received 1/20/2006 4

Int. Street 2 | Town DRA

Belongs To | Location Priority

Equipment | WO Priority

Contact Information

Violation/Delay | Notifications | CUE | Damages | Diary

Requestor

Customer

Phone | Role MANDATED PR

Location Detail

Parking Reg

Svc Seq # | Circuit # | Map/Grid

Billing Unit | Tax District DRA

Problem

Failure Class

Problem Code

Leak Reading%

Upgraded Date

Classification

Job Plan

Program PVIP

Safety Plan

PM

Responsibility

Own. Org. MSFLOW | Scheduler CH4

Perf. Org. MSFLOW | Crew Leader MARIJ

Proj. Mgr. | Contr. Company

Designer | Contr. Contact

Associated Project/ Work Order Detail

Oracle Project # LOW003

FWMS Project #

LMS #

Ext Ref # VDRA003H

Status 1703

Scheduling Information

	Start	Completion
Target		6/22/2006 12:00 A
Scheduled		
Actual	3/11/2006 8:56 AM	3/14/2006 12:26 P

Customer Need/Appt. Date

Est. Dur. 0:00 | Rem. Dur. | Plng./Sched?

Follow-up Work

Originating WO

Has Follow-up Work? N

Modified

By SMARTTIME

Date 8/19/2006 7

Work Order 471658 | WorkType IV | Status CASBUILT

Location 571003 | HILDRETH ST,DRA | Town DRA

Operation 10 | Standard Unit | Count 1

Loc 571003 | HILDRETH ST,DRA | Completion Date 8/18/200

Repairs

Work Action NONLK | Paving Code | # Main FT Inspected | Repair sent to LMS? N

Joint Seal Replaced? | Type of Joint Replaced | Reason for Failure

Facility Type | Size | Material | Pressure

Where Leak | Leak Cause | Contributing Factor | Depth

Comments | Construction Type

Relights

RGO Performed? | House Heaters | Water Heaters

Standby? | Ranges | Other

Reconnect? | Comments

Pressure Test

Pressure | Medium

Duration | Chart?

Valve Inspections

Primary Valve? Y | Location Verified ? Y | Valve Greased N

Valve Box Cleaned N | Valve Operability? | CGI Reading (% Gas) 0

Comments VALVE OPERATED

Work Order 527631 | Region/Company NEGCLW | Work Type IV | Status CASBUILT
Location 629762 | HILDRETH ST,DRA | Status Due Date
Direction From | Int. Street 1 PLEASANT ST | Date Received 1/3/2007 4:
Int. Street 2 | Town DRA
Belongs To | Location Priority
Equipment | WO Priority

Contact Information | Violation/Delay | Notifications | CUE | Damages | Diary

Location Detail

Requestor
Customer
Phone | Role MANDATED PR
Parking Reg
Svc Seq # | Circuit # | Map/Grid
Billing Unit | Tax District DRA

Problem | Classification | Responsibility

Failure Class | Job Plan | Own. Org. MSFLOW | Scheduler CH4
Problem Code | Program PVIP | Perf. Org. MSFLOW | Crew Leader POMEMJ
Leak Reading% | Safety Plan | Proj. Mgr. | Contr. Company
Upgraded Date | PM | Designer | Contr. Contact

Associated Project/ Work Order Detail | Scheduling Information | Follow-up Work

Oracle Project # LOW003
FWMS Project # | Start | Completion | Originating WO
LMS # | Target | 3/14/2007 12:00 A | Has Follow-up Work? N
Ext Ref # VDRA003H | Scheduled | | Modified
Status 1703 | Actual 1/3/2007 9:02 AM | 1/4/2007 8:18 AM | By SMARTTIME
Customer Need/Appt. Date | Date 1/6/2007 7:
Est. Dur. 0:00 | Rem. Dur. | Plng./Sched?

Work Order 527631 | WorkType IV | Status CASBUILT
Location 629762 | HILDRETH ST,DRA | Town DRA

Operation 10 | Standard Unit | Count 1
Loc 629762 | HILDRETH ST,DRA | Completion Date 1/4/2007

Repairs

Work Action | Paving Code | # Main FT Inspected | Repair sent to LMS? N
Joint Seal Replaced? | Type of Joint Replaced | Reason for Failure
Facility Type | Size | Material | Pressure
Where Leak | Leak Cause | Contributing Factor | Depth
Comments | Construction Type

Relights

RGO Performed? | House Heaters | Water Heaters
Standby? | Ranges | Other
Reconnect? | Comments

Pressure Test

Pressure | Medium
Duration | Chart?

Valve Inspections

Primary Valve? Y | Location Verified ? Y | Valve Greased N
Valve Box Cleaned 2 | Valve Operability? Y | CGI Reading (% Gas) 0
Comments NC

EXHIBIT 8

Work Order

Work Order	581765	WorkType	IV	Status	CASBUILT
Location	686415	HILDRETH ST,DRA		Town	DRA

Operation	20	Standard Unit		Count	1
Loc	686415	HILDRETH ST,DRA		Completion Date	2008-01-24-0.0

Repairs

Work Action		Paving Code		# Main FT Inspected		Repair sent to LMS?	N
		Joint Seal Replaced?		Type of Joint Replaced		Reason for Failure	
Facility Type		Size		Material		Pressure	
Where Leak		Leak Cause		Contributing Factor		Depth	
Comments				Construction Type			

Relights

RGO Performed?		House Heaters		Water Heaters	
Standby?		Ranges		Other	
Reconnect?		Comments			

Pressure Test

Pressure		Medium	
Duration		Chart?	

Valve Inspections

Primary Valve?	Y	Location Verified ?	Y	Valve Greased	N
Valve Box Cleaned	2	Valve Operability?	Y	CGI Reading (% Gas)	0
Comments	CK V				

EXHIBIT 9

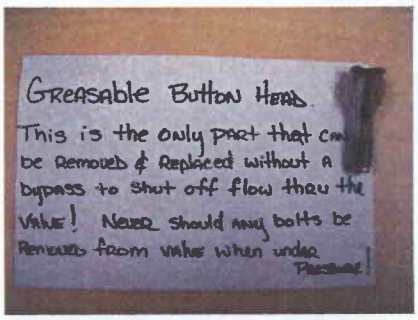
Segments of Training Program

Information Request PL 3-4

Respondent: Pasquale DiGregorio

Request: Provide a copy of the training program that was provided to the employees involved in the incident with respect to the operation and maintenance of critical valves. Identify the segments of the training program that explain the lubrication of valves and the removal of valve covers including the type of valve involved in this incident.

Response: The employees received training on the maintenance and operation of valves as part of National Grid's basic training course (Module 14). An important part of this training is a hands on component where the instructor demonstrates how to remove the cover and lubricate valves using cuts outs(see below). The instructor would also cover the key components of National Grid's Valve Inspection Policy. See Module 14 and Valve Inspection Policy marked as Exhibit PL 3-4



3.1 General Requirements

a. The following valves shall be inspected and tested for proper operation annually.
   1. Valves on gas systems operating at pressures of 125 PSIG or higher.
   2. Sectionalizing Valves on gas systems operating at pressures of 124 PSIG or less.
   3. Regulator Station Valves that have been specifically designated as required for the safe operation of the station.
   4. System Interconnect Valves.

3.2 Valve Inspections

The processes described in this section apply to all the valves covered by this document.

a. Prior to inspection, perform a leak check with a Combustible Gas Indicator in the valve box or pit. If the readings are detected, take appropriate action.

b. Ensure that all required valve data is provided and available. Update hose systems as necessary.

   1. Required valve data (for valves covered by this procedure) shall include the location of the valve, direction of rotation, number of turns to fully operate, and valve number.
   2. Additional data (for valves covered by this procedure) should include size, valve type, depth of cover and the valve manufacture.

3.2 Valve Inspections

c. Accurately locate valve using available information
   1. Verify the "as found" measurements are accurately documented in valve records.
   2. Correct valve records as necessary.

d. Verify that the valve is stamped or tagged with the correct valve number.
   1. Verify the valve number documented on the valve records matches the stamped or tagged number.
   2. If the valve number documented on valve records does not match the stamped or tagged number, notify the supervisor and/or Gas Control immediately, for further instruction.

e. Clear any debris that may impede the operation of the valve.

f. For below grade valves, observe whether the surface connection sleeve contains water or grease. If water is found, clear water from the sleeve so that the operating nut is visible.

3.2 Valve Inspections

g. Test fit a valve key onto the operating nut. Check for key adaptability. (Install an adapter to convert any oblong head on a valve to a 2" square head.)

h. Verify locking device is in place and operational, if applicable.

i. Check whether gears (if any and where accessible) are opened or encased. If encased, check oil level.

j. Where applicable, inspect glands and bolts for corrosion. Replace bolts if necessary.

k. Visually inspect gauge lines, if applicable. Note any corrosion on work order.

l. Inspect oil lines on gauge valves for corrosion.

m. Inspect valve purge points for accessibility and operability. Correct as necessary. Note any corrosion on associated piping and equipment

3.2 Valve Inspections

n. Inspect valve box or pit for deficiencies (i.e., cracked casing, missing cover, etc.)
   1. If the valve is not accessible and cannot be repaired at the time of the inspection, notify Gas Control and create a Repair Work Order.
   2. The repair period for a valve that is not accessible should not exceed 90 days.

3.3 Testing Valve Operation

a. Gas Control shall be notified prior to operating any of the following valves:
   1. Valves on gas systems operating at pressures of 125 PSIG or higher.
   2. Any valve associated with the operation of a regulator station.
   3. System Interconnect valve.
   4. Any valve with a "DO NOT OPERATE" warning tag.

b. Gas Control should be notified prior to operating any sectionalizing valve.

c. Loosen gland bolts, if necessary (on gage valves only), prior to operating.

d. Where possible, visually inspect non-gear operated valves to determine the position of the valve operating head relative to the stops.

e. If visual inspection indicates the valve is not in a fully open position, slowly operate the valve until the operating head rests against the valve stop in a fully open position.

3.3 Testing Valve Operation

f. If the full open position cannot be verified, report this condition to the supervisor and wait further instructions. Document on a Job Order Form that the valve position is uncertain.

g. Install a removable valve key extension on valves as required. The extension shall be removable to facilitate valve lubrication.

h. Insert the valve key on the valve operator to determine if there are any obstacles to using the key for valve operation.

i. If needed, adjust the valve box to all for proper valve key alignment.

j. Verify the valve position by turning against the open stop, for normally open valves, to ensure that the valve is in a a fully open position as indicated on valve documentation

3.3 Testing Valve Operation

k. Place a starting point mark on the ground using the key handle as a reference point prior to turning the key. This reference point will be used to return the valve to its original position.

CAUTION: Exercise extreme care when partially operating valves in order to prevent interrupting the gas supply. If the gas supply is accidentally interrupted, notify the supervisor and Gas Control immediately and await further instructions.

k. "Multi-turn" (gear-operated) valves", in the open position, shall be partially operated to 25% of the total number of turns unless it is requested otherwise by Gas Control. Verify the number of turns, against valve documentation, prior to operating the valve.

3.3 Testing Valve Operation

m. "Quarter turn valves" (i.e., ball valves and plug valves), in the open position, shall be partially operated 1/8 of one full turn (or 50% of the full travel of the valve.) Verify the number of turns, against valve documentation, prior to operating the valve.

n. If the valve is not operable and cannot be repaired at the time of inspection, notify Gas Control and create a Repair Work Order.
   1. The repair period for a valve that is not operable should not exceed 90 days.

o. Return valve to its original full position using the starting mark and note if valve stop hits.
   1. Do not Operate beyond original marked position.
   2. If stop is not felt during operation, report this condition to the supervisor and note on a Job Order Form, that the stop was not felt and full open valve position is uncertain.

3.3 Testing Valve Operation

p. "Motorized Valves": There are several methods of operating motorized valves. The method of operation shall be verified prior to any attempt to inspect or operate these valves. The following are examples.

1. Locally electrically: This is accomplished by setting the selector switch on the valve from remote to local. Then close or open the valve as needed.
2. Manual: This is accomplished by setting the selector switch on the valve from remote to local. This will prevent the Control Center from operating the valve while you are operating the valve. Engage the clutch as stated on the valve. Operate the valves as needed with a hand wheel. To disengage the clutch, operate the valve locally electrically until the clutch disengages, then return the valve to the desired position locally electrically.
3. Valves shall be returned to the remote mode once you are completed with the operation.

q. Perform a leak check (using CGI, and/or soap solution as required) before leaving the location. Any leak found that cannot be repaired during inspection shall be investigated, classified and recorded in the valve documentation.

EXHIBIT 10

National Grid Employee Qualifications

Information Request PL 3-5

Respondent: Pasquale DiGregorio

Request: Refer to the Company Response to IR-PL-1-21. Provide a copy of the operator qualification tests taken by the employees involved in the incident, prior to April 16, 2009, for covered tasks 41-43.

Response: National Grid does track what tasks employees are qualified for and for how long but does not keep the copies of the operator qualification tests.

EMPLOYEE QUALIFICATIONS

06/23/2009 **National Grid - New England**

Employee ID: New-Tremblay **First Name:** Paul **Last:** Tremblay
Title: **Phone:**
Company: National Grid - New England
Company: **State:**
Location:
Department:
Union Code:

QUALIFICATIONS

Task ID	Name	Revision	Date	Next Date
NGA-006	Inspecting for atmospheric corrosion	1	03/06/2009	03/06/2014
NGA-008	Visually inspecting for internal corrosion	1	03/06/2009	03/06/2014
NGA-011	Applying pipe coating in the field	1	03/06/2009	03/06/2014
NGA-012	Cleaning and either coating or jacketing pipe for atmospheric	1	03/06/2009	03/06/2014
NGA-014	Installing/replacing an anode	1	03/06/2009	03/06/2014
NGA-015	Installing/replacing and testing electrical isolation couplings	1	10/10/2008	10/10/2013
NGA-016	Install/replace a corrosion test station on a pipeline	1	03/06/2009	03/06/2014
NGA-017	Repair coating on steel pipelines	1	03/06/2009	03/06/2014
NGA-020	Investigating leak/odor complaints	1	03/06/2009	03/05/2012
NGA-021	Line locating and mark out	1	11/14/2008	11/14/2011
NGA-022	Inspection of 3rd party excavations for damage prevention	1	11/14/2008	11/14/2013
NGA-023	Inspecting the condition of exposed pipe or pipe coating	1	11/18/2008	11/18/2013
NGA-024	Inspect pipe for damage	1	11/18/2008	11/18/2013
NGA-029	Repair distribution line leaks	1	03/06/2009	03/05/2012
NGA-030	Repair a non-leaking damaged pipe	1	03/06/2009	03/06/2014
NGA-032	Purging air from pipeline	1	10/03/2008	10/03/2013
NGA-033	Purging gas from pipeline	1	10/03/2008	10/03/2013
NGA-034	Performing pressure test on a pipeline	1	10/03/2008	10/03/2013
NGA-035	Stopping gas flow	1	08/27/2008	08/27/2011
NGA-036	Abandonment or Deactivation of Facilities	1	08/27/2008	08/27/2011
NGA-037	Tapping pipelines under pressure	1	10/03/2008	10/03/2011
NGA-039	Remove service tee or fitting from steel or cast iron mains	1	08/27/2008	08/27/2013
NGA-040	Install/Replace tracer wire	1	11/18/2008	11/18/2013
NGA-041	Inspect and operate valves	1	08/27/2008	08/27/2013
NGA-042	Repair and maintain distribution line valves	1	08/27/2008	08/27/2013
NGA-043	Lubricate distribution line valves	1	08/27/2008	08/27/2013
NGA-045	Restore service	1	11/18/2008	11/18/2013

EMPLOYEE QUALIFICATIONS

06/23/2009 **National Grid - New England**

Employee ID: New-Tremblay **First Name:** Paul **Last:** Tremblay

Title: **Phone:**

Company: National Grid - New England

Company: **State:**

Location:

Department:

Union Code:

QUALIFICATIONS

Task ID	Name	Revision	Date	Next Date
NGA-047	Abandon a gas service line	1	04/06/2009	04/06/2014
NGA-048	Extend or cut back on an existing service line	1	10/09/2008	10/09/2013
NGA-049	Mechanical Joining of pipe other than plastic	1	03/06/2009	03/05/2012
NGA-050 Demo	Joining plastic pipe	1	02/04/2009	02/04/2010
NGA-050 Written	Joining plastic pipe	1	02/04/2009	02/04/2010
NGA-051 Demo	Install bolt-on tee on plastic pipe	1	02/04/2009	02/04/2010
NGA-051 Written	Install bolt-on tee on plastic pipe	1	02/04/2009	02/04/2010
NGA-052 Demo	Inspect plastic pipe fusion joint	1	03/06/2009	03/06/2010
NGA-052 Written	Inspect plastic pipe fusion joint	1	03/06/2009	03/06/2010
NGA-070	Abnormal Operating Conditions and Properties of Natural	1	08/15/2008	08/15/2011
NGA-071	Operator Excavation and backfilling in the Vicinity of a	1	08/27/2008	08/27/2013
NGA-072	Installation of Customer Meters and Regulators	1	04/06/2009	04/06/2014
NGA-PJQ-01A	Butt Fusion - Straight Pipe	1	02/04/2009	02/04/2010
NGA-PJQ-01B	Butt Fusion - Coiled Pipe	1	02/04/2009	02/04/2010
NGA-PJQ-04	Electro Fusion - Saddle	1	02/04/2009	02/04/2010
NGA-PJQ-05	Electro Fusion - Coupling	1	02/04/2009	02/04/2010
NGA-PJQ-06	Mechanical Coupling - Bolt On	1	02/04/2009	02/04/2010
NGA-PJQ-07	Mechanical Coupling - Stab	1	02/04/2009	02/04/2010
NGA-PJQ-08	Mechanical Coupling - Compression	1	02/04/2009	02/04/2010
NGA-PJQ-09	Mechanical Coupling - Thread	1	02/04/2009	02/04/2010
NGA-PJQ-10	Soil Compaction	1	02/04/2009	02/04/2010

EMPLOYEE QUALIFICATIONS

06/23/2009 **National Grid - New England**

Employee ID: New-Puppo **First Name:** Frank **Last:** Puppo Jr.
Title: **Phone:**
Company: National Grid - New England
Company: **State:**
Location:
Department:
Union Code:

QUALIFICATIONS

Task ID	Name	Revision	Date	Next Date
NGA-006	Inspecting for atmospheric corrosion	1	02/26/2009	02/26/2014
NGA-008	Visually inspecting for internal corrosion	1	02/26/2009	02/26/2014
NGA-011	Applying pipe coating in the field	1	02/26/2009	02/26/2014
NGA-012	Cleaning and either coating or jacketing pipe for atmospheric	1	02/26/2009	02/26/2014
NGA-014	Installing/replacing an anode	1	02/26/2009	02/26/2014
NGA-015	Installing/replacing and testing electrical isolation couplings	1	10/10/2008	10/10/2013
NGA-016	Install/replace a corrosion test station on a pipeline	1	02/26/2009	02/26/2014
NGA-017	Repair coating on steel pipelines	1	02/26/2009	02/26/2014
NGA-020	Investigating leak/odor complaints	1	02/26/2009	02/26/2012
NGA-021	Line locating and mark out	1	02/26/2009	02/26/2012
NGA-022	Inspection of 3rd party excavations for damage prevention	1	11/18/2008	11/18/2013
NGA-023	Inspecting the condition of exposed pipe or pipe coating	1	11/18/2008	11/18/2013
NGA-024	Inspect pipe for damage	1	11/18/2008	11/18/2013
NGA-029	Repair distribution line leaks	1	02/26/2009	02/26/2012
NGA-030	Repair a non-leaking damaged pipe	1	02/26/2009	02/26/2014
NGA-032	Purging air from pipeline	1	10/03/2008	10/03/2013
NGA-033	Purging gas from pipeline	1	10/03/2008	10/03/2013
NGA-034	Performing pressure test on a pipeline	1	11/18/2008	11/18/2013
NGA-035	Stopping gas flow	1	08/27/2008	08/27/2011
NGA-036	Abandonment or Deactivation of Facilities	1	08/27/2008	08/27/2011
NGA-037	Tapping pipelines under pressure	1	10/03/2008	10/03/2011
NGA-039	Remove service tee or fitting from steel or cast iron mains	1	08/27/2008	08/27/2013
NGA-040	Install/Replace tracer wire	1	11/18/2008	11/18/2013
NGA-041	Inspect and operate valves	1	08/27/2008	08/27/2013
NGA-042	Repair and maintain distribution line valves	1	08/27/2008	08/27/2013
NGA-043	Lubricate distribution line valves	1	08/27/2008	08/27/2013
NGA-045	Restore service	1	11/18/2008	11/18/2013

EMPLOYEE QUALIFICATIONS

06/23/2009 **National Grid - New England**

Employee ID: New-Puppo **First Name:** Frank **Last:** Puppo Jr.

Title: **Phone:**

Company: National Grid - New England

Company: **State:**

Location:

Department:

Union Code:

QUALIFICATIONS

Task ID	Name	Revision	Date	Next Date
NGA-047	Abandon a gas service line	1	10/09/2008	10/09/2013
NGA-048	Extend or cut back on an existing service line	1	10/09/2008	10/09/2013
NGA-049	Mechanical Joining of pipe other than plastic	1	02/26/2009	02/26/2012
NGA-050 Demo	Joining plastic pipe	1	02/26/2009	02/26/2010
NGA-050 Written	Joining plastic pipe	1	02/26/2009	02/26/2010
NGA-051 Demo	Install bolt-on tee on plastic pipe	1	02/26/2009	02/26/2010
NGA-051 Written	Install bolt-on tee on plastic pipe	1	02/26/2009	02/26/2010
NGA-052 Demo	Inspect plastic pipe fusion joint	1	02/26/2009	02/26/2010
NGA-052 Written	Inspect plastic pipe fusion joint	1	02/26/2009	02/26/2010
NGA-070	Abnormal Operating Conditions and Properties of Natural	1	08/15/2008	08/15/2011
NGA-071	Operator Excavation and backfilling in the Vicinity of a	1	08/27/2008	08/27/2013
NGA-072	Installation of Customer Meters and Regulators	1	02/26/2009	02/26/2014
NGA-PJQ-01A	Butt Fusion - Straight Pipe	1	02/04/2009	02/04/2010
NGA-PJQ-01B	Butt Fusion - Coiled Pipe	1	02/04/2009	02/04/2010
NGA-PJQ-04	Electro Fusion - Saddle	1	02/04/2009	02/04/2010
NGA-PJQ-05	Electro Fusion - Coupling	1	02/04/2009	02/04/2010
NGA-PJQ-06	Mechanical Coupling - Bolt On	1	02/04/2009	02/04/2010
NGA-PJQ-07	Mechanical Coupling - Stab	1	02/04/2009	02/04/2010
NGA-PJQ-08	Mechanical Coupling - Compression	1	02/04/2009	02/04/2010
NGA-PJQ-09	Mechanical Coupling - Thread	1	02/04/2009	02/04/2010
NGA-PJQ-10	Soil Compaction	1	02/04/2009	02/04/2010

EMPLOYEE QUALIFICATIONS

06/23/2009 **National Grid - New England**

Employee ID: 23881 **First Name:**Robert **Last:** Devito

Title: Tech A Technician A **Phone:**

Company: National Grid - New England

Company: BGC **State:** MA

Location: LOWELL

Department: MSF

Union Code: Union

QUALIFICATIONS

Task ID	Name	Revision	Date	Next Date
510	Fall Training, MSF/PCS	1	11/15/2002	11/15/2101
NGA-006	Inspecting for atmospheric corrosion	1	04/06/2009	04/06/2014
NGA-008	Visually inspecting for internal corrosion	1	04/06/2009	04/06/2014
NGA-011	Applying pipe coating in the field	1	04/06/2009	04/06/2014
NGA-012	Cleaning and either coating or jacketing pipe for atmospheric	1	04/06/2009	04/06/2014
NGA-014	Installing/replacing an anode	1	04/06/2009	04/06/2014
NGA-015	Installing/replacing and testing electrical isolation couplings	1	06/17/2008	06/17/2013
NGA-016	Install/replace a corrosion test station on a pipeline	1	04/06/2009	04/06/2014
NGA-017	Repair coating on steel pipelines	1	04/06/2009	04/06/2014
NGA-017A	Repair coating on steel pipelines	1	04/06/2009	04/06/2014
NGA-018	Conducting gas leakage surveys	1	06/22/2005	06/22/2010
NGA-019	Patrolling and inspecting pipeline	1	06/22/2005	06/22/2010
NGA-020	Investigating leak/odor complaints	1	04/06/2009	04/05/2012
NGA-021	Line locating and mark out	1	04/06/2009	04/05/2012
NGA-022	Inspection of 3rd party excavations for damage prevention	1	05/02/2007	05/01/2012
NGA-023	Inspecting the condition of exposed pipe or pipe coating	1	06/17/2008	06/17/2013
NGA-024	Inspect pipe for damage	1	06/17/2008	06/17/2013
NGA-029	Repair distribution line leaks	1	04/06/2009	04/05/2012
NGA-030	Repair a non-leaking damaged pipe	1	04/06/2009	04/06/2014
NGA-032	Purging air from pipeline	1	05/02/2007	05/01/2012
NGA-033	Purging gas from pipeline	1	05/02/2007	05/01/2012
NGA-034	Performing pressure test on a pipeline	1	05/17/2006	05/17/2011
NGA-035	Stopping gas flow	1	06/17/2008	06/17/2011
NGA-035A Demo	Stopping Gas on Polyethelyene (PE) Main	1	06/17/2008	06/17/2011
NGA-036	Abandonment or Deactivation of Facilities	1	06/17/2008	06/17/2011
NGA-037	Tapping pipelines under pressure	1	05/02/2007	05/01/2010
NGA-039	Remove service tee or fitting from steel or cast iron mains	1	06/17/2008	06/17/2013

EMPLOYEE QUALIFICATIONS

06/23/2009 **National Grid - New England**

Employee ID: 23881 **First Name:** Robert **Last:** Devito

Title: Tech A Technician A **Phone:**

Company: National Grid - New England

Company: BGC **State:** MA

Location: LOWELL

Department: MSF

Union Code: Union

QUALIFICATIONS

Task ID	Name	Revision	Date	Next Date
NGA-040	Install/Replace tracer wire	1	06/17/2008	06/17/2013
NGA-041	Inspect and operate valves	1	06/17/2008	06/17/2013
NGA-042	Repair and maintain distribution line valves	1	06/17/2008	06/17/2013
NGA-043	Lubricate distribution line valves	1	06/17/2008	06/17/2013
NGA-045A	Restore Service	1	05/17/2006	05/17/2011
NGA-047	Abandon a gas service line	1	04/06/2009	04/06/2014
NGA-048	Extend or cut back on an existing service line	1	05/02/2007	05/01/2012
NGA-049	Mechanical Joining of pipe other than plastic	1	04/06/2009	04/05/2012
NGA-050 Demo	Joining plastic pipe	1	04/06/2009	04/06/2010
NGA-050 Written	Joining plastic pipe	1	04/06/2009	04/06/2010
NGA-051 Demo	Install bolt-on tee on plastic pipe	1	04/06/2009	04/06/2010
NGA-051 Written	Install bolt-on tee on plastic pipe	1	04/06/2009	04/06/2010
NGA-052 Demo	Inspect plastic pipe fusion joint	1	04/06/2009	04/06/2010
NGA-052 Written	Inspect plastic pipe fusion joint	1	04/06/2009	04/06/2010
NGA-070	Abnormal Operating Conditions and Properties of Natural	1	05/02/2007	05/01/2010
NGA-071	Operator Excavation and backfilling in the Vicinity of a	1	05/17/2006	05/17/2011
NGA-072	Installation of Customer Meters and Regulators	1	04/06/2009	04/06/2014

NGA

Covered Tasks 41, 42, 43

1. Most valves in a distribution system turn counter-clockwise to close.

   A. TRUE B. FALSE

2. "Check valves" allow the flow of gas to go in one direction only.

   A. TRUE B. FALSE

3. Which of the following two types of valves are most common in a distribution system?

   A. One-half turn valves and check valves
   B. Slip valves and gear valves
   C. One-quarter turn valves and multi-turn valves
   D. Full-turn valves and reverse-turn valves

4. It is important to take and maintain good ties to valve locations because:

   A. A lot of time can be wasted looking for a particular valve.
   B. Quick access to a valve may be needed in an emergency.
   C. Valving is more efficient than stopping or squeezing off equipment.
   D. All of the above

5. "Critical valves" are essential parts of a transmission and distribution system.

   A. TRUE B. FALSE

6. "Critical valves" must always be readily accessible and operable.

   A. TRUE B. FALSE

7. What is the first action you should take to try to correct a leaking or stuck valve?

   ANSWER: ___?___

8. When lubricating a valve, it is important to know:

A. the type of valve it is.
B. the manufacturer's recommended type of lubricant.
C. how much lubrication is required.
D. all of the above

9. Which of the following is a recommended method of testing an open valve after maintenance?

A. Fully close, then immediately re-open the valve
B. Close the valve all the way, wait, and then re-open
C. Slowly and partially close the valve, and then re-open
D. All of the above

10. After maintenance has been done on a valve, the valve should always be left:

A. In an open position
B. In a closed position
C. Partially closed
D. In its original position

11. In a natural gas distribution system, some valves can be used to control and/or isolate the flow of gas.

A. TRUE B. FALSE

12. Plastic valves require no lubrication.

A. TRUE B. FALSE

13. A full port valve allows less gas to flow through the pipe.

A. TRUE B. FALSE

14. Plastic valves can easily be damaged if too much force is used to operate them.

A. TRUE B. FALSE

15. At least two measurements should be taken from above-ground permanent structures to locate a valve.

A. TRUE B. FALSE

16. When you dig up a leaking valve, what is a good method for finding the leak?

ANSWER: ___?___

17. Corrective measures for repair of a faulty valve may include tightening bolts or replacing the housing on the valve.

A. TRUE B. FALSE

18. Service boxes are typically located?

A. Curb to property line
B. Customer's property
C. Foundation
D. Basement
E. Both A and B

19. Which of the following is a reason why you might not be able to locate a service or curb box?

A. The box was paved or cemented over.
B. A tree encased the box.
C. The box was broken or destroyed.
D. No box was installed.
E. All of the above

20. What is the primary purpose of a service or curb box?

ANSWER: ___?___

21. The proper way to raise a service or curb box is to loosen the soil around the box and pry it up.

A. TRUE B. FALSE

22. Which of the following is an appropriate method for removing debris to access a service or curb box?

A. Blow pipe
B. Vacuum
C. Mechanical grippers/tongs
D. All of the above
E. None of the above

23. If you cannot locate a service or curb box by another method, you should check the service card for measurements.

A. TRUE B. FALSE

24. If all evidence suggests that a box is beneath a tree, the best course of action is to cut in a new valve.

A. TRUE B. FALSE

25. What is the most important reason for ensuring that a valve box is installed straight not tilted?

ANSWER: ___?___

26. How often should a C.G.I. be calibrated?

A. Per manufacturer's recommendations
B. As specified in the Company's O & M Plan
C. Whenever the operator believes it is necessary
D. All of the above

27. Before using a C.G.I., it is essential to:

A. Check tightness of fittings/hose
B. Check the voltage
C. Perform calibration in gas-free atmosphere
D. All of the above

28. If your C.G.I. is calibrated on natural gas and detects gasoline, the readings you get for percent gas in air may be false.

A. TRUE B. FALSE

29. If your C.G.I. registers in the explosive range and you suspect that it is detecting a hydrocarbon other than natural gas, you are required to make the situation safe.

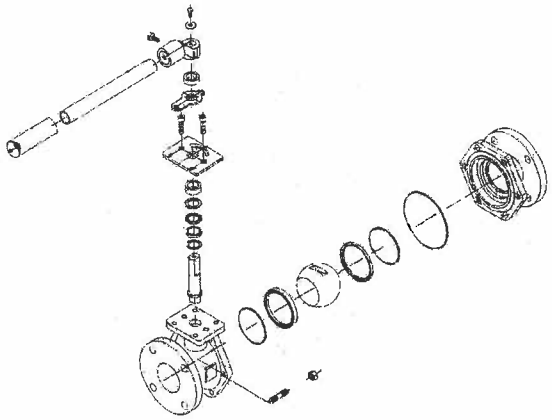
A. TRUE B. FALSE

30. All multi-turn valves require fourteen (14) turns to fully open and close.

A. TRUE B. FALSE

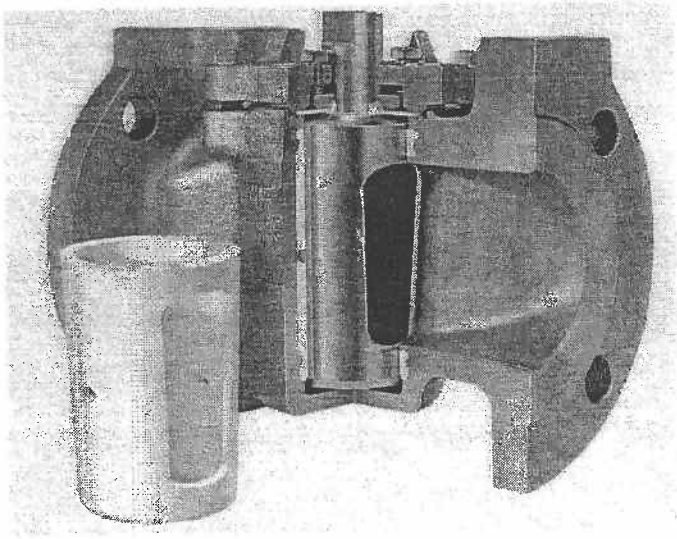
31. Is the diagram below a quarter turn or multi-turn valve?

A. Quarter Turn B. Mulit-Turn



32. Is the picture below a quarter turn or multi-turn valve?

A. Quarter Turn B. Mulit-Turn



33. Which valve is multi-turn and used primarily for on-off, nonthrottling service?

A. Gate Valve
B. Butterfly Valve
C. Ball Valve
D. Plug Valve

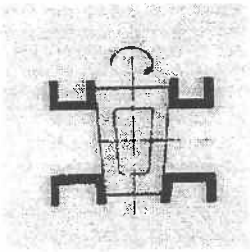
34. Which valve controls flow by means of a cylindrical or tapered section with a hole in the center that lines up with the flow path of the valve to permit flow?

A. Gate Valve
B. Butterfly Valve
C. Ball Valve
D. Plug Valve

35. Which valve controls flow by using a circular disk or vane with its pivot axis at right angles to the direction of flow in the pipe?

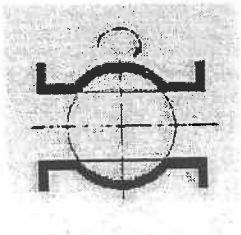
A. Gate Valve
B. Butterfly Valve
C. Ball Valve
D. Plug Valve

36. The diagram shows which type of valve?



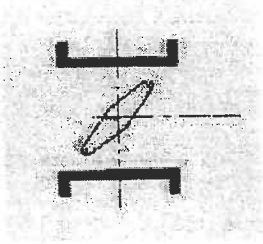
A. Gate Valve
B. Butterfly Valve
C. Ball Valve
D. Plug Valve

37. The diagram shows which type of valve?



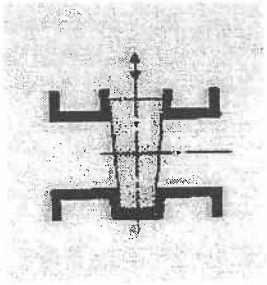
A. Gate Valve
B. Butterfly Valve
C. Ball Valve
D. Plug Valve

38. The diagram shows which type of valve?



A. Gate Valve
B. Butterfly Valve
C. Ball Valve
D. Plug Valve

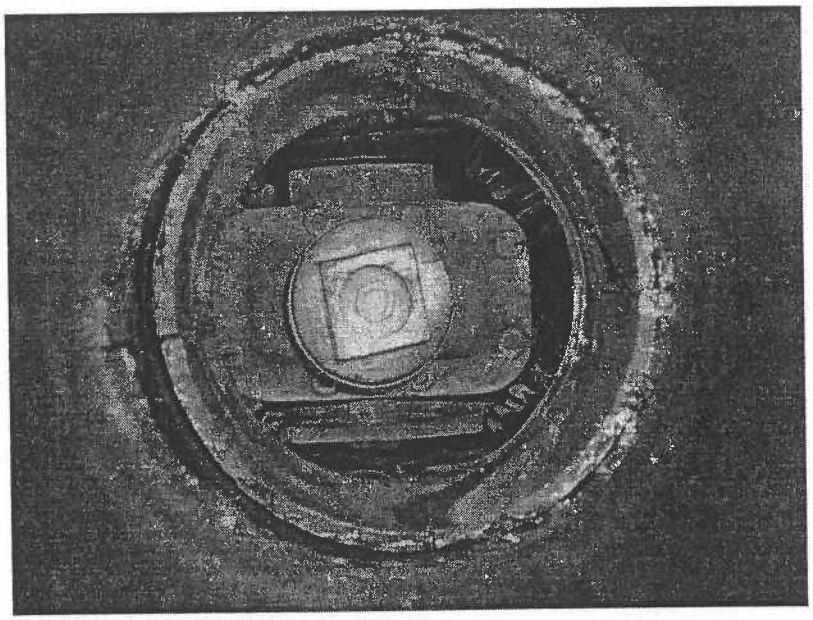
39. The diagram shows which type of valve?



A. Gate Valve
B. Butterfly Valve
C. Ball Valve
D. Plug Valve

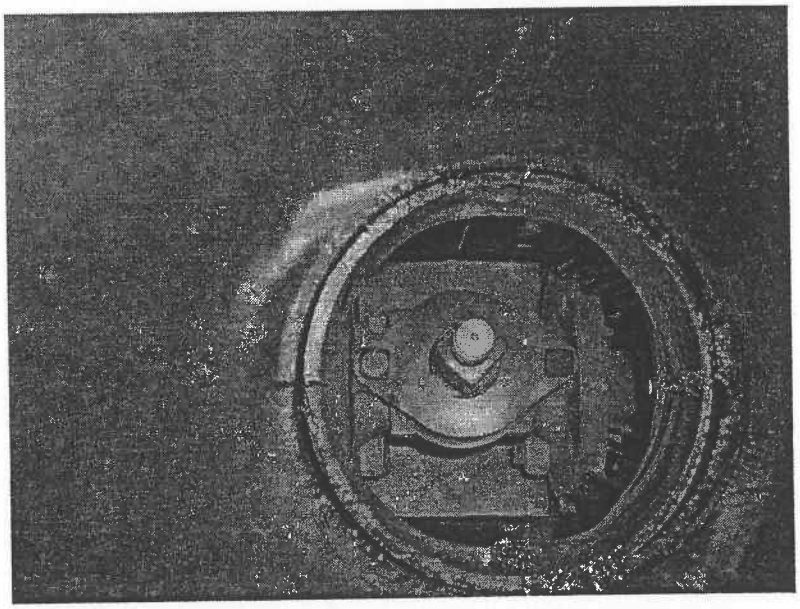
40. Is the picture below a quarter turn or multi-turn valve?

A. Quarter Turn B. Mulit-Turn



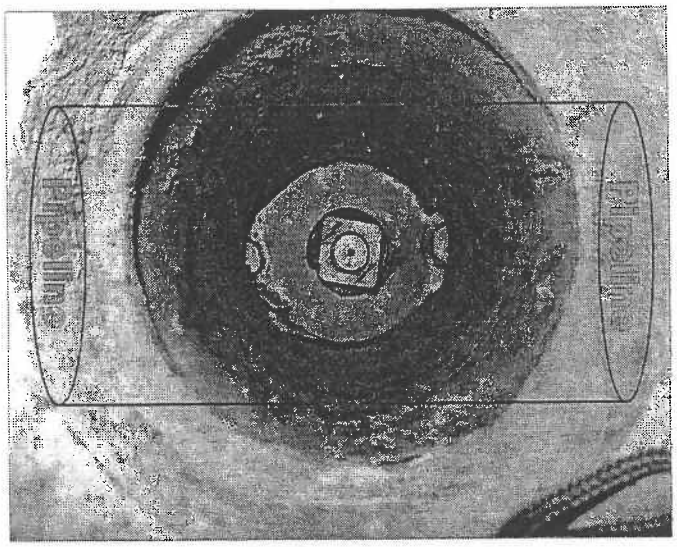
41. Is the picture below a quarter turn or multi-turn valve?

A. Quarter Turn B. Mulit-Turn



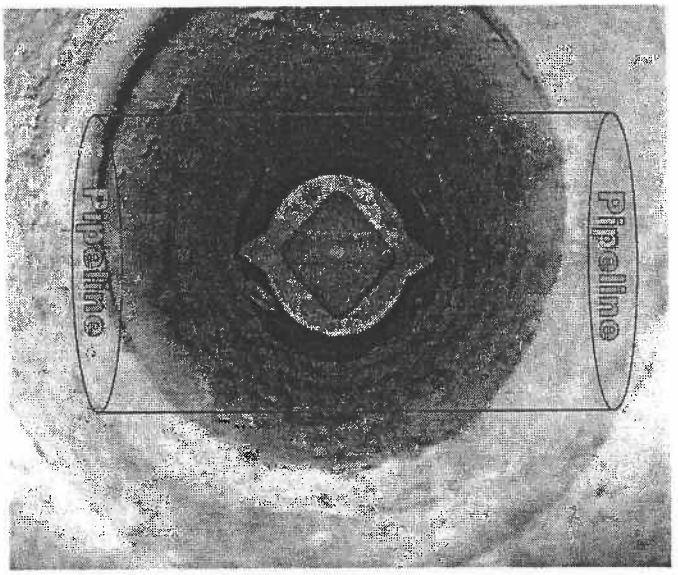
42. In this picture the valve is in which position?

A. Open
B. Closed
C. Partially Open



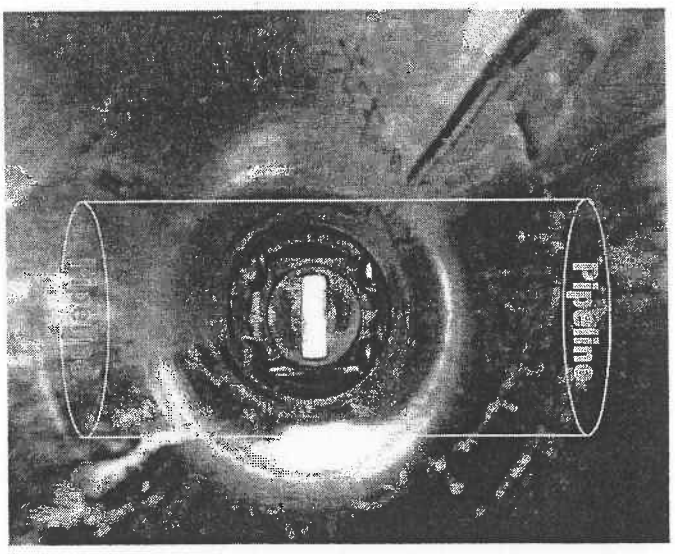
43. In this picture the valve is in which position?

A. Open
B. Closed
C. Partially Open



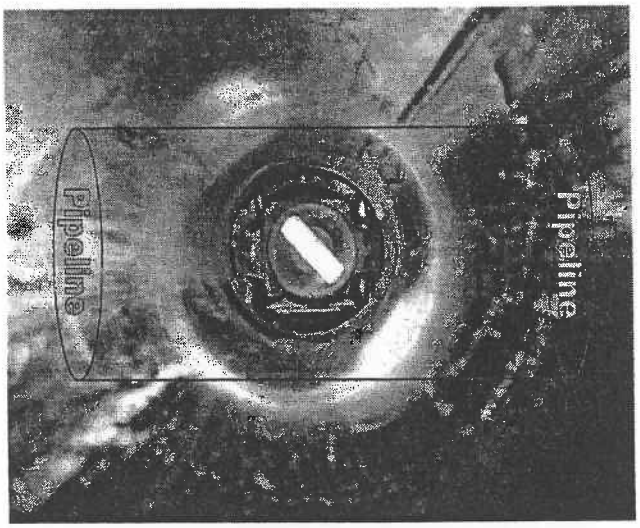
44. In this picture the valve is in which position?

A. Open
B. Closed
C. Partially Open



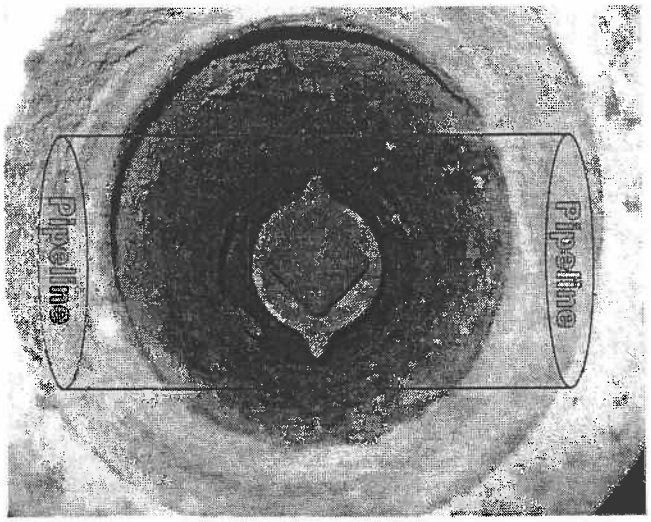
45. In this picture the valve is in which position?

A. Open
B. Closed
C. Partially Open



46. In this picture the valve is in which position?

A. Open
B. Closed
C. Partially Open



47. In this picture the valve is in which position?

A. Open
B. Closed
C. Partially Open