

DOT **US Department of Transportation**
PHMSA **Pipeline and Hazardous Materials Safety Administration**
OPS **Office of Pipeline Safety**
 Eastern Region

Principal Investigator Edwin Clarkson - WV PSC
Region Director Byron Coy
Date of Report 8/5/2011
Subject Failure Investigation Report – Columbia Gas Transmission Ripley Valve Failure

Operator, Location, & Consequences

Date of Failure 11/16/2009
Commodity Released Natural Gas
City/County & State Ripley/Jackson County WV
OpID & Operator Name 2616 – Columbia Gas Transmission
Unit # & Unit Name 65951 - Ripley & Rockport Storage Fields - WV
SMART Activity # 129902
Milepost / Location Latitude 38.84527 Longitude -81.69804
Type of Failure Leak - Failed cap screws on Pig Valve
Fatalities 0
Injuries 0
Description of area impacted Class 2 area, non-HCA
Property Damage \$5,167

Failure Investigation Report – Columbia Gas Transmission Ripley Valve Failure

Failure Date 11/16/2009

Executive Summary

On November 16, 2009, at 16:40, a call was made to the Columbia Gas Transmission monitoring center by a passer-by who reported a gas leak on a well line in Ripley Storage Field. The storage line was isolated and the leak was determined to be from a pig valve. Further field investigation indicated that four cap screws associated with the trunnion plate of the pig valve had failed. The manufacturer of this valve was notified, the failed valve was removed from the site and the storage line was plugged and capped at both ends. The failed valve and the recovered cap screws were sent to a laboratory for further analysis to determine the cause of the failure. The analysis indicated that the cap screws had failed due to improper tempering. The cap screws on the pig valve were replaced.

No fire was involved in this event. There were no fatalities, injuries, or supply issues as a result of the incident.

System Details

The Ripley Storage Field is located near the town of Ripley in Jackson County, WV, approximately 35 miles north of Charleston. The system covers approximately 18,000 acres and includes 52 wells and 19.9 miles of 4" through 16" pipeline. The MAOP is 1700 psig. The valve that failed was a 4" Tulsa Valve, ANSI 900.

Events Leading up to the Failure

The pressure prior to failure was 1458 psig. There were no unusual events reported in the operation of the field prior to the failure.

Emergency Response

On November 16, 2009, at 16:40, a call was made to the Columbia Gas Transmission monitoring center by a passer-by who reported a gas leak on a well line in Ripley Storage Field. Company personnel reported to the site within 20 minutes. Valves both upstream and downstream were closed to stop the release of gas. The storage line was isolated and the leak was determined to be from a pig valve. Columbia Gas Transmission reported this event to the National Response Center (NRC) on November 16, 2009, at 19:27. (NRC Report Appendix F).

Summary of Return-to-Service

Laboratory analysis (Appendices C and D) indicated that the cap screws had failed due to improper tempering. The cap screws on the pig valve that failed, and the cap screws on a second similar valve in the Ripley Storage facility, were replaced, and the portion of the system affected was returned to full operation. Pig valve trunnion plate cap screws were also replaced in other similar valves at a separate Columbia Gas Transmission Storage facility.

Investigation Details

Field investigation indicated that four cap screws associated with the trunnion plate of the 4" shut-off pig valve (Appendix B) had failed. The manufacturer of this valve was notified (Appendix E), the failed valve was removed from the site and the storage line was plugged and capped at both ends. The failed valve (Appendix A) and the recovered cap screws were sent to a laboratory for analysis to determine the cause of the failure. The analysis indicated that the cap screws had failed due to improper tempering. There were no indications of elongation, fretting or thread deformation indicative of over torquing the screws during installation.

Findings and Contributing Factors

The leak from the pig valve was caused by the failure of cap screws associated with the valve trunnion plate. Laboratory analysis showed that the cap screws were not properly tempered to the required temperature level.

Failure Investigation Report – Columbia Gas Transmission Ripley Valve Failure

Failure Date 11/16/2009

Appendix

A	Photographic Documentation
B	IOM Shutoff Pig
C	Columbia Ripley Storage failed Valve Investigation
D	Ripley Cap screw Report 909-90577
E	Tulsa Valve Letter
F	NRC 923776
G	Incident Report_20090132-8561
H	Incident Location Map



Photo 1
Columbia Gas Transmission
Ripley Storage valve failure
Manufacturer Tulsa Valve
ANSI 900 4 inch
Shut- off pigging valve
X-59-W7308
Photo by ED Clarkson
West Virginia Gas Pipeline Safety

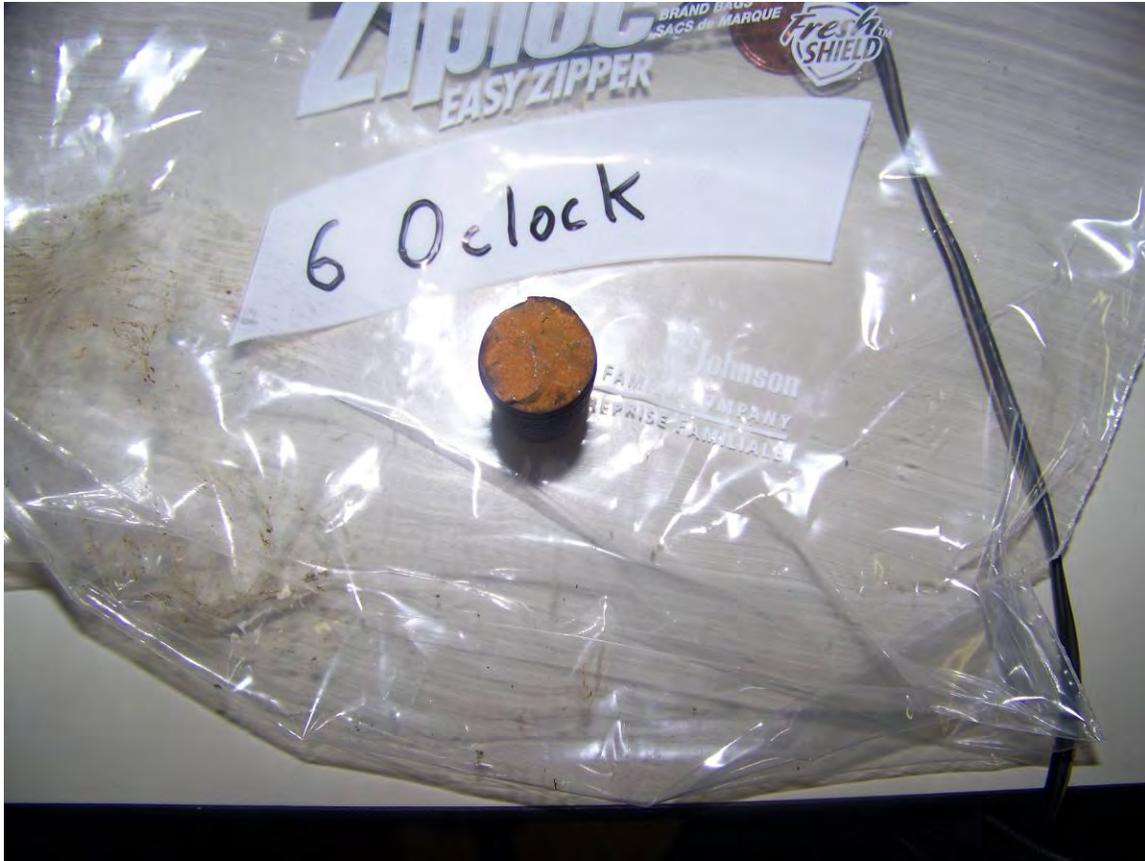


Photo 2
Columbia Gas Transmission
Ripley Storage valve failure
Manufacturer Tulsa Valve
ANSI 900 4 inch
Trunnion cover bolt
Photo by ED Clarkson
West Virginia Gas Pipeline Safety

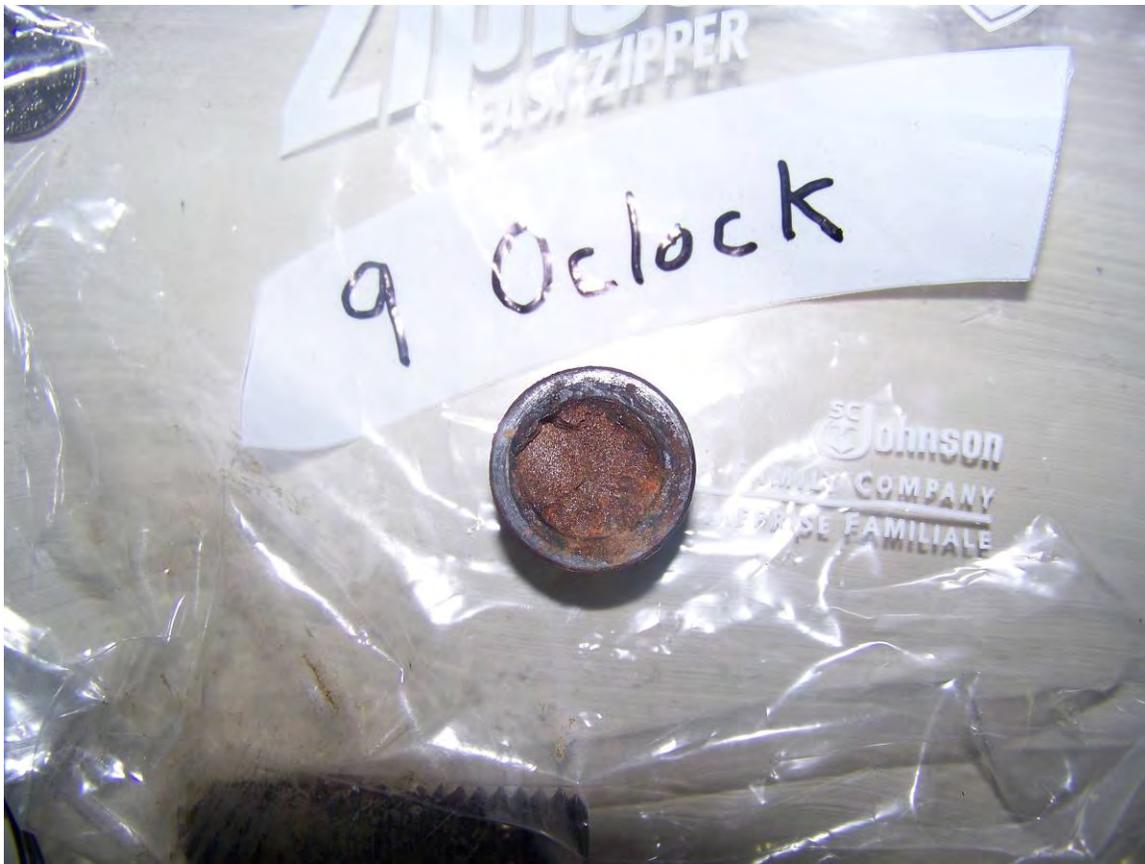


Photo 3
Columbia Gas Transmission
Ripley Storage valve failure
Manufacturer Tulsa Valve
ANSI 900 4 inch
Trunnion cover bolt
Photo by ED Clarkson
West Virginia Gas Pipeline Safety



Photo 4
Columbia Gas Transmission
Ripley Storage valve failure
Manufacturer Tulsa Valve
ANSI 900 4 inch
Trunnion cover bolt
Photo by ED Clarkson
West Virginia Gas Pipeline Safety



Photo 5
Columbia Gas Transmission
Ripley Storage valve failure
Manufacturer Tulsa Valve
ANSI 900 4 inch
Trunnion cover cap
Photo by ED Clarkson
West Virginia Gas Pipeline Safety



Photo 6
Columbia Gas Transmission
Ripley Storage valve failure
Manufacturer Tulsa Valve
ANSI 900 4 inch
Photo by ED Clarkson
West Virginia Gas Pipeline Safety



Photo 7
Columbia Gas Transmission
Ripley Storage valve failure
Manufacturer Tulsa Valve
ANSI 900 4 inch
Photo by ED Clarkson
West Virginia Gas Pipeline Safety



Photo 8
Columbia Gas Transmission
Ripley Storage valve failure
Manufacturer Tulsa Valve
ANSI 900 4 inch
Photo by ED Clarkson
West Virginia Gas Pipeline Safety

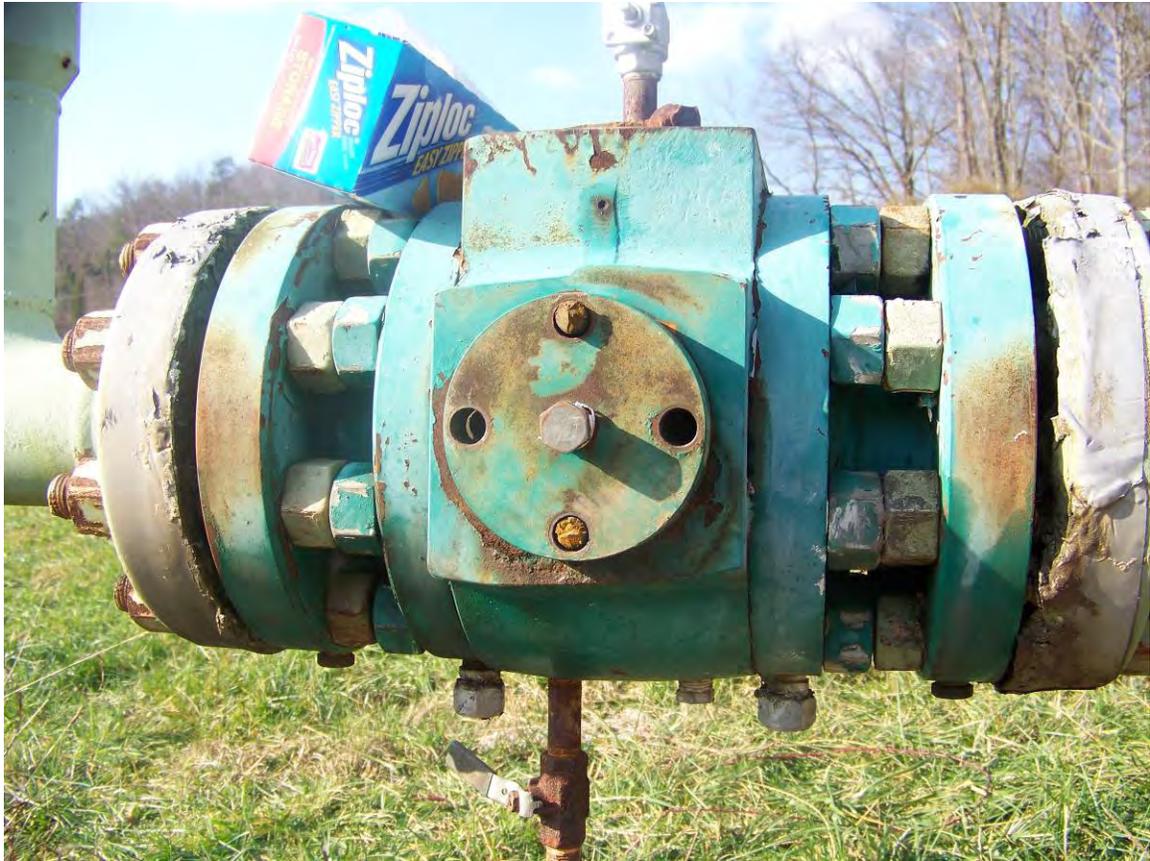


Photo 9
Columbia Gas Transmission
Ripley Storage valve failure
Manufacturer Tulsa Valve
ANSI 900 4 inch
Photo by ED Clarkson
West Virginia Gas Pipeline Safety



Photo 10
Columbia Gas Transmission
Ripley Storage valve failure
Manufacturer Tulsa Valve
ANSI 900 4 inch
Trunnion
Photo by ED Clarkson
West Virginia Gas Pipeline Safety

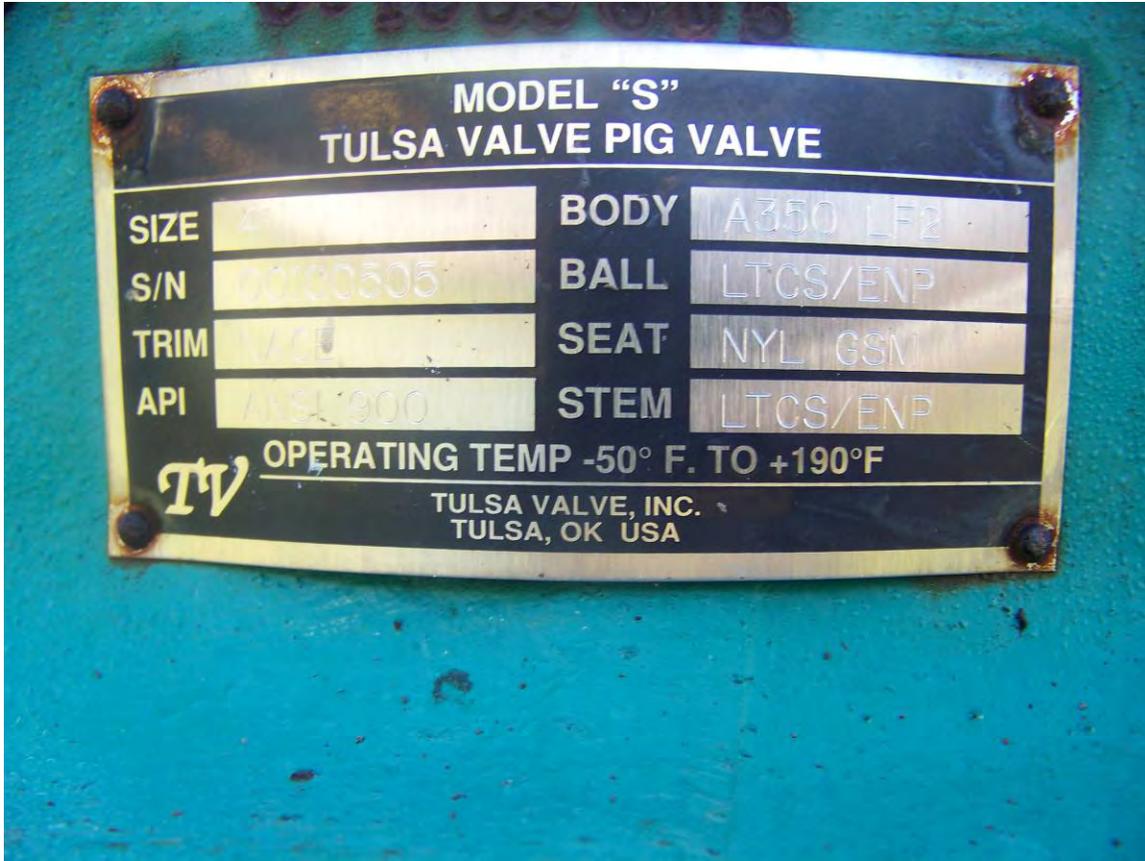


Photo 11
Columbia Gas Transmission
Ripley Storage valve failure
Manufacturer Tulsa Valve
ANSI 900 4 inch
Valve cover plate
Photo by ED Clarkson
West Virginia Gas Pipeline Safety



Photo 12
Columbia Gas Transmission
Ripley Storage valve failure
Manufacturer Tulsa Valve
ANSI 900 4 inch
Photo by ED Clarkson
West Virginia Gas Pipeline Safety

TULSA VALVE
 P.O. Box 35
 Cleveland, Oklahoma 74020

Doc. No.: IOM-SO-1000.01.02
 Date: 8/8/07
 Revision: E

Shut Off Style Pig Valve
IOM - Installation, Operation & Maintenance

Contents:

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<i>Operation</i>	2 - 3
<i>Bill of Materials</i>	4 - 7
<i>Maintenance</i>	8 - 10

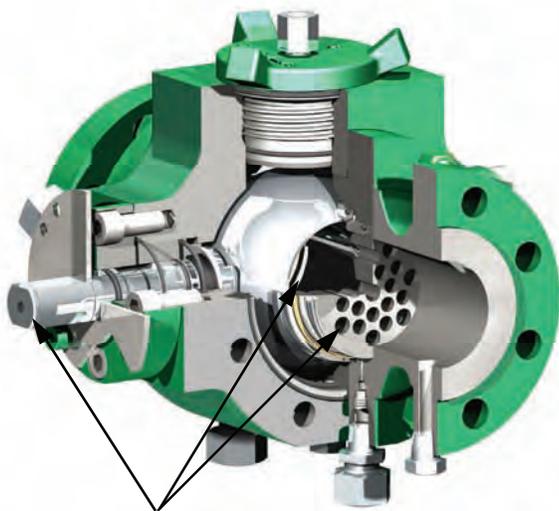
Installation:

Install the valve in the system using the proper size and type mating flanges and/or Ring Type Gaskets. The Launch/Receive direction and Catcher Side is noted on the Cover of the Gear Operator or Top of the Stem, See diagram B for details. The valve orientation is dependent on whether the valve will be used as a Receiver or a Launcher. If the valve is to be a Receiver, the Catcher position and operation should be noted to verify the valve will catch a pig. If the valve is to be used as a launcher, the Catcher position (If used) and operation should be noted to verify the direction of launch. Ample Clearance above and below the valve is required to install and/or remove the pig.



General Diagram A

Diagram B



The top of the stem is stamped indicating flow direction and catcher position.

Never hold or lift the valve by the Davit Assembly, Gear Operator or Handle, use the flange bolt holes or put straps around the adapter between the flanges. The valve is not balanced and care should be taken when lifting to prevent the valve from shifting or spinning around. Use proper lifting equipment and techniques.

After the valve is installed, the closure and/or davit assembly should be fully operated to ensure it is in proper working condition. The gear operator is set at the factory. Before applying pressure to the valve, verify that the Ball is in the open position (Diagram B indicator is horizontal). Verify that the bleed fitting (30) is closed. Verify that the Closure (8) is screwed down tight (a few light knocks on the closure lugs with a striking hammer should be sufficient). Rotate the ball by turning the Gear hand wheel, or Handle.

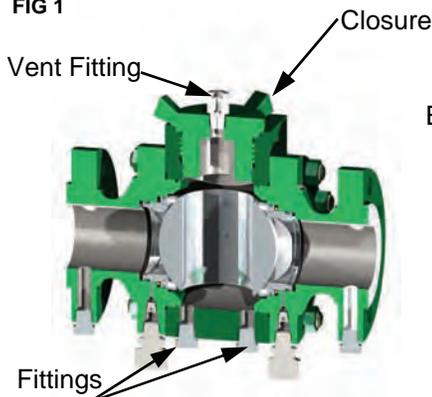
Operation:

The Tulsa valve Shut-off Style Pig Valve is designed to be used as either a Launcher or a Receiver. The Installation determines how the valve will be used. Below are basic diagrams outlining the steps required to either Launch or Receive. **Some Designs may vary consult the factory if your design is not represented.**

Launching Procedures

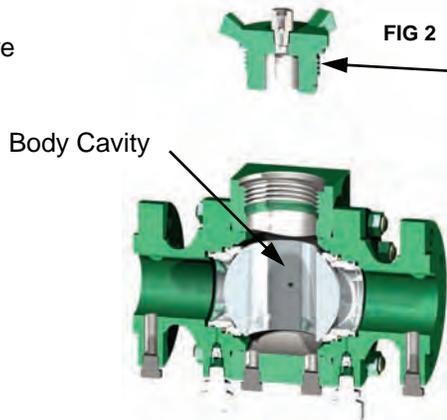
Before opening any fittings or closures first review the orientation of the ball using the Indicator as described in diagram B on page 1. The Indicator marking represents the orientation of the ball port — Perpendicular to the flow bore indicates closed. **Follow the instructions below carefully and read the Caution notes. The images are with the stem pointed towards the operator.**

FIG 1



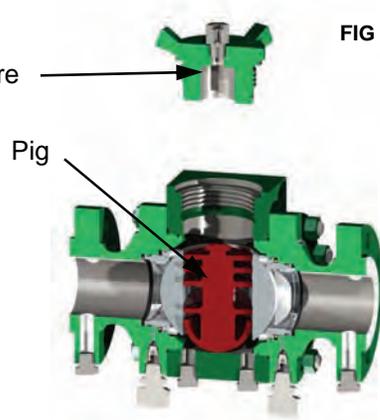
Close Valve. Vent body cavity chamber with vent fitting. After the valve is vented the body fittings may be opened to drain or flush the valve if required. **Caution should be exercised to not spill or vent hazardous materials on the ground or in the air. Use proper safety precautions.**

FIG 2



After verifying the body cavity chamber is vented the closure may be opened. Unscrew closure slowly. **Caution: if Gas or Liquid starts to vent from the closure during opening STOP. The body cavity is not vented or the valve is not closed. Screw closure back and repeat step 1.**

FIG 3



Remove closure to expose the pig chamber. Install the pig in the chamber, with the valve stem facing the field technician. If the flow is moving through the valve from left to right, install the pig into the chamber nose down. If the flow is right to left, install the pig in the chamber nose up. This will ensure the pig will travel down the line nose first and allow the pig to be retrieved from the receiving valve using the knob provided on the butt end of the pig.

FIG 4



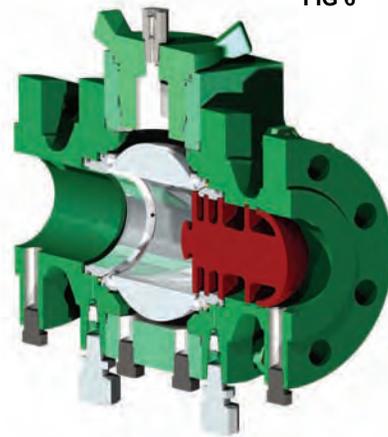
Make Sure all seals are in place and in good condition on the closure and in the body. Replace the closure and verify the vent fitting and body fittings are closed.

FIG 5



To Launch the pig open [Counterclockwise] the valve and the pig will be launched downstream.

FIG 6



Receiving Procedures

Before opening any fittings or closures first review the orientation of the ball using the Indicator markings described in diagram B on page 1. The Indicator must be —Horizontal (inline with the valve flow bore). **Follow the instructions below carefully and read the Caution notes. Some Designs may vary consult the factory if your design is not represented.**

CAUTION NOTES

Opening any fittings or closures is dangerous. Make sure to follow all safety precautions when operating this valve. Take measures not to pollute the atmosphere or ground when opening the vent, drain fittings or closure. These valves are under high pressures re-verify that the pig chamber is vented before opening closure. Improper use may result in serious injury or death.

FIG 7



FIG 8

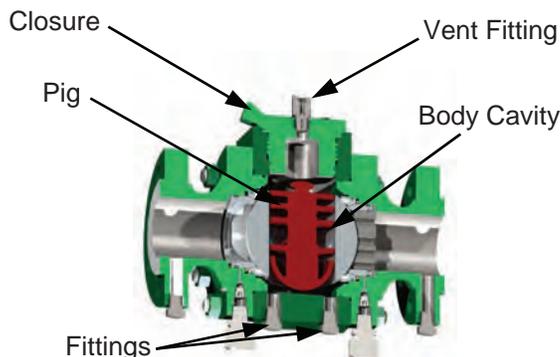
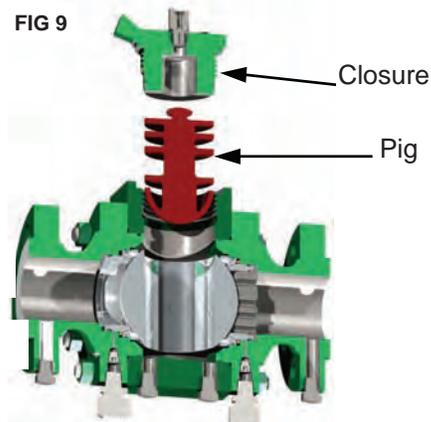


FIG 9



To receive pigs the valve must be installed as shown and the ball open to flow. The catcher must be down stream to allow the pig to enter fully into the ball cavity.

After the pig has entered the ball cavity the valve is ready to operate. First verify that the vent fittings are closed and the closure is installed correctly. Close the valve and vent the body cavity using the bleed fitting. After verifying the body cavity chamber is vented the closure may be opened.

Unscrew closure slowly. **Caution: if Gas or Liquid starts to vent from the closure during opening STOP. The body cavity is not vented or the valve is not closed. Screw closure back and repeat step 2.** Remove Closure to expose the Pig Chamber.

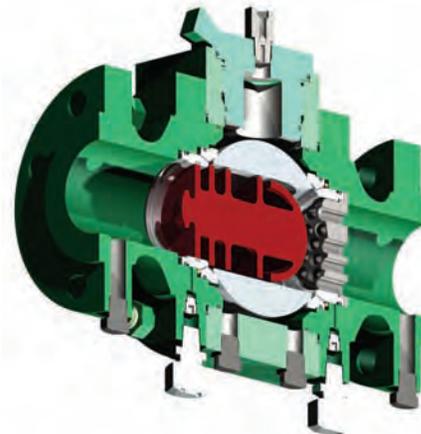
FIG 10



FIG 11

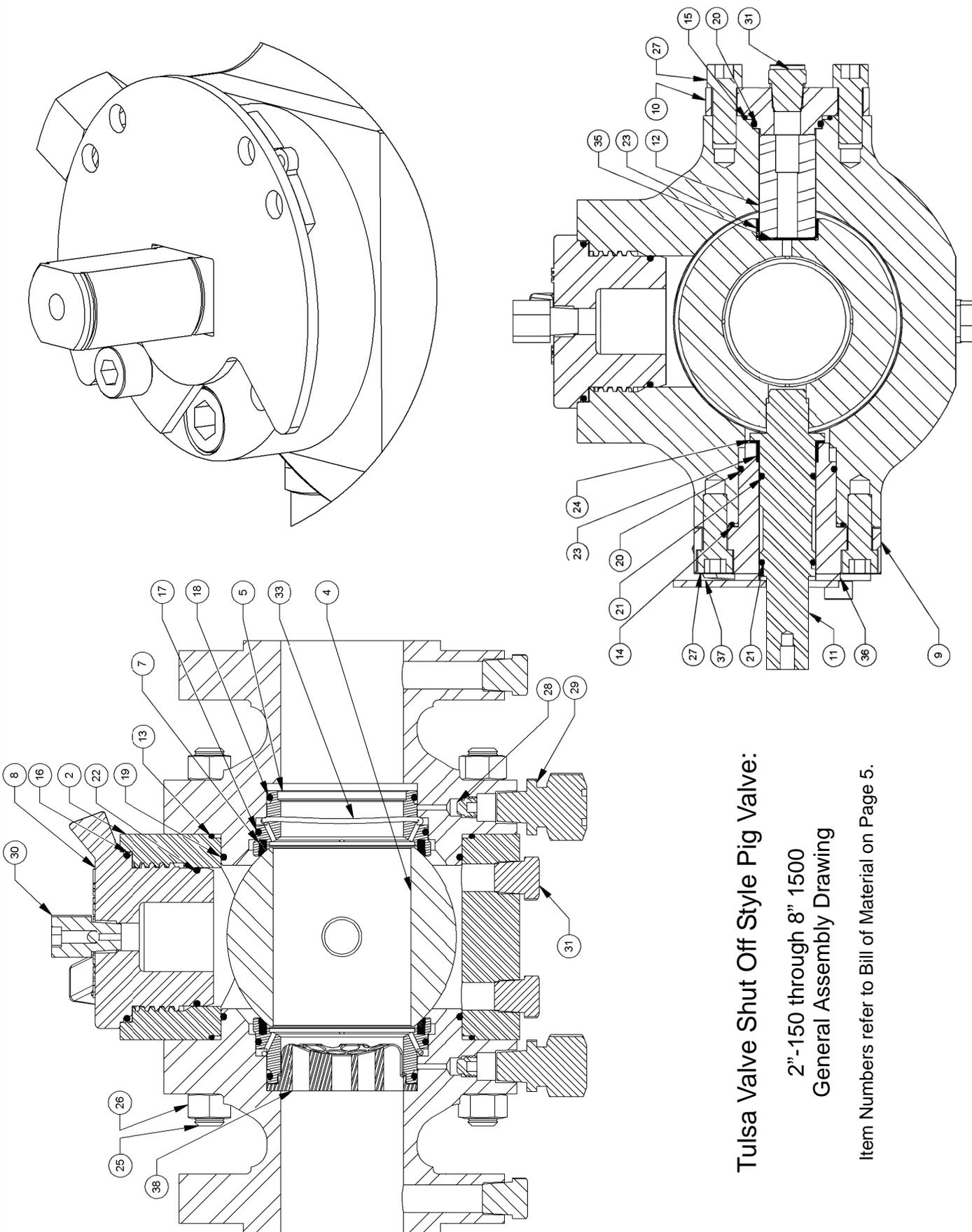


FIG 12



Remove the Pig. **Caution: Valve is under pressure use caution when removing pigs. Flush the valve clean.**

Make Sure all seals are in place and in good condition on the closure and in the body. Replace the closure and verify the vent fitting and body fittings are closed.



Tulsa Valve Shut Off Style Pig Valve:

2"-150 through 8" 1500

General Assembly Drawing

Item Numbers refer to Bill of Material on Page 5.

Generic Bill of Material

Use the Assembly Drawing and the Bill of Materials shown to reference parts. The repair and maintenance procedures reference these Item numbers. The recommended spare parts are listed in the Bill of Material. Some Designs may vary in construction for 8" components please consult the factory.

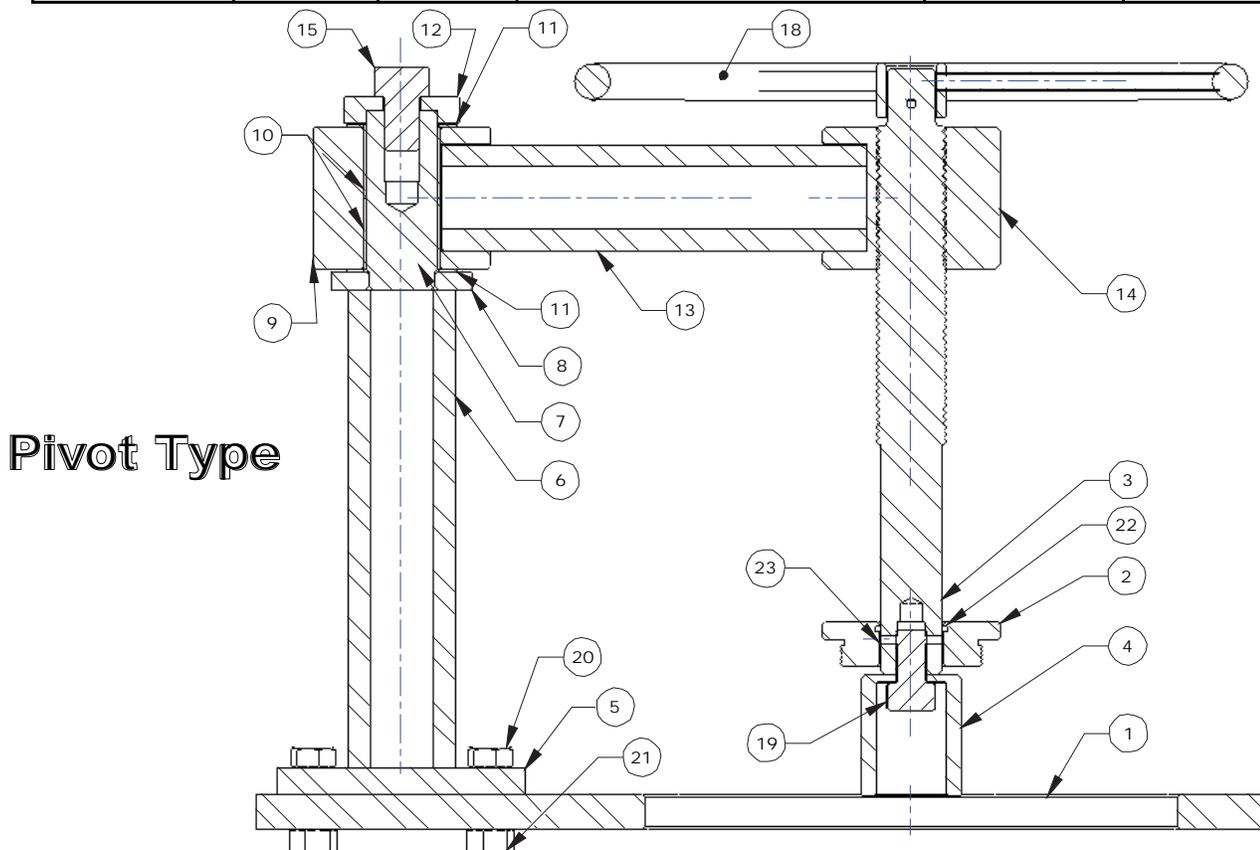
For other materials and part numbers consult the Factory.

Item	Qty	Description
1	1	Assembly
2	1	Body Machined
3	2	Adapter Machined
4	1	Ball Finished
5	2	Seat Ring Assembly
6	2	Seat Ring Machined
7	2	Seat Insert Machined
8	1	Cap Machined
9	1	Bonnet Machined
10	1	Trunnion Cover Machined
11	1	Stem Machined
12	1	Trunnion
13	2	Adapter Gasket O-ring
14	1	Bonnet Gasket O-ring #
15	1	Trunnion Cover Gasket O-ring
16	1	Cap Gasket O-ring
17	2	Seat Seal Primary O-ring
18	2	Seat Seal Secondary O-ring
19	2	Adapter Seal O-ring
20	1	Bonnet Seal O-ring
21	2	Stem Seal O-ring
22	1	Cap Seal O-ring
23	2	DU Trunnion Bearings
24	1	Thrust Bearing
25	Varies	Body Studs
26	Varies	Body Nuts
27	Varies	Bonnet/Cover Bolts
28	2	Buried Check 1/4 NPT
29	2	Grease Fitting 1/2 NPT
30	1	Bleed Fitting 1/2 NPT
31	3	1/2 NPT Pipe Plug
32	1	Retaining Ring (Not Shown)
33	2	WAVO Spring
34	1	Flat Head Machine Screw (Not Shown)
35	1	Ball Trunnion Bearing
36	1	Lock Plate
37	1	Stop Plate
38	1	Catcher

Davit Assembly (If Used)

The Davit should not need to be serviced or lubricated. The main lifting and turning components are either Teflon Composite bearings or Xylan Coated for lubricity and corrosion protection. Use the drawing and Bill of Material when referencing the Davit and it's components.

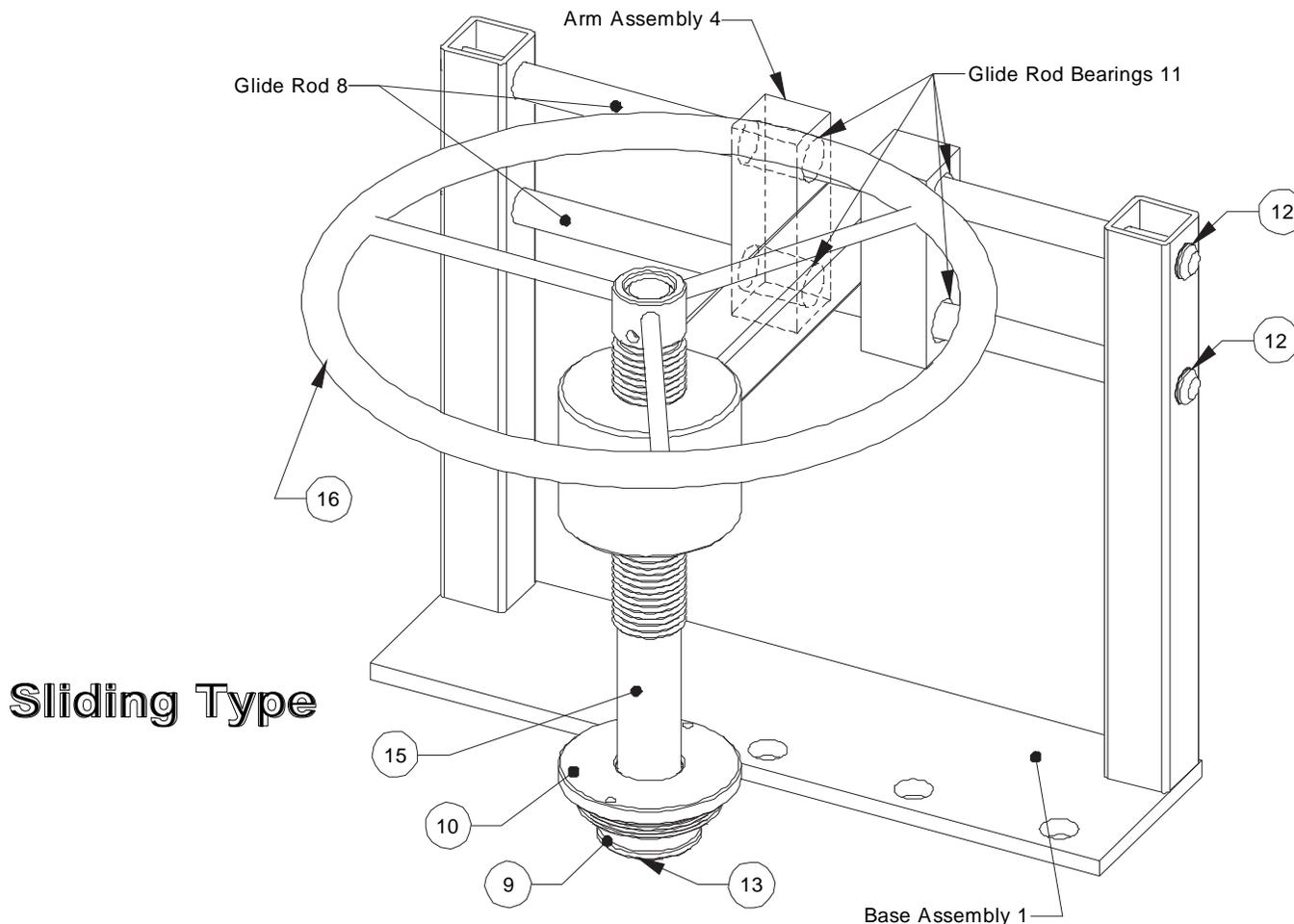
ITEM NO.	QTY.	DESCRIPTION	MATERIAL	COATING
1	1	Bracket	CS	
2	1	Lock Nut	1018 CS	XYLAN
3	1	Shaft	1018 CS	XYLAN
4	1	Washer/Spacer	1018 CS	XYLAN
5	1	Pivot Base	CS	XYLAN
6	1	Pivot Tube	CS	XYLAN
7	1	Pivot Shaft	1018 CS	XYLAN
8	1	Pivot Shaft plate	CS	XYLAN
9	1	Pivot Hub	1018 CS	XYLAN
10	2	Pivot Bearing	DU	
11	2	Pivot Thrust Bearing	DU	
12	1	Pivot Shaft plate top	1018 CS	XYLAN
13	1	Pivot Arm	CS	XYLAN
14	1	Hub	1018 CS	XYLAN
15	1	1-8 UN X 1.5 LG bolt	18-8 SS	
18	1	Handle wheel Assembly	IRON	
19	1	3/4-10 UNC X 1.25 LG Socket Hd Cap Screw	18-8 SS	
20	4	3/4-10 UNC X 2.5 LG Hex Hd Cap Screw	18-8 SS	
21	4	3/4-10 UNC Hex Nut	18-8 SS	
22	1	Lock Nut O-ring	Nitrile	
23	1	Washer/Spacer Lock Pin	SS	



Davit Assembly (If Used)

The Davit should not need to be serviced or lubricated. The main lifting and turning components are either Teflon Composite bearings or Xylan Coated for lubricity and corrosion protection. Use the drawing and Bill of Material when referencing the Davit and it's components.

Item	Qty	Description	Material
1	1	Base Plate Assy	
2	1	Base Plate	1018/26 Carbon Steel
3	2	Post	Carbon Steel Tube
4	1	Arm Assembly	
5	1	Arm	Carbon Steel Tube
6	2	Bearing Support	1018/26 Carbon Steel Xylan Coated
7	1	Hub	1018/26 Carbon Steel Xylan Coated
8	2	Glide Rod	1040/45 Carbon Steel Xylan Coated
9	1	Washer	1018/26 Carbon Steel Xylan Coated
10	1	Lock Nut	1018/26 Carbon Steel
11	4	Bearing	DU or Equal
12	4	Ext Retaing Ring 1"	Steel
13	1	3/4-10 Hex Bolt x 1 long	B7
14	3	1-8 Hex Bolt x 1.5 long	B7
15	1	Shaft	1040/1045 CS Xylan Coated
16	1	Hand Wheel 12 Dia 1.38 Hole	Steel



Valve Assembly/Disassembly Procedures

Tulsa Valve Shut Off Style pig valves may be rebuilt after removing from the pipeline. Standard shop tools and lifting equipment required. Tulsa Valve Inc. is not responsible for improper assembly or disassembly including injury, wrong materials, bad repair practices or other unforeseen actions. Consult the factory prior to working on any valve.

Reconditioning Valve

Caution! Prior to removing or disassembly, valve must first be isolated from system pressure and flow. Also, with the valve ball at approximately half open, internal pressure must be bled to 0 psi. Finally, as a safety precaution open bleed fittings (30). Use proper lifting equipment and tools when disassembling the valve. Valve components are heavy and care must be exercised when handling components. See Gear removal instructions if needed.

After observing the above caution, disassembly may begin.

Step 1: Position the valve vertically. Use some method to hold the valve stable prior to disassembly.

Step 2: remove the closure (8)

Step 3: remove the body nuts (25) and lift one adapter (3) off the body (2) **caution the seat assembly (5) is in the bottom of the adapter and may slip out.** Remove the body gasket (13) and adapter seal (19). Remove the seat assembly and wave spring (33).

Step 4: Remove the trunnion cover bolts (27), Trunnion Cover (10) and the trunnion (12). Remove the seals (15) & (20).

Step 5: Remove the stop plate (37) and lock plate (36). Remove the bonnet bolts (27) and slide the bonnet (9) off the stem (11). The stem may come out with the bonnet, this is OK. Slide the stem out of the bonnet. Remove all seals.

Step 6: The ball (4) may now be removed. Use a heavy duty nylon type strap through the ball port to lift the ball carefully out of the body cavity. Be careful not to bang the ball as you remove it.

Step 7: Remove the other adapter if required. Remove the bottom seat assembly from the other adapter. Remove the wave spring.

Step 8: Clean all surfaces and inspect for damage. Inspect all seals and sealing surfaces.

If the fittings need to be replaced they may be removed at any time during the procedure.

At this point all seals are readily accessible on the various components. Make sure all seals are removed and inspected prior to re-building the valve. Replace any seals that are damaged or worn.

Rebuilding Valve

To rebuild the valve first make sure all seals are in good working condition. Have grease lubricant handy and use it on all seals. **Caution make sure any lubricant is compatible with the Seals and the intended valve service conditions.**

To rebuild the valve just reverse the instructions above. Install all Poly-paks (o-rings) and seals on the various components according to the assembly drawing.

Step 1: Place the wave spring first then the seat assembly with seals in the adapter seat pocket. Lay the adapter gasket over the pilot on the adapter. Install the adapter seal on the adapter in the provided groove.

Step 2: Install the body studs in the body. Place the body down on the adapter. Care should be taken not to damage any seals.

Step 3: Make sure the ball is clean and free from scratches. Install the trunnion bearing in the ball. Place the ball into the body and align the trunnion hole with the bottom of the body and the stem slot with the top of the body.

Step 4: Install the seal (20) onto the bonnet. Install the bearing into the bonnet. Slide the stem into the bonnet. Some versions use O-rings on the stem these must be installed prior to inserting the stem. Install the bonnet gasket into the body.

Step 5: Push the stem and bonnet as a group into the body and into the ball slot. Slide the trunnion into the bottom of the body and ball. If the ball does not line up easily install the second adapter with the seat assembly and wave spring first. This will center the ball and ease the assembly of the stem and trunnion. Install the trunnion cover gasket and the trunnion seal. Bolt on the trunnion cover and the bonnet. Install the stem seals and packing follower if required.

Step 6: Install the closure seals in the body and In some valves on the closure. Install the closure. Install the bleed fitting and all other fittings and buried checks as shown in the assembly drawing.

Step 7: Install the lock plate and the stop plate.

Make sure all bolts and nuts are tightened securely. Make sure all bleed fittings are installed properly. Rotate the ball to verify its operation. Unscrew the closure (see launching and receiving instructions for this). Test the valve prior to using in service.

General Maintenance

Tulsa Valve Shut Off Style Valves require routine and consistent maintenance to assure proper function and useful life.

Valve Lubrication

The Shut Off Pig valve is supplied with several lubrication fittings. They are all the Giant Button Head design. There is one fitting supplied on the Bonnet for emergency stem sealing in case of a stem seal leak—The stem is permanently lubricated at the factory and it is not recommended that grease be injected into this fitting. And there is one fitting at each seat. These fittings serve two purposes: 1. to lubricate the valve for general maintenance and 2. to provide for emergency seat sealant in case of a seat leak. It is important to use the proper greases and or sealants when injecting into the valve. The grease or sealant must be compatible with the media flowing through the valve and the seals used in the valve. The factory can provide approved compounds for seal compatibility. For compatibility with the flowing media please consult the manufacturers of the grease/sealants. Damaged fittings are dangerous and must be fixed at the earliest opportunity.

Seat Lubrication:

The Seat Injection fittings are supplied with safety vent caps and buried check valves. If a fitting is leaking it means that the buried check valves are not working properly. **DO NOT REMOVE** the fitting if the valve is under pressure for any reason. In many cases flushing the fittings with grease will remove any debris keeping the fittings from sealing properly.

1. Check and verify that the lubrication equipment is in proper working condition. Remove the safety cap and verify the fittings are also in good working condition and clean. After launching or receiving pigs it is recommended that a compatible lubrication be pumped into the seat pockets through the grease fittings. Follow the attached chart for general lubrication. This lubrication will keep the seats in good working order and help remove any debris or media from the seat areas. If the valve is open pressure may not increase on the grease gun gauge, this is normal. If the valve is closed and under line pressure the gauge may go up. If the gauge pressure does increase make sure it does not exceed the working pressure of the valve.
2. For full service maintenance the procedure is the same as above except the amount of grease is increased. Please see the attached chart. This type of maintenance should be performed periodically based on how often the valve is used and the conditions of the service. A program can be developed for your specific applications.

Emergency Seat Sealant

The Seat and Stem injection fittings also provide a method to stop the valve from leaking. A special sealant is used that flows easily through the fittings and won't damage the seals. **PLUG VALVE GREASE** and other heavy sealing greases are not suitable. One recommended grease is **SEALWELD 50/50**. It contains small Teflon particles and will seal most leaks caused by normal wear. Please verify this sealant is compatible with your system prior to use. As this grease is heavier it should be pumped in at a slower rate.

1. The procedure for using the sealant is the same as above except: For the seats the valve must be closed. Also the pressure in the gauge will go up indicating the leak has been successfully stopped. Since the valve is closed the block and bleed fitting at the top of the closure can be opened to verify the leak has stopped. Remember to use all safety precautions and good environmental practices when opening fittings to atmosphere.
2. When used at the stem area the sealant should be pumped in slowly and once the leak has stopped do not pump more sealant into the bonnet. Watch the gauge carefully it should not exceed the testing pressure of the class valve being worked on. Only pump in enough sealant to enact a seal.

Seat Injection Cleaner

Periodically or when a valve appears to be operating harder than normal a valve cleaner may be used to improve the performance of the valve. The same procedure used for full lubrication is followed except instead of grease use a cleaner such as, **Sealweld Valve Cleaner**. After cleaning the seat pockets with the cleaner follow the full lubrication procedure with the approved grease. In many cases the cleaner will work rather quickly but there are times when the cleaner may have to soak in over a period of time. The valve should be cycled several times to ensure the problem has been improved. Block and bleed the valve to ensure the valve is sealing properly following all necessary precautions when opening fittings.

General Maintenance— continued

Tulsa Valve Inc. Shut Off Style Valves require routine and consistent maintenance to assure proper function and useful life.

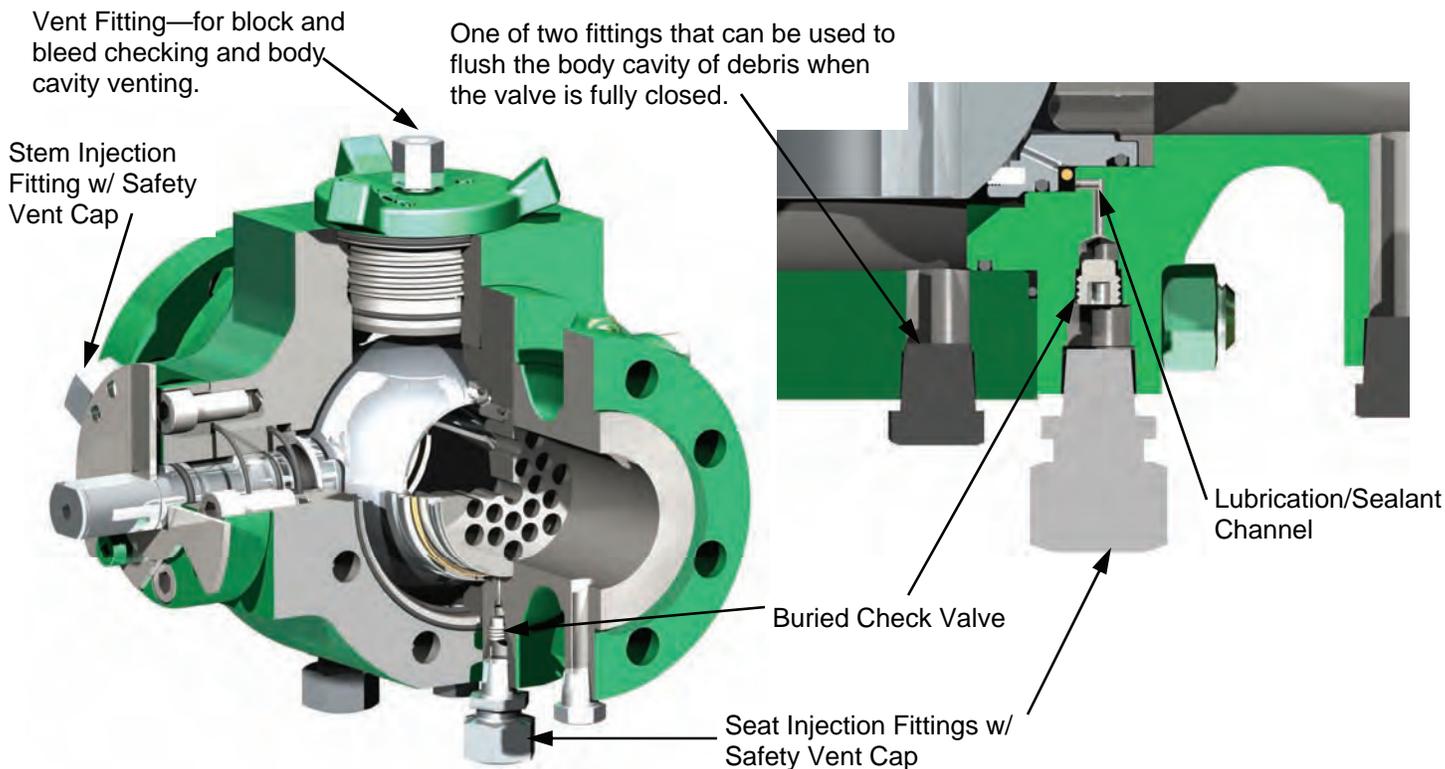
Valve Operation

Valves should be periodically operated. The longer a valve sits without operation the higher the valve torque will be. Operate valves frequently to maintain their useful life.

Verify the valve is operating properly using the Block and Bleed function of the valve. Close the valve and, following all safety precautions, open the bleed fitting at the top of the closure and vent the body cavity. If the valve stops venting the seats are functioning properly. If the valve does not stop venting the seats are not holding pressure. Follow the steps used for full lubrication first prior to injecting the seat sealant. In many cases the grease will fix the problem. Usually only the upstream seat will need to be lubricated or sealed. If a bypass has been installed or there is pressure on both sides of the closed valve lubrication or sealant will need to be injected into both seats, simultaneously if possible. This should allow the body cavity to bleed off and allow for the closure to be removed if required. If the valve did not function properly a scheduled repair should be made to inspect the valve and determine the cause.

Valve Lubrication Quantities and Valve Details

Valve size	General Periodic Lubrication	Full Lubrication
2" Valves	4- 6 pumps	2 oz per seat
3" Valves	4-6 pumps	4 oz per seat
4" Valves	4-6 pumps	6 oz per seat
6" Valves	6-8 pumps	8 oz per seat
8" Valves	6-8 pumps	10 oz per seat

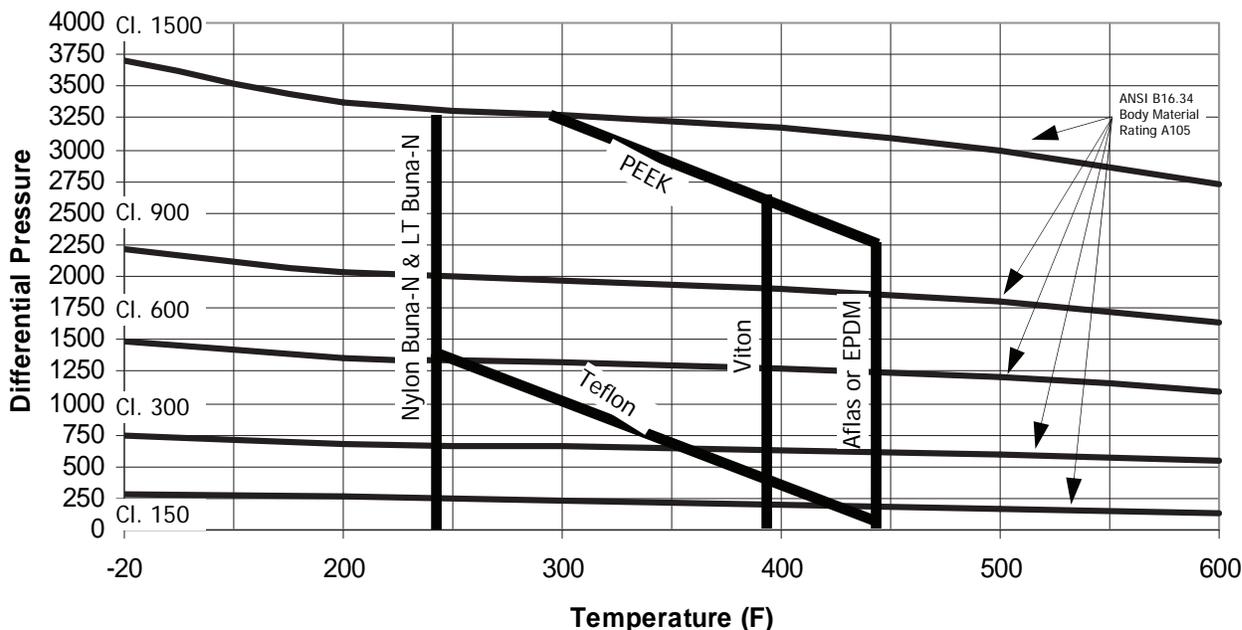


TULSA VALVE

Shut Off Style Pig Valve

Pressure Temperature & Seal Data

Pressure Temp Chart



Low Temperature limits for Metallic and Soft Seals

Body Materials	Degrees F	Degrees C
A105N	-20	-29
LF2	-50	-46
316 SS	-50	-46

Seat Materials	Degrees F	Degrees C
Nylon	-50	-46
Teflon	-50	-46
PEEK	-50	-46

Seal Materials	Degrees F	Degrees C
Buna-N	-30	-34
Low Temp Buna	-50	-46
Viton	-20	-29
Aflas	+32	0
EPDM	-50	-46

TULSA VALVE
 P.O. Box 35
 Cleveland, OK 74020

PH: 1-800-895-1380
 Fax: (918) 358-3595

PH: (918) 358-3494
 Email: sales@tulsavalve.com



NiSource Gas
Transmission & StorageSM
Columbia Gas Transmission

1700 MacCorkle Avenue, SE
Charleston, WV 25314

Direct: (304) 357-3728
Fax: (304) 357-3804
ghamaty@nsource.com

George Hamaty
Engineer, Codes & Standards

February 4, 2010

Re: Investigative Report for Columbia Gas Transmission Ripley Storage Incident
November 16, 2009

Dear Mr. Hippchen:

Columbia Gas Transmission LLC (Columbia) respectfully submits the attached laboratory analysis for the DOT Reportable Incident that occurred at Columbia's Ripley Storage Field on November 16, 2009. The incident cause was the failure of four capscrews on a 4" pigging valve. This pigging valve was installed near Well Line 7038 in the Ripley Storage facility.

In summary, the capscrews involved in this investigation failed due to improper tempering. Laboratory analysis shows that the capscrews were not properly tempered to the required temperature level, even though they met the chemical composition and tensile property requirements. There were no indications of elongation, fretting or thread deformation indicative of over torquing the screws during installation. The cap screws were installed at the factory.

If you need any additional information, please let me know.

Kind Regards,

George Hamaty

Appendix D Ripley Cap screw Report 909-90577

This document is on file at PHMSA



May 24, 2010

To Tulsa Valve pigging valve customers:

In January 2010, it was brought to our attention by Columbia Gas Transmission that one of our pigging valves that had been in service for approximately four years had a failure of the bolting for the trunion cover.

The valve and bolting were sent for independent testing. The failure was found to be due to intergranular fracture that is known to be promoted by hydrogen, phosphorous, arsenic, tin, and antimony. The Rockwell C (HRC) hardness was determined on each failed bolt to be 41 to 42 HRC. To avoid this intergranular fracturing, a recommended bolting of a max 35 HRC should be installed in any valve that may be susceptible to high volumes of hydrogen or any other of the above.

Tulsa Valve has addressed this problem by building all new pigging valves with L7M bolting that has a max HRC of 35. Any customers who purchased shut-off pig valves (before May 31, 2010) that would possibly be affected by high volumes of hydrogen should contact Tulsa Valve for replacement bolting.

As an ISO 9001:2008 certified company, Tulsa Valve strives to manufacture the finest quality valves, and we believe that the safety of our customers is of the highest regard.

To date, this is the only failure of our pigging valves to be reported by any of our customers.

Regards,

Mahlon Gray, President
Tulsa Valve

129902 Appendix F - NRC923776

NATIONAL RESPONSE CENTER 1-800-424-8802

*** For Public Use ***

Information released to a third party shall comply with any applicable federal and/or state Freedom of Information and Privacy Laws

Incident Report # 923776

INCIDENT DESCRIPTION

*Report taken at 19:21 on 16-NOV-09

Incident Type: PIPELINE

Incident Cause: UNKNOWN

Affected Area:

The incident was discovered on 16-NOV-09 at 16:56 local time.

Affected Medium: AIR / ATMOSPHERE

SUSPECTED RESPONSIBLE PARTYOrganization: COLUMBIA GAS TRANSMISSION
CHARLESTON, WV 25314

Type of Organization: PRIVATE ENTERPRISE

INCIDENT LOCATION

County: JACKSON

City: RIPLEY State: WV Zip: 25271

OFF OF STATE ROUTE 21 / RIPLEY STORAGE FACILITY

RELEASED MATERIAL(S)

CHRIS Code: ONG Official Material Name: NATURAL GAS

Also Known As:

Qty Released: 0 UNKNOWN AMOUNT

DESCRIPTION OF INCIDENT

CALLER IS REPORTING A RELEASE OF NATURAL GAS FROM A PIPELINE DUE TO UNKNOWN CAUSES.

INCIDENT DETAILS

Pipeline Type: DISTRIBUTION

DOT Regulated: YES

Pipeline Above/Below Ground: ABOVE

Exposed or Under Water: NO

Pipeline Covered: UNKNOWN

DAMAGES

Fire Involved: NO Fire Extinguished: UNKNOWN

INJURIES: NO Hospitalized: Empl/Crew: Passenger:

FATALITIES: NO Empl/Crew: Passenger: Occupant:

EVACUATIONS: NO Who Evacuated: Radius/Area:

Damages: NO

<u>Closure Type</u>	<u>Description of Closure</u>	<u>Length of Closure</u>	<u>Direction of Closure</u>
Air: N			
Road: Y	SECTION OF STATE ROUTE 21	2	Major Artery: N
Waterway: N			
Track: N			

Passengers Transferred: NO

Environmental Impact: NO

Media Interest: LOW Community Impact due to Material:

129902 Appendix F - NRC923776

REMEDIAL ACTIONS

FIRE DEPT IS ONSITE, ISOLATING THE AREA, TRYING TO BLOW DOWN THE LINE TO FIX THE LEAK THAT IS UNDER CONTROL
 Release Secured: NO
 Release Rate:
 Estimated Release Duration:

WEATHER

Weather: CLEAR, 65°F

ADDITIONAL AGENCIES NOTIFIED

Federal: NONE
 State/Local: WV PSC
 State/Local On Scene: FIRE DEPT, POLICE, WV PSC
 State Agency Number: NO REPORT #

NOTIFICATIONS BY NRC

ATLANTIC STRIKE TEAM (MAIN OFFICE)
 16-NOV-09 19:30
 USCG ICC (ICC ONI)
 16-NOV-09 19:30
 CG INVESTIGATIVE SERVICE BALTIMORE (MAIN OFFICE)
 16-NOV-09 19:30
 DOT CRISIS MANAGEMENT CENTER (MAIN OFFICE)
 16-NOV-09 19:30
 EPA OEM (MAIN OFFICE)
 16-NOV-09 19:33
 EPA OEM (AFTER HOURS SECONDARY)
 16-NOV-09 19:33
 U.S. EPA III (MAIN OFFICE)
 16-NOV-09 19:31
 NATIONAL INFRASTRUCTURE COORD CTR (MAIN OFFICE)
 16-NOV-09 19:30
 NOAA RPTS FOR WV (MAIN OFFICE)
 16-NOV-09 19:30
 NTSB PIPELINE (MAIN OFFICE)
 16-NOV-09 19:30
 PIPELINE & HAZMAT SAFETY ADMIN (OFFICE OF PIPELINE SAFETY (AUTO))
 16-NOV-09 19:30
 PIPELINE & HAZMAT SAFETY ADMIN (OFFICE OF PIPELINE SAFETY WEEKDAYS (VERBAL))
 16-NOV-09 19:32
 SECTOR OHIO VALLEY (COMMAND CENTER)
 16-NOV-09 19:30
 OH EPA ATTN: DUTY OFFICER (MAIN OFFICE)
 16-NOV-09 19:30
 WEST VIRGINIA DEP (MAIN OFFICE)
 16-NOV-09 19:30
 WV DEP ATTN: DUTY OFFICER (MAIN OFFICE)
 16-NOV-09 19:30
 WV DEP SPILL LINE (MAIN OFFICE)
 16-NOV-09 19:30
 WV INTELLIGENCE/FUSION CENTER (COMMAND CENTER)
 16-NOV-09 19:30

ADDITIONAL INFORMATION

CALLER STATED THE FIRE DEPT ASKED NEIGHBORS TO EVACUATE AND THEY REFUSED.

*** END INCIDENT REPORT # 923776 ***

129902 Appendix G - Incident Report_20090132-8561

NOTICE: This report is required by 49 CFR Part 191. Failure to report can result in a civil penalty not to exceed \$25,000 for each violation for each day that such violation persists except that the maximum civil penalty shall not exceed \$500,000 as provided in 49 USC 1678. Form Approved OMB No. 2137-0522



INCIDENT REPORT - GAS TRANSMISSION AND GATHERING SYSTEMS

Report Date _____
 No. _____
 (DOT Use Only)

INSTRUCTIONS

Important: Please read the separate instructions for completing this form before you begin. They clarify the information requested and provide specific examples. If you do not have a copy of the instructions, you can obtain one from the Office Of Pipeline Safety Web Page at <http://ops.dot.gov>.

PART A - GENERAL REPORT INFORMATION

Check one or more boxes as appropriate:

Operator Name and Address

Original Report **Supplemental Report** **Final Report**

- a. Operator's 5-digit Identification Number (when known) / _____ /
- b. If Operator does not own the pipeline, enter Owner's 5-digit Identification Number (when known) / _____ /
- c. Name of Operator _____
- d. Operator street address _____
- e. Operator address _____
 City, County or Parrish, State and Zip Code

2. Time and date of the incident

/_____/ /_____/ /_____/ /_____/
 hr. month day year

3. Location of incident

- a. _____
Nearest street or road
- b. _____
City and County or Parrish
- c. _____
State and Zip Code
- d. Mile Post/Valve Station _____
- e. Survey Station No. _____
- f. Latitude: _____ Longitude: _____
 (if not available, see instructions for how to provide specific location)
- g. Class location description
 Onshore: Class 1 Class 2 Class 3 Class 4
 Offshore: Class 1 (complete rest of this item)
 Area _____ Block # _____
 State /_____/ or Outer Continental Shelf
- h. Incident on Federal Land other than Outer Continental Shelf
 Yes No
- i. Is pipeline Interstate Yes No

4. Type of leak or rupture

- Leak: Pinhole Connection Failure (complete sec. F5)
 Puncture, diameter (inches) _____
- Rupture: Circumferential - Separation
 Longitudinal - Tear/Crack, length (inches) _____
 Propagation Length, total, both sides (feet) _____
- N/A
- Other: _____

5. Consequences (check and complete all that apply)

- a. Fatality Total number of people: /_____/
 Employees: /_____/ General Public: /_____/
 Non-employee Contractors: /_____/
- b. Injury requiring inpatient hospitalization Total number of people: /_____/
 Employees: /_____/ General Public: /_____/
 Non-employee Contractors: /_____/
- c. Property damage/loss (estimated) Total \$ _____
 Gas loss \$ _____ Operator damage \$ _____
 Public/private property damage \$ _____
- d. Release Occurred in a 'High Consequence Area'
- e. Gas ignited - No explosion f. Explosion
- g. Evacuation (general public only) /_____/ people
 Reason for Evacuation:
 Emergency worker or public official ordered, precautionary
 Threat to the public Company policy

6. Elapsed time until area was made safe:

/_____/ hr. /_____/ min.

7. Telephone Report

/_____/ /_____/ /_____/ /_____/
 NRC Report Number month day year

8. a. Estimated pressure at point and time of incident:

_____ PSIG
 b. Max. allowable operating pressure (MAOP): _____ PSIG

- c. MAOP established by 49 CFR section:
 192.619 (a)(1) 192.619 (a)(2) 192.619 (a)(3)
 192.619 (a)(4) 192.619 (c)

d. Did an overpressurization occur relating to the incident? Yes No

PART B - PREPARER AND AUTHORIZED SIGNATURE

 (type or print) Preparer's Name and Title Area Code and Telephone Number

 Preparer's E-mail Address Area Code and Facsimile Number

 Authorized Signature (type or print) Name and Title Date Area Code and Telephone Number

PART C - ORIGIN OF THE INCIDENT

- | | |
|---|--|
| <p>1. Incident occurred on
Transmission System
Gathering System
Transmission Line of Distribution System</p> <p>2. Failure occurred on
Body of pipe Pipe Seam
Joint
Component
Other: _____</p> | <p>3. Material involved (<i>pipe, fitting, or other component</i>)
Steel
Plastic (If plastic, complete all items that apply in a-c)
Plastic failure was: a.ductile b.brittle c.joint failure
Material other than plastic or steel: _____</p> <p>4. Part of system involved in incident
Pipeline Regulator/Metering System
Compressor Station Other: _____</p> <p>5. Year the pipe or component which failed was installed: / ____ /</p> |
|---|--|

PART D - MATERIAL SPECIFICATION (if applicable)

1. Nominal pipe size (NPS) / ____ / in.
 2. Wall thickness / ____ / in.
 3. Specification _____ SMYS / ____ /
 4. Seam type _____
 5. Valve type _____
 6. Pipe or valve manufactured by _____ in year / ____ /

PART E - ENVIRONMENT

1. Area of incident In open ditch
Under pavement Above ground
Under ground Under water
Inside/under building Other: _____
 2. Depth of cover: _____ inches

PART F - APPARENT CAUSE

Important: There are 25 numbered causes in this section. Check the box to the left of the **primary** cause of the incident. Check one circle in each of the supplemental items to the right of or below the cause you indicate. See the instructions for this form for guidance.

F1 - CORROSION

If either F1 (1) External Corrosion, or F1 (2) Internal Corrosion is checked, complete all subparts a - e.

- | | |
|------------------------------|---|
| <p>1. External Corrosion</p> | <p>a. Pipe Coating b. Visual Examination c. Cause of Corrosion</p> <p>Bare Localized Pitting Galvanic Stray Current</p> <p>Coated General Corrosion Improper Cathodic Protection</p> <p>Other: _____ Microbiological</p> <p>Other: _____ Stress Corrosion Cracking</p> <p>Other: _____</p> |
| <p>2. Internal Corrosion</p> | <p>d. Was corroded part of pipeline considered to be under cathodic protection prior to discovering incident?
No Yes, Year Protection Started: / ____ /</p> <p>e. Was pipe previously damaged in the area of corrosion?
No Yes, How long prior to incident: / ____ / years / ____ / months</p> |

F2 - NATURAL FORCES

3. Earth Movement => Earthquake Subsidence Landslide Other: _____
 4. Lightning
 5. Heavy Rains/Floods => Washouts Flotation Mudslide Scouring Other: _____
 6. Temperature => Thermal stress Frost heave Frozen components Other: _____
 7. High Winds

F3 - EXCAVATION

8. Operator Excavation Damage (*including their contractors*) / Not Third Party
9. Third Party Excavation Damage (*complete a-d*)
- a. Excavator group
General Public Government Excavator other than Operator/subcontractor
- b. Type: Road Work Pipeline Water Electric Sewer Phone/Cable Landowner Railroad
Other: _____
- c. Did operator get prior notification of excavation activity?
No Yes: Date received: / ____ / mo. / ____ / day / ____ / yr.
Notification received from: One Call System Excavator Contractor Landowner
- d. Was pipeline marked?
No Yes (*If Yes, check applicable items i - iv*)
- i. Temporary markings: Flags Stakes Paint
ii. Permanent markings: Yes No
iii. Marks were (*check one*) Accurate Not Accurate
iv. Were marks made within required time? Yes No

F4 - OTHER OUTSIDE FORCE DAMAGE

10. Fire/Explosion as primary cause of failure => Fire/Explosion cause: Man made Natural
 11. Car, truck or other vehicle not relating to excavation activity damaging pipe
 12. Rupture of Previously Damaged Pipe
 13. Vandalism

F5 – MATERIAL AND WELDS

Material

- 14. Body of Pipe => Dent Gouge Wrinkle Bend Arc Burn Other: _____
- 15. Component => Valve Fitting Vessel Extruded Outlet Other: _____
- 16. Joint => Gasket O-Ring Threads Other: _____

Weld

- 17. Butt => Pipe Fabrication Other: _____
- 18. Fillet => Branch Hot Tap Fitting Repair Sleeve Other: _____
- 19. Pipe Seam => LF ERW DSAW Seamless Flash Weld Other: _____
 HF ERW SAW Spiral

Complete a-g if you indicate **any** cause in part F5.



a. Type of failure:

- Construction Defect => Poor Workmanship Procedure not followed Poor Construction Procedures
- Material Defect

b. Was failure due to pipe damage sustained in transportation to the construction or fabrication site? Yes No

c. Was part which leaked pressure tested before incident occurred? Yes, complete d-g No

d. Date of test: / / mo. / / day / / yr.

e. Test medium: Water Natural Gas Inert Gas Other: _____

f. Time held at test pressure: / / hr.

g. Estimated test pressure at point of incident: _____ PSIG

F6 – EQUIPMENT AND OPERATIONS

- 20. Malfunction of Control/Relief Equipment => Valve Instrumentation Pressure Regulator Other: _____
- 21. Threads Stripped, Broken Pipe Coupling => Nipples Valve Threads Mechanical Couplings Other: _____
- 22. Ruptured or Leaking Seal/Pump Packing

23. Incorrect Operation

a. Type: Inadequate Procedures Inadequate Safety Practices Failure to Follow Procedures Other: _____

b. Number of employees involved who failed post-incident drug test: / / Alcohol test: / /

c. Were most senior employee(s) involved qualified? Yes No d. Hours on duty: / /

F7 – OTHER

24. Miscellaneous, describe: _____

25. Unknown
 Investigation Complete Still Under Investigation (submit a supplemental report when investigation is complete)

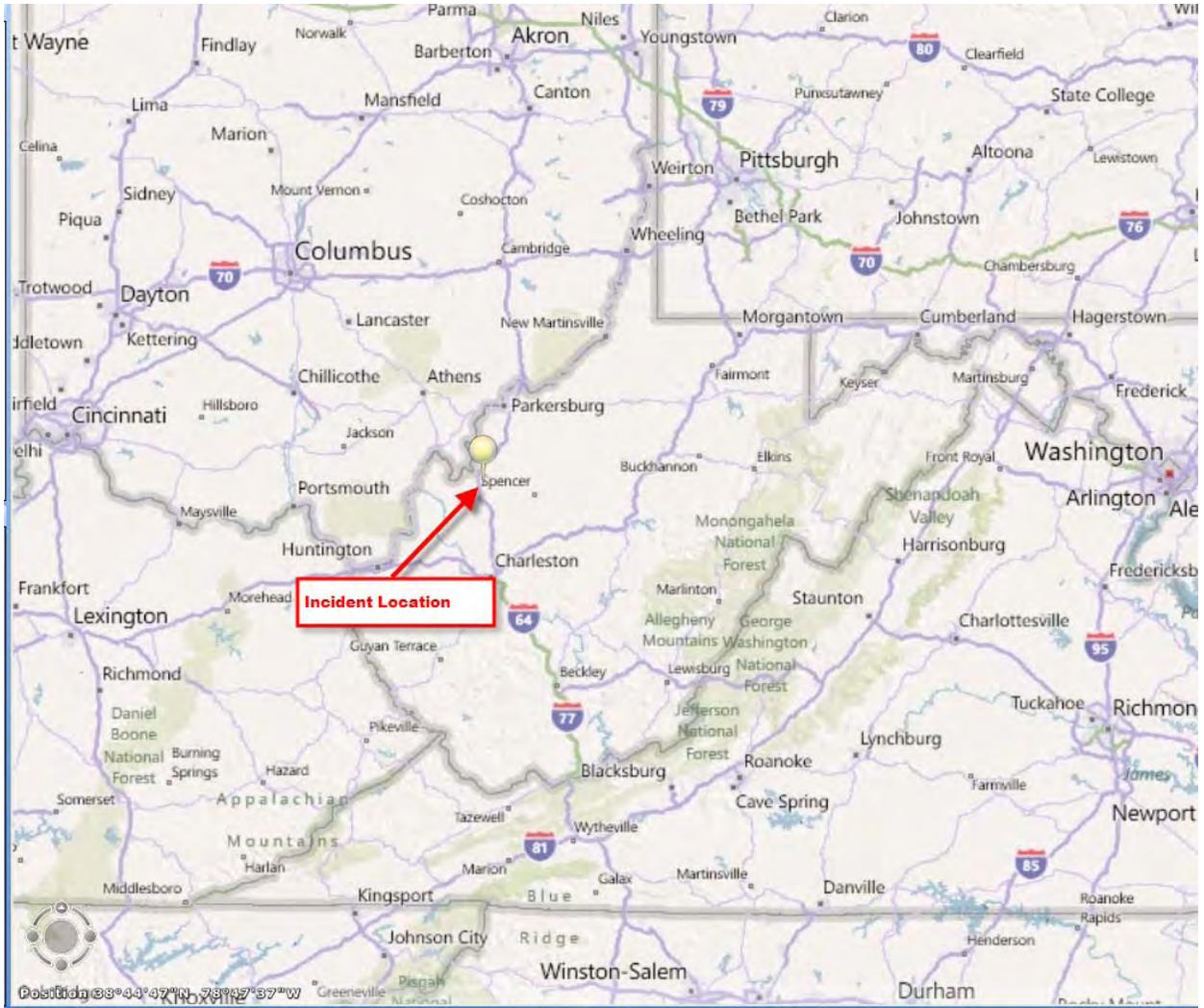
PART G – NARRATIVE DESCRIPTION OF FACTORS CONTRIBUTING TO THE EVENT

(Attach additional sheets as necessary)

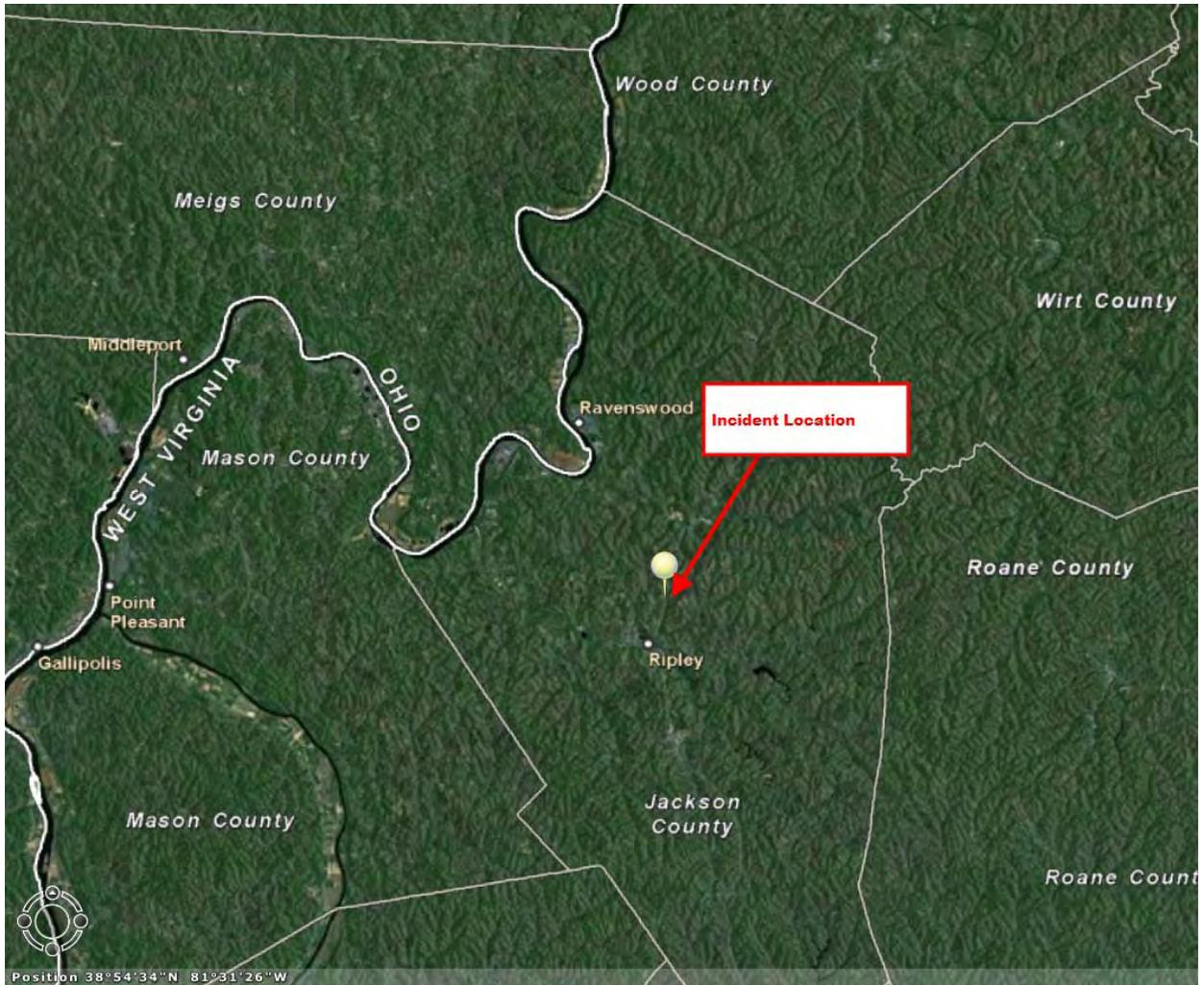
129902 Appendix H - Incident Location Map



129902 Appendix H - Incident Location Map



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129902 Appendix H - Incident Location Map

