



Description To define defects in steel pipeline and specify the acceptable method for their disposal.

Regulatory Applicability

- Regulated Transmission Pipelines
- Regulated Gathering Pipelines (Type A)
- Regulated Gathering Pipelines (Type B)
- Regulated Distribution Pipelines

Frequency As needed

Reference

49 CFR 192.309	<i>Repair of Steel Pipe</i>
49 CFR 192.703	<i>General</i>
49 CFR 192.711	<i>Transmission Lines: General Requirements for Repair Procedures</i>
49 CFR 192.713	<i>Transmission Lines: Permanent Field Repair of Imperfections and Damages</i>
49 CFR 192.715	<i>Transmission Lines: Permanent Field Repair of Welds</i>
49 CFR 192.717	<i>Transmission Lines: Permanent Field Repair of Leaks</i>
49 CFR 192.719	<i>Transmission Lines: Testing of Repairs</i>

Forms / Record Retention

F-192.619	<i>MAOP Determination / Life of Pipeline System</i>
F-192.709	<i>Repair Work Order / Life of Pipeline System</i>
Form WTG-1100	<i>Exposed Pipeline Inspection / 5 Years</i>

Related Specifications

API Spec. 5L	<i>Specification for Line Pipe</i>
API Spec. 5L1	<i>RP for Railroad Transportation of Pipe</i>
API Spec. 6D	<i>Pipeline Valves</i>
ASTM A53/A53M-04a	<i>Standard Specification for Pipe Steel, Black and Hot-Dipped, Zinc Coated, Welded and Seamless</i>



ASTM A106/A106M-04b	<i>Standard Specification for Seamless Carbon Steel Pipe for High-Temperature Service</i>
ASTM A333/A372M	<i>Standard Specification for Carbon and Alloy Steel Forgings for Thin-Walled Pressure Vessels</i>
ASTM A381	<i>Standard Specification for Metal-Arc Welded Steel Pipe for Use with High Pressure Transmission Systems</i>
ASTM A671	<i>Standard Specification for Electric Fusion-Welded Steel Pipe for Atmospheric and Lower Temperatures</i>
ASTM A672	<i>Standard Specification for Electric Fusion-Welded Steel Pipe for High Pressure Service and Moderate Temperatures</i>
ASTM A691	<i>Standard Specification for Carbon and Alloy Steel Pipe, Electric Fusion-Welded for High Pressure Service with High Temperatures</i>
ASTM D2513	<i>Standard Specification for Thermoplastic Gas Pressure Pipe, Tubing, and Fittings</i>
ASTM D2517	<i>Standard Specification for Reinforced Epoxy Resin Gas Pressure Pipe and Fittings</i>
ASME B16.1	<i>Cast Iron Pipe Flanges and Flanged Fittings</i>
ASME B16.5	<i>Flanges and Flanged Fittings</i>
ASME Boiler Pressure and Vessel Code, Section VIII, Division 1	<i>Rules for Construction of Pressure Vessels</i>
ASME Boiler and Pressure Vessel Code, Section VIII, Division 2	<i>Rules for Construction, Pressure Vessel Alternative Rules</i>



OQ Covered	1041	<i>Install Mechanical Clamps and Sleeves – Bolted</i>
Task	1051	<i>Fit-Up of Weld Type Repair Sleeve</i>
	1061	<i>Install Composite Sleeves</i>
	1071	<i>Repair of Steel Pipe by Grinding</i>
	0731	<i>Joining of Pipe – Flange Assembly</i>

(In order to perform the tasks listed above; personnel must be qualified in accordance with West Texas Gas's Operator Qualification program or directly supervised by a qualified individual.)



Procedure Steps

General

Any segment of pipe that becomes unsafe must be replaced, repaired, or removed from service. The following procedure describes the most effective way to accomplish this promptly and safely. Hazardous leaks must be repaired promptly.

Immediate temporary measures will be taken to protect the public whenever a leak, imperfection, or damage that impairs the serviceability of a segment operating at or above 40% of SMYS; and it is not feasible to make a permanent repair at the time of discovery. Permanent repairs will be made according to the following:

- A. Non – Integrity Management Repairs: Permanent repairs will be made as soon as feasible.
- B. Integrity Management Repairs: When WTG discovers a condition on a pipeline covered under 49 CFR 192 Subpart O - Gas Transmission Pipeline Integrity Management, WTG will remediate the condition as prescribed by §192.933
- C. (d).

WTG may not use any pipe, valve, or fitting for replacement or repairing pipeline facilities unless it is designed and constructed as required by Part 192.

Unless specifically noted as an exception in this procedure, welded patches will not be used as a means of repair.

Pipeline excavations for repair are to follow procedure P-192.319.

All materials used in the repair of the pipeline or components must comply with the requirements of 49 CFR 192 Subpart B.

Pipe and components being used as replacement in a pipeline must be designed in accordance with 49 CFR Subpart C and D respectively.

Accommodation of Internal Inspection Devices

- 1. Except as provided in paragraphs 2 and 3 below, each new pipeline and each line section of a pipeline where the line pipe, valve, fitting or other line component is replaced must be designed and constructed to accommodate the passage of internal inspection devices.
- 2. Paragraph 1 above, does not apply to:
 - a) Manifolds,
 - b) Piping associated with storage facilities, other than a continuous run of transmission line between a compressor station and storage facilities,
 - c) Crossovers
 - d) Sizes of pipe for which an instrumented internal inspection device is not commercially available



- e) Transmission lines, operated in conjunction with a distribution system which are installed in Class 4 locations,
 - f) Other piping under 49 CFR 190.9 that the Administrator finds in a particular case would be impracticable to design and construct to accommodate the passage of instrumented internal inspection devices
 - g) Gathering pipelines (Type A or B)
3. An operator encountering emergencies, construction time constraints, and other unforeseen construction problems need not construct a new or replacement segment of a pipeline to meet paragraph 1 above, if the operator determines and documents why an impracticality prohibits compliance with paragraph 10 above. Within 30 days after discovering the emergency or construction problem, the operator must file a petition under 49 CFR 190.9 for approval of the design and construction that does not accommodate the passage of an instrumented internal inspection device, and why it would be impractical. If the petition is denied, within one (1) year after the date of the notice of denial, the operator must modify that segment to allow passage of instrumented internal inspection devices.

Preliminary Investigation

1. Inspect any exposed pipeline for leaks, impact damage, coating conditions and external corrosion. Refer to procedure P-192.459 for steps on conducting this inspection.
2. Visually inspect buried welds whenever the coating has been removed for any reason. Refer to procedure P-192.241 for steps on conducting this inspection.
3. Make a preliminary assessment to determine the extent of the damage or defect. In most cases a visual inspection is sufficient. Use X-ray or other forms of inspection that could be considered helpful if conditions warrant. Refer to procedure P-192.243 for steps on conducting non-destructive testing.
4. Investigate to determine the cause of any leaks that are found. Hazardous leaks will be repaired promptly.
5. Determine if a safety-related condition exists and whether it should be reported (refer to procedure P-191.23).

Repairs While Operating Under Pressure

1. The pressure criteria in this procedure are based upon industry experience and mathematical analysis predicting acceptable pipeline pressures. Such experience indicates that a pipeline which has been damaged and does not subsequently fail (rupture) probably will not fail during the course of repair activities if the actual pressure in the pipe is reduced. With this consideration, the greater the pressure reduction, a reduced risk of pipe failure will occur.
2. To minimize risk, repair activities should be accomplished at the lowest operating pressure possible.
3. Good engineering judgment is needed to determine the appropriate safe pipeline pressure during repairs. Circumstances to consider when determining safe pipeline pressure include



but are not limited to the following: extent of damage to the pipeline, deliverability requirements, class location, etc.

NOTE: The WTG Operations Manager must be consulted and approval obtained when pipeline pressures are above the recommended maximum pressures and left in service.

NRI Trident Seal Leak Repair System

West Texas Gas has determined that the NRI Trident Seal product, when installed according to the manufacturer's specifications, produces an acceptable and permanent leak repair on pipelines with an operating pressure of 60 psi or less. Utilize the following manufacturer-provided procedure for installing the Trident-Seal Repair Kit.

Installation of the Trident-Seal™ Repair Kit

1. Pinpoint origin of leak following your standard operating leak detection procedures (if using leak detection soap wipe clean and remove any remaining soap from pipe surface before beginning repair).
2. Clean and roughen using a wire brush or included sanding cloth to remove excess rust, dirt or loose scale. Remove any oils, greases, soaps, or foreign materials from pipe surface with included solvent cleaning wipe.
3. Blend or knead putty until it is uniform in color with no streaks.
4. Setting time of putty is a Key Point – DO NOT exceed 3 minute working time of putty before applying rubber pressure sealing tape.

Application of Putty –Pinholes

1. Place ½" ball of putty directly over the pinhole.
2. Press firmly in place. Do not use an excessive amount of putty as it may hinder the repair.

Application of Putty - Joints

1. Roll putty into rope long enough to encompass the entire joint.
2. Use just enough putty to make a smooth transition between the pipe and the fitting.
3. Press firmly in place. Do not use an excessive amount of putty as it may hinder the repair.

Before Application of Pressure Sealing Tape

1. Open pressure sealing tape and remove protective paper from adhesive tape attached to rubber tape end. Adhesive portion anchors pressure sealing tape to the pipe so adequate pressure can be applied.

Application of Pressure Sealing Tape- Pinhole

1. Begin wrapping adhesive tape portion adjacent to the putty to anchor pressure sealing tape to pipe.
2. After one wrap with the adhesive tape begin covering the putty.



3. Apply pressure sealing tape with maximum pressure by stretching as it is applied. Apply most of the tape directly over the putty
4. Tape should be applied totally encasing the putty. Apply all of the tape until the end adhesive tape appears.
5. Continue with end adhesive tape until completed. This will hold pressure sealing tape in position until Outer Wrap can be applied.
6. Be sure end adhesive is fully attached to repair.

Application of Pressure Sealing Tape - Joints

1. Start adhesive portion of tape adjacent to putty. Once the pressure sealing tape starts to cover the adhesive tape begin stretching the tape to apply pressure.
2. Continue stretching the tape as it is wrapped to apply pressure and force the putty into the joint.
3. Continue to apply tape with firm pressure over putty and extending somewhat onto elbow or T surface. Use entire roll of tape until end adhesive appears.

Remove paper backing.

1. Firmly press end adhesive tape on to repaired area.
2. Smooth end onto surface to finish and to retain pressure sealant tape in place and retain tape until Outer Wrap is applied.

STOP: After applying Trident-Seal Pressure Sealing Tape test repair by following your standard leak detection procedures to ensure the gas is sealed and contained. Wipe clean after test. DO NOT open Glass Outer Wrap package until you know leak is completely sealed.

Application of Trident-Glass™ Outer Wrap

1. Water is needed to activate Trident-Glass™ Outer Wrap.
2. Put on supplied gloves.
3. Open foil package at notches on side.
4. Submerge in water for ten seconds.
5. Wrap Trident-Glass™ Outer Wrap over the entire repair area ensuring you achieve an 8-layer application over the leak area.

Application of Trident-Glass™ Outer Wrap – Pinholes

1. Begin wrapping the Outer Wrap adjacent to the repair site, extending over the Pressure Sealing Tape. Use firm pressure while wrapping!
2. Twisting the glass wrap as it is applied helps to conform tightly to the pipe surface.
3. Squeeze and mold in direction of the wrap in order to tighten wrap and conform to pipe area.

Application of Outer Wrap – Joints



1. Begin wrapping adjacent to repair applying firm pressure after the first wrap to cinch the glass around the pipe.
2. Continue wrapping in the direction of the repair applying pressure so the wrap conforms to the joint or T area.
3. Twisting the glass outer wrap as it is applied helps it to conform to the repair surface.
4. Squeeze and mold in direction of the wrap in order to tighten wrap and conform to pipe area.

Application of Compression Film

1. Unroll the first few inches of compression film and begin wrapping from end of repair.
2. Apply two layers of compression film to repair area, pulling tightly to mold glass outer wrap and seal the ends of the wrap to the pipe.
3. Poke holes with pin, wire brush or knife-point in the compression film to allow excess water and gases generated by resin curing process to escape through plastic film.
4. The compression film should be removed and discarded after ten minutes cure time.
5. Paint repair before leaving jobsite.

Things to Remember:

- Make sure pipe surface is TOTALLY clean.
- Make sure Putty is mixed above 50°F (10°C).
- Remember there is only a 3 min working time once the putty is mixed. (knead well so no streaks of color remain).
- Rubber tape must be applied within the 3 minute working time of the putty.
- Don't squeeze the putty out of the joint, squeeze it into the joint.
- Always apply maximum tension to the Pressure Tape.
- Apply most of the tape directly over the repair.
- Don't open the Trident-Glass™ Outer Wrap until you are ready to apply (as it will slowly activate once the bag is opened from the moisture in the air).
- Always leak test the repair prior to application of the Glass Outer Wrap.
- Does not adhere to polyethylene piping.
- If corrosion is larger than leak area, NRI recommends reinforcing with NRI Trident -Wrap™ or approved composite rehabilitation system.

Pipe Kits vs. Pipe Diameter

Each kit contains the correct amount of leak sealant, rubber tape, and outer wrap to accommodate indicated pipe diameters



- For up to **1" Diameter Pipe**: Trident-Glass Outer Wrap is 2 inches wide and 5.8 feet long. Appropriate item is TS2580
- For **1.25" to 2" Diameter Pipe**: Trident-Glass Outer Wrap is 3 inches wide and 10.4 feet long. Appropriate item is TS3104
- For **2.5" to 4" Diameter Pipe**: Trident-Glass Outer Wrap is 4 inches wide and 17.3 feet long. Appropriate item is TS4173
- For **4.5" to 6" Diameter Pipe**: Trident-Glass Outer Wrap is 4 inches wide and 33.5 feet long. Appropriate item is TS4335

Permanent Field Repair of Imperfections and Damages

1. Each imperfection or damage that impairs the serviceability of a length of steel pipeline under 40% SMYS must be repaired or removed. If the repair is made by grinding, the remaining wall thickness must be at least equal to either:
 - a) The minimum thickness required by the tolerances in the specification to which the pipe was manufactured; or
 - b) The nominal wall thickness required for the design pressure of the pipeline.
2. Each of the following dents (depressions that produce a gross disturbance in the curvature of the pipe wall reducing the pipe-wall thickness) must be removed from steel pipe to be operated at a pressure that produces a hoop stress of 20% or more of SMYS, unless the dent is repaired by a method that reliable engineering tests and analyses show can permanently restore the serviceability of the pipe:
 - a) The dent contains a stress concentrator such as a scratch, gouge, groove or arc burn;
 - b) The dent affects the longitudinal weld or circumferential weld.
 - c) If the pipe is to be operated at a pressure that produces a hoop stress of 40% or more of SMYS. A dent that has a depth (measured as the gap between the lowest point of the dent and a prolongation of the original contour of the pipe) of:
 - i) More than $\frac{1}{4}$ inch in pipe 12 $\frac{3}{4}$ inches or less in outer diameter; or
 - ii) More than 2% of the nominal pipe diameter in pipe over 12 $\frac{3}{4}$ outer diameter.
3. Arc burns in pipe that produces a hoop stress of 40% or more of SMYS must be repaired according to procedure P-192.245.
4. Each imperfection or damage that impairs the serviceability of pipe in a steel transmission line operating at or above 40% SMYS must be:
 - a) Removed by cutting out and replacing a cylindrical piece of pipe (See Pipe Replacement section of this procedure); or
 - b) Repaired by a method that reliable engineering tests and analyses show can permanently restore the serviceability to the pipe.



Repair of Welds

1. If it is feasible to take the segment of pipeline out of service, the weld must be repaired per Procedure P-192.245.
2. A weld may be repaired in accordance with repair or removal of defective weld per applicable code and standard while the segment of transmission line is in service if:
 - a) The weld is not leaking;
 - b) The pressure in the segment is reduced so that it does not produce a stress that is more than 20 percent of the specified minimum yield strength of the pipe; and
 - c) Grinding of the defective area can be limited so that at least 1/8 inch thickness in the pipe weld remains.
3. A defective weld that cannot be repaired in accordance with above must be repaired by installing a full encirclement welded split sleeve of appropriate design.

Permanent Field Repair of Leaks

1. If feasible, the segment of pipeline must be taken out of service and repaired by cutting out a cylindrical piece of pipe and replacing it with pipe of similar or greater design strength.
2. If it is not feasible to take the segment of pipeline out of service, repairs must be made by installing a full encirclement welded split sleeve of appropriate design, unless the line is joined by mechanical couplings and operates at less than 40% of SMYS (See Welded Split Sleeve portion of this procedure.)
3. If the leak is due to a corrosion pit, the repair may be made by installing a properly designed bolt-on-leak clamp (See Bolt-on-Leak Clamp portion of this procedure).
4. If the leak is due to a corrosion pit and on pipe that operates less than 40% SMYS, fillet weld a steel plate patch with round corners of the same or greater thickness than the pipe, and not more than 1/2 of the diameter of the pipe in size over the pitted area. (See welded patch portion of this procedure).
5. If the leak is on a submerged offshore pipeline or submerged pipeline in an inland navigable waterway, mechanically apply a full encirclement split sleeve of appropriate design. (See Clockspring and Plidco Sections of this procedure).
6. For a repaired leak with a gas concentration reading greater than 0% at the time of repair, conduct a post-repair leak inspection within 30 days after the repair to determine whether the leak has been effectively repaired. If post-repair inspection shows greater than 0% gas concentration, please refer to Post Repair Inspections in P-192.706(b).
7. All repairs performed must be tested and inspected.

Testing of Repairs

1. Testing of replacement pipe:
 - a) The replacement pipe must be tested to the pressure required for a new line installed in the same location. This test may be made on the pipe before it is installed.

- b) For lines of 6-inch diameter or larger and that operate at 20% or more of SMYS, the repair will be non-destructively tested in accordance with 192.241(c).
2. Inspection and test of welds:
- a) Visual inspection of welding must be conducted to insure that the welding is performed in accordance with the welding procedure. Refer to procedure P-192.241.
 - b) Nondestructive testing of weld must be performed by a trained technician. Interpretation of x-rays shall be made by a technician trained to a Level II. Refer to Procedure P-192.243.
 - c) The acceptability of a weld that is nondestructively tested or visually inspected is determined according to the standards in Section 6 of API Standard 1104 or ASME Section IX.

Repair of Corrosion Condition

1. General Corrosion:
- a) Each segment of pipeline with general corrosion and with a remaining wall thickness less than that required for the maximum operating pressure of the pipeline must be removed by cutting out a cylindrical piece of pipe and replacing it with pipe of similar or greater design strength or the operating pressure must be reduced commensurate with the strength of the pipe based on the actual remaining wall thickness. However, if the area of general corrosion is small, the corroded pipe may be repaired. If corrosion pitting is so closely grouped that it affects the overall strength of the pipe, the pitting is considered general corrosion.
 - b) References for determining the remaining strength of a pipeline are:
 - i) ASME/ANSI B31G (1991), "Manual for Determining the Remaining of Corroded Pipelines."
 - ii) AGA Pipeline Research Committee, Project PR-3-805, "A Modified Criterion for Evaluating the Remaining Strength of Corroded Pipe," December 22, 1989.
2. Localized Corrosion Pitting:
- a) Each segment of pipeline with localized corrosion pitting to a degree where leakage might result must be repaired or removed by cutting out a cylindrical piece of pipe and replacing it with pipe of similar or greater design strength or the operating pressure must be reduced commensurate with the strength of the pipe, based on the actual remaining wall thickness in the pits. Inspect the interior of the cutout and the ends of the remaining pipe for internal corrosion, record on Form WTG-1100.

Repair Shorted Casing

1. Expose casing and excavate workable area around the carrier pipe.
2. Remove end seal.
3. Take cathodic protection readings before moving anything, both on pipe and casing. Leave Cu-CuSO₄ reference electrode in the same position in coil when taking both readings.



4. Gently lift pipe with nylon or other straps. Retake cathodic protection readings as in step 3 to determine if short connection has been broken.

NOTE: Expect only a 0.1 to 0.2 V DC shift if the connection breaks; it may take several days for polarization to dissipate off the casing and for casing to show an unprotected potential.

5. Before setting pipe back down, clean out any mud and/or water from casing end, if possible. Inspect exposed pipe for pitting damage per P-192.459.

NOTE: This inspection may necessitate the determination of a safety-related condition. A new determination of the MAOP may be required F-192.619.

6. Center the carrier pipe in the bottom of the casing.
7. Install new casing insulator while providing adequate support. If there is adequate access, install two casing insulators, one directly behind the other, to distribute support more evenly.
8. Lower pipe back down. Check need to install any supplemental support on the pipeline outside of the casing, i.e. with sandbags.
9. Install test wires as required.
10. Install new end seal.
11. Backfill supported pipe and casing end in such a manner that new end seal will not be ruptured.
12. Conduct testing to ensure the casing is repaired. If not, excavate other end and repeat this procedure.

Pipe Replacement

1. Shut-in the pipeline and isolate the section to be replaced. Purge of gas.

Note: A stopple may be inserted to isolate the section of pipe. Refer to the following portions of this procedure: Stopples Fitting Preparations, Sealing the Pipeline with a Stopples Plug, and Plugging the Pipeline with the Lock-o-Ring Plug.

2. Post a fire watch.
3. Cut out the cylinder of pipe.
4. Replace the pipe and weld in place using procedure P-192.225.

Welded Split Sleeve

1. Prepare surface by wire buffing or abrasive blasting as required.
2. Fill dents or voids as needed.
3. Obtain the induced AC potential.
4. Ensure proper ultrasonic has been done for weld ends.
5. Refer to Authorization Procedure for direct welding on line.



6. Prepare and fit collars to pipeline using jacks and chains so inside welds are 4" less than desired length of oversleeve when using 4" collars.
7. Post fire watch.
8. Tack weld side seams of collars.
9. Remove jacks and chains from collars.
10. Weld side seams of collars.
11. Prepare and fit bottom and top halves of oversleeve to collars using jacks and chains (desired length of oversleeve is distance between centers of collars).
12. Tack weld side seams of oversleeve.
13. Remove jacks and chains from oversleeve.
14. Weld side seams of oversleeve.
15. Weld oversleeve ends to center of collars.
16. Weld ends of collars to pipeline.

Bolt-on-Leak Clamp

Mechanical leak repair clamps may not be used as permanent repair methods for any plastic pipe. For steel pipe, manufacturer's procedures will be followed. Install Tight Fitting Sleeve

1. Prepare surface by wire buffing or abrasive blasting as required.
2. Fill dents or voids as needed.
3. Obtain the induced AC potential.
4. Ensure proper ultrasonic has been done for weld ends.
5. Refer to authorization procedure for direct welding on line.
6. Prepare and fit top and bottom of tight fitting sleeve to pipeline.
 - a) Install backup straps under longitudinal welds.
 - b) Use jacks and chains to achieve a tight fit, and equal welding gaps for the side seam.
7. Post fire watch.
8. Weld first pass on side seams in all accessible areas.
9. Remove jacks and chains.
10. Complete welding side seams to each other.
11. Weld ends to pipeline.

Sandwich Valve Installation

1. Check bolts, faces and sandwich valves.



2. Rig sandwich valve for installation.
 - a) Clean the flange face of the stopple fitting and the bottom face of the sandwich valve.
 - b) Install the proper gasket.
3. Install sandwich valve.
 - a) Mount the sandwich valve on the stopple fitting making sure retainer ring screws are not obstructed.
 - b) Quarter and tighten the stud nuts (refer to flange-tightening procedure).
 - c) Install cat walk.
 - d) Open the sandwich valve with the valve handle, and record the number of turns for later use. On larger sandwich valves, the travel distance of the valve extension rod.
 - e) Check for proper sandwich valve and stopple fitting bore alignment using a straight edge. (If alignment is poor, loosen stud nuts and make the adjustment.)
4. Take measurements.
 - a) Measure and record from the top of the sandwich valve to the top center of the pipeline, including gaskets. (This measurement will be used in both the tapping and stopple plugging operation.)
 - b) Measure and record from the top of the sandwich valve, plus the gaskets, to the top of the retainer ring segments. (This measurement will be used to set the lock-o-ring plug.)

Stopple Fitting Preparation

1. Read chart or blueprint.
2. Refer to Excavation Procedure.
3. Determine proper location of stopple fitting (no closer than 2" from a circumferential weld).
4. Refer to Authorization Procedure for direct welding on line.
5. Operate ultrasonic where fillet welds are to be made.
6. Prepare fitting: Buff or grind paint off bevel, Check and clean stopple fitting flange face.
7. Fit stopple fitting on line (see sleeving procedure).
8. Place the stopple fitting square to and on the center of the pipe.
9. Rotate all retainer ring screws clockwise and counter clockwise to advance and retract the retainer ring segments inside the stopple fitting. (These segments are used to hold the lock-o-ring plug.)
10. Record the exact number of turns required to fully advance the segments, which is the same number of turns used to set the lock-o-ring plug at a later time.
11. Preheat as needed.
12. Weld side seams.



13. Request pressure reduction.
14. Preheat as needed.
15. Post fire watch.
16. Weld ends on stopple fittings.
17. Weld on 2" equalization fittings when ends are welded (minimum of 18" from fitting could also be used for venting behind vapor plugs).
18. Request return to operating pressure.
19. Support stopple fitting.

Sealing the Pipeline with a Stopple Plugging Machine

1. Prepare the stopple plugging machine.
 - a) Unlock bar lock clamps that keep plugging head and control bar from moving during transportation.
 - b) Extend control bar to expose plugging head by moving control valve handle down. **WARNING:** Do not over-extend plugging head housing.
 - c) Clean and inspect all parts of plugging head housing assembly.
2. Apply sealing element.
 - a) Remove nose piece and discard used sealing element.
 - b) Place new sealing element on yoke face aligning bolt holes.
 - c) Position nose piece on new element.
 - d) Tighten bolts gradually on opposite sides until element has expanded evenly and is tight and centered.
 - e) Torque all bolts.
 - f) Grease sealing element liberally.
 - g) Retract plugging head.
 - h) Tighten bar lock clamps.
 - i) Disconnect power units' hydraulic hoses.
3. Take measurements before moving plugging head onto proper position:
 - a) Control bar face to adapter face.
 - b) Top of sandwich valve to top center of pipe.
 - c) Outside diameter of pipe minus one wall thickness. Install stopple plugging machine.
 - d) Place stopple plugging machine on sandwich valve with plugging head facing section to be isolated.
 - e) Quarter and tighten bolts.



- f) Install bleeder valve, equalization valve and high pressure hose.
 - g) Open bypass on sandwich valve to fill stopple plugging adapter while purging air through bleeder valve.
 - h) Open sandwich valve.
 - i) Close bypass valve.
 - j) Release bar lock clamps.
 - k) Connect power unit hydraulic hoses to stopple plugging machine.
4. Insert plug (downstream stopple first).
- a) Open equalization valves to equalize pressure across plugging head.
 - b) Lower plugging head slowly into position by moving control valve handle down.
 - c) Tighten bar clamps.
 - d) Close equalization valves to divert oil flow.
5. Withdraw plugging head (upstream stopple first).
- a) Open both equalization valves to equalize pressure across the plugging head.
 - b) Unlock bar lock clamps.
 - c) Retract plugging head slowly to zero by moving control valve handle up.
 - d) Lock bar lock clamps.
 - e) Close sandwich valves and equalization lines.
 - f) Bleed pressure through bleeder valve or drain line on sandwich valve.
 - g) Drain stopple plugging machine.
 - h) Disconnect equalization valve, hoses and bleeder valve.
 - i) Remove stopple plugging machine.

Plugging the Pipeline with the Lock-o-Ring Plug

1. Install coupon to plug making sure arrows are aligned.
2. Install and tighten plug holder to boring bar with retainer rod on tapping machine.
3. Inspect: Plug, Ball check, Spring, Teflon seat.
 - a) Ensure plastic protector has been removed from bottom of Lock-o-Ring.
4. Assemble components.
 - a) Install rubber O-ring into lower groove of lock O-ring plug. Align and tighten plug to plug holder. Tighten plug into boring bar.
5. Take necessary measurements.
6. Install tapping machine with plug fully retracted.



7. Equalize pressure.
 - a) Attach 2" equalization line, Equalize pressure only through bypass on sandwich valve. Open 2" equalization line (optional).
8. Advance opposite segments after coupon passes segments.
9. Run plug down to the top of segments.
 - a) Power plug down within 2". Hand crank to top of segments, Backup plug four turns (1/4").
10. Retract opposite segments.
11. Crank down proper number of turns manually to set plug.
12. Install all segments.
13. Crank down until plug stops and backup until plug stops, then one turn down.
14. Release plug from boring bar with measuring rod
15. Back off boring bar 12 turns on tapping machine.
16. Close 2" equalization line.
17. Open 1/4" bleeder valve and reset if pressure does not bleed off.
18. Retract measuring rod to zero.
19. Relieve pressure from tapping machine.
20. Disconnect 2" equalization line.
21. Pull tapping machine.
22. Remove oil in sandwich valve.
23. Remove plug adapter for future use.
24. Close sandwich valve.
25. Plug and remove 2" valve.
26. Install 2" cap with Teflon tape.
27. Remove sandwich valve.
28. Install flextallic gasket and blind flange on stopple fitting and bolt completion blind.



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