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March 4, 2010

Mr. Dennis Hinnah
Deputy Director, Western Region
Pipeline and Hazardous Materials Safety Administration
222 W. 7th Avenue, #200
P.O. Box 37
Anchorage, Alaska 99513

Re: CPF 5-2010-0002M

Dear Mr. Hinnah:

This letter contains Marathon Pipe Line LLC's (MPL) response to the Pipeline and Hazardous Materials Safety Administration's (PHMSA) January 14, 2010, Notice of Amendment (NOA) sent by your office, which identified three inadequacies found within MPL's operating procedures during an August, 2009 inspection in the Kenai, Alaska area.

MPL's plan to address PHMSA's written comments is underway. Accompanying this letter are copies of revised standards, which MPL feels will satisfactorily address PHMSA's concerns. Please find below a summary of PHMSA's NOA comments (in *italics*) followed by our responses.

1. *MPL Standard MPLMNT020 (Corrosion Management) did not specify the methods used by MPL for determining the corrosive properties of transported gas (§192.475).*

   MPL Response

   MPL Standard MPLMNT072 (Internal Corrosion Management) has been modified and was approved on February 23, 2010, to address PHMSA's concern regarding MPL's not having specified methods for determining corrosive properties in transported gas. The enhancements to the document appear under sections 8.1.6.1; 8.1.8; 8.1.8.3-5; and 8.1.8.5.1-2.

2. *MPL Standard MPLMNT030 (In-Service Welding) allowed for the repair of in-service welds but did not include the prescribed requirements of §192.715(b)(1) and (2). Those requirements hold that the weld to be repaired is not leaking, and the pressure in the associated pipeline segment be reduced to a stress that is no greater than 20 percent of the segment's SMYS.*

   MPL Response

   MPL Standard MPLMNT030 (In-Service Welding), section 4.1 was approved on February 12, 2010, to now require that if a variance to this standard granting repair to an in-service weld occurs, the requirements set forth in §192.715(b)(1) and (2) must be followed. Additional reference to Part 192 will be added to this standard by the end of June 2010.

3. *MPL failed to provide a standard or procedure that requires the capacity of relief valves be determined at intervals not exceeding 15 months but at least once each calendar year (§192.743).*

   MPL Response

   The attached guidance document "192.743 Pressure Limiting and Regulating Stations: Capacity of Relief Devices," which was approved on February 16, 2010, has been added to our Operations and Maintenance Manual. This document describes how MPL initially determines the adequate capacity of pressure relief valves and ensures thereafter that the capacities remain sufficient.

MPL feels with the changes outlined, the concerns expressed by PHMSA in its Notice of Amendment have been addressed. However, your comments or suggestions for further improvement are always welcome.

Sincerely,

Craig O. Pierson, P.E.
Vice President, Operations

cc: D. DiRe
P. DePriest
R. Everett
V. May
J. Swearingen
R. Thomson

Attachments:
1. MPL Standard MPLMNT072
2. MPL Standard MPLMNT030
3. Compliance Method "192.743 Pressure Limiting and Regulating Stations: Capacity of Relief Devices"

MARATHON PETROLEUM COMPANY LLC
MARATHON PIPE LINE LLC
STANDARDS

Standard Number	Title	Standard Category	Standard Type	Resp. Org.	Revision Number	Effective Date
MPLMNT030	In-Service Welding	MNT	Specification	IDP&R	3	02/12/10

Organization	Approver	Title	Signature	Subject Matter Expert
MPL	P. H. DePriest	Integrity, Damage Prevention & Risk Manager	On File	J. R. Barber
TT&M	N/A			
M&TE	N/A			
T&L	N/A			

Records Retention: Policy, Standard, Procedure or Guideline-General (ACT+10)	**Original Date of Issue: 11/22/99**

Review & Update Requirements Max: 3 Years

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"STANDARD SPECIFICATION" STATEMENT:

A Specification Standard, sets forth details related to materials and/or equipment an/or establishes criteria for performance. Deviation from this Standard shall only be allowed with the prior expressed written permission of the Integrity, Damage Prevention & Risk Manager, or designee.

PURPOSE:

This Standard ensures practices, requirements and techniques used in the conduct of in-service welding shall be (1) managed to regulatory assurance for *49 CFR 195*, (2) managed to process assurance for uniform performance and (3) consistent with the highest quality industry standards attainable within the practical limitations of equipment, techniques, and materials available.

SCOPE:

This Standard contains practices, requirements and techniques used in the conduct of in-service welding on Marathon Pipe Line (MPL) and Marathon Petroleum Company (MPC) owned or operated DOT jurisdictional and non-jurisdictional systems associated with the transmission of hazardous liquids.

MAINTENANCE OF STANDARD:

The Integrity, Damage Prevention & Risk Developer is responsible for the maintenance of this Standard.

REGULATIONS:

This Standard provides MPL uniform practices, requirements and techniques used in the conduct of in-service welding in accordance with *49 CFR 195*, including all codes and industry standards referenced therein.

§49 CFR 195 Subparts C and D:

- *§195.208 – Welding of Supports and Braces*
- *§195.214 – Welding procedures*
- *§195.216 – Welding: Miter Joints*
- *§195.224 – Welding: Weather*
- *§195.226 – Welding: Arc Burns*

§195.228 – Welds and Welding inspection: Standards of Acceptability
§195.230 – Welds: Repair or removal of defects
§195.234 – Welds: Nondestructive Testing
§195.266 – Construction Records

REFERENCES:

API Standard 1104, "Welding Pipelines and Related Facilities," (19th edition, 1999 including October 31, 2001 errata)
ASME B31.4-2002 (October 2002) "Pipeline Transportation Systems for Liquid Hydrocarbons and Other Liquids"
MPLCON016 Production Welding
MPLCON038 Welding Management System
MPLMEQ013 Steel Reinforcement Sleeve
MPLMNT034 In-Service Welding Procedures
MPLMNT037 Steel Repair Sleeve Design, Installation, and Inspection
MPLMNT121 In-Service Welder Qualification
TNLCON010 Magnetic, Liquid Dye Penetrant, and Ultrasonic Testing of Welds and Piping

DEFINITIONS:

Reference Standard MPLCON038 Welding Management System

INDEX:

PROCEDURE:

1.0 General

1.1 Standard MPLCON038 Welding Management System provides Project Leaders required process steps for managing to assurance the qualification, performance, testing and documentation of welders, welding procedures, inspection and weld testing conducted on MPL and MPC owned or operated *49CFR Part 195* jurisdictional systems and MPL operated non-jurisdictional systems.

1.2 This standard considers all ASME B31.4 code references.

1.3 Roles & Responsibilities, reference Standard MPLCON038 Welding Management System.

1.4 In the event MPL is performing the welding, the terms set forth in this specification for the CONTRACTOR shall also apply to MPL.

2.0 In-Service Welding

2.1 General Welding Requirements

2.1.1 In-service welding on MPL and MPC owned or operated jurisdictional systems and MPL operated non-jurisdictional systems shall be performed in accordance with practices, requirements and techniques authorized and referenced in this Standard.

2.1.2 Welds made onto "in-service" pipelines cool at an accelerated rate because of the ability of the pipeline contents to remove heat from the weld. There are two primary risks that need to be mitigated during in-service welding (1) burn-through and (2) hydrogen-induced cracking.

2.1.3 The Contractor shall not deviate from the specifications described in this Standard.

- Under no circumstances shall instructions or deviations from these specifications, including those approved on drawings, requisitions, or work orders, take precedence over the qualification testing procedure and requirements described in this Standard.
- The Contractor shall furnish all labor, equipment, tools, and supplies, including welding rods.
- The Contractor shall be responsible that all workmanship and materials comply with the testing procedure and code requirements described in this Standard.

2.1.4 All welds shall be made by either the manual Shielded Metal Arc Welding (SMAW, or "stick welding") process using low-hydrogen filler metal (electrodes-E7018).

2.1.5 In accordance with *API 1104 Section 7.1* and *API 1104 Appendix B.3*, in-service piping shall be welded by (1) qualified welders, reference Standards MPLMNT121 In-Service Welder Qualification, and (2) using qualified MPL procedures, reference Standard MPLMNT034 In-Service Welding Procedures.

2.1.6 Before welding onto an in-service pipeline or piping system, welders should consider aspects that affect safety, such as operating pressure, flow conditions, wall thickness at the location of the welding.

2.1.7 The areas to be welded should be inspected to ensure that imperfections are not present and the wall thickness is adequate.

2.1.8 All welders performing in-service (maintenance) work should be familiar with the safety precautions associated with cutting and welding on pipe that contains or has contained crude petroleum, petroleum products or fuel gases.

2.1.9 Welding on pipe and sleeves 12" and greater shall require two (2) welders unless authorized by the Welding Process Leader.

2.1.10 For installation of sleeves, reference this Standard as applicable, and Standard MPLMNT037 Steel Repair Sleeve Design, Installation, and Inspection.

2.1.11 Degaussing of the line pipe may be required if an in-line inspection vehicle has been recently run, or if the pipe is near a high-voltage overhead power line.

2.1.12 All welds should be completely welded out by the end of the day.

2.1.13 After the weld is completed, the finished weld shall be cleaned of slag.

2.1.14 Protrusions of the weld metal more than 1/16" beyond the exterior surface of the pipe will not be permitted and should be ground down to 1/16".

2.1.15 Welding speeds shall be maintained at speeds noted in the welding procedure to be used. The CONTRACTOR shall not use a bonus system or any other plan that would tend to encourage welding speeds beyond the reasonable capabilities of the welders.

2.2 **Arc Burns** - Repair and removal of arc burns shall conform to *API 1104 Section 10.0,* in accordance with *49CFR Part 195.226 (a) each arc burn shall be repaired.*

2.2.1 Striking the arc on the pipe at any point other than the welding groove shall not be permitted.

2.2.2 Reference Repair and Removal of Defects.

2.3 **Construction Records** - In accordance with *49CFR Part 195.266(a)*, a complete record that shows the following must be maintained by MPL for the life of each pipeline facility:

2.3.1 The total number of welds and the number of nondestructively tested, including the number rejected and disposition of each rejected weld, reference Standard TNLCON010 Magnetic, Liquid Dye Penetrant, and Ultrasonic Testing of Welds and Piping.

2.4 **Cutting Holes in Pipe** - Not applicable - reference Standard MPLCON016 Production Welding.

2.5 **Grinding** - No grinding outside of the bevel area is allowed. Any grinds outside the bevel made shall be assumed to be arc-burns and shall be repaired or sleeved, as directed by MPL.

2.5.1 The Contractor shall be responsible for notifying MPL of any grind marks found on the pipe before welding begins on the subject joint.

2.5.2 Any grinds which are not brought to MPL/the Project Leader's attention prior to welding shall be deemed to have been caused by the Contractor and shall be repaired or sleeved, as directed by MPL.

2.6 **Grounds** - In accordance with *49 CFR Part 195.226 (c)*, a ground shall not be welded to the pipe or fitting that is being welded. Additionally, a ground shall not contact the pipe except at girth weld locations.

2.7 **Miter Joints** - Not applicable.

2.8 **Welding of Supports & Braces** - In accordance with *49 CFR Part 195.208, support and braces shall not be welded directly to pipe.*

2.9 **Equipment** - In accordance with *API 1104 Section 4.1* equipment shall conform to the following:

2.9.1 Equipment to be used in the conduct of in-service welding shall be of a size and type suitable for the work and shall be maintained in a condition that ensures acceptable welds, continuity of operation, and safety of personnel.

2.9.2 Arc-welding equipment shall be operated within the amperage and voltage ranges given in the qualified welding procedure.

2.9.3 Equipment that does not meet these requirements shall be repaired or replaced.

2.10 **Materials** - In accordance with *API 1104 Section 4.2 and Section 7.1,* surfaces to be welded shall be smooth, uniform, and free from laminations, tears, scale, slag, grease, paint, and other foreign material that might effect the welding.

2.10.1 The carbon equivalent may be contained in the M-PIE database, which stores the results of tests conducted on pipe samples removed from MPL and MPC owned or operated DOT jurisdictional systems and MPL operated non-jurisdictional systems.

2.10.2 If the M-PIE contains no data, or insufficient data, to determine the carbon equivalent of the carrier pipe, contact the Design & Construction Process Leader for assistance, or assume that the carbon equivalent of the carrier pipe is 0.50.

2.10.3 If the sleeve, or other material that is being welded to the pipeline, was purchased using MPL approved processes and vendors, the carbon equivalent of these materials will not be the limiting factor in choosing a welding procedure.

2.10.4 The chemical composition of the materials being welded has a greater affect on hydrogen-cracking susceptibility than grade or diameter. Therefore, the procedures are grouped according to chemical composition and are applicable to all grades and diameters within a given chemical composition group.

2.11 **Pipe and Fittings** - In accordance with *API 1104 Section 4.2.1* pipe and fittings to be welded onto the existing facility, shall conform to the following specifications:

- API Specification 5L PS2 (pipe)
- Applicable API and ASTM specifications (fittings)
- MPL Standard <u>MPLMEQ013</u> Steel Reinforcement Sleeve

2.12 **Filler Metal** - In accordance with *API 1104 Section 4.2* filler metal (electrode) types and size shall conform to the following specifications:

- AWS A5.1
- AWS A5.5

2.12.1 **Note:** For manual shielded metal arc welding of all grades of line pipe and similar materials, filler metals (electrodes) shall conform with American Welding Society (AWS) Classification E7018 .

2.13 **Filler Metal Storage and Handling** - In accordance with *API 1104 Section 4.2* the storage and handling of filler metal (electrodes) and fluxes shall conform to the following specifications:

2.13.1 Electrodes shall only be used out of a freshly opened container or from an electrode holding oven in which they have been properly stored.

2.13.2 When a new container of electrodes is opened, the portion that will not be used on the current weld shall be placed into an electrode holding oven. The bare electrodes must be stored at a 250° F to 300° F temperature until such time as they are needed.

2.13.3 Low-hydrogen AWS Classification E7018 electrodes shall not be exposed to the atmosphere for more than two (2) hours before being used in welding. Low-hydrogen AWS Classification E7018 electrodes exposed to the atmosphere for longer than two (2) hours can absorb excessive amounts of moisture and must be reconditioned or discarded.

2.13.4 **Note:** Electrodes shall be reconditioned by baking at 650° F to 700° F for one (1) hour, followed by immediate placement into a holding oven.

2.13.5 Any electrodes which become wet, or are suspected of being exposed to excessive moisture or improper handling, shall be discarded in a manner to ensure they will not be used.

2.13.6 To avoid the inadvertent use of incorrect filler metals, welders should carry only the types of electrodes that are needed for the particular welding procedure being used.

2.14 **In-Service Welding Joint Design & Preparation -** In accordance with *API 1104 Section 7.0* and *API 1104 Appendix B.4* joint design and lineup in the conduct of in-service welding shall conform to the following:

2.14.1 The joint design and spacing shall be in accordance with the authorized procedure specification reference Standard MPLMNT034 In-Service Welding Procedures.

2.15 **Burn-Through -** Burn-through shall be mitigated by using in-service welding procedure specifications found in Standard MPLMNT034 In-Service Welding Procedures.

2.15.1 A burn-through or blowout as it is sometimes referred to, will occur if the unmelted area beneath the weld pool has insufficient strength to contain the internal pressure of the pipe, and is governed by three primary factors: (1) pipe wall thickness, (2) weld penetration and (3) pipeline operating conditions.

2.15.2 Previous research by Battelle and others concluded that a burn-through will not occur unless the inside surface temperature exceeds 1800° F when using low-hydrogen electrodes and that this temperature is unlikely to be reached if the wall thickness is 0.250" or greater, provided that normal welding practices are used.

2.15.3 The Battelle model was used to show that procedures MPL-R-2 and MPL-R-3, reference Standard MPLMNT034 In-Service Welding Procedures, are safe for use on pipe wall thicknesses as low as 0.188 inch, and that MPL-R-4 is safe for use on pipe wall thicknesses as low as 0.219 inches.

2.16 **Hydrogen-Induced Cracking -** The risk of hydrogen-induced cracking shall be mitigated by using in-service welding procedure specifications found in Standard MPLMNT034 In-Service Welding Procedures.

2.16.1 Hydrogen-cracking can occur when three factors co-exist: (1) hydrogen in the welding environment, (2) crack-susceptible microstructure, and (3) tensile stress.

2.16.2 The fast weld cooling rates associated with in-service welding promote the formation of hard Heat-Affected Zone (HAZ) microstructures (e.g., martensite) and make these welds particularly susceptible to hydrogen-cracking.

2.16.3 Hydrogen is generated as moisture or hydrocarbons in the flux coating, or on the base metal surface, are consumed from the heat of the welding arc. The intense heat of the welding arc also converts much of the hydrogen to its monatomic or H+ state. In this state, it is readily absorbed by the molten weld pool and heat affected zone of the base metal. When the weld metal and base metal cool, the hydrogen is trapped in the solid metal.

2.16.4 Monatomic hydrogen is insoluble in the hard HAZ microstructures and diffuses to discontinuities in the metal lattice where it preferentially collects at areas of highest stress concentration. Although the mechanism is not clearly understood, the interaction of the hydrogen with the submicroscopic discontinuities causes them to enlarge to crack size.

2.16.5 Once formed, the microscopic cracks continue to grow via interaction of hydrogen which continues to diffuse to the highly stressed crack tip. This hydrogen-cracking process will continue until all the stress in the affected area has been relieved by the formation of cracks. Hydrogen-cracking may occur immediately after welding.

2.16.6 However, because the cracking process is dependent upon diffusion of hydrogen atoms to the crack tip, it may take hours or days for a sizable crack to form. Hence, this type of cracking is sometimes referred to as "delayed hydrogen-cracking". Hydrogen-cracking has been responsible for many sleeve and branch connection failures in the past.

2.17 **Wall Thickness -** Wall thickness precautions shall be addressed by using in-service welding procedure specifications found in Standard MPLMNT034 In-Service Welding Procedures.

2.17.1 Pipeline operating conditions that affect weld cooling rates include: (1) pipeline contents, (2) flow rate, (3) pressure (gas only), (4) pipe surface and ambient temperature, and (5) pipe wall thickness. Unlike other welding applications, as pipe wall thickness decreases, the cooling rate of welds made onto in-service pipelines increases.

2.17.2 Welds made onto thin-wall pipe are made in close proximity to the flowing pipeline contents, which removes heat from the pipe wall. This effect becomes less prominent as pipe wall thickness exceeds some critical value (thought to be approximately ½-inch for typical applications) and reverts back to a conventional relationship due to the thermal mass of the pipe wall itself at greater thicknesses.

2.17.3 Pre-heating of thicker-wall pipe ($t > 3/4$ inch) is often less difficult as a result of the less prominent effect of heat removal by the pipeline contents.

2.18 **Chemical Composition -** Chemical composition of materials to be welded shall be addressed by using in-service welding procedure specifications found in Standard MPLMNT034 In-Service Welding Procedures.

2.18.1 The chemical composition of the materials to be welded (pipe and sleeve or fittings) has a large influence on microstructure of the weld and heat-affected zone (HAZ). As the carbon content or carbon equivalent (includes the effect of carbon and other important alloying elements) increases, it becomes easier to form hard crack-susceptible microstructures, such as martensite, in the weld's heat-affected zone.

2.18.2 When the carbon equivalent is very low, the weld cannot cool fast enough to create these microstructures. At high carbon equivalent levels, even relatively slow weld cooling rates can lead to the formation of these microstructures.

2.18.3 The carbon equivalent (CE) is used to consider the effects of carbon and several other important alloying elements on hardenability.

2.18.4 When the chemical composition of the pipe to be welded is unknown, it can be determined by one of two methods; direct analysis using portable equipment, or by removal of samples for laboratory analysis.

2.19 **Heat Input -** Heat Input shall be followed using in-service welding procedure specifications found in Standard MPLMNT034 In-Service Welding Procedures.

2.19.1 The most commonly used method for developing procedures for welding onto in-service pipelines is to determine and specify the minimum required heat input necessary to avoid the formation of hard, crack-susceptible microstructures. The welding heat input is generally calculated as follows:

$$\textbf{Heat Input (KJ/inch)} = (V \times A \times 60 \div 1000) / \textbf{Travel Speed}$$

(Where V= volts, A = amps, and Travel Speed is in inches per minute.)

2.20 **Run-Out Ratio** - Run-out ratio shall be followed using in-service welding procedure specifications found in Standard MPLMNT034 In-Service Welding Procedures.

2.20.1 A simple method to monitor the welding heat input without the need to measure arc voltage, current or travel speed is the run-out ratio. The run-out ratio is defined as the ratio of the length of electrode consumed to the length of weld deposited (L/D).

2.20.2 The run-out ratio is based on the relationship between welding current and the rate at which an electrode is consumed and for a given electrode diameter, the run-out ratio is proportional to the heat input.

Run-out Ratio = Weld Length / (Original electrode length - Stub length).
Note: The stub length refers to the length of the unused portion of the electrode.

2.20.3 The run-out ratio varies with electrode diameter and flux composition, so changes in either electrode type or size will alter the ratio.

2.20.4 Under certain severe conditions, even high heat-input welds can cool faster than the limiting value required to avoid the formation of a hard, crack-susceptible microstructure. In these cases, it is often a better approach to use a temper bead procedure.

2.21 **Temper Bead Sequence -** Temper bead sequence (temper bead technique) shall be followed using in-service welding procedure specifications found in Standard MPLMNT034 In-Service Welding Procedures.

2.21.1 Temper bead sequence can aid in the reduction and risk of hydrogen-induced cracking.

2.21.2 Temper bead technique can influence the resulting HAZ hardness. The stringer bead technique, with the last pass deposited on a previous pass (i.e., the last pass is not allowed to impinge on the pipe material), has been shown to result in a lower-HAZ hardness level than the stacked weave bead technique, which has been used often times in the past.

2.21.3 A suitably developed multi-pass or temper bead procedure can be used to reheat the hard HAZ constituents of one pass by a subsequent pass. This can result in re-transformation to form softer microstructures, or tempering of the hard structures without subsequent transformation.

2.21.4 The use of buttering layers as part of the temper bead procedure is also beneficial in that weld cooling rates in the fitting side of the joint are reduced by increasing the local thickness of the pipeline.

2.21.5 Temper bead procedures are the most cumbersome to execute and there are potential problems with their use, such as irregular weld profiles or hard zones resulting from improper bead placement.

2.22 **Alignment -** In accordance with API 1104 Section 7.2 and API 1104 Appendix B.4.1.1 *alignment and fit-up used for in-service welding on butt welds* shall conform to the following:

2.22.1 The alignment of abutting ends shall minimize the offset between surfaces. For pipe ends of the same nominal thickness, the offset should not exceed 1/8" inch (3 mm).

2.22.2 Larger variations are permissible provided the variation is caused by variations of the pipe end dimensions within the purchase specification tolerances, and such variations have been distributed essentially uniformly around the circumference of the pipe.

2.22.3 Hammering the pipe to obtain proper lineup should be kept to a minimum.

2.22.4 For sleeve and saddle welds, the gap between the sleeve or saddle and the carrier pipe should not be excessive.

2.22.5 Clamping devices should be used to obtain proper fit-up.

2.22.6 Weld metal build-up on the carrier pipe is permitted to minimize gapping.

2.22.7 For specific geometric information regarding joint design and lineup, reference Standard MPLMNT034 In-Service Welding Procedures.

2.22.8 Contractor shall furnish the required number of skids or jack stands to support the pipe at the required height for welding.

2.23 **Use of Lineup Clamp for Butt Welds -** Not applicable.

2.24 **Mill Bevel -** In accordance with *API 1104 Section 7.4* mill longitudinal edge bevels on pipe ends shall conform to the following:

2.24.1 Unless otherwise stated, all sleeves and fittings shall be furnished with beveled ends.

2.24.2 All mill bevels on sleeve and fitting ends shall conform to the joint design used in the procedure specification.

2.25 **Field Bevel** - In accordance with *API 1104 Section 7.4* field bevels shall conform to the following:

2.25.1 All paint, rust, scale, dirt, oil, moisture, or other foreign material that may adversely affect the quality of the welds, shall be removed from the bevel prior to welding. Hand chisels, power chisels, grinders, and slag hammers may be used to clean the surface for welding.

2.25.2 If pitted due to prolonged storage, bevels shall be power ground to bright metal. This grinding can not reduce the wall thickness of the material outside of the weld area.

2.25.3 Torch cuts and bevels shall be made to maintain a uniform angle and make cuts perpendicular to the longitudinal axis of the pipe.

2.25.4 Manual oxygen cutting shall not be used for beveling ends.

2.25.5 The beveled ends shall be reasonably smooth and uniform with dimensions and tolerances, reference Standard MPLMNT034 In-Service Welding Procedures.

2.25.6 Ends shall have all burrs removed from both inside and outside edges.

2.25.7 All oxides resulting from torch cutting shall be removed.

2.25.8 Immediately prior to lineup, the Contractor shall visually inspect the uncoated ends for nicks, dents, general damage, laminations, or other surface defects. If the pipe ends are damaged to the extent that they cannot be fit up within specifications, ends shall be cut back to an undamaged area.

2.26 **Weather Conditions** - In accordance with API 1104 Section 7.5 and *49 CFR Part 195.224*, welding must be protected from weather conditions that would impair the quality of the completed weld, including sudden temperature variations.

2.26.1 MPL shall decide if weather conditions are suitable for welding.

2.26.2 In the event of windy or rainy weather, in-service welding shall not be performed in the rain, unless the welding area is protected from wind or rain with windshields or fire resistant tarpaulins.

2.26.3 No welding is permitted when ambient temperature falls below -15° F.

2.26.4 If weather conditions (ambient temperature and/ or humidity) cause moisture to form on the pipe surface, welding must be postponed or the area to be welded must be preheated.

2.26.5 Welding shall not be done when the quality of the completed weld would be impaired by the prevailing weather conditions, including but not limited to airborne moisture, blowing sand, or high winds.

2.26.6 The Contractor shall, at MPL request, water down the right-of-way in areas where dust blowing may affect weld quality.

2.27 **Clearance** - In accordance with *API 1104 Section 7.6,* working clearance shall conform to the following:

2.27.1 When pipe is welded above ground, the working clearance around the pipe at the weld should not be less than 16" (400 mm).

2.27.2 When pipe is welded in a trench, the bell hole shall be large enough to provide the welder or welders with ready access to the pipe.

2.28 **Cleaning Between Beads** - In accordance with *API 1104 Section 7.7* cleaning between beads shall conform to the following:

2.28.1 Scale and slag shall be removed from each bead and groove.

2.28.2 Each pass shall be cleaned by a power grinder and/or power brush before the succeeding pass is made.

2.29 **Root Opening – Longitudinal Seam Welds - In accordance with *API 1104 Appendix B.4.1.2* in-service weld root openings – longitudinal seam welds shall conform to the following:**

2.29.1 For longitudinal butt welds of full encirclement sleeves, when 100% penetration is required, the root opening, (the space between abutting edges) should be sufficient.

2.29.2 These joints should be fitted with a mild steel back-up strip or suitable tape to prevent penetration of the weld into the carrier pipe.

2.29.3 **Note:** Penetration of the longitudinal butt weld into the carrier pipe is undesirable since any crack that might develop is exposed to the hoop stress in the carrier pipe.

2.30 **Weld Sequence – Sleeve and branch welding sequences** - In accordance with *API 1104 Appendix B.4.2* welding sequence for in-service welding shall conform to the following:

2.30.1 For full-encirclement fittings requiring circumferential fillet welds, the long seam should be completed before beginning the circumferential welds.

2.30.2 With the Welding Process leader's (WPL) approval, others welding sequences may be used per API 1104 (reinforcing pad, reinforcing saddle, encirclement tee, encirclement sleeve/tee, & encirclement saddle)

2.31 **Position Welding** - In accordance with *API 1104 Section 7.8* position welding shall conform to the following:

2.31.1 All position welds shall be made with the parts to be joined secured against movement and with adequate clearance around the joint to allow the welder(s) space in which to work.

2.31.2 Filler and Finish Beads. Reference specific welding procedure sequence; and for sleeves, reference Standard MPLMNT037 Steel Repair Sleeve Design, Installation, and Inspection.

2.32 **Roll Welding** - Not applicable.

2.33 **Identification of Welds** - In accordance with *API 1104 Section 7.10,* weld identification shall conform to the following:

2.33.1 Each welder shall be assigned by the MPL representative, unique alpha-numeric identification (e.g. A1) for each welding event and shall identify each weld made by that welder by marking this number, using non-oil-based chalk or crayon, adjacent to the weld.

2.33.2 Should any welder leave a welding event, the welder's assigned alpha-numeric identification shall be void and not duplicated when another welder is employed.

2.34 **Heat Treatment** - As applicable, reference the specific In-Service Welding Procedure specification, per Standard MPLMNT034 In-Service Welding Procedures.

2.34.1 In general, preheating of in-service welds is considered impractical, so other techniques are used to assure that limiting cooling rates are not exceeded.

2.34.2 In contrast, preheating of a fitting or sleeve may be useful. Since the sleeve or fitting is not influenced directly by the pipeline contents until it is welded, useful pre-heat temperatures may be achieved and maintained during in-service welding to successfully reduce cooling rates in the sleeve or fitting HAZ.

2.34.3 Preheating an in-service pipeline for welding is difficult due to the ability of the flowing pipeline contents to remove heat from the pipe wall, particularly with thinner-wall pipes (less than ½") and at higher flow rates.

2.34.4 Even if pre-heating of the carrier pipe can be achieved, the maximum allowable time interval before re-heating is required is short, making it impractical.

2.34.5 Induction heating coils with large power sources have been used to preheat welds, but this method is expensive to perform in the field, and often limits the welder's access to the weld area.

3.0 Inspection and Testing of In-Service Welds

Inspection and testing of in-service welds shall conform to *API 1104 Section 8* and *Appendix B.5.1,* in accordance with *49CFR Part 195.228:*

(a) Each weld and welding must be inspected to insure compliance with the requirement of this subpart. Visual inspection must be supplemented by nondestructive testing.
(b) The acceptability of a weld is determined according to standards in API 1104 Section 9.

3.1 **Rights of Inspection** - In accordance with *API 1104 Section 8.1* MPL reserves all rights for non-destructive inspection and testing of in-service welds.

3.2 Methods of Inspection

3.2.1 The completed weld should be allowed to sit for 12 to 48 hours before it is inspected. Hydrogen-induced cracking is a diffusion process and can occur several hours after the welding is completed.

3.2.2 The pipeline may be returned to its normal operating pressure levels for non-penetrating features/anomalies after the weld has been completed and prior to the NDT examination per TNLCON010 Magnetic, Liquid Dye Penetrate and Ultrasonic Testing of Welds and Piping.

3.2.3 Non-destructive examination (NDE) of repair welds shall include (a) visual examination, and (b) NDE by the same method used to find the original defect.

3.2.4 Non-destructive testing (1) may consist of magnetic particle or other inspection methods specified by MPL, and (2) shall produce indications of imperfections that can be accurately interpreted and evaluated.

3.2.5 The acceptance of welds shall be on the basis of *API 1104 Section 8.0 and 9.0.*

3.3 **Destructive Testing** When applicable, reference Standard MPLCON038 Welding Management System.

4.0 Repair and Removal of In-Service Weld Defects. In accordance with *DOT 49 CFR 195.230* and *API 1104 Appendix B.7* repair and removal of In-Service weld defects shall conform to the following:

4.1 Each in-service weld that has rejectable indications per API Standard 1104 Section 9 shall be remedied by a means other than repairing the rejected weld by re-welding it. Examples of how rejected welds would be remedied include over-sleeving or cut-out. "Re-welding" includes a repair that requires re-welding an area removed by grinding. Buffing of a finished weld to remove minor surface defects shall not be considered a welding repair.

4.1.1 If a variance to Section 4.1 is granted to allow the repair of a defective in-service weld, current federal code requires: 1) the defective in-service weld must not be leaking; 2) the pressure in the segment shall be reduced so that it does not produce a stress that is more than 20% of the SMYS of the pipe; and 3) grinding of the defective area shall be limited so that at least 1/8" thickness in the pipe weld remains.

4.2 A qualified repair welding procedure is required to be used whenever a repair is made a weld using a process different from that used to make the original weld or when repairs are made in a previously repaired area.

5.0 Technical Issues & Guidance.

5.1 **General.**

In order to avoid hydrogen-cracking in in-service welds at least one of the three conditions necessary for its occurrence (hydrogen, crack-susceptible microstructure, tensile stress) must be eliminated. A significant amount of residual tensile stress acting on the weld cannot be avoided and must always be assumed to be present. Likewise, the material chemistry (CE) of the pipe being welded on is a factor that cannot be altered.

One factor that can be significantly minimized is hydrogen in the welding environment. This is accomplished by using low-hydrogen electrodes or a low-hydrogen welding process. In addition to that, procedures are developed to minimize the formation of crack-susceptible microstructures and to minimize hardness levels, since low-hydrogen levels cannot always be guaranteed.

There are three commonly used options for hardness control:

- Specification of a minimum-required welding heat-input level
- Specification of a minimum-required pre-heat temperature
- Specification of a temper-bead procedure
- Or some combination of these three options

5.2 **Hydrogen Level.**

The risk of hydrogen-induced cracking increases as the amount of hydrogen generated during in-service welding increases. To control the amount of hydrogen generated during welding, in-service welding should be performed with either the Shielded Metal Arc Welding (SMAW) process using low-hydrogen electrodes (E7018) or the Gas Metal Arc Welding (GMAW) process.

In-service welding may only be performed where conditions are favorable in terms of moisture and contamination on either the electrodes or the pipe and fitting surfaces. The flux coating will readily absorb moisture from rain or atmospheric humidity, so the electrodes must be used directly out of a freshly opened can or an electrode holding oven.

In-service welding should not be performed in the rain, unless the welding area is protected under a canopy. In-service welding should not be performed on wet or "sweating" pipe. If the weather conditions (ambient temperature, pipe temperature, and humidity) cause moisture to form on the pipe surface, welding must be postponed or the area to be welded must be preheated to 250° F and maintained at 250° F while welding is being performed.

To insure that low amounts of hydrogen are generated during in-service welding, the electrodes must be clean and dry. Special handling instructions are provided for the proper storage, handling and re-conditioning of low hydrogen E7018 electrodes.

Some of the favorite welding electrodes of pipeliners worldwide are E6010/ E7010G. These rods are coated with an organic (cellulosic) flux that generates a large amount of hydrogen during welding which gives them good penetrating capabilities. However, the high hydrogen contents make them undesirable for in-service welding.

5.3 **Industry Research.**

Industry Codes pertaining to in-service or maintenance welding, such as *API 1104 Appendix B*, generally suggests that the cooling effects of the flowing pipeline contents be considered, but do not, however, specify how this consideration should be given.

There are also several discrepancies between the technological requirements of in-service welding and the requirements of several pertinent industry codes. For example, these codes generally require that procedures be qualified according to pipe grade groups, but hydrogen-cracking susceptibility is more a function of pipe material chemical composition, which can vary widely within a pipe grade group varying with the manufacturer and the vintage of pipe.

For example, a modern *API 5L Grade X-52* material that has been thermo-mechanically treated may have a low carbon-equivalent value and therefore, a high resistance to hydrogen-cracking; whereas, most 1950s-vintage X-52 materials have a much higher carbon-equivalent value and are more susceptible to hydrogen-racking.

Edison Welding Institute (EWI) organized a group sponsored project, EWI Project Number J6176, titled "Qualification and Selection of Procedures for Welding onto In-Service Pipelines and Piping Systems". A copy of this report is on file at MPL Title & Contract (T&C) File Number 11-459-STY-000000, User Area 73.

The EWI project focused on hydrogen-induced cracking susceptibility, and EWI developed and qualified several welding procedures on a wide range of chemical compositions rather than a specific set of pipe grades. The procedures were developed and qualified under very specific thermal conditions, i.e. weld cooling rates and welding heat input.

The results of the project are a set of procedures that are to be selected according to the expected thermal conditions for a particular application and the chemical composition or carbon-equivalent of the materials being welded.

Several of the In-Service Welding Procedural specifications MPL-R-3 and MPL-R-4, referenced in MPLMNT034 In-Service Welding Procedures, were developed from the results of the EWI project.

6.0 RECORDS MANGEMENT:

Original in-service welding documents (NDT reader sheets, weld maps, qualifications, etc) shall be placed in the Project File and maintained in the Title & Contract (T&C) Central File Room with the retention of Project File, Engineering and Construction - Final (ACT+10).

At least one copy of an applicable NDE report listing all of the various welders utilized on a particular project should be forwarded to the Marathon Records Administrator in T&C and filed in the individual Welder Files after being entered into the Welder Database. If the project the welders are working on is to last longer than 6 months, a copy of one of the X-ray report should be forwarded at no more than 6 month intervals. The retention of the Welder Files is Record, Maintenance and Repair – Pipelines and Terminals (ACT+10).

7.0 TRAINING:

Training for Standard MPLMNT030 In-Service Welding shall be in accordance with the following outline.

7.1 **Purpose:** Provide training on the practices, requirements and techniques for using and performing in-service welding procedures on MPL and MPC owned or operated jurisdictional systems and MPL operated non-jurisdictional systems in accordance with *49CRF195* and API Standard 1104.

7.2 **Audience:** All personnel who oversee or execute the practices, requirements and techniques for in-service welding who are identified on this standard.

7.3 Learning Objectives:

- Oversight Level - Know the process, procedures and regulations to properly provide oversight to individuals who perform execution of this standard to perform in-service welding, subject to the *49 CFR 195* and API 1104.
- Execution Level - Know the process, procedures and regulations to properly evaluate, implement and execute the process of performing in-service welding, subject to *49 CFR 195* and API 1104.

7.4 Primary Delivery Methods:

- Oversight Level Training - View and Test Power Point on MaraLearn
- Execution Level Training - View and Test Power Point on MaraLearn

7.5 Delivery Time:

- Oversight Level: Approximately .50 hours
- Execution Level: Approximately .50 hours

7.6 **Refresher Training:** If a revision is made to the standard that involves a change in methods and/or procedures, refresher training must be completed.

7.7 Related Training:

- Standard MPLMNT034 In-Service Welding
- Standard MPLCON038 Welding Management System

8.0 ATTACHMENTS:

None

MARATHON PETROLEUM COMPANY LLC
MARATHON PIPE LINE LLC
STANDARDS

Standard Number	Title	Standard Category	Standard Type	Resp. Org.	Revision Number	Effective Date
MPLMNT072	Internal Corrosion Management	MNT	Practice	IDP&R	1	02/23/10

Organization	Approver	Title	Signature	Subject Matter Expert
MPL	P. H. DePriest	Integrity, Damage Prevention & Risk Manager	On File	T. D. Blair
TT&M	N/A			
M&TE	N/A			
T&L	N/A			

Records Retention: Policy, Standard, Procedure or Guideline – General (ACT+10)	**Original Date of Issue:** 1/14/2001
Review & Update Requirements Max: 3 Years	
Attention: Printed copies should be used with caution. The user of this document must ensure the current approved version of the document is being used. This copy was printed on 3/3/2010 at 13:02.	

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1.0 STANDARD STATEMENT

1.1 **Practice:** This standard addresses management level issues involving processes or procedures, and documents a way of performing tasks. Deviations to this standard can be granted by the MPL Integrity, Damage Prevention & Risk Manager, the Corrosion Control Supervisor, or their assigned representative.

2.0 PURPOSE

2.1 This practice outlines and documents internal corrosion management processes which are designed to ensure that MPL operated and managed assets are of sound integrity and are regulatory compliant with respect to internal corrosion.

3.0 SCOPE

3.1 This practice applies to all MPL operated and managed assets susceptible to internal corrosion.

4.0 MAINTENANCE OF STANDARD

4.1 The Integrity, Damage Prevention & Risk Department is responsible for maintenance and implementation of this practice.

5.0 REGULATIONS

5.1 CFR 49 DOT Part 195.579

5.2 CFR 49 DOT Part 192.475 & 477

6.0 REFERENCES

6.1 MPLOPR031 Pigging Operations

6.2 MPLCON021 Hydrostatic Testing

6.3 MPLOPR022 Products Quality Procedures and Guidelines

6.4 MPLMNT069 Managing In-Line Inspection Data

6.5 MPLCON020 Injection Equipment

6.6 MPLMNT020 Corrosion Management – Regulatory Compliance

6.7 TNLCON022 Paint and Tank Lining Systems

6.8 TNLDGN008 Sump System Design

6.9 MPLMNT003 Inspecting and Evaluating Line Pipe Metal Loss

6.10 MPL AIM Work Order System

6.11 NACE Standard TM0172-2001 (or most recent revision): Determining Corrosive Properties of Cargoes in Petroleum Product Pipelines

6.12 NACE Publication 3T199: Techniques for Monitoring Corrosion and Related Parameters in Field Applications

6.13 NACE RP0497-2004 (or most current revision): Field Corrosion Evaluation Using Metallic Test Specimens

6.14 NACE SP0106-2006 (or most current revision): Control of Internal Corrosion in Steel Pipelines and Piping Systems

6.15 NACE RP0775-2005 (or most current revision) Preparation, Installation, Analysis, and Interpretation of Corrosion Coupons in Oil Field Operations

7.0 DEFINITIONS

7.1 ***AIM***: An acronym for Asset Information Manager - MPL's name for the Computerized Maintenance Management System used to facilitate the work order process. The software package being used is Information Enterprise Asset Manager. Also referred to in this standard as MPL AIM Work Order System and MPL AIM System.

7.2 ***ALIRTS***: An Acronym for an MPL process that stands for Auditing, Lessons Learned, Incident, & Recommendation Tracking System.

7.3 ***Cleaning Pigs:*** Pigs with a combination of scrapers and cups that are specifically designed to clean or remove build-up from the internal wall of a pipeline.

7.4 ***Corrosion Inhibitor***: A chemical that retards corrosion by reducing or eliminating step(s) of the corrosion process.

7.5 ***Corrosion Rate***: A measurement of metal loss over a specific time period; typically measured in mils per year (mpy).

7.6 ***Coupon***: A material of a known alloy, size, surface area, and weight introduced into a system for the purpose of measuring the corrosion rate.

7.7 ***Electrical Resistance (ER) Probe***: a device introduced into a system for the purpose of measuring corrosion rate by converting resistance between metal alloys into a corrosion rate.

7.8 ***ICM Module:*** Internal Corrosion Module used for categories within the Corrosion Control Database to group internal corrosion data types.

7.9 ***Internal Corrosion:*** The degradation of a material, such as the interior portion of a pipeline or tank, due to a reaction with the environment in which the material resides.

7.10 ***Management of Change Request (MOCR):*** A system utilized by MPL to track and document changes affecting pipeline assets.

7.11 ***MPY***: An acronym for Mils Per Year (1 mil = 1/1000th of an inch) used in reporting corrosion rate.

7.12 ***NACE*** – National Association of Corrosion Engineers, also known as NACE International.

7.13 ***NACE Spindle Test***: A standardized test conducted to determine the corrosivity of gasoline and/or distillate fuels. This test is conducted by placing a cylindrical steel test specimen in a mixture of the test fuel and distilled water, stirring at a prescribed temperature, and then rating by the proportion of test surface that has corroded.

8.0 STANDARD CONTENT

8.1 **Preventing, Monitoring, Assessing, and Mitigating Internal Corrosion:** MPL utilizes various processes to manage internal corrosion on its assets (i.e., pipelines and tanks) as described in the following sections. When determining the individual processes to be utilized to manage internal corrosion on specific pipeline systems, MPL considers the type of commodity, flow rate/velocity, pressure, temperature, pipe configuration, elevation profiles, foreign substances in the commodity (including chemicals), microbial activity, and other conditions that could cause internal corrosion.

8.1.1 **Cleaning Pigs:** Cleaning pigs are utilized on a routine schedule to remove undesirable material (e.g., water, basic sediment, bacteria, particulates, etc.) which may influence internal corrosion rates. The cleaning intervals depend on the material being shipped (e.g., crude oil, refined liquid products, natural gas) and are documented in MPL Standard MPLOPR031 Pigging Operations. The cleaning activity is scheduled and documented in MPL's AIM System and is managed by the MPL Operations Support Services Process Leader.

8.1.2 **Corrosion Inhibitor:** Corrosion inhibitor is utilized on certain pipeline systems to mitigate the corrosive effects of the transported commodity and/or the materials that may be present within them. The Internal Corrosion Management (ICM) Process Leader is responsible for determining and documenting which pipelines require corrosion inhibitor and will consult with vendors and/or industry experts to determine chemical types and injection rates, as applicable. Corrosion rates determined by coupon/ probe monitoring, corrosive properties testing, and liquid sample analysis results that exceed acceptable criteria as referenced in this standard are typically the reason corrosion inhibitor is utilized. Attachment 12.8 MPL Corrosion Inhibitor Systems documents locations, types of inhibitors, and injection rates utilized by MPL. The MOCR system will be utilized if any of the corrosion inhibitor variables (rates, type, locations, etc.) are to be revised.

8.1.2.1 Corrosion Inhibitor and Associated Equipment: MPL Corrosion Technicians (or other personnel as assigned by the responsible Area Manager) shall be responsible for ensuring that appropriate levels of corrosion inhibitors are maintained at those sites where injected by MPL, and shall notify the ICM Process Leader when additional chemical is required (notification must occur well before corrosion inhibitor inventory is completely depleted). Attachment 12.9 lists the vendor name and contact information for ordering additional inhibitor. These individuals will also ensure the inspection and maintenance of the tanks, tubing, injection rates, piping, etc. to ensure proper working condition. If maintenance is required, they will contact the ICM Process Leader to ensure the appropriate maintenance is completed. If corrosion inhibitor injection rates need to be modified or calibrated for any reason, the ICM Process Leader will be responsible to ensure completion of this task.

8.1.2.2 Corrosion Inhibitor Injection Access: MPLCON020 Injection Equipment specifies the consistent selection, installation, operation, and maintenance of equipment used to inject specialty type products, such as corrosion inhibitor. Any modification to an existing injection system, or installation of a new system, shall be done in consultation with the appropriate MPL System Integrity Leader (SIL).

8.1.2.3 Corrosion Inhibitor Pump Installation: Attachment 12.5 Typical Corrosion Inhibitor Pump Installation Drawing provides a typical drawing of an inhibitor pump installation, including material listing.

8.1.3 **Corrosive Properties Testing:** MPL requires that any gasoline or distillate fuel shipped on an MPL operated pipeline meet a NACE B+ rating or better as defined by NACE TM0172-2001 (or latest revision). This requirement ensures that refined products carried through MPL's pipelines and/or tankage minimizes the effect of internal corrosion. This information is documented on the Certificate of Analysis (C of A) from the shipper.

8.1.3.1 The criterion for assets in refined product service as determined by the NACE Spindle Test is a B+ rating or better. If a product is discovered or allowed to be shipped in an MPL system that does not meet this criterion, the ICM Process Leader, or assigned representative, will document the event and recommend follow-up activities in the MPL ALIRTS System.

8.1.4 **Visual Inspection:** MPL performs visual inspections of internal pipe surfaces as required by *CFR 49 DOT Part 195.579* and DOT Part 192.475 to determine if evidence of internal corrosion is present. This information is documented and maintained in MPL Form PLLPMR Land & Pipe Management Report. MPLMNT020 Corrosion Management – Regulatory Compliance provides information on the regulatory requirements for visual inspection and also on how to determine active and inactive corrosion.

8.1.5 **In-Line Inspection (ILI):** Data from ILI assessments of piggable pipeline segments is reviewed for evidence of internal corrosion and field examinations are conducted in accordance with MPLMNT069 Managing In-Line Inspection Data. This includes repair and/or replacement to ensure sound integrity of the pipeline. MPL Analysis Process Leader's (APL's) shall be responsible for reviewing/providing data related to internal corrosion anomalies to the ICM Process Leader as part of the Information Analysis Book (IAB) review.

8.1.6 **Indirect Assessment and Direct Examination:** MPL performs indirect assessment and direct examination (e.g. Ultrasonic Thickness testing, Long-Range Guided Wave, flow-modeling, depth of pipeline profile, inclination angle determination, and other applicable technology) on piping where the likelihood of internal corrosion is higher due to stagnant or low velocity operating conditions, such as on tank and relief lines, or on non-piggable pipeline segments. The information collected from the assessments and examinations shall be documented as part of the MPL Project File, and reactions to anomalies discovered are treated in the same manner as described in MPLMNT003 Inspection and Evaluation of Line Pipe Metal Loss. This specific process is summarized in Attachment 12.1 ICM Assessment Process Summary Flowchart. The assigned M&TE Project Leader ensures that the field data and vendor reports are placed in the project file. The ICM Process Leader is responsible to write a summary of the findings and provide to the M&TE Project Leader to place in the project file. The ICM Process Leader is responsible to document any necessary follow-up activities in the MPL ALIRTS System.

8.1.6.1 Ultrasonic Thickness (UT) testing is utilized as a corrosion monitoring method used in lieu of, or in combination with, other monitoring techniques such as coupon/probe monitoring or chemical analysis. The results of UT testing, when utilized as an internal corrosion monitoring tool, will be documented and stored in the ICM Module of the corrosion database.

8.1.7 **Coupon/ ER Probe Monitoring:** MPL utilizes metallic coupons and ER probes in order to monitor and evaluate internal corrosion. Locations selected for monitoring are typically based on pipelines that are directly treated with corrosion inhibitor utilized by MPL, and on other pipelines to monitor internal corrosion to determine if corrosion inhibitor or other treatments are necessary. If the internal corrosion monitoring is performed on a pipeline that MPL directly utilizes corrosion inhibitor, the monitoring is done in accordance with requirements set forth in *CFR 49 DOT Part 195* and Part 192. Coupon/ Probe location and data is documented in the ICM Module, while the installation/removal schedule is maintained in the MPL AIM Work Order System. This specific process is summarized in Attachment 12.2 Coupon/ ER Probe Monitoring Summary Flowchart.

8.1.7.1 If a corrosion coupon is discovered as lost in the line during the removal process, the ICM Process Leader will ensure an MPL Incident Report is completed to document the loss. Recommendations of the Incident Report will include documenting the loss in the ICM Module, as well as any additional coupon installation/monitoring that may be required (e.g., substituting a short cycle monitoring period to allow documentation of weight loss results for a specific time period). Relevant and recent historic weight loss results will also be reviewed and documented as part of the Recommendation closure.

8.1.7.2 The criterion for assets monitored by either coupon or ER probe is <1.0 mpy of metal loss (as determined by total weight loss). This criterion was conservatively established to ensure sound operation based on MPL operating history for all operating conditions, and as categorized as a 'Low ' corrosion rate in Table 2 of NACE RP0775 Preparation, Installation, Analysis, and Interpretation of Corrosion Coupons in Oil Field Operations.

8.1.7.2.1 If a corrosion rate of ≥1.0 mpy (as determined by total weight loss) is found for two consecutive monitoring periods, the ICM Process Leader will document the event and recommended follow-up activities in the MPL ALIRTS System. This corrosion rate was determined by reference to NACE RP0775 Preparation, Installation, Analysis, and Interpretation of Corrosion Coupons in Oil Field Operations, Table 2, at the point where corrosion rate is moving from 'low' to 'moderate' and may require further treatment to mitigate.

8.1.7.2.2 If a corrosion rate of ≥3.0 mpy (as determined by total weight loss) is found in any one monitoring period, the ICM process leader will document the event and recommend follow-up activities in the MPL ALIRTS System. This rate was determined by reference to NACE RP0775 Preparation, Installation, Analysis, and Interpretation of Corrosion Coupons in Oil Field Operations, Table 2, as the mid-point of a 'moderate' corrosion rate and may require further treatment to mitigate.

8.1.7.3 Coupon and ER Probe Equipment Maintenance: MPL Corrosion Technicians (or other personnel as assigned by the responsible Area Manager) shall be responsible for inspecting and maintaining the required equipment to install, extract, and monitor coupons and ER Probes in their assigned area of responsibility. This includes items such as coupon/probe holders, coupon/probe retractors, Remote Monitoring Units (RMU's), and other associated equipment. When new coupons are required for inventory, the appropriate technician should contact the ICM Process Leader, with adequate advanced notice, who will order the material through the appropriate vendor. Attachment 12.9 lists the vendor name and contact information. Coupon holders will be maintained by the supplying vendor on a rotating 36 month schedule to repack and/or replace seals to ensure proper working condition. Attachment 12.10 lists the vendor contact information. The ICM Process Leader will establish and maintain this schedule in the MPL AIM Work Order System.

8.1.7.4 Coupon/ ER Probe Equipment Installation List: Attachment 12.3 Typical Hand Retractable Coupon/ ER Probe Holder Material List includes typical material/equipment necessary to install and maintain coupons/probes. Attachment 12.4 ACMC MM50HT Coupon Holder/Retractor Drawing provides a drawing of the standard coupon holder/retractor tool utilized by MPL (ACMC Model MM50HT).

8.1.8 **Chemical Analysis:** MPL analyzes solid/liquid/gas samples to determine the presence of Microbiological Influenced Corrosion (MIC) and/or other corrosive properties.

8.1.8.3 Sampling of tank bottoms are typically conducted on tanks by the MPL Operations & Logistics department per MPL Standard MPLOPR022 Products Quality Procedures and Guidelines.

8.1.8.4 Sampling of liquid pipelines are typically limited to instances where a specific issue has been recognized (e.g., excessive sediment or water in line, abnormal off-spec. product entered system, known sludge problem, etc.) and analysis would assist in determining further follow-up actions.

8.1.8.5 Sampling of gas pipelines is utilized to determine the corrosive properties of the transported gas and to determine effectiveness of corrosion mitigation activities. Corrosive constituents from pipeline samples to be analyzed may include (but are not limited to) hydrogen sulfide, carbon dioxide, water, oxygen, and bacteria (APB and SRB) levels. Sampling may include gas, liquid, and solids, depending on their known or suspected presence in a gas pipeline. The ICM Process Leader, in consultation with industry consultants, will determine if corrective actions are required based on sampling results and shall document follow-up actions in the MPL ALIRTS System. In general, test results above levels referenced in NACE SP0106-2006 (or most current revision) "Control of Internal Corrosion in Steel Pipelines and Piping Systems" shall require a documented follow-up plan to provide for further monitoring or mitigation activities.

8.1.8.5.1 Gas pipeline sampling results shall be documented and stored in the ICM Module of the corrosion database.

8.1.8.5.2 Gas pipeline sample frequency will vary according to the pipeline system and shall be scheduled through the MPL Aim Work Order System to ensure completion.

8.1.9 **Internal Tank Liners:** MPL utilizes tank liners to mitigate internal corrosion on tank bottoms due to sediment and water contact. TNLCON022 Paint and Tank Lining Systems and TNLDGN008 Sump System Design specify the materials and situations in which they are utilized.

8.1.10 **Treatment of Hydrostatic Test Water:** MPLCON021 Hydrostatic Testing specifies that clean, fresh filtered water shall be utilized for any hydrostatic test. Potable water is preferred for the purpose of internal corrosion management. Potable and non-potable water that remains in a pipeline for 30 days or less requires no chemical treatment (i.e., corrosion inhibitor and/or biocide) Non-potable water in a pipeline for longer than 30 days, or potable water in a pipeline for longer than 90 days, will require communication with the ICM Process Leader to determine if chemical treatment is necessary. If antifreeze is used in any hydrotest water, chemical treatment is likely and communication with the ICM Process Leader must occur. The same timeframes apply for any storage of hydrostatic test water in MPL operated tankage.

8.1.11 **Risk Assessment:** MPL's Risk Management process considers the threat of internal corrosion on pipeline segments and facilities based on factors such as commodity type, operational flow parameters, ILI indications, coupon results, pigging frequency, and inhibitor usage. This is done as part of the integrity management program to assist in determining the areas of highest risk/priority related to internal corrosion; and to develop additional preventive and mitigative measures as applicable. The Risk Management group oversees and documents this process, and documents communication with the ICM Process Leader on stakeholder input.

8.1.12 **Miscellaneous:** MPL may utilize other proven methods determined practical to preserve assets from the deleterious effects of internal corrosion. Examples include planned routine turbulent flushing, specialty liners/coatings, design modifications, and asset repair or replacement. In addition to the multitude of actions referenced above in the individual sections, MPL will respond to internal corrosion discoveries that affect pipeline and facility integrity in a timely and process focused manner. Reactions will be documented (typically in the ALIRTS System) and will include action items and time-bound responses. Metallurgical analysis, corrosion product analysis, solids and liquid chemical analysis, and other failure analysis as applicable will be conducted in those cases where it can benefit MPL in understanding, reacting, and improving internal corrosion management.

8.2 **ICM Process Metrics:** MPL shall utilize various metrics to measure the success of the ICM Process which will be documented and maintained in the ICM Process Change Plan. The Change Plan will be maintained on the MPL Corrosion Control website. Typical metrics measured will include: number of sites monitored (coupons/ probes) and percent meeting completion deadlines and criteria, number of process-related releases (current year and historical), number of cleaning pigs scheduled/completed, and number of process-related incidents.

8.3 **Continuous Improvement:** MPL shall strive for continuous improvement by planning, monitoring, measuring, and revising (as applicable) the ICM Process. The continuous improvement process will be documented as part of the ICM Process Change Plan which will be maintained by the ICM Process Leader and updated at least annually by the end of each calendar year. The Change Plan will be maintained on the MPL Corrosion Control website.

8.3.1 Some of the improvements that may be considered include changes in maintenance procedures, monitoring schedules, design, corrosion inhibitors, operation procedures, equipment maintenance, material selection, and practices.

8.4 **Process Budget:** The ICM Process Leader will be responsible for submitting an annual budget that allows for maintenance and protection of MPL's assets subject to internal corrosion attack.

8.4.1 Items that are typically included in the annual budget submittal include coupon/probe installation/maintenance, corrosion inhibitor purchase, and ICM assessment at facilities.

9.0 <u>RESPONSIBILITIES</u>

9.1 ICM Process Leader

9.1.1 Develop, manage, and revise, as necessary, the ICM process to ensure protection of MPL's assets.

9.1.2 Document necessary follow-up actions when criteria exceedance or other process issues exists.

9.1.3 Maintain and update a process change plan to ensure continuous improvement is measured and ongoing. The change plan will include specific metrics to measure the success of the process.

9.1.4 Provide SME support and collaborate with MPL stakeholders to ensure the success of the ICM process.

9.1.5 Collaborate with external stakeholders (e.g., vendors, industry consultants, etc.) to ensure the success of the ICM process.

9.1.6 Submit an annual budget to ensure that routine maintenance and capital resources are available to carry out the ICM process.

9.1.7 Ensure routine maintenance schedules are established in the MPL AIM Work Order System for various equipment utilized to provide internal corrosion management (e.g., coupon holders, inhibitor pumps, etc.) and ensure any required maintenance is performed.

9.1.8 Order coupons and inhibitor when requested by field personnel.

9.1.9 Determine and complete task of ensuring corrosion inhibitor injection rates are appropriate based on testing results and/or any other reason for an adjustment.

9.1.10 Ensure data analysis from coupon and/or ER probes is documented in the ICM Module.

9.1.11 Complete a summary report of Indirect Assessment/Direct Examination projects and provide to assigned M&TE Project Leader for inclusion into project file; document any necessary follow-up activities in the MPL ALIRTS System.

9.2 MPL Corrosion Technicians (or assigned representative)

9.2.1 Ensure coupons/probes are installed/ removed per the MPL AIM Work Order System schedule and route to the designated lab for analysis, as applicable. Coupon analysis data (e.g., location, date installed/removed, etc.) will be routed to vendor with coupon on the appropriate tabulation sheet (see Attachment 12.6 MPL Coupon Data Analysis Tabulation Sheet).

9.2.2 Troubleshoot issues related to coupon or ER probes, including RMU communication issues as needed. This may include replacing coupons/probes, resetting failed RMU communication, ensuring maintenance of coupon/probe holders and equipment, communicating special maintenance needs to the ICM Process Leader, and other various troubleshooting needs.

9.2.3 Ensure routine maintenance for internal corrosion related equipment (e.g., coupon holders, ER probes, RMU's, etc.) is performed and documented per the MPL AIM Work Order System schedule, or as needed.

9.2.4 Request coupons and/or inhibitor orders by ICM Process Leader as needed to ensure proper inventory levels.

9.3 Corrosion Control Database Subject Matter Expert

9.3.1 Collaborate with the ICM Process Leader to ensure that the ICM Module and the MPL AIM System accurately records and reflects the needs of the ICM Process. This may include data mining, entering schedules, delinquency issues, conformance issues, and other various tasks.

9.4 MPL Area Manager

9.4.1 Collaborate with the respective MPL Corrosion Technicians and the ICM Process Leader as related to assigned scheduled tasks and routine maintenance of equipment.

9.5 MPL Operations Support Services Process Leader

9.5.1 Collaborate with the ICM Process Leader on cleaning pig schedules and types of equipment utilized, as necessary. This includes any variances of the schedules or equipment specified in MPL Standard MPLOPR031 Pigging Operations.

9.5.2 Collaborate with the ICM Process Leader on tank sampling procedure as related to internal corrosion concerns, as necessary.

9.6 MPL Analysis Process Leader (APL)

9.6.1 Communicate the finding of internal corrosion anomalies identified from ILI assessments.

9.7 M&TE Project Leader(s)

9.7.1 Ensure Indirect Assessment/Direct Examination field data, vendor reports, and findings summary are placed in the project file.

10.0 RECORDS MANAGEMENT

10.1 Compliance related records referenced in this Standard will be maintained in the ICM Module of the corrosion database.

10.2 Non-Compliance records that are utilized for reference/administrative purposes will be stored in the ICM Module of the corrosion database or in the MPL Network Folder.

11.0 TRAINING

11.1 Purpose

11.1.1 The purpose of this training is to ensure the requirements and maintenance set forth in this standard are communicated and understood by the various stakeholders that have been identified to carry out responsibilities related to the standard.

11.2 Target Audience

11.2.1 All personnel who oversee and execute the process of mitigating internal corrosion and have been identified on their organization's Training Plan for this standard.

11.3 Learning Objectives

11.3.1 Oversight Level: Know the procedures, practices and requirements to oversee individuals who perform the execution of this standard.

11.3.2 Execution Level: Know the procedures, practices and requirements to properly execute the tasks as stated in this standard.

11.4 Delivery Method

11.4.1 Oversight level: The primary training method shall utilize a View and Credit through MaraLearn. Employees will view standard with attachments and acknowledge that they understand the required learning objective to oversee the execution of this standard.

11.4.2 Execution Level: The primary training method shall utilize a View and Credit through MaraLearn. Employees will view standard with attachments and acknowledge that they understand the required learning objective for execution of the standard procedures.

11.5 Delivery Time

11.5.1 Oversight Level: 30 minutes

11.5.2 Execution Level: 45 minutes

11.6 Refresher Training

11.6.1 If a revision is made to the standard which involves a change in methods/procedures, refresher training must be completed.

12.0 ATTACHMENTS

12.1 ICM Assessment Process for Low-Flow/Stagnant Pipeline Assets Summary Flowchart

12.2 Coupon/ ER Probe Monitoring Summary Flowchart

12.3 Typical Hand Retractable Coupon/ ER Probe Holder Material List

12.4 ACMC MM50HT Coupon Holder/Retractor Drawing

12.5 Typical Corrosion Inhibitor Pump Installation Drawing

12.6 MPL Coupon Data Analysis Tabulation Sheet

12.7 Land & Pipe Management Report (PLLPMR)

12.8 MPL Corrosion Inhibitor Systems

12.9 Coupon and Corrosion Inhibitor Ordering Information

12.10 Coupon Holder Maintenance Contact Information

192.743 Pressure Limiting and Regulating Stations: Capacity of Relief Devices

Introduction

This document providesguidance to fullfill Pipeline and Hazardous Materials Safety Administration's (PHMSA) requirements prescribed by §192.743.

Definitions

Management of Change (MOC) – The system Marathon Pipe Line (MPL) uses to ensure potential changes are recognized, documented, formally reviewed, and approved prior to implementation in order to avoid potential health, safety, environmental, and/or operational problems.

Pressure Control – The process MPL O&L Hydraulics manages to ensure pipeline internal operating pressures do not exceed the Maximum Allowable Operating Pressure (MAOP) limits for normal or abnormal operating conditions, which is documented through the following:

1. **Design Basis Memorandum (DBM)** – Report containing engineering calculations which MPL uses to document a pressure relief system has adequate capacity to protect pipeline segments from overpressure.
2. **Pressure Control Analysis (PCA)** – Report MPL uses to document the analysis of active engineered pressure controls and to establish the pressure control set points to protect pipeline segments from overpressure.
3. **Pressure Set Point Change Notification**– Form MPL O&L Hydraulics uses to document and communicate necessary pressure control set point changes to protect pipeline segments from overpressure.
4. **Pressure Control Set Point** – Pressure control device setting which can only be changed by notification and approval from the MPL O&L Hydraulics Supervisor after a pressure control investigation is complete.

System Modification – Any changes to the system, equipment or procedures that could reduce the MAOP, increase the supply of gas from a source, reduce the capacity of the control device or affect the ability of the relief device to handle the required flow.

Relief Device Capacity Determination

The following steps are taken to determine relief device capacity;

- MPL Operations & Logistics (O&L) Hydraulics determines the actual and required relieving capacity of relief devices through engineering analysis.
- MPL verifies the capacity of relief devices is sufficient to protect facilities to which they are connected by either
  - testing the devices in place; or
  - by review and calculations to ensure actual relieving capacity is greater than required relieving capacity.

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- MPL O&L Hydraulics issues a DBM to document the actual relieving capacity is sufficient to provide overpressure protection

Recalculation of Relief Device Capacity

The following table provides guidance for recalculating relief device capacity if System Modifications are proposed via a Management of Change request.

Step	Action
1	MPL O&L Hydraulics receives notice of proposed changes via Management of Change.
2	MPL O&L Hydraulics performs a technical review when proposed changes will result in System Modification.
3	MPL O&L Hydraulics evaluates if System Modifications: • exceed the capacity of the existing pressure relief system; • can be accommodated by a Pressure Control Device Set Point Change; or • require recalculation of pressure relief system performance.
4	MPL O&L Hydraulics recalculates as necessary • actual relieving capacity and • required relieving capacity
5	MPL O&L Hydraulics documents recalculation in a DBM.
6	MPL O&L Hydraulics issues a new DBM to Title and Contract Central File Room (T&C) when relief system capacity is recalculated. **Note**: A new DBM is not issued to T&C if no pressure relief system recalculation is performed.

Annual Calculations

Subsequent annual calculations are not made because change is managed by the above process.

Records Management

MPL uses the following Records Management Procedures:

- MPL O&L Hydraulics deposits DBM and PCA reports in T&C

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192.743 Pressure Limiting and Regulating Stations: Capacity of Relief Devices, continued

- MPL O&L Hydraulics retains copies of Pressure Set Point Change Notification Forms.
- MPL O&L Hydraulics updates and maintains Pressure Control Set Points in MPL's electronic New Operations Manual and Data System (NOMADS).
- MPL retains MOC requests in the MPL Electronic Management of Change system.

References

MPL Electronic Management of Change System

Pressure Control Set Point Change Notification Flow Chart

Pressure Control Set Point Change Notification Form

Pressure Control Device Set Points