

**ExxonMobil Pipeline Company**

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**Mark D Weesner**

Safety, Health And Environment Department  
Manager



March 28, 2014

Mr. Rodrick M. Seeley  
PHMSA Southwest Region, Director  
8701 S. Gessner Road, Suite 1110  
Houston, TX 77074

Re: CPF No. 4-2013-5006H; *Correction Action Item No. 4*  
Part I of the Integrity Verification and Remedial Work Plan

Dear Mr. Seeley:

Pursuant to the requirements of *CPF No. 4-2013-5006H; Correction Action Item No. 4*, ExxonMobil Pipeline Company (EMPCo) on behalf of Mobil Pipe Line Company, hereby submits Part I of the Remedial Work Plan. Part I of this plan specifically covers the Pegasus Pipeline segment from Patoka, IL to Corsicana, TX. Part II of this Work Plan for those sections south of Corsicana, TX will be submitted in a separate proposal.

EMPCo proposes to further assess the integrity of the Patoka to Corsicana segments of the pipeline through completion of examinations/repairs resulting from the 2010/2013 TFI tool runs and subsequent third-party data analyses, followed by hydrostatic pressure testing 648 miles of 20" mainline piping, including a spike test. Upon completion of a successful hydrostatic test, EMPCo proposes to return the line to operation at the re-established (or newly established) Maximum Operating Pressure (MOP) as described in the attached documents.

EMPCo proposes to divide the pipeline into 27 hydrostatic test sub-segments (as depicted in the attached package) and will keep PHMSA informed of the completion of a successful hydrostatic test for each sub-segment.

To meet the requirements of CAO No. 4, EMPCo's Remedial Work Plan Part I will include the following:

- A. Threat Identification; failure analysis summary;
- B. Hydrostatic testing overview/scope
- C. Pre-test procedures
- D. Documentation plans
- E. Proposed data integration timeline
- F. Continual assessment process

For reference only *CPF No. 4-2013-5006H; Correction Action Item No. 4* provided the following:

4. *Within 90 days after completing the metallurgical testing and analysis, submit a Remedial Work Plan to the Director for approval. The Work Plan must provide for the verification of the integrity of the*

*Affected Pipeline and must address all factors known or suspected in the failure, including but not limited to:*

- *Integration of the results of the failure analysis and other actions required by this Order with all relevant operating data including all historical repair information, results of past in-line inspections, construction, operating, maintenance, testing, metallurgical analysis, or other third party consultation information, and assessment data for the pipeline*
- *Performance of additional field testing, inspections, and evaluations to determine whether and to what extent the conditions associated with the failure or any other integrity-threatening conditions are present elsewhere on the affected pipeline. The results of the inspections, field excavations, and evaluations must be made available to PHMSA or its representative*
- *Performance of repairs or other corrective measures that fully remediate the identified risk conditions associated with the failure and any other integrity-threatening condition everywhere along the affected pipeline. Based on the known history and condition of the pipeline, the plans for repairs must include continuing long-term periodic testing and integrity verification measures to ensure the ongoing safe operation of the pipeline considering the results of the analyses, inspection, and corrective measures undertaken pursuant to the Order*
- *Proposed schedule for completion of the three items listed in this section 4*

Based upon previously approved extensions, the current deadline for EMPCo submittal of the Remedial Work Plan is April 7, 2014.

EMPCo requests PHMSA review these documents and approve this Part I of the Integrity Verification and Remedial Work Plan for the portion of the Pegasus Pipeline from Patoka IL to Corsicana TX. Please contact Thad Massengale (thad.massengale@exxonmobil.com or 832-624-7880) if you have questions or comments.

Sincerely,

 BT Maguire for MD Weesner

Mark D Weesner  
Safety, Health and Environment Department Manager

*Attachment: North Pegasus -- Remedial Work Plan*

**PEGASUS NORTH SEGMENT  
(North of Corsicana)  
REMEDIAL WORK PLAN  
PART I**

- A. THREAT IDENTIFICATION; FAILURE ANALYSIS SUMMARY
- B. HYDROSTATIC TESTING OVERVIEW/SCOPE
- C. PRE-TEST PROCEDURES
- D. POST TESTING DOCUMENTATION PLANS
- E. PROPOSED DATA INTEGRATION TIMELINE
- F. CONTINUAL ASSESSMENT PROCESS

ATTACHMENTS

- I. Schematic of Test Sub-segments
- II. Trunk Line Charts
  - A. S-110-1 – Patoka to Doniphan
  - B. S-110-2 – Doniphan to Conway
  - C. S-110-3 – Conway to Foreman
  - D. S-110-4 – Foreman to Corsicana
- III. Google Earth Maps – Hydrostatic Test Segments
- IV. Pipe Information Tables
  - A. Patoka to Doniphan
  - B. Doniphan to Conway
  - C. Conway to Foreman
  - D. Foreman to Corsicana
- V. API Recommended Practice 1110 (2013): Pressure Testing of Steel Pipelines for the Transportation of Gas, Petroleum Gas, Hazardous Liquids, Highly Volatile Liquids or Carbon
- VI. EMPCo FIMMS Document: Hydrostatic Pressure Testing
- VII. EMPCo Global Practice 87-87-17: Hydrostatic Pressure Testing of Pipeline Facilities

## Pegasus Integrity Testing Plan

This plan serves as “Part I” of EMPCo’s response to CPF No. 4-2013-5006H requirement #4. The purpose of this plan is to obtain PHMSA review/endorsement of the approach to integrity verification of the Pegasus Northern Segment (North of Corsicana).

ExxonMobil Pipeline Company intends to meet CAO requirement # 4 using these steps:

1. *Submit an integrity verification plan (hydrostatic test plan) to PHMSA for endorsement for the Northern segment (this submission).*
2. *Complete excavation, examination, evaluation, and repair (as required) of anomalies identified from 2010 and 2013 tool runs and those identified by third-party analysis of the 2010 and 2013 TFI tool runs. (In progress)*
3. *Hydrostatically test Segment 1 (Patoka to Doniphan). Complete any necessary repairs. Segment 1 is 175.2 miles in length and will require 7 separate hydrostatic test segments.*
4. *Hydrostatically test Segment 2 – (Doniphan to Conway) Complete any necessary repairs. Segment 2 is 142.4 miles in length and will require 5 separate hydrostatic test segments.*
5. *Hydrostatically test Segment 3 (Conway to Foreman). Complete any necessary repairs. Segment 3 is 163.6 miles in length and will require 8 separate hydrostatic test segments.*
6. *Hydrostatically test Segment 4 (Foreman to Corsicana). Complete any necessary repairs. Segment 4 is 166.5 miles in length and will require 7 separate hydrostatic test segments.*
7. *Confirm system MOPs/define new MOPs based upon the results of the hydrostatic testing*
8. *Request PHMSA endorsement to restart Segments 1, 2, 3, and 4 under the re-established/new MOPs.*

Additional “Parts” of the Remedial Work Plan for those segments south of Corsicana Station will be submitted under a separate proposal.

### A. THREAT IDENTIFICATION; FAILURE ANALYSIS SUMMARY

A metallurgical analysis was performed by Hurst Metallurgical Laboratories as part of CAO Item #2 (provided to PHMSA under separate submission). Hurst identified the failure mechanism as an original manufacturing hook crack defect. The degradation mechanism of the hook crack defect to failure was undetermined. Through its metallurgical investigation, Hurst found no evidence of the following possible threat mechanisms:

1. External Corrosion (general, pitting, or selective seam corrosion)
2. Internal Corrosion (microbial or selective seam corrosion)
3. Stress Corrosion Cracking
4. Welding or fabrication related defect
5. Equipment failure

6. Third Party Damage
7. Weather related or outside force damage
8. Pressure Cycle Induced Fatigue

Subsequent additional analysis eliminated operator error and/or incorrect operating procedure (i.e. overpressure) as a causal factor, since the failure pressure was well below the Maximum Operating Pressure (MOP) at normal operating conditions and the MOP was correctly verified from the hydrostatic pressure test records.

The failure analysis concluded that the primary/root cause of the pipeline failure was original manufacturing defects in the DC-ERW seam, including upturned bands of brittle martensite (precursors to hook cracks), hook cracks, and atypical pipe properties when compared to pipe of similar vintage and manufacture. The atypical properties for the failed pipe joint include: very high local hardness in the areas of the seam; very low fracture resistance/toughness; very high yield strength for X-42 pipe; and unique chemical properties (namely for Carbon, Manganese, and Sulfur concentrations). The combination of the manufacturing defects and atypical pipe properties rendered the pipe seam susceptible to many different crack growth mechanisms, resulting in relatively unpredictable crack growth rates. Accelerated crack growth mechanisms may include a combination of the following:

- Brittle pipe properties (i.e. toughness)
- Residual stress within the pipe/seam (e.g. hoop stress, bending stress, longitudinal tensile stress);
- Contribution from adjacent defects;
- Pressure Cycle induced fatigue (although pressure cycling was light); and
- Environmental Induced Cracking (e.g., Hydrogen Stress Cracking).

Other potential crack growth accelerators were analyzed, but eliminated as potential contributory factors. These included: pressure pulsations beyond measured/assumed; mechanical damage; H<sub>2</sub>S in crude (eliminated due to crack propagation from outside diameter to inside diameter). In addition, there was no evidence of contribution from external or internal corrosion; stress corrosion cracking; girth welding or field fabrication-related defects; equipment failure; weather-related or outside force damage; operator error and/or incorrect operating procedure.

## B. HYDROSTATIC TESTING OVERVIEW / SCOPE

EMPCo proposes to assess integrity of the northern portions of the Pegasus pipeline system through hydrostatic pressure testing. Individual hydrostatic pressure tests will be performed

for 27 sub-sections. The attached documents describe the physical segmentation and piping of each section and sub-section.

- Attachment I – Schematic of Test Sub-segments
- Attachment II – Trunk Line Charts
- Attachment III – Google Earth (Aerial and Street Map) views of each test segment
- Attachment IV – Pipe Information Tables

EMPCo proposes to hydrostatically test 647.7 miles of 20" mainline piping (Sections 1, 2, 3, & 4) to return the pipeline to operation at the re-established/ newly established MOPs for each sub-segment upon conclusion of the successful tests.

The hydrostatic test will be performed AFTER completion of excavation, examination, evaluation, and repair (as required) of anomalies identified from 2013 TFI tool run (Conway to Corsicana) and those identified by third-party analysis of the 2010 and 2013 TFI tool runs (Patoka to Corsicana). Additionally, in the ditch nondestructive examination and metallurgical testing will be performed to determine if excavated segments may exhibit similar properties to the failed pipe.

The hydrostatic tests will be spike test (139% of MOP) followed by and an eight hour (125% of MOP) sustained pressure test for each sub-segment per EMPCo and Industry standards. The initial target for each sub-segment will be a spike test to 100% of the specified minimum yield strength of the limiting pipe at the low point elevation of the test section. See Attachment I for a listing of target test pressures. If a significant number of pressure-reversal failures occur, EMPCo may decide to reduce the targeted test pressures in order to complete the testing in more efficient manner. Should this become necessary, the resulting MOPs will be at the same ratio of test pressure to MOP, i.e. MOP will not be more than 72% of the peak spike test pressures obtained in each test section.

### C. PRE-TEST PROCEDURES

Prior to the start of the hydrostatic in-field testing activities, EMPCo will perform the following activities:

- Notify all affected public (i.e. any inhabited structures) within 75' feet of the pipeline of the planned pressure test. Flyers describing the proposed hydrostatic test, including emergency notification numbers, will be left at each residence/business contacted.
- Ensure that public officials and Local Emergency Planning Councils (LEPC) in each parish/county along the line are advised that testing will be taking place.

- Provide written instructions and a copy of the test procedures to all test personnel supervision and leadership.
- Install barriers (ropes, warning tape, and/or signs) at above ground testing facilities.
- Check all equipment, instrumentation, test headers, valves and connection to verify in good working order for the test.
- Perform daily tailgate safety meeting for all EMPCo and third party contracted workers prior to the beginning of the hydrostatic testing activities and on a regular basis throughout the hydrostatic testing operation. As appropriate, all workers will be qualified according to 49 CFR Part 195 “Operator Qualifications” requirements for the safety related tasks on the pipeline.
- Ensure that EMPCo SHE personnel (Pipeline Safety Advisor) is notified so that appropriate PHMSA notifications are made regarding test timing and progress.

#### D. POST-TEST DOCUMENTATION

The following documentation will be prepared and maintained for each of the 27 proposed sub-segments

- Test Summary which includes:
  1. Date of test
  2. Description of pipe tested – test site locations
  3. Procedures (summary and detailed)
  4. Weather conditions
  5. Personnel present
  6. Conclusions
  7. Signature of EMPCo’s Qualified Individual who certifies the test
- EMPCo PL-709- Hydrostatic Pressure Test Data Sheet
- Pressure and temperature recorder charts
- Equipment calibration test reports
- Hydrostatic test report from contract services provider

#### E. PROPOSED TIMELINE

EMPCo has initiated excavation, examination, and assessment of anomalies identified from the 2013 TFI tool run of Segments 3 and 4 (Conway to Corsicana). Additionally, EMPCo is in the process of performing a third-party analysis of the data from both the 2010 and 2013 TFI tool runs (Patoka to Corsican) and will also address indications identified by this process prior to initiation of a hydrostatic test on each segment. It is anticipated that EMPCo will initiate

hydrostatic testing activities at the north end of the line (Patoka, IL) in the third or fourth quarter of 2014 and that testing will continue for up to one year to complete the entire 648 miles under this plan.

EMPCo proposes to provide a monthly status update regarding hydrostatic testing progress to PHMSA via electronic mail.

EMPCo will complete preliminary Data Integration one hundred and eighty days (180) from completion of hydrostatic testing for Segments 1,2,3, and 4,—identifying any additional areas of concern to be addressed with follow-up actions consistent with EMPCo IMP timing requirements.

EMPCo will complete Final Data Integration, Updated Risk Assessment, and Preventive and Mitigative Measures analyses consistent with EMPCo IMP timing requirements three hundred and sixty-five (365) days from completion of the hydrostatic testing for Segments 1, 2, 3, and 4.

#### F. CONTINUAL ASSESSMENT PROCESS

Re-assessments of these segments will be determined based on the following information:

- Results of hydrostatic testing
- Results of additional analyses of failed test segments
- Operational parameters on the line segments
- An analysis that ensures any time dependent defects remaining will not grow to actionable levels before the next integrity assessment (e.g. ILI) with a Factor of Safety = 2.

The reassessment interval will not exceed five (5) years. However, it is premature to specify long-term periodic testing and integrity verification measures prior to the completion of the above specified plan. EMPCo proposes to submit a comprehensive long term plan for both the Northern and Southern Pegasus segments at the conclusion of the testing processes noted above and those addressed in Part I of this plan.

#### G. FINAL DOCUMENTATION

The following final documentation will be prepared and maintained for Segments 1, 2, 3, and 4:

- EMPCo Form 3.1: IMP HCA Update
- EMPCo Form PL-751: Piping Inspection and Remedial Action Report (for any pipe inspected during repair/cutout processes)

- EMPCo Form PL-0018: Pipeline and Facility Change Diagram
- EMPCo Forms 6.1: IMP P&M Analysis
- EMPCo Form 6.2: IMP EFRD Analysis
- EMPCo Form 6.3: IMP Leak Detection Analysis
- EMPCo Long Seam Failure Susceptibility Analysis
- EMPCo Stress Corrosion Cracking Susceptibility Analysis