TransCanada
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August 14, 2013

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Mr. Patrick Fahn
North Dakota Public Service Commission
600 E. Boulevard, Dept 408
Bismarck, ND 58505-0780

VIA ELECTRONIC DELIVERY AND COURIER

Dear Mr. Fahn:

Please find attached the monthly reports from February, 2013 to April, 2013 summarizing our submissions to the U.S. Pipeline and Hazardous Materials Safety Administration (PHMSA) as required by the Amended Corrective Action Order (CAO) issued June 23, 2011. The activities detailed in these reports relate to a delivery terminal in Illinois. All pump station remediation work was completed prior to submission of the January, 2013 report.

A final letter was sent to PHMSA on May 30, 2013 stating that all conditions of the CAO had been satisfied and requested closure of the CAO.

As requested by Ms. Sacco's May 17th, 2011 e-mail, we are providing documents that do not require FOIA protection.

If you have any questions regarding the enclosed documents, please contact me.

Sincerely,

Ken Crowl

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781 **PU-06-421** Filed: 8/15/2013 Pages: 15
Summary of February to April, 2013 monthly reports submitted to PHMSA

TransCanada Keystone Pipeline, LP

Ken Crowl, Manager, US Reg. Compliance

Executive Summary

In accordance with the Corrective Action Order (CAO) issued by PHMSA on June 3, 2011 and amended on June 28, 2011, TC Oil Pipeline Operations, Inc., as agent for TransCanada Keystone Pipeline. LP (Keystone) submits the following information in a report format.

As reported in the January 2013 monthly report, remediation work and validation vibration tests were completed at all delivery terminals, fixed speed and VFD stations. An opportunity to further improve the long term integrity of small diameter branch connections at Harford delivery terminal was identified and the additional scope is currently scheduled to be completed in March, 2013 and validated in April, 2013.

Introduction

The Keystone oil pipeline system operates from Hardisty, Alberta to delivery terminals in Wood River and Patoka, Illinois, and Cushing, Oklahoma. On May 7, 2011, the system experienced a reportable oil release of approximately 400 barrels at the Ludden, ND pump station. On May 29, 2011, a second reportable oil release of approximately 10 barrels occurred at the Severance, KS pump station.

A Corrective Action Order (June 3, 2011) and subsequent Amended Corrective Action Order (June 28, 2011) were issued to Keystone. A series of Monthly Reports have been submitted beginning in July of 2011 to document Keystone's progress regarding the work undertaken to ensure the reliable operation of the Keystone pipeline.

The following Monthly Report is submitted per Item 11 of the CAO.

Vibration Remediation Work

Remediation work has been completed at all delivery terminals, fixed speed and VFD stations and validation vibration tests were completed at all facilities. The remedial work has been successful to ensure the safe and reliable operation of the Keystone pipeline.

Analysis of the vibration data from a continuous monitoring system installed at Hartford delivery terminal revealed that, although general piping vibration levels at this facility were below the target value of 1 in/s, the results did not meet our standards due to a few rare excursions. In order to improve the long term piping integrity, additional remediation work involving removal and modification of several branch connections adjacent to the terminal PCV is currently scheduled to be completed at Hartford in March, 2013 and validated in April, 2013. The same modifications were previously implemented and successfully validated at all fixed speed stations.

CPF No. 3-2011-5006H – Keystone Pipeline Corrective Action Order
March 2013 Monthly Report

Executive Summary

In accordance with the Corrective Action Order (CAO) issued by PHMSA on June 3, 2011 and amended on June 28, 2011, TC Oil Pipeline Operations, Inc., as agent for TransCanada Keystone Pipeline. LP (Keystone) submits the following information in a report format.

As reported in the February 2013 monthly report, an opportunity to further improve the long term integrity of several small diameter branch connections at Harford delivery terminal was identified. This additional scope of work was completed on March 26, 2013 and the validation testing is currently scheduled to be completed by April 30, 2013.

Introduction

The Keystone oil pipeline system operates from Hardisty, Alberta to delivery terminals in Wood River and Patoka, Illinois and Cushing, Oklahoma. On May 7, 2011, the system experienced a reportable oil release of approximately 400 barrels at the Ludden, ND pump station. On May 29, 2011, a second reportable oil release of approximately 10 barrels occurred at the Severance, KS pump station.

A Corrective Action Order (June 3, 2011) and subsequent Amended Corrective Action Order (June 28, 2011) were issued to Keystone. A series of Monthly Reports have been submitted beginning in July of 2011 to document Keystone's progress regarding the work undertaken to ensure the reliable operation of the Keystone pipeline.

The following Monthly Report is submitted per Item 11 of the CAO.

Vibration Remediation Work

Remediation work has been completed at all delivery terminals, fixed speed and VFD stations and validation vibration tests were completed at all facilities.

The remedial work has been successful to ensure the safe and reliable operation of the Keystone Pipeline. Analysis of the vibration data from a continuous monitoring system installed at Hartford delivery terminal identified an opportunity to further improve the long term integrity of several branch connections adjacent to the terminal PCV. The additional scope of work was completed on March 26, 2013 and included the following:

- Two pressure transmitter nozzles located upstream from the PCV (PT-2201 and PT-2204) were removed and capped. New ¾" root valves were installed to minimize the branch connection weight, as shown in Figures 1 and 2.
- Two pressure transmitter nozzles located downstream from the PCV (PT-2207 and PT-2208) were removed and capped. New ¾" root valves were installed to minimize the branch connection weight, as shown in Figures 3 and 4.
- Bracing of a drain located upstream from the PCV was improved as shown in Figure 5.

- Drain and water injection nozzles located downstream from the PCV were removed and capped, as shown in Figure 6.
- Thermal relief valve assembly (PSV-2206) located downstream from the PCV was relocated to the piping not exposed to vibration, as shown in Figure 7.

Validation testing is currently scheduled to be completed by April 30, 2013. The same modifications were previously implemented and successfully validated at all fixed speed stations.

Figure 1: PT-2201 branch connection: original configuration (left) and new root valve (right).

Figure 2: PT-2204 branch connection: original configuration (left) and new root valve (right).

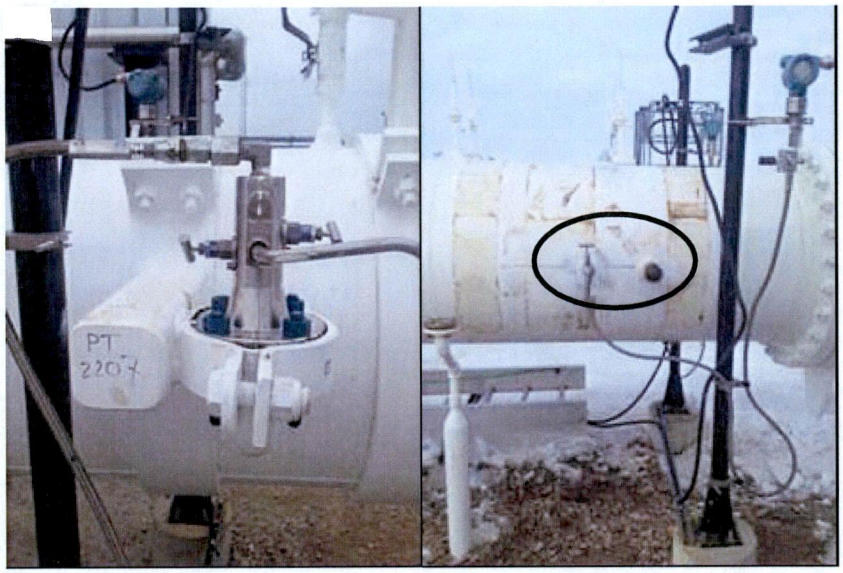

Figure 3: PT-2207 branch connection: original configuration (left) and new root valve (right).

Figure 4: PT-2208 branch connection: original configuration (left) and new root valve (right).

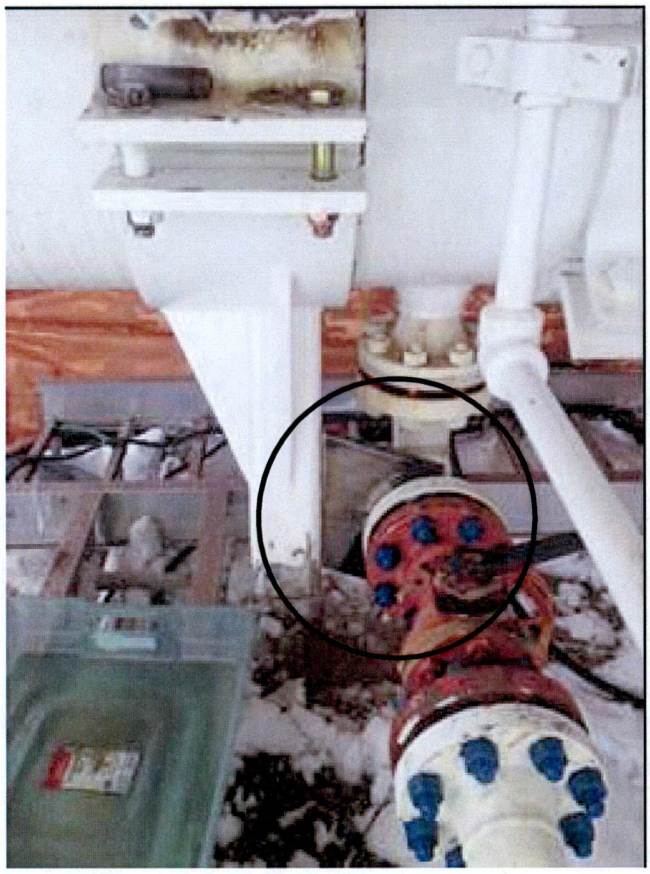

Figure 5: Improved bracing of drain upstream from the PCV.

Figure 6: Drain and water injection nozzles downstream from the PCV: original configuration (left) and removed and capped nozzles (right).

Figure 7: PSV-2206 assembly relocated to piping not exposed to vibration.

CPF No. 3-2011-5006H – Keystone Pipeline Corrective Action Order
April 2013 Monthly Report

Executive Summary

In accordance with the Corrective Action Order (CAO) issued by PHMSA on June 3, 2011 and amended on June 28, 2011, TC Oil Pipeline Operations, Inc., as agent for TransCanada Keystone Pipeline. LP (Keystone) submits the following information in a report format.

As reported in the March 2013 monthly report, an additional scope of work was completed at Hartford delivery terminal to further improve the long term integrity of several small diameter branch connections. Validation strain and vibration tests, which were completed on April 4 and April 19, 2013, determined that the expected improvements have been achieved and all the connections are acceptable.

Introduction

The Keystone oil pipeline system operates from Hardisty, Alberta to delivery terminals in Wood River and Patoka, Illinois and Cushing, Oklahoma. On May 7, 2011, the system experienced a reportable oil release of approximately 400 barrels at the Ludden, ND pump station. On May 29, 2011, a second reportable oil release of approximately 10 barrels occurred at the Severance, KS pump station.

A Corrective Action Order (June 3, 2011) and subsequent Amended Corrective Action Order (June 28, 2011) were issued to Keystone. A series of Monthly Reports have been submitted beginning in July of 2011 to document Keystone's progress regarding the work undertaken to ensure the reliable operation of the Keystone pipeline.

The following Monthly Report is submitted per Item 11 of the CAO.

Vibration Remediation Work

Remediation work has been completed at all delivery terminals, fixed speed and VFD stations and validation vibration tests were completed at all facilities.

As reported in the March 2013 monthly report, additional scope of work was completed at Hartford delivery terminal to further improve the long term integrity of several small diameter branch connections. Vibration and strain tests were completed on April 19, 2013 to validate the effectiveness of the improvements. The tests were carried out at energy dissipation across the terminal PCV of no less than 1550 kW. This level of energy dissipation was based on the terminal operating data during January to March 2013 time period and took into consideration the improvements achieved due to automation of the terminal outlet valve (MOV-2208), as described in the December 2012 monthly report. The actual PCV energy dissipation during this period was lower than 1550 kW 99.9% of the time when the terminal was receiving oil. The test results are described below.

1. Pressure Transmitter PT-2201 and PT-2204 Root Valves

   As reported in the March 2013 monthly report, pressure transmitter nozzles PT-2201 and PT-2204 located upstream from the terminal PCV were removed and capped, and new root valves were installed instead. All vibration readings of the new PT-2201 and PT-2204 root valves were below the screening value of 1 in/s, as shown in Table 2. The new root valves are acceptable for service.

2. Pressure Transmitter PT-2207 and PT-2208 Root Valves

   As reported in the March 2013 monthly report, pressure transmitter nozzles PT-2207 and PT-2208 located downstream from the terminal PCV were removed and capped, and new root valves were installed instead. Vibration readings of the new PT-2207 and PT-2208 root valves exceeded the screening value of 1 in/s. The root valves were further braced, as shown in Figure 1, and retested.

   The tests included relative vibration measurements between the main pipe and the root valves. The relative vibration data showed that the root valves vibrate in phase with the main pipe at frequencies below 180 Hz in X direction and below 130 Hz in Y direction, and vibrate independently of the main pipe above these frequencies. The overall vibration levels were applied to the lowest distinctive frequency peak at which the valves vibrate independently of the main pipe and compared to the severity chart shown in Figure 2 to determine acceptability. The maximum acceptable vibration value for 180 Hz is approximately 2 in/s and for 130 Hz 1.8 in/s. Vibration levels of the PT-2207 and PT-2208 root valves, summarized in Table 1, are therefore acceptable.

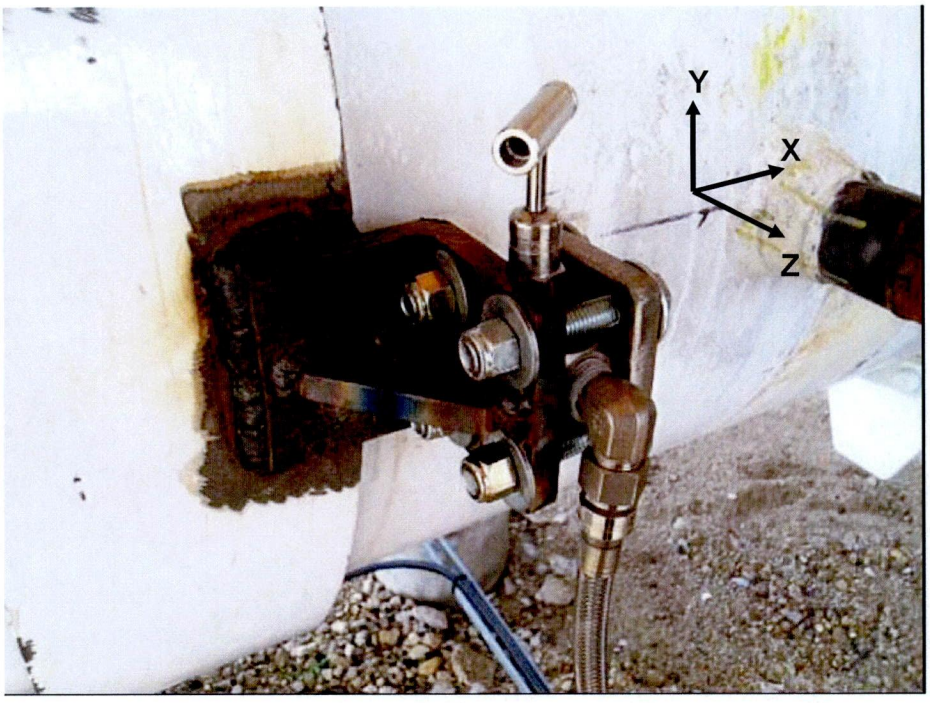

Figure 1: Braced PT-2207 root valve

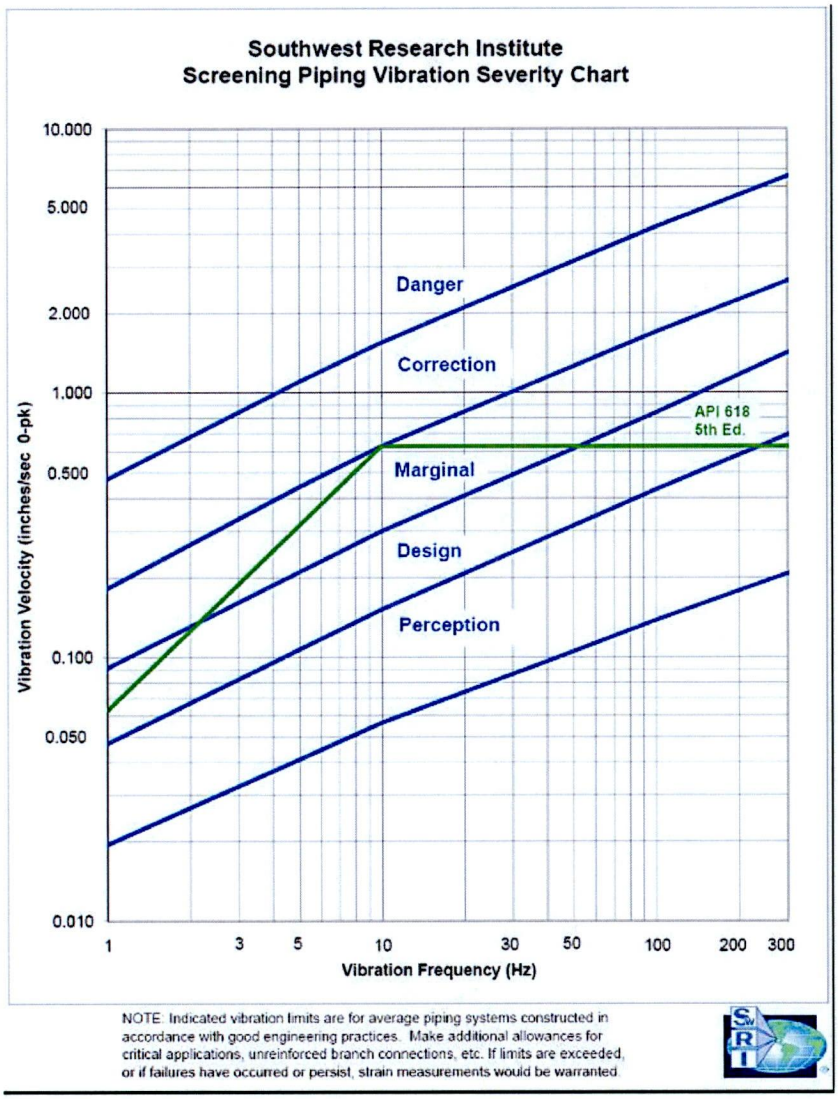

Figure 2: Vibration severity chart

Table 1: PT-2207 and PT-2208 root valves relative vibration

	X vibration (RMS*1.414)	Y vibration (RMS*1.414)
PT-2207	1.39	1.36
PT-2208	1.32	1.38
Acceptable vibration	2.0	1.80

3. Drain Upstream from the PCV

Bracing of a drain located upstream from the PCV was improved as shown in Figure 3. The effectiveness of the improved bracing was verified through a strain test. The highest measured strain was 104 με at 1650 kW energy dissipation across the PCV, as shown in Figure 3. A 3D Finite Element Analysis (FEA) was used to determine strain amplification between the strain gauge location and the adjacent weld toe. The analysis determined the strain amplification factor to be 2.87 as shown in Figure 4. The resulting peak strain at the weld toe was 298 με and the resulting factor of safety for the nozzle was 2.90, based on the material endurance limit of 866 με. The bracing improvement was effective in reducing the nozzle strains to acceptable levels.

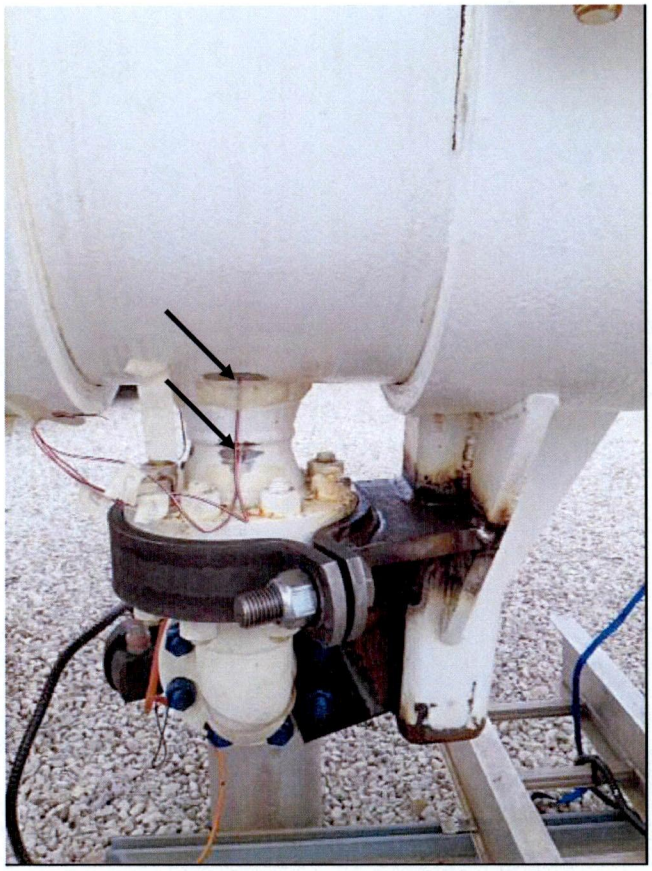

Figure 3: Improved bracing of the drain located upstream from the PCV. Arrows point to the location of strain gauges.

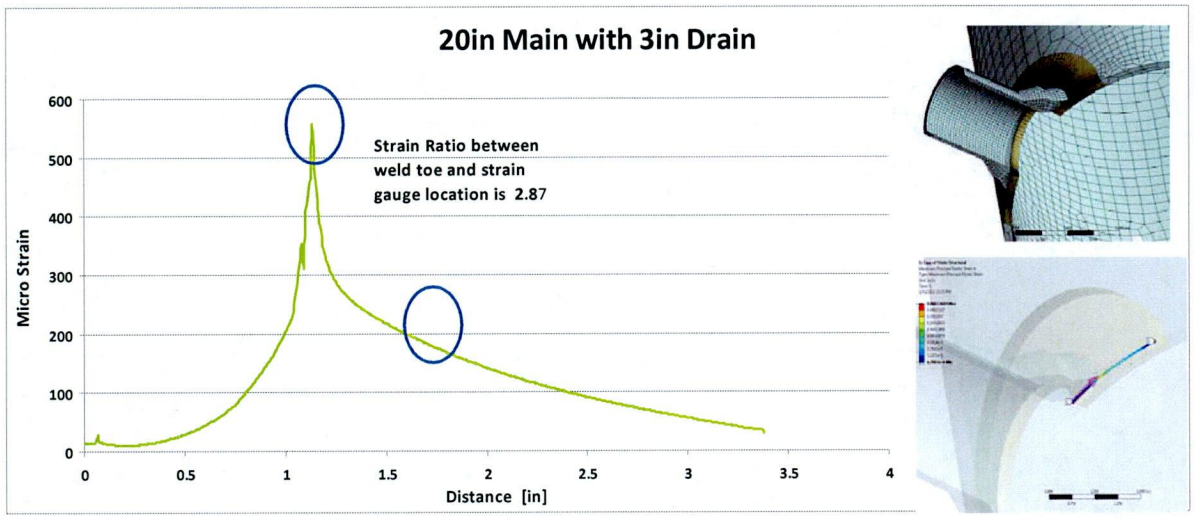

Figure 4: Results of the FEA for the 3" drain located upstream from the PCV

4. Thermal Relief Valve PSV-2205

The effectiveness of the bracing of the thermal relief valve assembly (PSV-2205) located upstream from the terminal PCV was validated through a strain test. Eight gauges were placed in four locations to measure piping strains in all critical areas, as shown in Figure 5. All strains were below the screening value of 100 με. The PSV bracing is therefore effective in reducing the piping strains to acceptable levels.

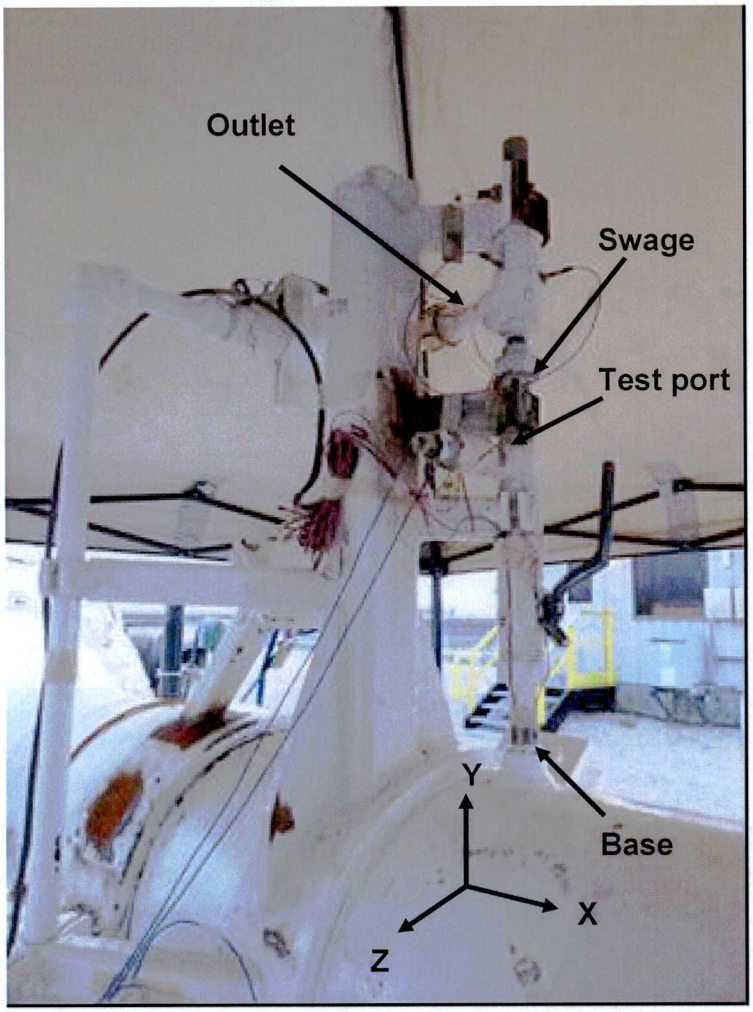

Figure 5: Braced PSV-2205 assembly

5. Thermal Relief Valve PSV-2206

The thermal relief valve assembly (PSV-2206) located downstream from the PCV was relocated to the piping not exposed to vibration, as shown in Figure 6. All vibration readings of the PSV assembly in the new location were below the screening value of 1 in/s, as shown in Table 2. The PSV-2206 assembly is therefore acceptable for service.

Figure 6: PSV-2206 assembly relocated to piping not exposed to vibration

Table 2: Hartford delivery terminal vibration readings

STATION NAME:	Hartford Delivery Terminal	
Date	19-Apr-13	
Time	8:15 to 9:15 AM	
	Units	Value
Station flow	m3/hr	3820
Station suction temperature	deg C	28
Station suction pressure	kPa	2095
Station discharge temperature	deg C	28
Station discharge pressure	kPa	628
PCV inlet pressure	kPa	2095
PCV outlet pressure	kPa	628
PCV position	%	48
Energy Dissipation	kW	1557
Location	Vibration	Vibration
	in/s RMS	in/s RMS*1.414
Piping Upstream of PCV - Sample Group 1		
Terminal Inlet PT-2201 Root Valve - X	0.487	0.689
Terminal Inlet PT-2201 Root Valve - Y	0.446	0.631
Terminal Inlet PT-2201 Root Valve - Z	0.494	0.699
Terminal Inlet PT-2204 Root Valve - X	0.509	0.720
Terminal Inlet PT-2204 Root Valve - Y	0.459	0.649
Terminal Inlet PT-2204 Root Valve - Z	0.471	0.666
Piping Downstream of PCV - Sample Group 2		
PSV 2206 - X	0.404	0.571
PSV 2206 - Y	0.182	0.257
PSV 2206 - Z	0.292	0.413
PSV 2206 1st Elbow on the PSV Discharge Line - X	0.363	0.513
PSV 2206 1st Elbow on the PSV Discharge Line - Y	0.118	0.167
PSV 2206 1st Elbow on the PSV Discharge Line - Z	0.161	0.228
PSV 2206 Test Port Tee - X	0.343	0.485
PSV 2206 Test Port Tee - Y	0.205	0.290
PSV 2206 Test Port Tee - Z	0.235	0.332
PSV 2206 Test Port Plug - X	0.333	0.471
PSV 2206 Test Port Plug - Y	0.188	0.266
PSV 2206 Test Port Plug - Z	0.208	0.294

Coordinate System		
	X	Large Pipe Axis
	Y	Vertical
	Z	Radial or Horizontal