2. **Document Title**

3. **Design Verification Required**
   ☒ Yes  ☐ No

4. **USQ Number**  ☐ N/A

5. **PrHA Number**  ☐ N/A
   PRHA-02040  Rev. 00

6. **USQ Screening:**
   
   a. Does the change introduce any new failure modes to the equipment?  ☒ Yes  ☐ No
      Basis is required for Yes:__________________
   
   b. Does the change increase the probability of existing failure modes?  ☒ Yes  ☐ No
      Basis is required for Yes:__________________
   
   c. For Safety Significant equipment, does the change require a modification to Chapter 4 of the DSA and/or FRED?  ☒ Yes  ☐ No  ☐ N/A
      Basis is required for Yes:__________________

   Chapter 4 of the DSA calls out the Safety-Significant PRV for compressed air systems by EIN number. This new FRED adds a second Safety-Significant PRV.

7. **Description of Change and Justification** (Use Continuation pages as needed)
   Initial release in support of retrieval of A and AX single shell tank farms.

8. **Approvals**

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   Please see continuation sheet

9. **Clearance Review:**

   **Restriction Type:**
   
   ☒ Public  ☐ Official Use Only Exemption 3-Statutory Exemption (OUO-3)
   ☐ Undefined  ☐ Official Use Only Exemption 4-Commercial/Proprietary (OUO-4)
   ☐ Unclassified Controlled Nuclear Information (UCNI)  ☐ Official Use Only Exemption 5-Privileged Information (OUO-5)
   ☐ Export Control Information (ECI)  ☐ Official Use Only Exemption 6-Personal Privacy (OUO-6)
   ☐ Official Use Only Exemption 2-Circumvention of Statute (OUO-2)  ☐ Official Use Only Exemption 7-Law Enforcement (OUO-7)
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## TBDs or Holds

☒ N/A

## Impacted Documents – Engineering

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Author Name: K Emory

ARES Corporation for Washington River Protection Solutions, LLC
Richland, WA 99352
U.S. Department of Energy Contract DE-AC27-08RV14800

EDT/ECN: DCRF UC: N/A
Cost Center: N/A Charge Code: N/A
B&R Code: N/A Total Pages: 28


Abstract: This document provides the evaluation and supporting data for the 241-A-285 Air and Water Service Building safety-significant compressed air system pressure relieving assembly, for its ability to perform safety functions under those conditions and events for which the safety function is required in accordance with TFC ENG DESIGN C 45, “Control Development Process for Safety Significant Structures, Systems, and Components.”

TRADEMARK DISCLAIMER. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof or its contractors or subcontractors.
241-A-285 SAFETY-SIGNIFICANT COMPRESSED AIR SYSTEM PRESSURE RELIEVING DEVICE – FUNCTIONS AND REQUIREMENTS EVALUATION DOCUMENT

April 2016

prepared by

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Washington River Protection Solutions, LLC
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Abbreviations, Initialisms, and Acronyms

ASME® American Society of Mechanical Engineers
B&PVC Boiler and Pressure Vessel Code
C of C Certificate of Conformance / Certificate of Compliance
CC Critical Characteristic
CGD Commercial Grade Dedication
FNPT Female National Pipe Thread
FRED Functions and Requirements Evaluation Document
HVAC Heating, Ventilation, and Air Conditioning
IQRPE Independent Qualified Registered Professional Engineer
KDA Key Design Attribute
MNPT Male National Pipe Thread
NCR Nonconformance Report
PrHA Process Hazard Analysis
PRV Pressure Relief Valve
SECD Safety Equipment Compliance Database
SSC Structure, System, and Component
TOC Tank Operating Contract

Units

gpm gallons per minute
in. inch
lb/in² gauge pounds per square inch gauge
rem roentgen equivalent man
scfm standard cubic feet per minute

1 ASME is a registered trademark of the American Society of Mechanical Engineers Corporation.
1.0 PURPOSE

The purpose of this document is to describe the engineering evaluation of the 241-A-285 Air and Water Service Building compressed air system pressure relieving device’s ability to perform its safety function(s) under those conditions and events for which the safety function is required. This document identifies the related structures, systems, and components (SSCs); key design attributes (KDAs); critical characteristics (CCs) for acceptance; functional and performance requirements; failure modes; boundaries; interfaces; and required support systems.

Note: This is a draft version of the Functions and Requirements Evaluation Document (FRED) to support detail design and advanced procurement of the safety-significant 241-A-285 Air and Water Service Building compressed air system pressure relieving device. This version provides the functional and design requirements for detail design, a system design description, and a summary of the Failure Modes and Effects Analysis with critical characteristics for advanced procurement. The individual sections of this document are written according to the FRED format provided in TFC-ENG-DESIGN-C-45, “Control Development Process for Safety-Significant Structures, Systems, and Components,” and reflects the scope required to release this document for final design and advanced procurement activities. The system design description is subject to change as the design evolves.

2.0 APPROACH

The safety function of the 241-A-285 Air and Water Service Building compressed air system pressure relieving device was developed based on hazard and accident analysis in RPP-13033, “Tank Farms Documented Safety Analysis.” Functional/performance requirements were developed by evaluating the required performance needed to accomplish the safety functions (i.e., prevent or mitigate accidents). Additional applicable functional requirements were developed during engineering evaluations of failure modes when the 241-A-285 Air and Water Service Building compressed air system pressure relieving device must perform its safety function, as documented in RPP-RPT-58920, “241-A-285 Safety-Significant Compressed Air System Pressure Relieving Device Failure Modes and Effects Analysis (FMEA).”

This evaluation was done in accordance with Tank Operating Contract (TOC) procedure TFC-ENG-DESIGN-C-45. The following information is provided in this document:

1. Identification of the safety-significant boundaries for the 241-A-285 Air and Water Service Building compressed air system pressure relieving device.

2. Documentation of support systems required for the 241-A-285 Air and Water Service Building compressed air system pressure relieving device to perform the intended safety function.

3. An evaluation of interfacing systems whose failure could prevent the 241-A-285 Air and Water Service Building compressed air system pressure relieving device from performing the intended safety function.
4. An evaluation of potential seismic interactions to determine if the motion or failure of any adjacent structure, equipment or distribution system could impact the 241-A-285 Air and Water Service Building compressed air system pressure relieving device and prevent it from performing the intended safety function.

5. Documentation of safety SSC functional and performance requirements necessary for the 241-A-285 Air and Water Service Building compressed air system pressure relieving device to perform the safety function. The safety SSC functional and performance requirements were identified from design requirements, engineering evaluations and calculations, the interactive hazard/accident analysis safety controls development/evaluation process, codes and standards, manufacturer’s instructions, and process hazard analysis.

6. KDAs necessary for the 241-A-285 Air and Water Service Building compressed air system pressure relieving device to perform the safety functions, and identification of how the KDAs can be verified to be met. The commercial grade dedication (CGD) process (TFC-ENG-DESIGN-C-15) may be used to provide reasonable assurance the safety SSC is acceptable and will perform its safety-related function.

Using information from the evaluation described above, CCs for the 241-A-285 Air and Water Service Building compressed air system pressure relieving device were identified. Subsequent to determining the CCs, key performance requirements were identified. This consisted of identifying any inspections, tests, evaluations or controls needed to verify compliance with CCs.

Compliance with the CCs identified in this Functions and Requirements Evaluation Document shall be verified and documented. Acceptable means of verification can be accomplished by one or more of the following methods:

- Procurement from a qualified supplier;
- Commercial grade dedication (TFC-ENG-DESIGN-C-15);
- Technical evaluation;
- Nonconformance report (NCR) disposition (see note below);
- Independent Qualified Registered Professional Engineer (IQRPE) review and approval (applies only to grandfathered systems upon expiration of the existing approved Independent Qualified Registered Professional Engineer review);
- Testing;
- Inspection; and/or
- Certificate of Compliance (C of C) or material certification.

NOTE: The CGD process shall be used for items in the warehouse to change classification from GS to SS. A Technical Evaluation (refer to TFC-ENG-FACSUP-C-03,
“Technical Evaluations”) shall determine how the FRED critical characteristics were verified and shall be listed in the Safety Equipment Compliance Database (SECD).

Documented evidence of compliance is identified in the SECD (refer to TFC-ENG-FACSUP-C-23).

3.0 SCOPE

The scope of this evaluation includes the 241-A-285 Air and Water Service Building compressed air system pressure relieving device that protects safety-significant waste transfer systems and components from failure due to overpressure by the 241-A-285 compressed air system. The device connects directly to the system air receiver tank without the use of any inlet piping, and includes discharge piping routed to outside of the 241-A-285 building. The piping system components between the PRV and the PRV discharge are included in the safety-significant boundary because their inside diameters and lengths are important assumptions in the sizing and set pressure calculations.

4.0 SAFETY FUNCTION

The safety function of the 241-A-285 Air and Water Service Building compressed air system pressure relieving device is to limit compressed air system pressure. Limiting compressed air system pressure mitigates the consequences of an air blow accident.
5.0 SYSTEM DESCRIPTION

5.1 OVERALL DESCRIPTION

The 241-A-285 Air and Water Service Building compressed air system pressure relieving device (A285-PA-PRV-034) is comprised of the PRV and the discharge piping off of the PRV. It is included in the process air system used to blow out residual liquid from hose-in-hose transfer line primary hose assemblies. PRV A285-PA-PRV-034 is installed directly on air receiver tank A285-PA-TK-001 inside building 241-A-285 and discharges through the discharge piping assembly to atmosphere outside the building in a downward direction. The compressed air receiver is connected to a Kobelco®2 model KNWA00-D/H air compressor (Equipment Identification Number [EIN] A285-PA-CMP-001). The compressed air system is controlled under a plant operation procedure during use. The following are the specifications for the PRV:

- Equipment Identification Number: A285-PA-PRV-034
- Dresser Consolidated Part Number: ½-19110LeF-2-CC-MS-34-MT-FT-GS
- Inlet/Outlet Ports: 0.5" MNPT x 1" FNPT
- American Society of Mechanical Engineers (ASME) B&PVC, Section VIII, “UV” Stamped PRV.
- Set Pressure 150 lb/in² gauge
- Must pass minimum flow rate of 236 scfm

5.2 BOUNDARIES

The 241-A-285 Air and Water Service Building compressed air system pressure relieving device is bounded by the PRV body and the discharge piping, which are designated as safety significant. Figure 5-1 shows the boundary of the pressure relieving device for the compressed air system. Figure 5-2 provides a cross-section of the PRV. The pressure relief device is depicted on drawing H-14-110033, A/AX Retrieval Air & Water Bldg Piping Arrangement, and is listed by part number in RPP-SPEC-60023, “Construction Specification for A/AX Farms Waste Retrieval Project.”

---

2 Kobelco is a registered trademark of Kabushiki Kaisha Kobe Seiko Sho, AKA Kobe Steel, Ltd., Chuo-Ku, Kobe-Shi, Hyogo, Japan.
Figure 5-1. Pressure Relieving Device System Boundary.
Figure 5-2. PRV Cross-Section.

Note: Female NPT cross section shown for cross-section/parts reference.

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5.3 INTERFACES

The 241-A-285 Air and Water Service Building compressed air system pressure relieving device interfaces are the waste retrieval system (lowest design pressure 275 lb/in² gauge), process air systems and water systems (lowest design pressure 150 lb/in² gauge).

6.0 SYSTEM EVALUATION

6.1 FUNCTIONAL/PERFORMANCE REQUIREMENTS

The functional and performance requirements for the 241-A-285 Air and Water Service Building compressed air system pressure relieving device are to limit compressed air system pressure to ≤ 500 lb/in² gauge. This ensures that onsite worker consequences due to an air blow accident are below 100 rem and PAC-3 (Protective Action Criteria). (See RPP-13033, Section 3.3.2.4.5 for the basis for this functional requirement).

To provide a margin of safety, the performance requirement for compressed air system pressure relieving devices is to limit compressed air pressure to ≤ 190 lb/in² gauge. This performance requirement ensures that onsite worker consequences of an air blow accident are below 5 rem and PAC-2. (See RPP-13033, Section 3.3.2.4.5 for the basis for this performance requirement).

The primary functional/performance requirement is that the A285-PA-PRV-034 compressed air system pressure relieving device is sized and has a set pressure that limits compressed air pressure to ≤ 190 lb/in² gauge. To meet this requirement, the pressure relieving device is sized (i.e., flow capacity) and the set pressure established in accordance with ASME B31.3, “Process Piping,” Section 322.6.3, which references Section VIII, Division 1 of the ASME Boiler and Pressure Vessel Code (B&PVC). In accordance with ASME B31.3 and Section VIII, Division 1 of the ASME B&PVC [UG-125(c)], pressure relieving devices shall prevent the pressure from rising more than 10% or 3 lb/in², whichever is greater, above the design pressure except as permitted elsewhere in the code. Therefore, a set pressure of ≤ 172 lb/in² gauge is required to limit the compressed air pressure to ≤190 lb/in² gauge (172 lb/in² gauge + 10% of 172 ≤ 190 lb/in² gauge).

The set pressure and capacity requirements are met by specifying a set pressure of 150 lb/in² gauge and selecting a PRV with a capacity to handle 236 scfm of air. A set pressure of 150 lb/in² gauge was chosen so that the PRV will also protect general service equipment, such as water skids. The ASME B&PVC, Section VIII rated capacity of this valve at 150 lb/in² gauge is 319 scfm which meets the design capacity of ≥236 scfm as calculated in RPP-CALC-60082, “241-A/AX Air Compressor Pressure Relief Valve Sizing Calculation.”
6.1.1 Vendor Recommended Installation Practices

The following are recommended installation practices that the PRV manufacturer suggests for a 19000 series valve to function properly.

- Mount PRV in a vertical position (± 1 degree).
  This PRV is installed directly to the air compressor receiver tank, so a tolerance of ± 1 degree may not be obtainable considering the pipe thread in the air receiver tank will dictate the angle of the PRV. An e-mail from Dresser Consolidated (Appendix B) acknowledged that this tolerance is their only guarantee to prevent seat leakage, that the valve reseats properly, and no moving parts are misaligned. This does not affect the safety function as this tolerance has no effect on initial popping of the valve. If the valve does not reseat properly, it will be readily detectable and is a safe failure. To mitigate failure of the valve seat, the valve shall be located as near vertical as practical.

- The pressure drop from the vessel (compressed air line) to the PRV shall not exceed 3% of the PRV set pressure.
  This is incorporated in the PRV sizing calculation (RPP-CALC-60082). There is no piping between the PRV and the air receiver tank.

- The PRV inlet pipe must be ≥ the inlet connection to the PRV.
  The PRV is directly installed on the air receiver tank and hence there is no inlet piping (see H-14-110033). Also, the connection size of the tank matches the PRV inlet connection (i.e., no bushings or adaptors are used).

- The PRV discharge pipe size must be ≥ the nominal size of the PRV outlet flange.
  The PRV discharge piping is equal to the nominal size of the PRV outlet as shown in the design (see H-14-110033).

- The PRV discharge piping must be designed to limit the total backpressure to ≤ 10% of the PRV set pressure or 400 lb/in² gauge, whichever is smaller.
  This is incorporated in the PRV sizing calculation. Per RPP-CALC-60082, the backpressure is accounted for in the calculations per the manufacturer’s sizing procedure for compressible fluids.

6.2 FAILURE MODE EVALUATIONS

To determine the potential failure modes of the 241-A-285 Air and Water Service Building compressed air system pressure relieving device, a Failure Modes and Effects Analysis (FMEA) was performed (RPP-RPT-58920). Failure modes of the components
of the system are identified to ensure that failure mechanisms are identified, and that necessary KDAs and controls are applied to the safety systems.

A failure mode is the manner in which a component of the system may fail. For example, two failure modes of a pipe are a loss of integrity and a pipe plugging. A failure mechanism is the cause of the failure mode. A failure mode may have several failure mechanisms. For example, a pipe loss of integrity could be the result of overpressurization, or could result from corrosion. When the mechanisms for failure are understood, KDAs and/or controls may be applied to ensure that the safety system performs its safety function, without failure of the safety system. A list of potential failure mechanisms is provided in Attachment A of TFC-ENG-DESIGN-C-45. The tables are not to be considered exhaustive and identification of potential failure mechanisms must draw on the expertise of the review team along with the tables.

The following table summarizes the results of the FMEA analysis for the 241-A-285 Air and Water Service Building compressed air system pressure relieving device, including only the failure modes could affect the ability of the safety system to perform its safety function. Following the table, there is a discussion of the failure mechanisms and the proposed controls and KDAs.

<table>
<thead>
<tr>
<th>Failure No.</th>
<th>Component</th>
<th>Failure Mode</th>
<th>Failure Effect on Safety Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>PRV Components</td>
<td>High pressure</td>
<td>Inability to relieve to set pressure</td>
</tr>
<tr>
<td>2</td>
<td>Discharge Piping</td>
<td>High pressure</td>
<td>Inability to relieve to set pressure</td>
</tr>
<tr>
<td>3</td>
<td>PRV Components</td>
<td>Plugging from particulates</td>
<td>Prevents PRV from discharging</td>
</tr>
<tr>
<td>4</td>
<td>Discharge Piping</td>
<td>Plugging from particulates</td>
<td>Increased back pressure (decreased ability to flow)</td>
</tr>
</tbody>
</table>

Each of the above failure modes will be discussed below, by failure mode, in each respective subsection. Failure mechanisms for each failure mode will be identified. Finally, KDAs and controls, as well as applicable codes and standards, will be discussed for each failure mechanism. Necessary KDAs and controls, as well as applicable codes and standards, are in bold type.

### 6.2.1 PRV Components: High Pressure

Mechanism 1: Process Pressure/Vacuum was identified as a potential mechanism that could lead to failure by high pressure. High pressure can cause failure of the component by overwhelming the flow capacity, which in turn leads to an inability of the component to relieve to the set pressure. The KDAs and controls that provide reasonable assurance that the SSC will perform its safety function include the PRV sizing Calculation, RPP-
CALC-60082, and the verification of the correct part number and materials of construction.

6.2.2 Discharge Piping: High Pressure

Mechanism 1: Process Pressure/Vacuum was identified as a potential mechanism that could lead to failure by high pressure. High pressure can cause failure of the component by overwhelming the flow capacity, which in turn leads to an inability of the component to relieve to the set pressure. The KDAs and controls that provide reasonable assurance that the SSC will perform its safety function include the PRV sizing calculation, RPP-CALC-60082, and the verification of the correct part number and materials of construction.

6.2.3 PRV Components: Plugging from Particulates

Mechanism 1: Plugging by Waste was identified as a potential mechanism that could lead to failure by plugging from particulates. Plugging can cause the component to fail by either completely blocking the relief path or reducing the relieving capacity to the point of being inadequate to meet the rate of compressed air generation. The KDAs and controls that provide reasonable assurance that the SSC will perform its safety function include the orientation of the PRV, the filters provided on the inlet of the compressor and the limit imposed on the service life of the PRV.

6.2.4 Discharge Piping: Failure to Relieve Pressure

Mechanism 1: Plugging by Waste was identified as a potential mechanism that could lead to failure by plugging from particulates. Plugging can cause the component to fail by either completely blocking the relief path or reducing the relieving capacity to the point of being inadequate to meet the rate of compressed air generation. The KDAs and controls that provide reasonable assurance that the SSC will perform its safety function include the screen on the discharge piping outlet, and periodic inspection.

6.3 SUPPORTING SYSTEMS

In some cases, safety-significant SSCs rely on supporting SSCs to perform their intended safety function. Support SSCs to safety-significant SSCs should be classified as safety-significant if their failures prevent a safety-significant SSC from performing its safety functions. The 241-A-285 Air and Water Service Building compressed air system pressure relieving device requires freeze protection. No other supporting systems exist. These support SSCs are addressed in the FMEA in RPP-RPT-58920, and those that do not fail safe are discussed above in Section 6.2.
**Freeze Protection:** Ambient temperatures at the Tank Farms can be as low as -25°F as specified in TFC-ENG-STD-02, “Environmental/Seasonal Requirements for TOC Systems, Structures and Components,” design parameters. According to manufacturer’s literature (Dresser Consolidated, General Information: Safety Relief Valve), design temperatures ranging from -25°F to 300°F (high conservative value bounding the compressed air temperature) are well within the temperatures this PRV can handle. No freeze protection is required for the pressure relief device to perform its safety function.

**Other:** No other supporting systems have been identified.

### 7.0 CONTROLS

The following controls were identified during the FMEA process:

- The PRV service life is to be limited to 2 years.
- The moisture separator at the outlet of the compressor is to be maintained regularly.
- The PRV is to be confirmed to be installed correctly on top of the compressor.
- The discharge piping/outlet screen is to be inspected every 24 months when the air tank PRV is replaced.

### 8.0 KEY DESIGN ATTRIBUTES AND CRITICAL CHARACTERISTICS

The following KDAs and CCs were identified during the FMEA process:

- **PRV:**
  - Manufacturer’s part number (thereby establishing a set pressure ≤ 172 lb/in² gauge)
  - Flow capacity must be ≥ 236 scfm (identified by calculation RPP-CALC-60082)
  - Design temperature rating is -75°F to 800°F (established by the materials of construction)

CCs of each component are listed in Table A-1 of Appendix A.

### 9.0 CONTROLS AND CRITICAL CHARACTERISTIC REQUIREMENTS

The following controls and CCs were identified during the FMEA process:
The PRV service life is to be limited to 2 years.

The moisture separator at the outlet of the compressor is to be maintained regularly.

The PRV is to be confirmed to be installed correctly on top of the compressor.

The discharge piping/outlet screen is to be inspected every 24 months when the air tank PRV is replaced.

Manufacturer’s part number (thereby establishing a set pressure \( \leq 172 \text{ lb/in}^2 \text{ gauge} \)).

Flow capacity must be \( \geq 236 \text{ scfm} \) (identified by calculation RPP-CALC-60082).

Design temperature rating is \(-75^\circ\text{F} \text{ to } 800^\circ\text{F} \) (established by the materials of construction).

### 10.0 REFERENCES


RPP-RPT-58493, Rev. 0


APPENDIX A

COMPRESSED AIR PRESSURE RELIEVING DEVICE’S CRITICAL CHARACTERISTICS
# Table A-1. Compressed Air Pressure Relieving Device Critical Characteristics.

<table>
<thead>
<tr>
<th>No.</th>
<th>Drawing Number</th>
<th>Description</th>
<th>Safety Function from RPP-13033</th>
<th>Critical Characteristics</th>
<th>Acceptance Criteria</th>
<th>Acceptable Methods of Verification</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Drawing: H-14-110033 Sheet Number: 3; RPP-SPEC-60023, Section 22 15 00 EIN: A285-PA-PRV-034 Nomenclature: PRV, Dresser Consolidated Material: Various. See Figure 5-2.</td>
<td>The safety function of the compressed air system pressure relieving device is to limit compressed air system pressure. Limiting compressed air system pressure mitigates the consequences of an air blow accident.</td>
<td>Part Number (Designates Set Pressure)</td>
<td>The PRV set pressure shall be ( \leq 172 ) lb/in(^2) gauge.</td>
<td>Commercial Grade Survey / C of C (Code Data Report)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Temperature Rating</td>
<td>The PRV shall meet a design temperature rating of (-75^\circ) to (800^\circ)F.</td>
<td>Commercial Grade Survey / C of C (Code Data Report)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Flow Capacity</td>
<td>The PRV shall have a flow capacity of ( \geq 236 ) scfm.</td>
<td>Commercial Grade Survey / C of C (Code Data Report)</td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX B

E-MAIL WITH DRESSER CONSOLIDATED ON VERTICAL POSITIONING TOLERANCE
Appendix B – E-Mail with Dresser on Vertical Positioning Tolerance (cont.)

From: Byers, Matthew E [mailto:matt.byers@dresser.com]
Sent: Wednesday, June 22, 2011 2:35 PM
To: Fink, Peter K
Cc: Brian Bull; Smith, Ryan D
Subject: Re: Question on Vertical Tolerance of Dresser Valves

Peter,

Your statements are correct.

Matt Byers
Manager, Application Engineering
Dresser Consolidated
GE Energy

On Jun 22, 2011, at 4:02 PM, "Fink, Peter K" <Peter.K.Fink@RI.gov> wrote:

After reading these e-mails, I conclude the following:

1) The vertical tolerance may only inhibit reseating or seat leakage due to internals possibly shifting.
2) These issues do not affect the valve from initially popping open at or possibly below the set pressure.

I want to confirm that these assumptions are correct before we go ahead with our safety analysis.

Thank You,

Peter Fink
Retirement & Closure Engineer
309-392-4476
Peter.K.Fink@RI.gov

Contain to the United States Department of Energy

From: Brian Bull [mailto:b_bull@bay-valve.com]
Sent: Wednesday, June 22, 2011 11:24 AM
To: Fink, Peter K
Subject: FW: Question on Vertical Tolerance of Dresser Valves

BRIAN BULL
PRESSURE RELIEF VALVE SALES
BAY-VALVE SERVICE INC.
4385 S. 133rd St – Seattle, WA 98188
Tel: (206) 267-3927 Fax: (206) 266-6541
b_bull@bay-valve.com
SHIP: ARO
Appendix B – E-Mail with Dresser on Vertical Positioning Tolerance (cont.)

From: Byers, Matthew E [mailto:matt.byers@dresser.com]
Sent: Wednesday, June 22, 2011 11:17 AM
To: Brian Bull
Cc: Rathbun, Mike
Subject: RE: Question on Vertical Tolerance of Dresser Valves

Brian,

The main issue would be seat leakage and reseating due to all internals being shifted one way or the other.

Regards,

Matt E. Byers
Manager, Applications Engineering
GE Energy/Dresser Consolidated
P.O. Box 1430 Alexandria, LA 71309-1430, USA
8011 Shreveport Hwy., Pineville, LA 71360
Office: +1 318 640 6401  Fax: +1 318 640 6175
Mobile: +1 318 715 0768
E-mail: matt.byers@ge.com
www.dresser.com

GE imagination at work

From: Brian Bull [mailto:b_bull@bay-valve.com]
Sent: Wednesday, June 22, 2011 1:14 PM
To: Byers, Matthew E
Cc: Rathbun, Mike
Subject: RE: Question on Vertical Tolerance of Dresser Valves

Thank you, Matthew.

What is the reasoning behind the need to be upright?
I can see the valve opening prior to its set pressure or maybe a problem with reseating...

BRIAN BULL
PRESSURE RELIEF VALVE SALES
BAY-VALVE SERVICE, INC.
4385 S. 133rd St - Seattle, WA 98168
Appendix B – E-Mail with Dresser on Vertical Positioning Tolerance (cont.)

Tel: (206) 267-3927 Fax: (206) 286-6541
b_bull@bay-valve.com
SHIP: ARO
FOB: FACTORY
FRT: PREPAID & ADD (OR COLLECT ON YOUR ACCOUNT)
TERMS: N30 (SUBJECT TO CREDIT APPROVAL)
PRICES ARE GOOD FOR 30 DAYS

From: Byers, Matthew E [mailto:matt.byers@dresser.com]
Sent: Wednesday, June 22, 2011 11:08 AM
To: Rathbun, Mike
Cc: Brian Bull
Subject: RE: Question on Vertical Tolerance of Dresser Valves

Mike,

I would say a +/-1.5 degrees wouldn’t inhibit performance. So another ½ degree either way from the recommended 1 degree.

Regards,

Matt E. Byers
Manager, Applications Engineering
GE Energy/Dresser Consolidated
P.O. Box 1430 Alexandria, LA 71309-1430, USA
8011 Shreveport Hwy., Pineville, LA 71360
Office: +1 318 640 6401 Fax: +1 318 640 6175
Mobile: +1 318 715 0768
E-mail: matt.byers@oe.com
www.dresser.com
<image001.jpg>

GE imaginations at work

From: Rathbun, Mike
Sent: Tuesday, June 21, 2011 4:28 PM
To: Byers, Matthew E
Cc: Brian Bull
Subject: FW: Question on Vertical Tolerance of Dresser Valves
Importance: High

Matt,

Is there something in writing this 1 degree issue? Seems they are putting together a mobile unit and this issue keeps coming up.

Thanks,
Appendix B – E-Mail with Dresser on Vertical Positioning Tolerance (cont.)

Mike Rathbun  
Regional Manager, West Coast, Dresser Consolidated  
1921 Running Branch Way, Tustin, CA 92780 U.S.A.  
Mobile: +1 714 290 5871  Fax: +1 714 838 3515  
E-mail: mike.rathbun@dresser.com  
www.dresser.com

<image002.jpg>

From: Brian Bull [mailto:b_bull@bay-valve.com]  
Sent: Friday, June 17, 2011 1:52 PM  
To: Rathbun, Mike  
Cc: Mark Peterson  
Subject: FW: Question on Vertical Tolerance of Dresser Valves  
Importance: High

Hey Mike,

Got a question from a WRPS engineer about the necessity that the valve remains upright. Is there somewhere I could look or someone I could talk to for a specific answer/OK for their use?

Thanks,

BRIAN BULL  
PRESSURE RELIEF VALVE SALES  
BAY-VALVE SERVICE, INC.  
4385 S. 133rd St - Seattle, WA 98168  
Tel: (206) 267-3927 Fax: (206) 286-6841  
b_bull@bay-valve.com
SHIP: ARO  
FOB: FACTORY  
FRT: PREPAID & ADD (OR COLLECT ON YOUR ACCOUNT)  
TERMS: N30 (SUBJECT TO CREDIT APPROVAL)  
PRICES ARE GOOD FOR 30 DAYS

From: Fink, Peter K [mailto:Peter_K_Fink@RI.gov]  
Sent: Friday, June 17, 2011 1:40 PM  
To: Brian Bull  
Subject: RE: Question on Vertical Tolerance of Dresser Valves  
Importance: High

Brian,

I am following up on this e-mail I sent a few days ago. If you could respond ASAP it would be greatly appreciated. The way our design stands right now, this PRV will be on a mobile unit and may or may not be able to meet this 1 degree vertical position, although it will be required to be in a “near” vertical position. I am trying to justify that the 1 degree is not critical to it
relieving pressure, only that it relates to reseating. If this is not the case, let me know because we will need to change our design.

**Please respond as soon as you can.** My deadline is coming up and I don’t want to hold this up longer than it has been already.

Thank You,

Peter Fink
Retrieval & Closure Engineer
509-373-4470
Peter_K_Fink@rri.gov
Contractor to the United States Department of Energy

**From:** Fink, Peter K  
**Sent:** Wednesday, June 15, 2011 8:06 AM  
**To:** “bbull@bay-valve.com”  
**Subject:** Question on Vertical Tolerance of Dresser Valves

Brian,

I called and asked you these questions about two months ago. Since all I got was a verbal confirmation, I wanted to send them to you again making sure I understood correctly the first time.

The Installation, Operation and Maintenance Manual for 19000 Series Consolidated Relief Valves states, “Installing a safety relief valve in any position other than vertical (±1 degree) will adversely affect its operation as a result of the induced misalignment of moving parts.” (Page 13)

What is the reasoning for the one degree vertical tolerance for positioning the relief valve? Is this only a reseating issue?  
Also is there a maximum angle that this valve can be positioned at before its operability to open is compromised?

Thank You,

Peter Fink
Retrieval & Closure Engineer
509-373-4470
Peter_K_Fink@rri.gov
Contractor to the United States Department of Energy