

66th Annual  
Oct. 6-9, 2015



# Safety & Health Conference

"Safety is not an object nor something you can measure! It's a culture, a value."

## State of Affairs with Safety and Pressure Relief Devices



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THE  
NATIONAL BOARD  
OF BOILER AND PRESSURE VESSEL INSPECTORS

**National Board Inspection Code  
First Published in 1946**



**ASME Boiler and  
Pressure Vessel  
Code published in  
1915**

**Boiler Safety Act**



## **ASME Boiler and Pressure Vessel Code published in 1915**

**Section 1-Power Boilers** provides requirements for all methods of construction of power, electric and miniature boilers; high temperature water boilers, heat recovery steam generator and certain fired pressure vessel to be used in stationary service and power boilers used in locomotive, portable and traction service.



Authorizing the use and application of the "V" mark for the Assembly of Safety Valves for Power Boilers



## **ASME Boiler and Pressure Vessel Code published in 1915**

**Section VII-Pressure Vessels** provides requirements applicable to the design, fabrication, inspection, testing and certification of pressure vessels operating at either internal or external pressures exceeding 15 psig. Such vessels may be fired or unfired.



Authorizing the use and application of the "UV" mark for the Assembly of Pressure Vessel Relief Valves



## **ASME Boiler and Pressure Vessel Code published in 1915**

**Section IV-Heating Boilers** provides requirements for design fabrication, installation and inspection of steam heating, hot water heating, hot water supply boiler and potable water heaters intended for low pressure service that are directly fired by oil, gas, electricity, coal or other solid or liquid fuels.

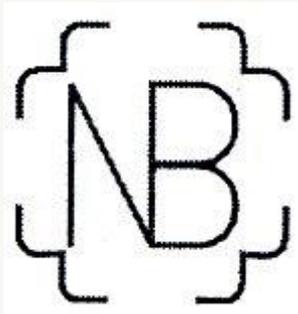


Authorizing the use and application of the "HV" mark for the Assembly of Safety Valves for Low pressure steam heating boilers at 15 psi only. Hot water supply and boilers to 160 psi or 250° f max.



**The National Board-** established in 1921 a system of "registering and recording ASME boilers." This system includes two parts:

- qualifying all inspectors to a common set of requirements and issuing a National Board commission to successful candidates
- authorizing manufacturers to stamp a National Board number on boilers inspected by a National Board Commissioned Inspector.



Authorizing the use and application of the "NB" mark to specified Pressure Relief Devices in accordance with the provisions of the National Board.



## **National Board Inspection Code First Published in 1946**

**The National Board-** provides standards for the installation, inspection and repair and/or alteration of boilers, pressure vessels and pressure relief devices.

The **NBIC** is organized into three Parts :

- **Part 1 Installation-** includes meeting specific safety criteria for construction, materials, design, supports, safety devices operation, testing and maintenance.
- **Part 2 Inspection-** information on personnel safety, non-destructive examination, tests, failure mechanisms, types of pressure equipment, fitness for service, risk-based assessments, and performance-based standards
- **Part 3 Repair and Alterations-** information and guidance to perform, verify and document acceptable repairs or alterations to pressure retaining items regardless of code construction.



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**The State of Kansas Boiler Safety Act-** the law, rules and regulation governing boiler construction, installation, inspection, maintenance and repair of boilers. Administered by The Office of the State Fire Marshall Boiler Safety Unit.

Enacted 1953; repealed 1975; reinstated 1977; latest amendment to law October 1998; latest amendment to rules and regulation November 2006



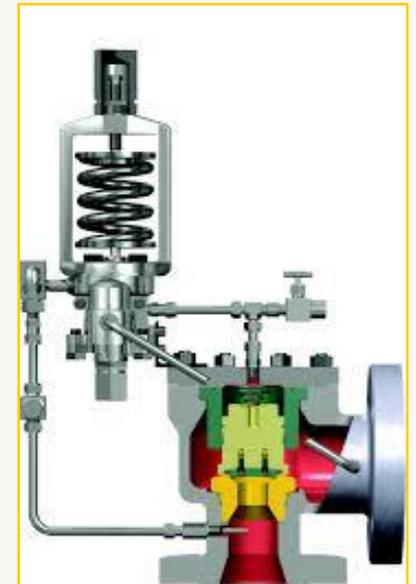
**The National Board-** offers the Certificate of Authorization and VR Stamp for the repair of pressure relief valves. Requirements are described in NB-514, Accreditation of VR Repair Organization.



Authorizing the use and application of the "VR" mark for Machining, Testing and Valve Repair for Steam, Air/Gas & Liquid.



# PRESSURE RELIEF VALVES



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# WHAT IS A SAFETY VALVE

**A device used for steam or vapor service operating automatically with a full-opening pop action and recloses when the pressure drops to a value consistent with the blowdown requirements established by governing code or standard.**



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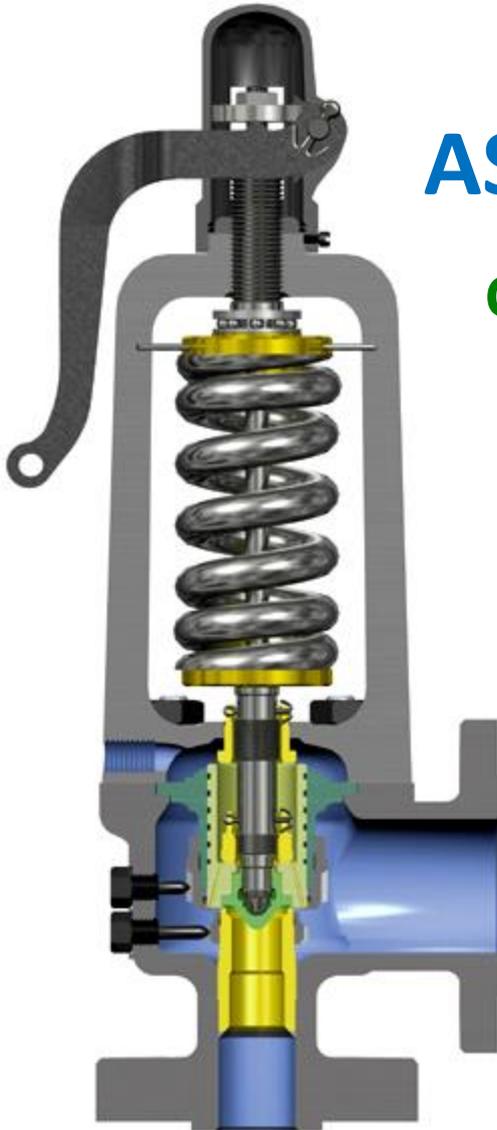


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# ASME Section I – 2 Ring Design

## CURRENT DESIGN TOP GUIDED PRESSURE RELIEF VALVES



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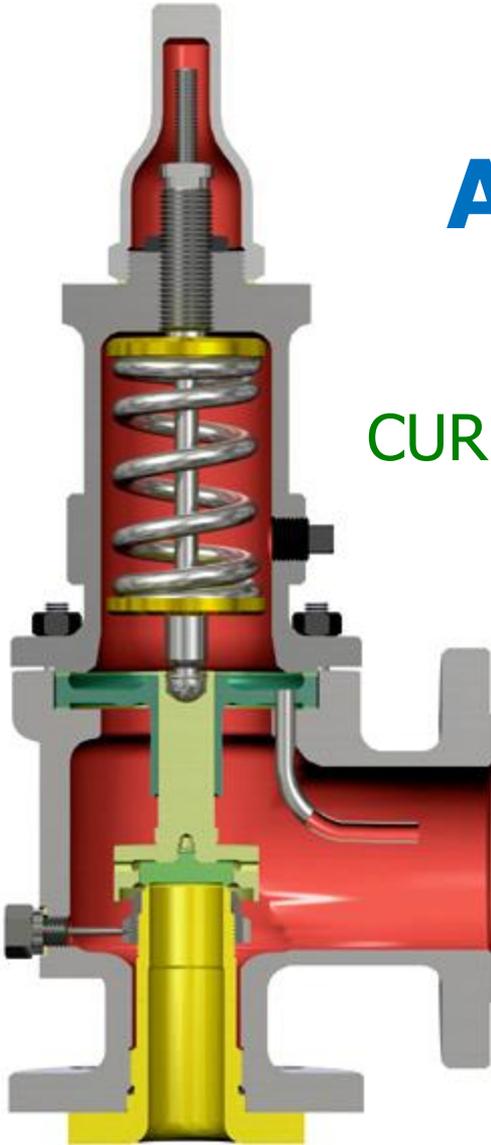


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# ASME Section VIII – 1 Ring Design

CURRENT DESIGN TOP GUIDED PRESSURE  
RELIEF VALVES





# WHAT IS A RELIEF VALVE

**A device typically used for liquid service operates automatically by opening proportionally to increase in pressure beyond to initial opening pressure and recloses when the pressure drops below the opening pressure.**





# WHAT IS A SAFETY RELIEF VALVE

**An automatic pressure relieving device which may be used as either a safety valve or relief valve depending upon the application**

**Conventional Spring Actuated**

**Balanced (bellows) Actuated**





## WHAT IS A PILOT VALVE

**A pressure relief valve in which the major relieving device is combined with and is controlled by a self activated auxiliary pressure relief valve**

**May be used on *steam, vapor, or liquids***

**Not ASME approved for Section I boiler service**

**Recently approved for Section I economizer service**



# PILOT VALVE ADVANTAGES

**Smaller operating gaps (Typically 1/2%)**

**Eliminates back-pressure problems**

**Offers remote sensing to overcome chatter due to inlet pressure drop.**

**Choice of modulating or pop valve action**

**Size & weight advantages**

**Dual pilots**





# WHAT IS A TEMPERATURE AND PRESSURE SAFETY RELIEF VALVE

**A device typically used on a potable water heater. In addition to its pressure relief function it also includes a temperature regardless of pressure.**



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# WHAT IS A REPTURE DISC

**A device that is classified as non-reclosing since the disc is destroyed upon actuation.**



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Non-Coded Relief Valves are similar in manufacturer to ASME Code Valves except they do not have the ASME Code Designator



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# National Board of Inspection Code Part 2 -----Inspection



## **2.5.7 TESTING & OPERATIONAL INSPECTION OF PRESSURE RELIEF DEVICES**

**Pressure relief valves must be periodically tested to ensure that they are free to operate and will operate in accordance with the original code of construction.**

**Testing should include:**

**Device set or opening pressure**

**Reclosing pressure**

**Seat leakage evaluation**

**Tolerances specified in the original code apply**



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## 2.5.7 TESTING & OPERATIONAL INSPECTION OF PRESSUR RELIEF DEVICES

MAY BE DONE BY OWNER OR A  
CONTRACTOR IN THE FIELD OR AT A  
QUALIFIED TEST FACILITY.



**CALIBRATED EQUIPMENT  
WRITTEN PROCEDURE  
AUXILIARY LIFT DEVICE  
USE OF 'LIFT' LEVER'**



## 2.5.7 TESTING & OPERATIONAL INSPECTION OF PRESSUR RELIEF DEVICES

### Testing Results:

- **VALVE STUCK CLOSED – REMOVE SYSTEM FROM SERVICE UNTIL PRV CAN BE REPAIRED**
- **IF SET POINT IS FOUND TO BE OUT OF TOLERANCE: MINOR ADJUSTMENTS (NO MORE THAN 2X THE PERMITTED TOLERANCE) SHALL BE MADE BY A NBBI ACCREDITED ORGANIZATION**

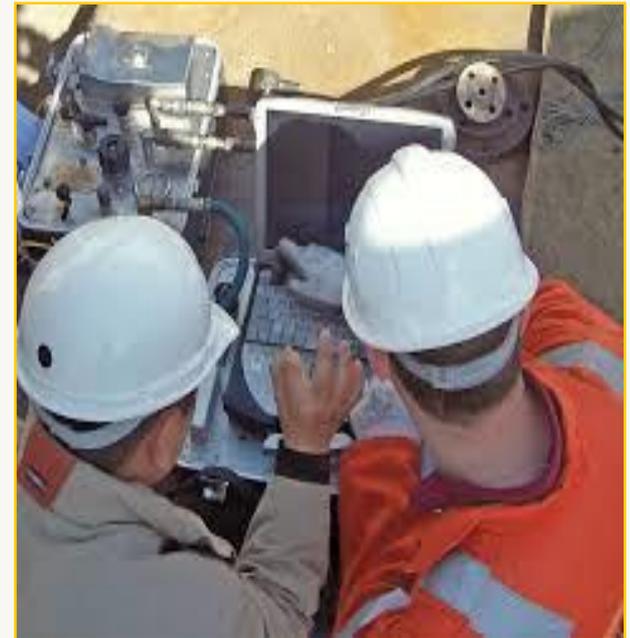




## 2.5.7 TESTING & OPERATIONAL INSPECTION OF PRESSUR RELIEF DEVICES

### Testing Results:

- **MAJOR ADJUSTMENTS MAY INDICATE THAT THE VALVE IS IN NEED OF DISASSEMBLY, INSPECTION AND REPAIR**
- **ALL ADJUSTMENTS MUST BE SEALED**



## **2.5.8 RECOMMENDED INSPECTION AND TEST FREQUENCIES FOR PRESSURE RELIEF DEVICES**

### **POWER BOILERS- PRESSURES LESS THAN 400 PSIG**

**"Manual check every 6 month;  
pressure test annually to verify  
nameplate set pressure or as  
determined by operating  
experience as verified by testing  
history."**





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## 2.5.8 RECOMMENDED INSPECTION AND TEST FREQUENCIES FOR PRESSURE RELIEF DEVICES

POWER BOILERS- PRESSURES

GREATER THAN 400

PSIG

**"Pressure test to verify nameplate set pressure every three years or as determined by operating experience as verified by testing history."**





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## 2.5.8 RECOMMENDED INSPECTION AND TEST FREQUENCIES FOR PRESSURE RELIEF DEVICES

### HIGH TEMPERATURE HOT-WATER BOILERS

**"Pressure test annually to verify nameplate set pressure or as determined by operating experience as verified by testing history. For safety reasons, removal and testing on a steam test bench is recommended."**



## 2.5.8 RECOMMENDED INSPECTION AND TEST FREQUENCIES FOR PRESSURE RELIEF DEVICES

### LOW PRESSURE STEAM HEATING BOILERS

**"Manual check quarterly;  
pressure test annually  
prior to steam heating  
season to verify  
nameplate set pressure."**



## 2.5.8 RECOMMENDED INSPECTION AND TEST FREQUENCIES FOR PRESSURE RELIEF DEVICES

### HOT WATER HEATING BOILERS

**"Manual check quarterly; pressure test annually prior to steam heating season to verify nameplate set pressure."**





## 2.5.8 RECOMMENDED INSPECTION AND TEST FREQUENCIES FOR PRESSURE RELIEF DEVICES

### WATER HEATERS

**"Manual check every two months. Due to the relatively low cost of safety valves for this service; it is recommended that a defective valve be replaced with a new valve if a repair or resetting is indicated."**





## 2.5.8 RECOMMENDED INSPECTION AND TEST FREQUENCIES FOR PRESSURE RELIEF DEVICES

### PRESSURE VESSELS AND PIPING

**"Frequency of test and inspection is greatly dependent on the nature of the contents and operation of the system and only general recommendations can be given."**





## 2.5.8 RECOMMENDED INSPECTION AND TEST FREQUENCIES FOR PRESSURE RELIEF DEVICES

### PRESSURE VESSELS AND PIPING

Service	Inspection Frequency
Steam	Annual
Air and Clean Dry Gases	Every three years
Pressure relief valves in combination with rupture disks	Every five years
Propane, Refrigerant	Every five years
All Others	Per inspection history



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## **2.5.8 RECOMMENDED INSPECTION AND TEST FREQUENCIES FOR PRESSURE RELIEF DEVICES**

### **HOW TO ESTABLISH FREQUENCIES?**

Jurisdictional Requirements

Consultation With Insurance Underwriters

Records Of Test Data & Inspection

Manufacturer's Recommendations

Operating History Of System

Results Of Visual Inspections

Common Discharge Headers

Outage Schedules

Critical Nature Of System



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## **PART 3 SUPPLEMENT 7**

### **S7.2 GENERAL REQUIREMENTS**

"a) Repair of a pressure relief valve is considered to include the disassembly, replacement, re-machining, or cleaning of any critical part, lapping of a seat and disc, reassembly, adjustment, testing or other operation that may affect the flow passage, capacity, function or pressure-retaining integrity."



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## **PART 3 SUPPLEMENT 7**

### **S7.2 GENERAL REQUIREMENTS**

"b) Conversion, changes or adjustments affecting critical parts are also considered repairs. The scope of the conversions may include changes in service fluid and changes such as bellows, soft seats and other changes that may affect Type/Model number provided such changes are recorded on the document as require for a quality system and the repair nameplate."



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## **PART 3 SUPPLEMENT 7**

### **S7.2 GENERAL REQUIREMENTS**

"c) The scope of repair activities shall not include changes in ASME Code."

**WHEN COMPLETED, THE VALVE'S CONDITION AND PERFORMANCE SHALL BE EQUIVALENT TO THE STANDARDS FOR NEW VALVES.**

## **PART 3 SUPPLEMENT 7**

### **S7.5 REPLACEMENT PATS FOR PRESSURE RELIEF DEVICES**

"a) Critical parts shall be fabricated by the valve manufacturer or to the manufacturer's specifications. Critical parts are those that may affect the valve flow passage, capacity, function, or pressure retaining integrity.

b) Critical parts not fabricated by the valve manufacturer shall be supplied with material test certification for the material used to fabricate the part."

## **PART 3 SUPPLEMENT 7**

### **S7.5 REPLACEMENT PATS FOR PRESSURE RELIEF DEVICES**

"b) Critical parts not fabricated by the valve manufacturer shall be supplied with material test certification for the material used to fabricate the part.

3) Receiving records for replacement critical parts obtained from a source other than the valve manufacturer or assembler of the valve type shall include a *Certificate of Compliance*....."

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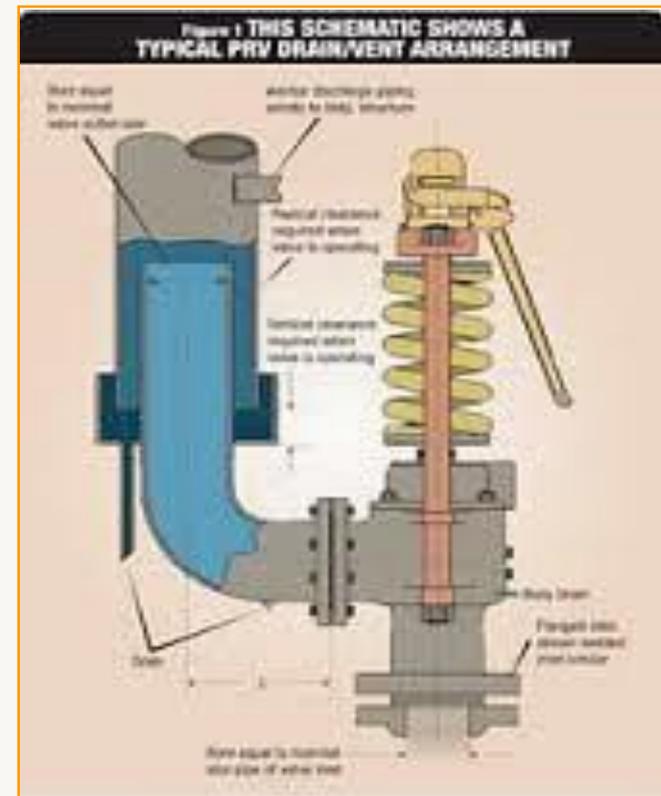
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# VISUAL IN SERVICE INSPECTION

Inspect Inlet and Discharge  
Piping for Code Compliance

Verify Discharge Piping is  
Draining

Verify Inlet/Discharge Piping  
Is Not Binding or Placing  
Stress on the Valve Body or  
Connections





# VISUAL IN SERVICE INSPECTION

Check Condition of  
Inlet/Discharge Piping  
Supports

Verify No Block Valves on  
Valve Inlet

Inspect and Verify Function  
of Changeover Valve if  
Present





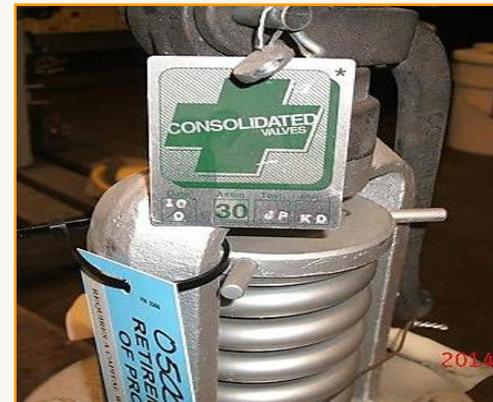
# VALVE IN SERVICE INSPECTION

Current Nameplate Marking  
or Stamping

Verify Nameplate Capacity

Check for Identification,  
Presence and Integrity of  
Seal

Check for Evidence of  
Leaking



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# VALVE IN SERVICE INSPECTION

Bolting Condition and  
Tightness

Deposits or Material Buildup

Evidence of Rust or  
Corrosion

Damaged or Misapplied Parts  
Verify No Obstructions for  
Proper Valve Operation

Bonnet Vent is Open (applies  
only to bellows valves)





No Adverse Findings--Return Valve to Service Till Next Inspection or Test Interval

PRV's are Mechanical Devices that Require Periodic Maintenance Even Though External Inspection and Test Results Indicate Acceptable Performance

Service Interval of No More Than Three Inspection Intervals or Ten years, Whichever is Less, Is Recommended to Maintain Device Condition

Service Records with Test Results and Finding Should be Maintained for all Overprotection devices.

## **PART 3 SUPPLEMENT 7**

### **S7.10 GUIDE TO JURISDICTIONS FOR AUTHORIZATION OF OWNER-USERS TO MAKE ADJUSTMENTS TO PRESSURE RELIEF VALVES**

"The Jurisdiction may authorize properly trained and qualified employees of boiler and pressure owner-users or their designees to restore set pressure and/or performance of pressure relief valves. All external adjustments shall be resealed with a seal identifying the responsible organization and a metal tag that identifies the organization and date the adjustment shall be installed."

## **PART 3 SUPPLEMENT 7**

### **S7.10 GUIDE TO JURISDICTIONS FOR AUTHORIZATION OF OWNER-USERS TO MAKE ADJUSTMENTS TO PRESSURE RELIEF VAVLES**

Owners-users or their designees must establish a documented in-house training program

Owners-users or their designees must document the evaluation and acceptance of an employee's or designee's qualifications

Owners-users or their designees must establish a written quality system including: calibration test equipment; valve testing, setting and sealing and valve marking



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## **PART 3 SUPPLEMENT 7**

### **S7.10 GUIDE TO JURISDICTIONS FOR AUTHORIZATION OF OWNER-USERS TO MAKE ADJUSTMENTS TO PRESSURE RELIEF VALVES**

"Only External Adjustments to Restore the Required Set Pressure and/or Performance of a Pressure Relief Valve shall be made under the Provisions of S7.10.1(a)"



# WHO SHOULD REPAIR MY VALVES?

State of Kansas Boiler Safety Act Section 49-50-10  
Safety Valve Repair

All ASME Code Section I "V" and Section VIII "UV"  
shall be repaired in accordance with the NBIC "VR"  
program

Repair Organizations in possession of  
a "VR" certificate of authorization





# WHAT DO YOU NEED TO REPAIR VALVES?

Training

Practice

Technical Documentation including  
Critical dimensions, spring charts and repair  
procedures

Specialized Tooling

Certified Test Equipment



# WHAT TO LOOK FOR IN A REPAIR SHOP?

NBBI "VR" Certificate Holder

National Board Approved Quality Assurance  
Manual

Established Personnel Qualification and Training  
System

Test Stands Benchmarked Against Certified Flow  
Loops



# VALVE SERVICE ORGANIZATION

PROVEN ABILITY TRACK RECORD

FACTORY TRAINING/AFFILIATION

UP TO DATE CRITICAL DIMENSIONS

UP TO DATE REPAIR PROCEDURES

FACTORY TRAINED TECHNICIANS

ACCESS TO NATIONWIDE PARTS & VALVE INVENTORIES

USE OF OEM PARTS



# VALVE SERVICE ORGANIZATION

HIGH CAPACITY TEST STANDS

AUXILLIARY LIFT DEVICE

MOBILE REPAIR FACILITY

24/7 SERVICE

FULL TIME TECHNICIANS

ASSET MANAGEMENT SYSTEM

OUTREACH TRAINING

SAFETY RECORD

REDUCTION IN SUPPLIER BASE



# VALVE REPAIR COSTS

1/2" TO 2" NPT CONNECTIONS

REPLACE

(non standard materials)

REPAIR

2" AND ABOVE

REPAIR

If the valve can be removed: Shop Repair

If the valve is welded in-place: Field Repair



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# DOCUMENTATION

GE Oil & Gas Consolidated Valves Sizing and Selection Report		Customer Information	
Quote No.: 20140109	RFQ No.:	Name:	
Rev. No.: 0	Customer PO:	Project:	
Prepared by: PSL	Serial No.:	End User:	
Checked by:	Sizing Rev. No.:	Item Number: 1	
Spec. Sheet No.:		3L4	
Tag No.:	PSV-2624		
P&ID Number - Location	-		
Valve Type	1905-30L-1-S4-MS-31-RF-GS-HP		
Gag Required	NO		
Inlet Connection			
Specified	3 in Flg 150# Rf		
Selected	3 in Flg 150# Rf		
Outlet Connection			
Specified	4 in Flg 150# Rf		
Selected	4 in Flg 150# Rf		
Sizing Data			
Design Code	ASME Section VIII		
Sizing Basis	Single Fluid - Required Area		
Fluid	METHYL ALCOHOL		
Fluid State	Gas / Vapour		
M	32.04		
Z	1		
k	1.256		
C	343		
Kd (vapor)	Kd (liquid)	0.855	
Kb	Kw	1	
Ksh	Kn		
G	Density @ P1		
Viscosity	kv		
Overpressure	Accumulation	10 %	10 %
Kc	Spring No.	1	0305SY
Pressure			
Operating	Set	40	50 Psi (g)
MAWP	CDTP	50	50 Psi (g)
Flowing		69.7	Psi (a)
Superimposed Minimum		0	Psi (g)
Superimposed Maximum		0	Psi (g)
Builtup	Total BP	5.9	5.9 Psi (g)
Barometric		14.7	Psi (a)
TEMPERATURE			
Operating		215	Deg. F
Relieving		276	Deg. F
Design		366	Deg. F
Flow Area			
Required		3.317in2	
Selected	Designation	3.317in2	L
Standard		ASME Certified	
Capacity			
Required			
Selected		14146.4	Lb/Hr
Nameplate		3628	SCFM
Reaction Force		106	lbf
Noise Level		134	DBa @ 3 Ft

GE Oil & Gas Consolidated Valves		Dimensional Drawing and Bill of Material	
Tag Number	PSV-2624		
Valve Type	1905-30L-1-S4-MS-31-RF-GS-HP		
P&ID No - Location	-	Item Number: 1	Client
Spec Sheet Number		Rev. Number	RFQ No.:
Inlet	3 in Flg 150# Rf	Area	3.317 in2
Outlet	4 in Flg 150# Rf	Set pressure	50 Psi (g)
		Project:	
		P.O. No.	
Certified by GE Oil & Gas		DIMENSIONS & WEIGHT	
		A:155.6 mm -- 6-1/8 in B:185.1 mm -- 6-1/2 in C:730.3 mm -- 28-3/4 in D:225.4 mm -- 8-7/8 in S:36.5 mm -- 1-7/16 in WEIGHT:83.5 kg -- 140	
		BILL OF MATERIALS	
		1) BASE 2) NOZZLE 3) ADJUSTING RING 4) ADJUSTING RING PIN 5) ADJ. RING PIN GASKET 6) DISC 10) DISC RETAINER 11) BELLOWS GASKET 12) BELLOWS ASSEMBLY BELLOWS NUT BELLOWS FLANGE BELLOWS 13) GUIDE (BELLOWS) 14) DISC HOLDER 15) GUIDE GASKET 21) BONNET GASKET (BELLOWS) 23) SPINDLE RETAINER 24) STUD NUTS 25) BASE STUDS 26) SPRING WASHER (BELLOWS) 28) SPRING (BELLOWS) 29) SPRING 30) BONNET 31) CAP GASKET 33) ADJUSTING SCREW NUT (BELLOWS) 34) CAP 35) ADJUSTING SCREW (BELLOWS) NOT SHOWN 1) BASE PLUG	MATERIAL ASME SA351 CF8M STAINLESS STEEL 316 STAINLESS STEEL 316 STAINLESS STEEL 316 STAINLESS STEEL MONEL 316 STAINLESS STEEL INCONEL X-750 MONEL 316L STAINLESS STEEL 316L STAINLESS STEEL INCONEL 625 LCF 316 STAINLESS STEEL 316 STAINLESS STEEL MONEL INCONEL X-750 ASME SA104 BM STAINLESS STEEL ASME SA193 B9M STAINLESS STEEL 316 STAINLESS STEEL 316 STAINLESS STEEL 316 STAINLESS STEEL (0305SY) ASME SA351 CF8M STAINLESS STEEL MONEL 316 STAINLESS STEEL 316 STAINLESS STEEL 316 STAINLESS STEEL
Valve picture is for reference only and is not to scale.			
		Thursday, January 09, 2014	SRVSPeQ v2.13

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# DOCUMENTATION



## New Relief Valve Data Sheet

400 Russell Blvd St. Louis, Mo. 63104

Owner  
Plant

PQ CORPORATION  
Kansas City

Work Ticket 618200-1

Sales Order 618200

Customer PO 45175558

Customer I. D. PSV-2624

### VALVE DATA

Model Number	1905-30LC-1-S4-MS-31-RF-GS-HP	Valve Size	3 L 4 = 2.853 IN <sup>2</sup>
Serial Number	SB88507	Service	VAPOR/SCFM
Trim Material	STAINLESS STEEL	Cap Type	SCREWED
Soft Seat Matl		Operating Temp	60 F
Set Pressure	50 PSIG	Req'd Blow Down %	=
Cold Diff Set Press	50 PSIG	ASME Capacity	3628 SCFM
Back Pressure	PSIG	Mfg Lift	IN
Restricted Lift	IN	Spring Number	03055Y
ASME Code	VIII/UV	From / To	42 to 50
Material	STAINLESS STEEL		

### ASSEMBLER'S INFORMATION

Comment

Assembled By BARR NICK

Date Assembled 2014/02/19

### TEST RESULTS

Date Tested	2014/02/20	Test Media	AIR/SCFM
Tested By	NESSER JEREMY THEIS SHANNON	Test Method	FULL FLOW
		Gauge 1	S17 1/14
		Gauge 2	S15 12/13

Gauges Calibrated Using Equipment Traceable to NIST

Set	52 PSIG	Notches	
Reseat Press	43 PSIG	Notches	
Seats Tight	45 PSIG	IN	
BP Test /	30 @ PSI	IN	

### FINAL INSPECTION

Certified Individual JAYCOX RUSTY  
Date Completed 2014/02/20  
Hydro Test Stamped Yes

### Check List / Quality Control

All Testing Complete YES  
All VK Fields Complete YES  
PSV Painted NO  
PSV Sealed YES  
MFG Plate Attached YES  
VR Stamp Attached NO  
Test Only Tag Attached NO  
Customer ID Attached YES

 <b>REPAIRED BY</b> <b>PIONEER INDUSTRIAL CORP.</b> <b>ST. LOUIS, MO</b>		
SO	DATE	
MODEL		
SET	CDTP	
CAP	BP	



# **INDUSTRY TRENDS**

INCREASED JURISDICTION OVERSIGHT

STRICTER NATIONAL BOARD AUDITS

LONGER REPAIR INTERVALS

INCREASED APPLICATION OF PILOT OPERATED

VALVES FOR EMISSION CONTROL

APPROVAL OF PILOT VALVES FOR

SEC I – ON BOILER SYSTEMS



THE NATIONAL BOARD OF BOILER & PRESSURE VESSEL INSPECTORS Certificate of Authorization



This is to certify that Pioneer Industrial Corporation 2611 Southwest Blvd. Kansas City, MO 64108 UNITED STATES

is authorized to use the VALVE REPAIR SYMBOL in accordance with the applicable rules of the National Board.

The scope of Authorization is limited as follows:

Location: Shop YR Special Process: Machining

ASME Code Section: VIII Test Media: Air/Gas

"VR" CERTIFICATE NUMBER: 635 ISSUE DATE: June 11, 2012 EXPIRATION February 11, 2015

Executive Director [Signature]



QUESTIONS & DISCUSSION



CERTIFICATE OF AUTHORIZATION

The named company is authorized by the American Society of Mechanical Engineers (ASME) for the scope of activity shown below in accordance with the applicable rules of the ASME Boiler and Pressure Vessel Code.

COMPANY: Pioneer Industrial Corporation 2611 Southwest Blvd. Kansas City, Missouri 64108

SCOPE: Assembly of pressure vessel pressure relief valves at the above location only (This authorization does not cover welding or brazing)

AUTHORIZED: [Signature] 4, 2012 EXPIRES: [Signature] 4, 2015 CERTIFICATE NUMBER: 4

[Signature]

Vice President, Conformity Assessment

[Signature]

Director, Conformity Assessment

