



THE NATIONAL BOARD  
OF BOILER AND PRESSURE VESSEL INSPECTORS

# CELEBRATING NBBI MILESTONES PRD TEST LAB

*30 YEARS OF EXCELLENCE*

**Joseph Ball**

Director, Pressure Relief Department



# 30<sup>TH</sup> ANNIVERSARY OF THE CURRENT PRD TEST LAB

## A bit of history

- National Board Involvement in PRD testing
  - Ohio State lab
  - Original National Board lab
  - A new beginning (30 years ago)

## Interface with ASME and National Board programs

- National Board Capacity Certification – assurance of device operation and capacity
  - Test Laboratory Certification
- National Board Valve Repair (**VR**) and Testing Certification – assurance of quality PRV testing and repair
- Investigation testing

## Challenges for the Future



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## A BIT OF HISTORY

- Original involvement in PRV testing: National Board sponsored tests at OSU in 1935
  - Design testing added to ASME Code for safety valves
  - Test work done at OSU Robinson Mechanical Engineering Laboratory
  - Steam tests done on the weekends



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# A BIT OF HISTORY



The Ohio State University Photo Archives

■ Robinson Laboratory in 1939, home to The Ohio State University's Mechanical Engineering Department and the National Board's first safety valve testing lab.

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TEST NO.	DATE	COMPANY	STEAM	Misc. Costs.
1063	7/16/51	STACK HEATER Co.	24.00	
1064	"	"	24.00	
1065	"	"	24.00	
1066	"	"	40.00	
1067	"	"	40.00	
1068	7/16/51	"	40.00	
1069	"	"	40.00	
1070	"	"	40.00	
1071	"	"	40.00, 10.50	10.50
1072	7/16/51	WATTS REG. Co.	2.00	
1073	"	"	2.00	
1074	"	"	2.00	
1075	"	"	1.00	
1076	"	"	1.00	
1077	"	"	1.00	
1078	7/24/51	"	1.50	
1079	"	"	1.50	
1080	"	"	1.00	
1081	"	"	1.00	
1082	"	"	2.00	
1083	"	"	1.00	
1084	1/18/52	MIS DONNELL & MILLER INC.	5.00	
1085	"	"	5.00	
1086	1/20	"	5.00	
1087	"	"	5.00	
1088	"	"	5.00	
1089	"	"	5.00	
1090	"	"	5.00	
1091	"	"	5.00	
1092	"	"	5.00	
1093	"	"	1.00	
1094	"	"	1.00	
1095	"	"	1.00	
1096	1/27	"	5.00	
1097	"	"	5.00	
1098	"	"	5.00	
1099	2/15/52	"	10.00	10.50, 3.68
1100	"	"	10.00	10.50, 3.68
— THE PATROL VALVE CO.				
116L AND 1127				
1101	2/19	WATTS REG. Co.	1.00	
1102	"	"	1.00	0.70
— KUNKLE VALVE Co.				
1103	3/1/52	"	1.00	
1104	"	"	1.00	
1105	"	"	1.00	
1106	"	"	1.00	
1107	"	"	1.00	
1108	"	"	1.00	2.10
— TEXTEAM CORP.				
1109	3/1/52	"	1.00	
1110	"	"	2.00	
1111	"	"	2.00	
1112	"	"	1.00	
1113	"	"	2.00	3.85
1114	"	"	3.00	26.08

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# A BIT OF HISTORY



*National Board Testing Laboratory*

- National Board builds its own laboratory in 1974
- Lab included steam and air; liquid system added

## A BIT OF HISTORY

- Code expansion, testing of production samples added (Winter, 1976)
- Assemblers added (Winter, 1976)
- Liquid valve certification (Summer, 1984)



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## STEAM TEST SYSTEM

Valves designed for steam service are demonstrated on this system which uses dry saturated steam as a test medium. Relieving capacities are determined using the weighed-water method by condensing the discharged steam from the valve being tested and collecting the condensate over an established period of time.

Steam generated at the Columbus and Southern Ohio Electric Company power plant enters the laboratory via a two inch insulated supply line at 1250 psig and 950°F. The pressure is reduced through one or more of three pressure reducing valves. An air-operated emergency shut-down valve is included for safety and can be activated from several locations in the laboratory.

The incoming superheated steam flows through an automatic, venturi type desuperheater to provide dry saturated steam for test purposes. The final desuperheating for this condition is carried out manually, using cooling jackets surrounding the steam supply piping.



*Steam Test Vessel and Condensers*

The steam enters a 42 inch diameter by nine foot, six inch long test accumulation vessel. This vessel is equipped with both three inch and four inch outlet connections to which either threaded or flanged pressure relief valves under test can be mounted. Adaptor fittings are available for smaller sizes. This vessel has a maximum allowable working pressure of 625 psig at 650°F. The three manually operated pressure control valves are used in parallel to provide for a more precise control of the test vessel pressure.



*Pressure Relief Valve Under Steam Performance Test*



*Condensate Collection and Weighing Station*

All steam discharged from the valve under test is captured, condensed in one of three water cooled condensers, collected in tanks for an established period of time and weighed on digital read-out scales. The system can measure flow rates up to approximately 15,000 pounds per hour, depending upon the test pressure used.

## A BIT OF HISTORY

- Problems at Picway
- Planning starts for a new facility, closer to main office
- Feasibility study done



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## A BIT OF HISTORY

- A location is chosen ...
- Where the lab should have been ...?

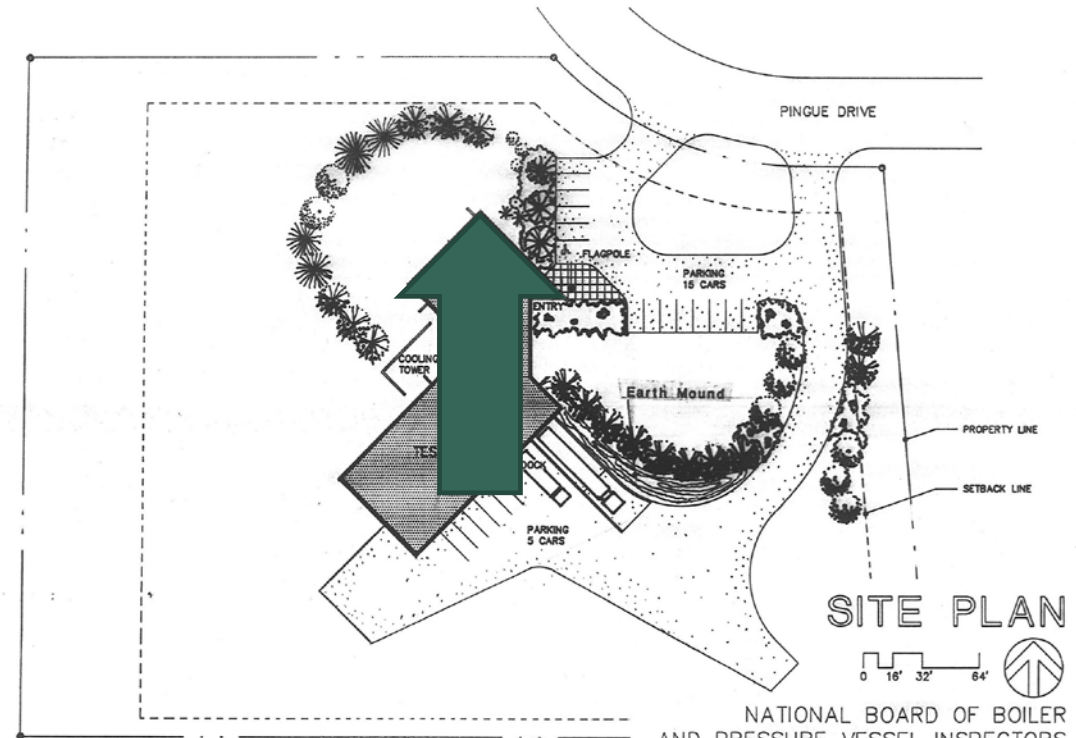


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# A BIT OF HISTORY

- A plan is drawn up
- What does this symbolize?



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SAFETY VALVE TESTING LABORATORY  
8923

12-20-89



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# A NEW BEGINNING

- The project is approved, and new lab is built.
- Completed in 1991.





## NOTHING STANDS STILL

- 1999: Rupture disk certification begins, RD test rigs built, and new air test vessel purchased
- 2011: 3,000-square-foot expansion with 2 new higher pressure gas test systems with permanent rupture disk testing equipment, gas testing changed from air to nitrogen
- 2015: Steam system revamped with new boilers



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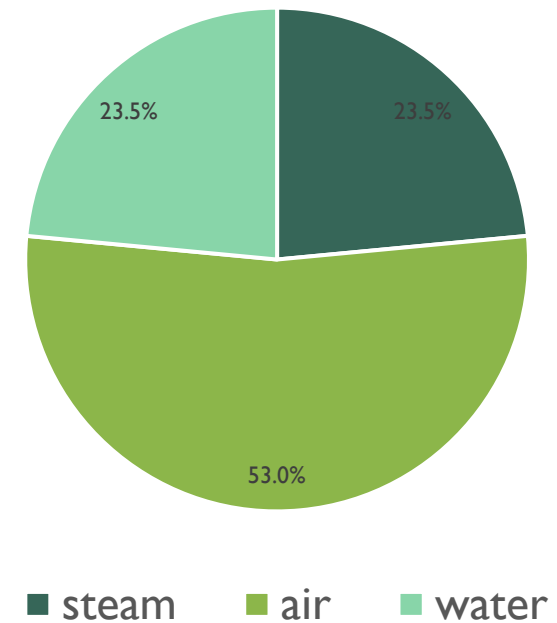
# NOTHING STANDS STILL



# A FEW NUMBERS: 30 YEARS OF TESTING

- Tests since opening: 53,804

Test Fluids



## A FEW NUMBERS: 30 YEARS OF TESTING

- New product certification: 36,493
- Repair Certification: 8,975
- Laboratory comparisons: 646
- Investigation: 197
- NB Tests: 2,015

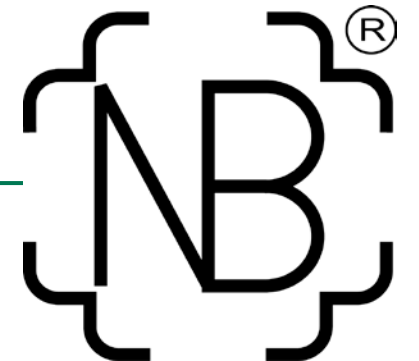


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# INTERFACE WITH ASME AND NATIONAL BOARD PROGRAMS: NEW PRODUCT CERTIFICATION

- National Board Capacity Certification (Average 1,216 test per year)
- Code requirement to test pressure relief device designs at an accepted laboratory
- Initial design tests are done by original manufacturer
- Production tests of randomly selected samples for each manufacturing or Assembler location (repeated every six years)
- Assurance to Members and the public they represent that PRD's will function properly and have an accurate capacity rating



# INTERFACE WITH ASME AND NATIONAL BOARD PROGRAMS: NEW PRODUCT CERTIFICATION

- 85% of tests done at NBTL (testing is also done at other labs)
- Qualified designs are listed in NB-18



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# NB18 Report

Tuesday, April 20, 2021

## Allied Valve, Inc. - Riverdale, IA (VRS)

Riverdale, IA 52722 United States

### This Company Manufactures or Assembles:

Design Name: 1811, 1511

NBCert # 18122

Manufacturer/Assembler	Code Sections	Expiration Date
Assembler	I, VIII Div. 1	06/23/2021

### Design Type

[Safety Valve] 1811, 1511  
 Capacity Tests: Sec. I, VIII Div. 1 at Dresser, Inc. on March 11, 1975  
 Method of Establishing Relieving Capacity: Flow Capacity, K  
 Certified Value: 0.877 Unitless  
 Media - Test: Air/Gas, Steam; Certified: Air, Gas, Steam  
 Set Pressure Definition: Pop  
 Blowdown Characteristics: Adjustable  
 Designed by: Dresser, LLC (DRJ)

Inlet Size	Outlet Size	Flow Area	Orifice [designator] dia.	Lift	Set Pressure Range	Media	Code Section
1.25-1.5 NPS	1.5 NPS	0.307 in <sup>2</sup>	[F] 0.625 in	0.156 in	15-1500 psi	Steam	I, VIII Div. 1
1.25-1.5 NPS	1.5 NPS	0.307 in <sup>2</sup>	[F] 0.625 in	0.156 in	15-1500 psi	Air	VIII Div. 1
1.25-1.5 NPS	1.5 NPS	0.503 in <sup>2</sup>	[G] 0.8 in	0.2 in	15-1500 psi	Steam	I, VIII Div. 1
1.25-1.5 NPS	1.5 NPS	0.503 in <sup>2</sup>	[G] 0.8 in	0.2 in	15-1500 psi	Air	VIII Div. 1
1.5-2.5 NPS	2.5 NPS	0.785 in <sup>2</sup>	[H] 1 in	0.25 in	15-1500 psi	Steam	I, VIII Div. 1
1.5-2.5 NPS	2.5 NPS	0.785 in <sup>2</sup>	[H] 1 in	0.25 in	15-1500 psi	Air	VIII Div. 1
1.5-2.5 NPS	2.5 NPS	1.287 in <sup>2</sup>	[J] 1.281 in	0.321 in	15-1500 psi	Steam	I, VIII Div. 1
1.5-2.5 NPS	2.5 NPS	1.287 in <sup>2</sup>	[J] 1.281 in	0.321 in	15-1500 psi	Air	VIII Div. 1
2-3 NPS	3, 4 NPS	1.84 in <sup>2</sup>	[K] 1.531 in	0.383 in	15-1500 psi	Steam	I, VIII Div. 1
2-3 NPS	3, 4 NPS	1.84 in <sup>2</sup>	[K] 1.531 in	0.383 in	15-1500 psi	Air	VIII Div. 1
2.5-4 NPS	4, 6 NPS	2.853 in <sup>2</sup>	[L] 1.906 in	0.477 in	15-1500 psi	Steam	I, VIII Div. 1

# INTERFACE WITH ASME AND NATIONAL BOARD PROGRAMS: LABORATORY COMPARISON

- NBBI is the ASME Designated Organization (ADO) for PRD Laboratory certification
- ASME PRD *Certificate of Authorization* for capacity testing
- NB lab is comparison standard between all labs (21 tests per year)



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Please contact the applicable facility for confirmation of their ability to test a particular valve. Also, please note that valves usually cannot be tested at both the maximum pressure and maximum capacity limits simultaneously.

For a list of Authorized Observers at a specific facility, please contact the facility directly.

Name/Address	Fluids	Pressure	Size	Capacity
<b>Anderson Greenwood Crosby</b> 901 Co. Rd. 473 El Campo, TX 77437 281.274.4400	Nitrogen Water	1000 psi 1000 psi	8" 4"	10-70000 scfm 5-2000 gpm
<b>BS&amp;B Safety Systems. LLC</b> 7455 East 46 <sup>th</sup> Street Tulsa, OK 74145 918.622.5950	Air	275 psi	4"	2000 scfm
<b>Continental Disc Corp.</b> 3160 West Heartland Drive Liberty, MO 64068 816.792.1500	Air Air Water	200 psi 650 psi 650 psi	4" 4" 4"	7200 scfm 6000 scfm 900 gpm
<b>Dresser, LLC</b> 12970 Normandy Blvd Jacksonville, FL 32221 904.570.3150	Nitrogen Water	700 psi 500 psi	4" 3"	4700 scfm 500 gpm
<b>Elfab Limited</b> Alder Road, West Chirton Industrial				

# INTERFACE WITH ASME AND NATIONAL BOARD PROGRAMS: NBBI VALVE REPAIR (VR) PROGRAM

- National Board Valve Repair Certification (**VR** program), Technical Requirements in NBIC Part 4, Administrative requirements in NB-514
- Scope: ASME Stamped NB Capacity Certified Pressure Relief Valves (PRV's)
- Verification valve tests required based on repair scope of work
  - Minimum of two valves repaired and tested
  - One valve for each test fluid/Code Section to be repaired
    - Typical repair test program is a Section I steam valve, a Section VIII air/gas valve and a Section VIII liquid service valve
    - Section IV valve
    - Section VIII steam valve set on air



# INTERFACE WITH ASME AND NATIONAL BOARD PROGRAMS: NBBI VALVE REPAIR (VR) PROGRAM

- **VR** valves tested to the same standards as new valves

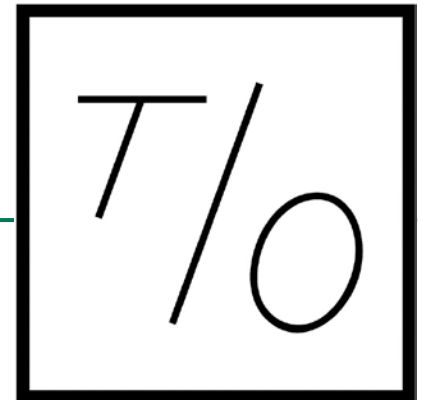
8,975 tests of valves for **VR** Certification (300 per year)



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# INTERFACE WITH ASME AND NATIONAL BOARD PROGRAMS: NBBI VALVE TESTING (T/O) PROGRAM

- National Board Testing Organization (**T/O** program), Technical Requirements in NBIC Part 4, Administrative requirements in NB-528
- Scope: Testing and recalibration of ASME Stamped NB Capacity Certified Pressure Relief Valves
- Verification valve tests required, depends on testing scope of work
  - At least two valves tested
  - One valve for each test fluid/Code Section to be tested
    - Typical repair test program is a Section I steam valve, a Section VIII air/gas valve and a Section VIII liquid service valve
    - Section IV valve
    - Section VIII steam valve set on air
    - *Note: VR Organizations qualified for T/O based on VR scope of work*





## INTERFACE WITH ASME AND NATIONAL BOARD PROGRAMS: VR AND T/O

- For **VR** and **T/O**, capabilities of the organization are demonstrated (valve designs were already certified)
- Capabilities of test equipment and knowledge of personnel are industry issues
- Demonstrations on typical work samples “encourage” repair organizations to improve their capabilities
- Assurance to Jurisdictions and Users that repairs are reliable



# INTERFACE WITH JURISDICTIONS - INVESTIGATION TESTING

- Available as a service to Membership

197 tests done for investigation (6.6 per year)



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## GOALS FOR THE FUTURE

- Continue to provide accurate informative tests to test lab customers
- Be prepared to respond to novel designs:
  - Spring and buckling pin non-reclosing pressure relief valves
  - Larger PRDs beyond capacity limits
- Respond to changing business environment
- Continue providing service to the Membership, and users of pressure equipment
- Keep the safety in pressure relief devices!



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THANK YOU!



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