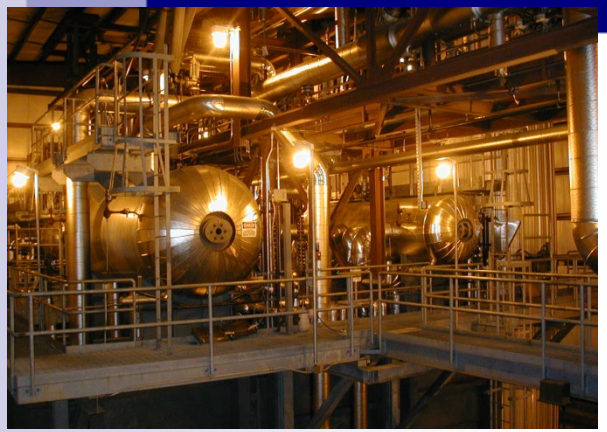
Drum Level Instrumentation and Compliance with PED & ASME Requirements

Clark·Reliance®

Presented by: Jim Kolbus

October 2021

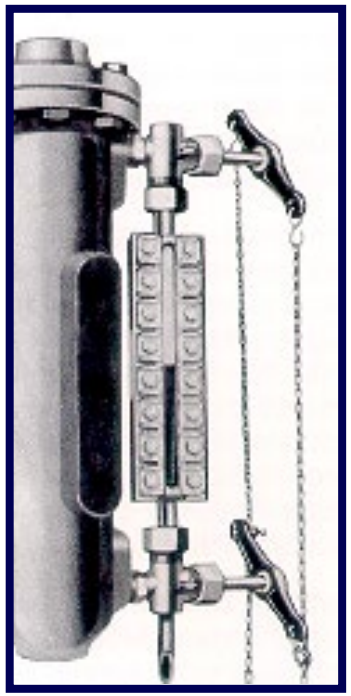


Anderson Separators® Clark Steam Traps™ Ernst Flow Industries® Enervac™ HYCOA® Jacoby-Tarbox®

Direct Reading Gage Glasses

Tubular Glass

to 17 Bar
(250 psi)



Prismatic (Reflex)

to 23 Bar
(350 psi)

Flat Glass (Transparent)

to 133 Bar
(2000 psi)

Bi-Color (Ported)

to 200 Bar
(3000 psi)

Clark·Reliance®

End-to-End Reflex Gage Glasses Are Permitted

- PG.60.1 Clarifies the use of multi-section gages without overlap, due to the light refraction principle

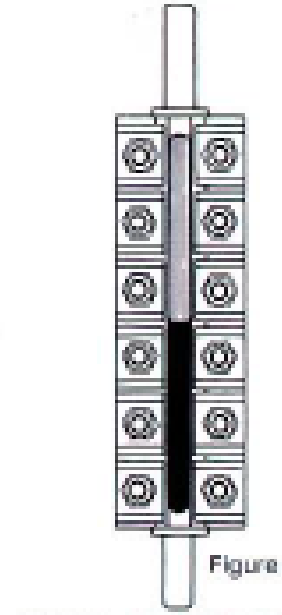


Figure 1

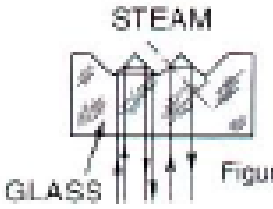


Figure 2

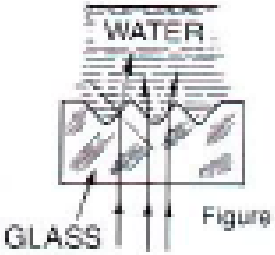


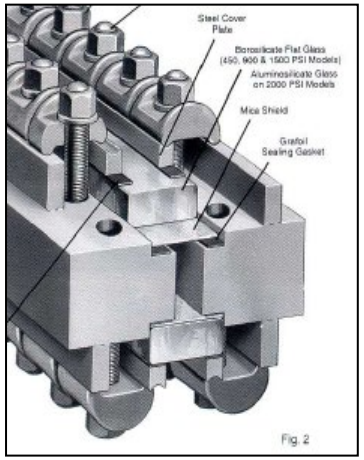
Figure 3

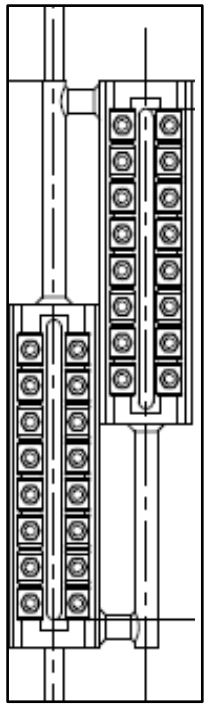
STEAM APPEARS WHITE
WATER APPEARS BLACK

Clark·Reliance®

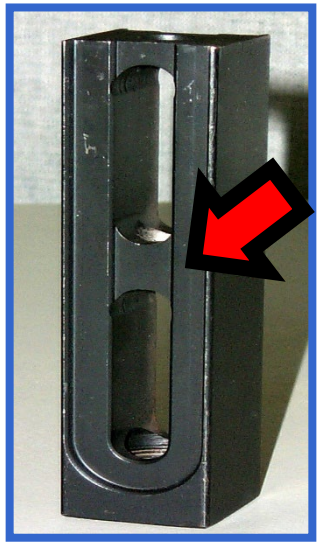
Flat Glass Transparent Type Water Gage Glass

ASME (PG.60.1) Transparent Type Multi-section gages require a 1”(25 mm) minimum overlap →





Typical View of Water Level with no obstructions in the viewing area. The gage must be illuminated, as needed for the level to be readily visible by the operator.



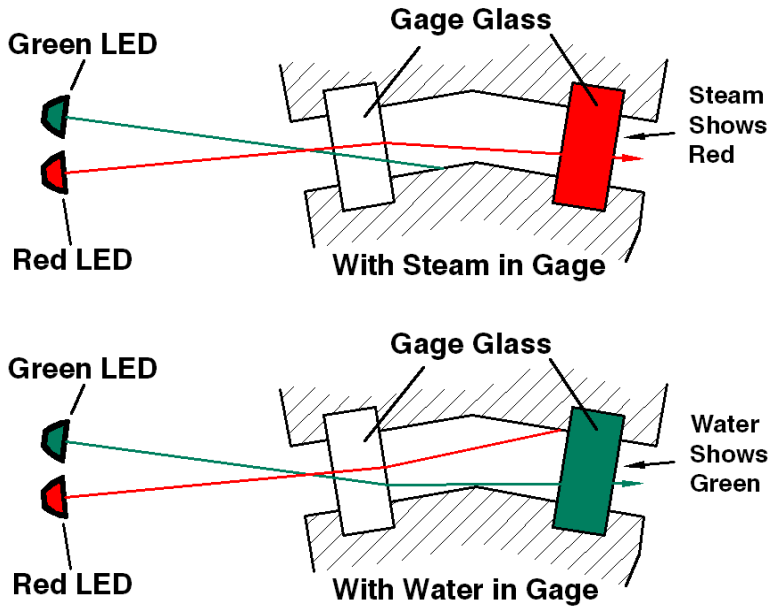
Structural web in the vision area are <u>not</u> permitted.

Clark·Reliance®

Bi-Color Ported Water Gage Principle of Operation

Water shows GREEN - Steam shows RED.

Principle of operation: Light refraction



Bi-Color Gages must be outfitted with an illuminator to be Code Compliant

Clark·Reliance®

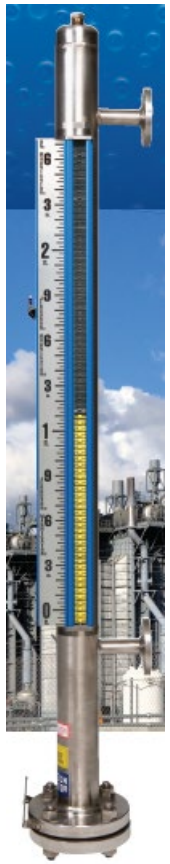
Bi-Color Water Gage Glasses with proper illumination

The level is easy to view, and the valves can be opened or closed with a chain (➔) from the operating floor.

Clark•Reliance®

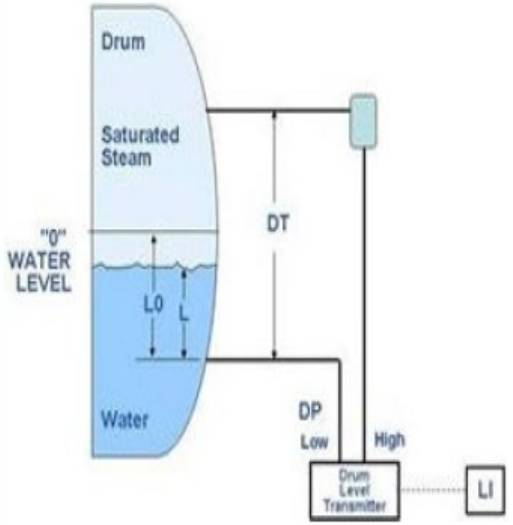
Common Remote (Indirect) Level Indicator Technologies

Conductivity Probe



Magnetic

Guided Wave



Differential Pressure

Clark•Reliance®

PED Requirements for Instrumentation

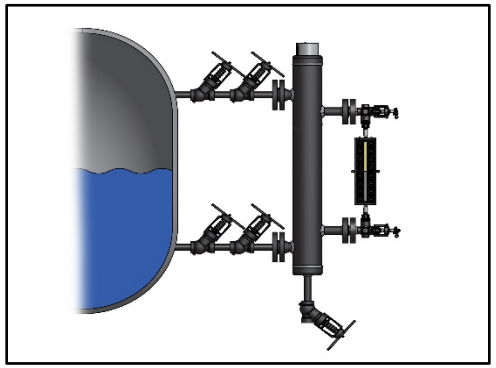
EN12952-7 is the reference standard

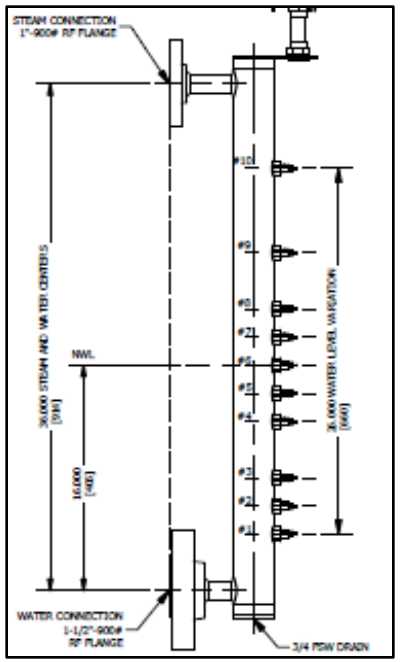
Subsection 5.4 requires a minimum of one water gage glass on all “Power Boilers” combined with 2 remote level indicators.

Connecting tubes (piping) between the boiler and the water level indicator must have a minimum inside diameter of 20 mm.

When the water connecting piping is longer than 750 mm, the inside diameter of the pipe must be at least 40 mm.

Water connecting piping from the boiler must always be horizontally oriented to the Water Level Indicators.





Clark·Reliance®

EN Requirements for Water Level Gages Glasses

All water gage glasses must be fitted with an internal self-closing safety device (ball check) for each of the water gage isolation valves.

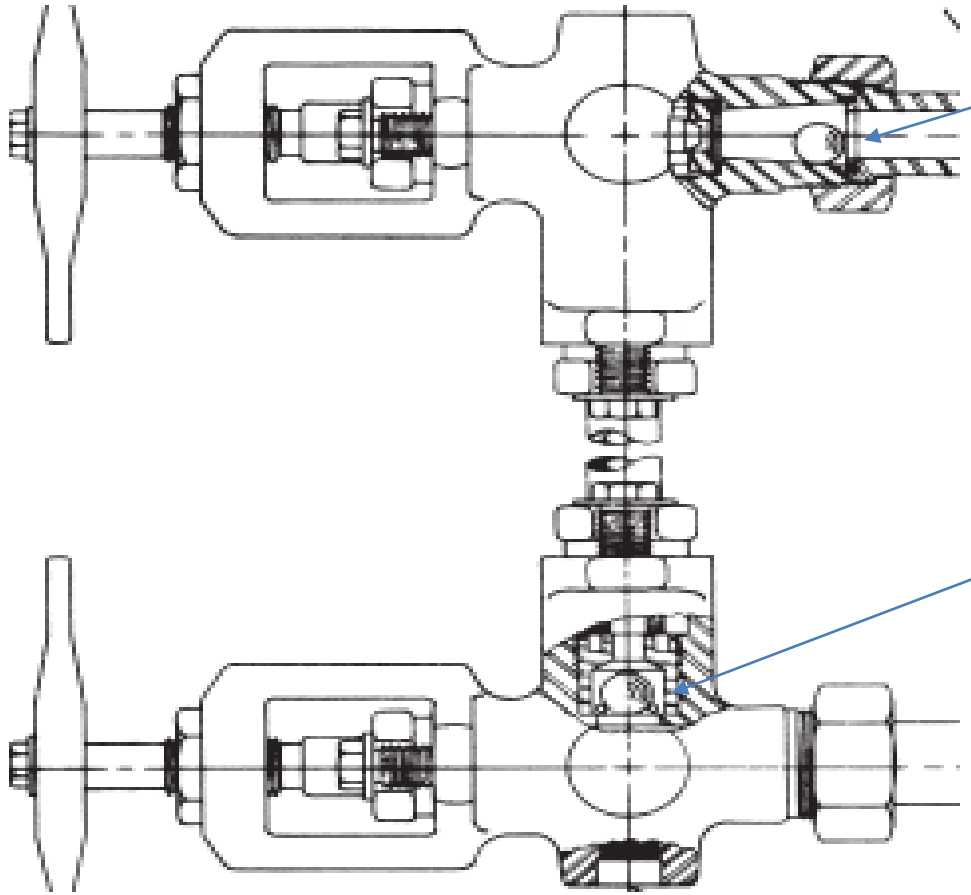
The lowest permissible water level on each water gage glass shall be marked “LWL”.

The “open position” on water gage cocks (valves) shall be indicated.

- Ball checks are mandatory on PED applications.
- Ball Checks are optional on ASME applications.

Ball check valves (Ref: “Automatic Shutoff Valves” in the Appendix of Section I in the ASME Boiler Code) defines the design requirements for this user option.

Ball Check Specifications

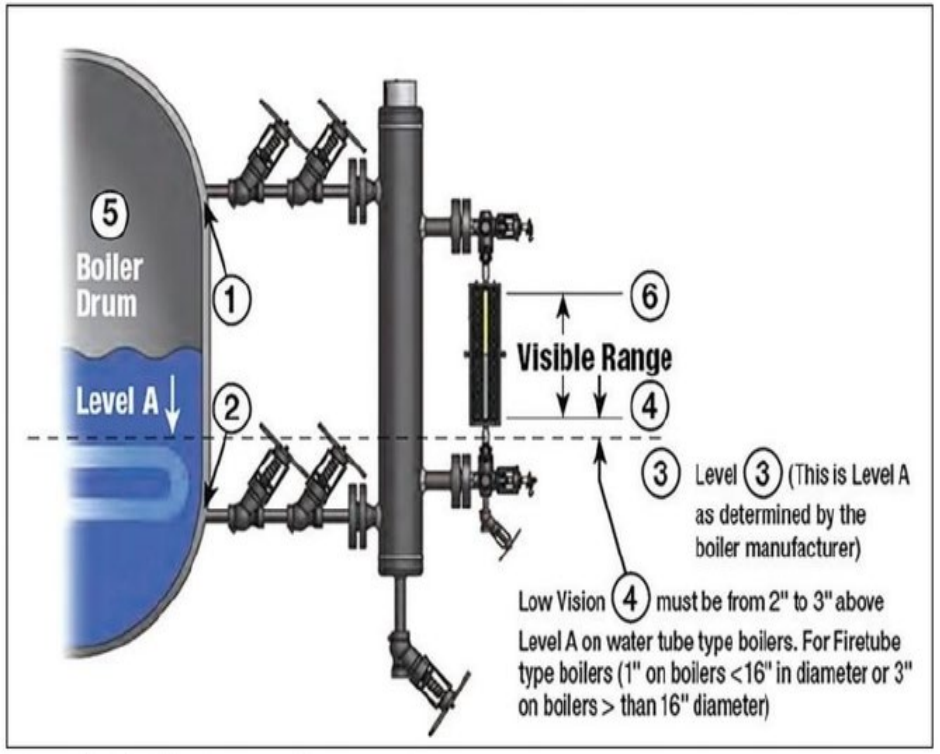


Typical upper ball check shown.

ASME requires a vertical rising ball in lower valve to prevent trap of water in gage glass.

Clark·Reliance®

ASME Water Gage Code Minimum Requirements:



<u>Boilers rated up to 400 psi (26 Bar) MAWP (*)</u>
One gage glass is required, and it <u>must</u> be kept continuous service.

Note: When the level in the gage glass cannot be seen in the control area, two remote level indicators must be continuously displayed

<u>Boilers rated over 400 psi (26 Bar) MAWP (*)</u>
Two gage glasses must be in service.

or

Two independent remote level indicators on continuous display, and one Gage Glass (which may be Isolated. The glass must be kept in serviceable condition.

MAWP (*) = Maximum Allowable Working Pressure

<u>Plant requirements may exceed code minimum.</u>

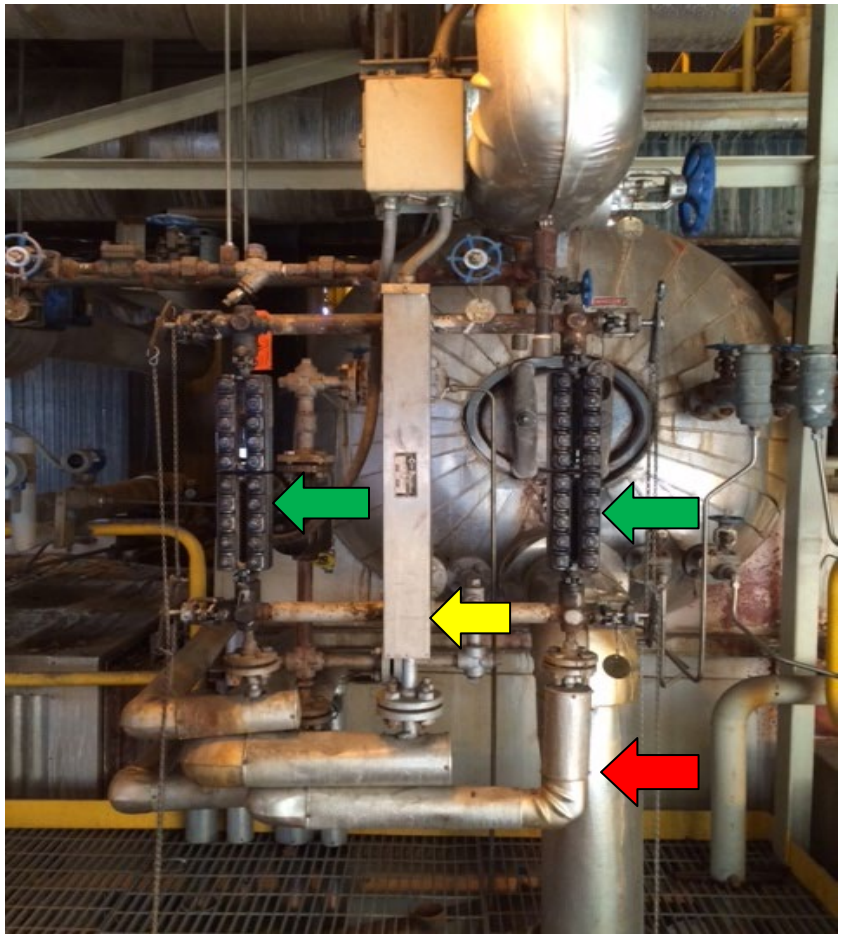
Clark·Reliance®

Code Compliant Installation of level Indicators

Two Remote Level Indicators installed on each drum for the operator, since the level in the gage glass is not visible from the control room.

Clark·Reliance®

Code Compliant Installation with added instruments for back-up



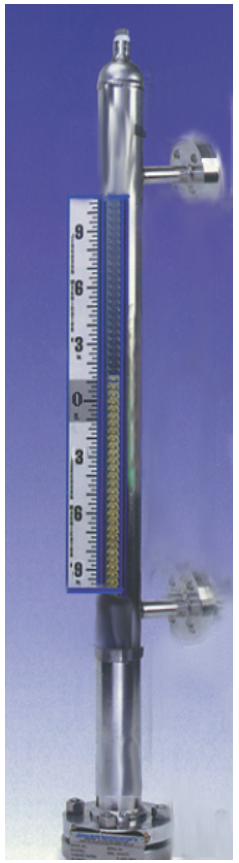
Comments:

- 2 Gage Glasses (1 required & 2nd is a back-up)
- 1 Eye-Hye Remote Level Indicator
- 2 DP Remote Level Transmitters
- All drain piping is routed to safe location.

Added gages & indicators provide additional insurance for code compliant operation in the event any single instrument is out of service for maintenance.

Clark·Reliance®

Magnetic Water Level Gages (Strict ASME requirements)

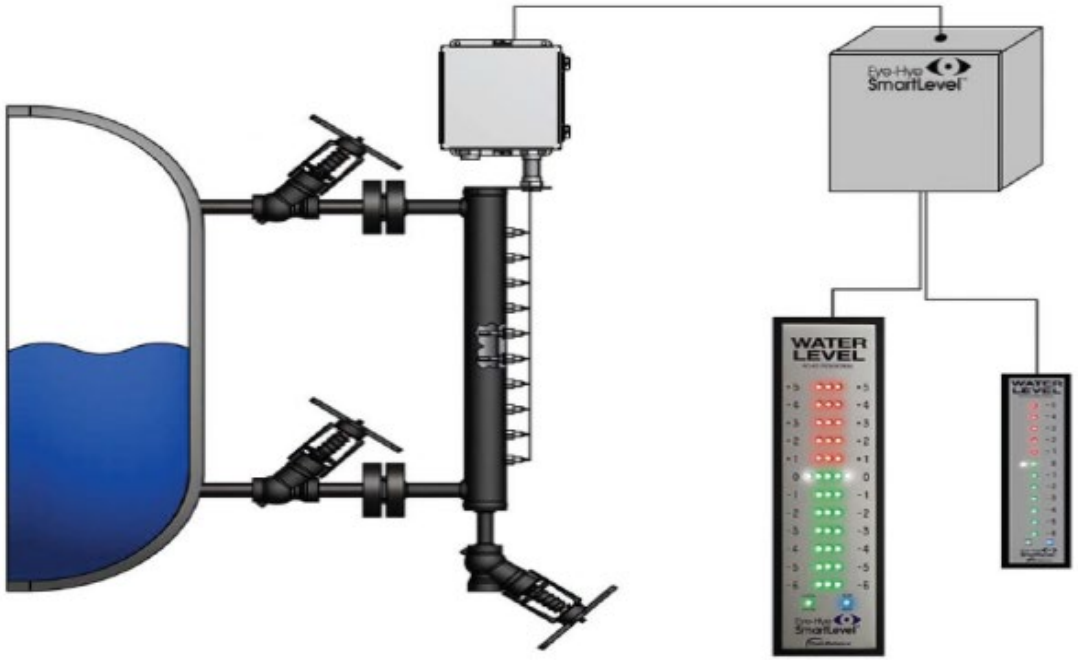


- May not be used to support a water Gage glass, due to prohibition of stainless-steel construction for water columns. Ref: PG-12.3.
- Accessories are <u>not</u> permitted to be attached for control purposes (no trip switches). This device must be used only for indication (Ref: PG-60.1.1.4).
- Does ***<u>NOT</u>*** replace the code required direct reading gage glass.
- Acceptable as an indirect (remote reading) indicator for applications up to 900 PSI (Ref: PG12.2).

Clark·Reliance®

Isolation & Drain Valve Concerns for Gage Glasses, Water Columns, Remote Level Indicators

Water Column
& Gage Glass



Remote Level Indicator

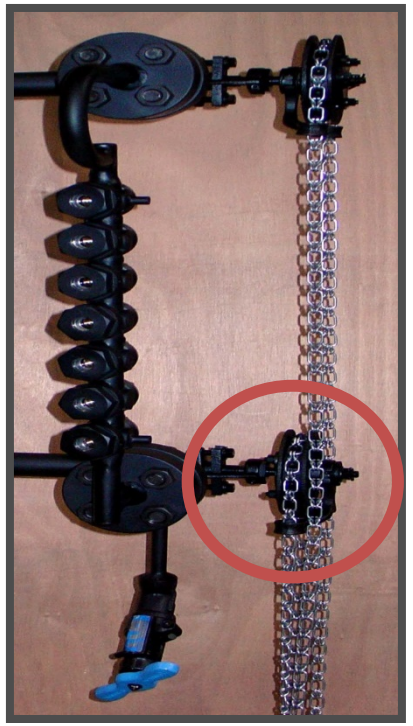
- Top, bottom, and drain valves must be installed.
- Drain outlet piping must routed to a safe discharge location.

Clark•Reliance®

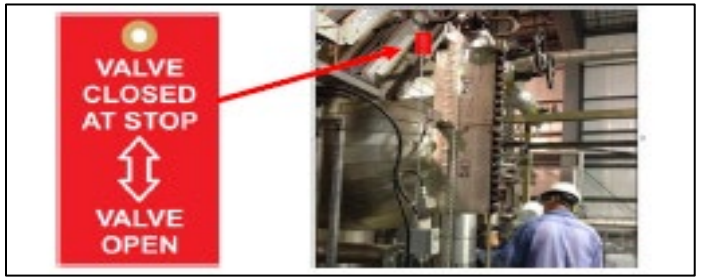
Operating Chains on Water Gage Valves

- **ASME requires gage valves must be operable the from the operating floor or platform.**
- ***A chain or mechanism is required when the top or bottom valve is more than 2M (7ft) above the operating floor or platform.***

¼ Turn Valves
Pull left handle down to open
Pull right handle down to close



Chain Wheel



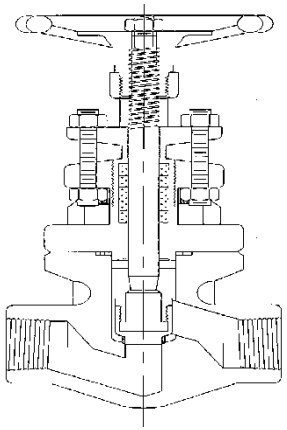
Position indication tag for chain wheel valves

Clark·Reliance®

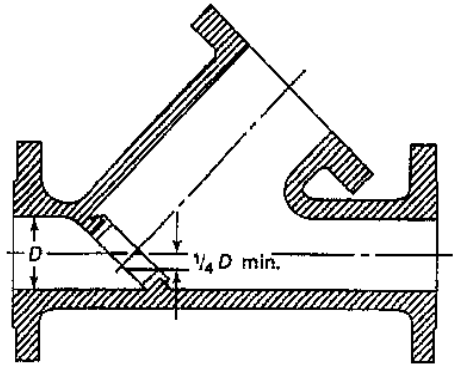
ASME Section I Valve Requirements

- Drain valves must have an unrestricted 6 mm (¼”) minimum opening and must route to a safe point of discharge.

- Globe type valves are permitted if the lowest edge of the seat is at least 25% of the port diameter. (Ref: PG-60.3.7).



Incorrect



Correct

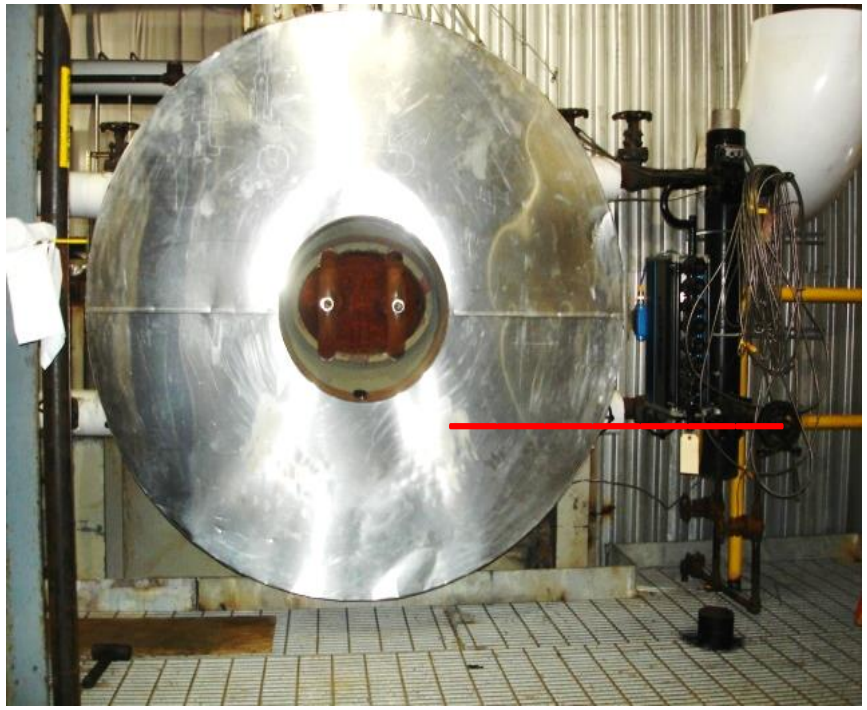
Clark·Reliance®

Common Code Violations and Concerns

- Isolated inoperable water gages
- Lack of proper maintenance
- Missing water gage glasses
- Missing illumination from water gages
- Inadequate display of remote level indicators in the control room combined with isolated gages

Serious Installation Error and Remedy

Installation error with gage elevation



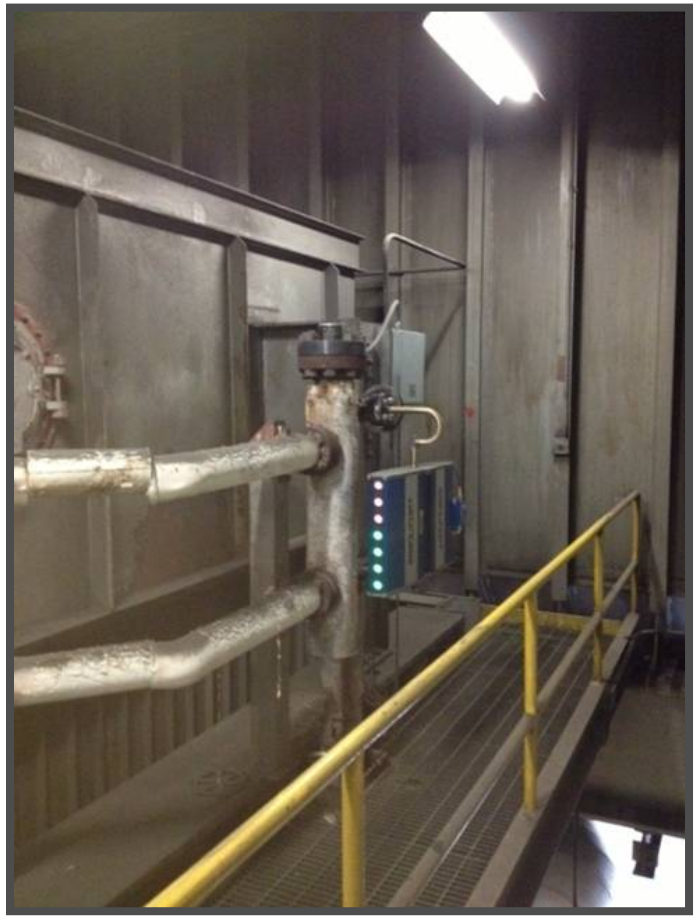
Remedy was completed before start-up

A code violation and operation risk to the boiler was prevented!

Clark·Reliance®

Violation and Remedy

Before

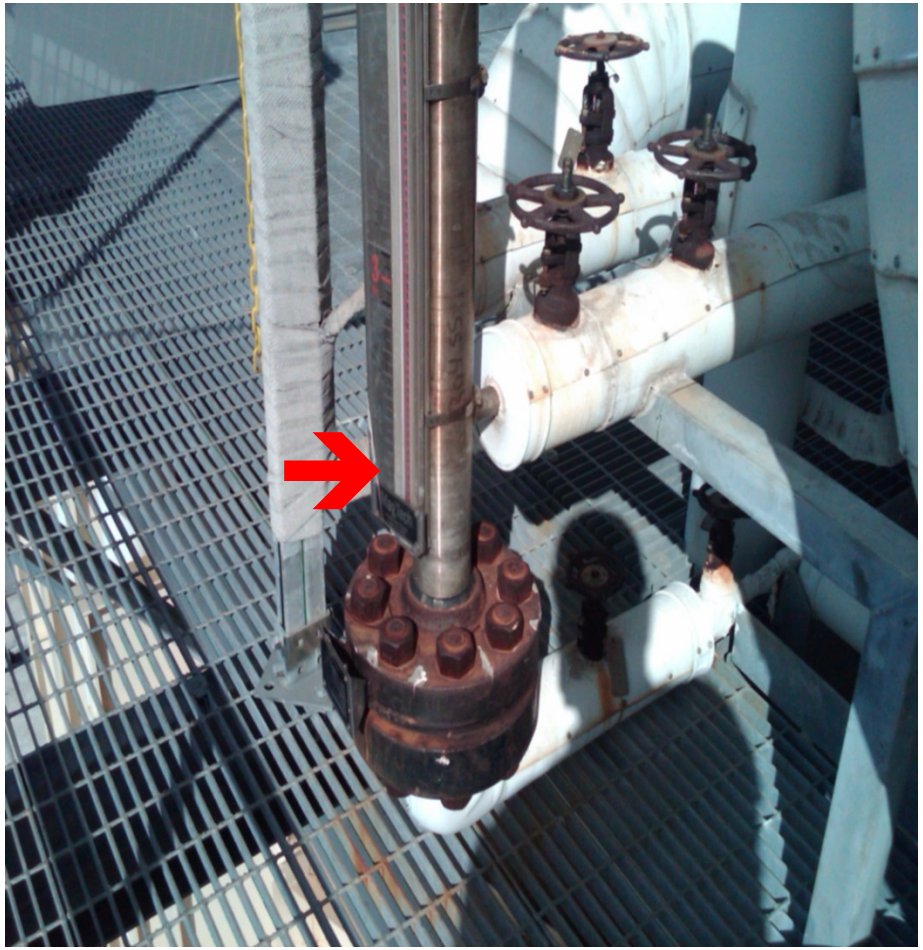


After

Clark•Reliance®

Code Violations Illustrated

A drain valve is missing on this lower water gage valve



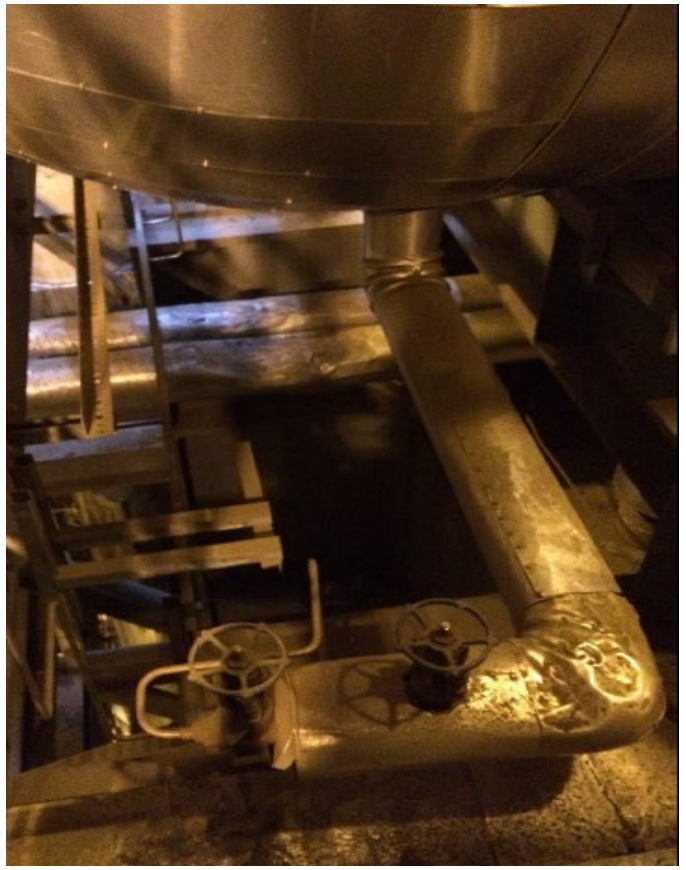
The scale on this magnetic level gage extends below lower connection, it will always indicate some level.

Clark•Reliance®

Indicator Scale Violation and Remedy

Clark·Reliance®

Check your all instrument connection piping



Sensing lines on level transmitters should be blown down periodically to eliminate any potential sediment.

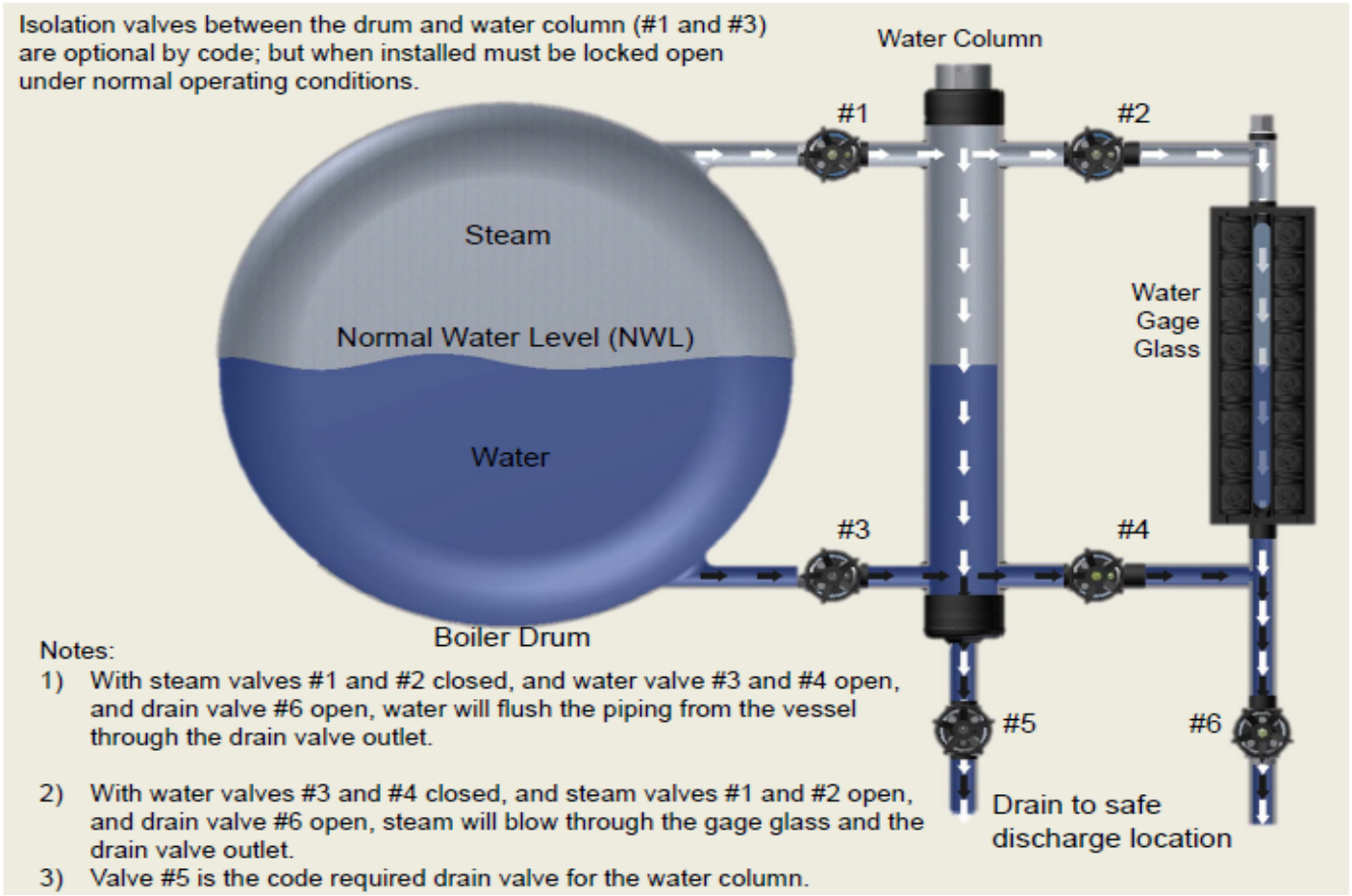
Clark•Reliance®

Recommended Maintenance Tips

- Inspect gages and valves routinely for wear or leakage.
- Plan annual maintenance intervals.
- Maintain insulation on mating piping for operation and personnel safety.
- Apply heat tracing to instrument applications that may be subjected to freezing conditions.
- Remedy any concerns without delay.
- Use OEM parts for most accurate information & maximum service life.
- Conduct proper blowdowns and not excessively. The duration should not exceed 20 seconds.

Clark•Reliance®

Recommended Blowdown Procedure



Note: Bypass Low Trip during this procedure

Clark·Reliance®

See the detailed Blowdown animation on our website in the Reliance Video Library @ www.clark-reliance.com.

Summary Recommendations for Technology with Drum Level Instrumentation

- Specify LED illumination for water gage glasses for the operator to view the level.
- Specify multiple technologies for remote indication to maximize reliability and protect against common mode failure.
- Recommend proper maintenance and routine inspection of these critical instruments.

Recommendations for Level Instrument Piping

- All piping from the drum to the water level instruments are to be insulated, for the following reasons:
    1. Provide safety for plant personnel
    2. Increase level accuracy
    3. Reduce excess condensate formation, which could increase service life
- Protect piping and instruments on applications that may be subjected to freezing conditions with heat tracing.
- Piping from drum to level instruments should be kept to a minimum < 2 M (6 Ft).

Other Vital Related Applications
“Off the Drum”

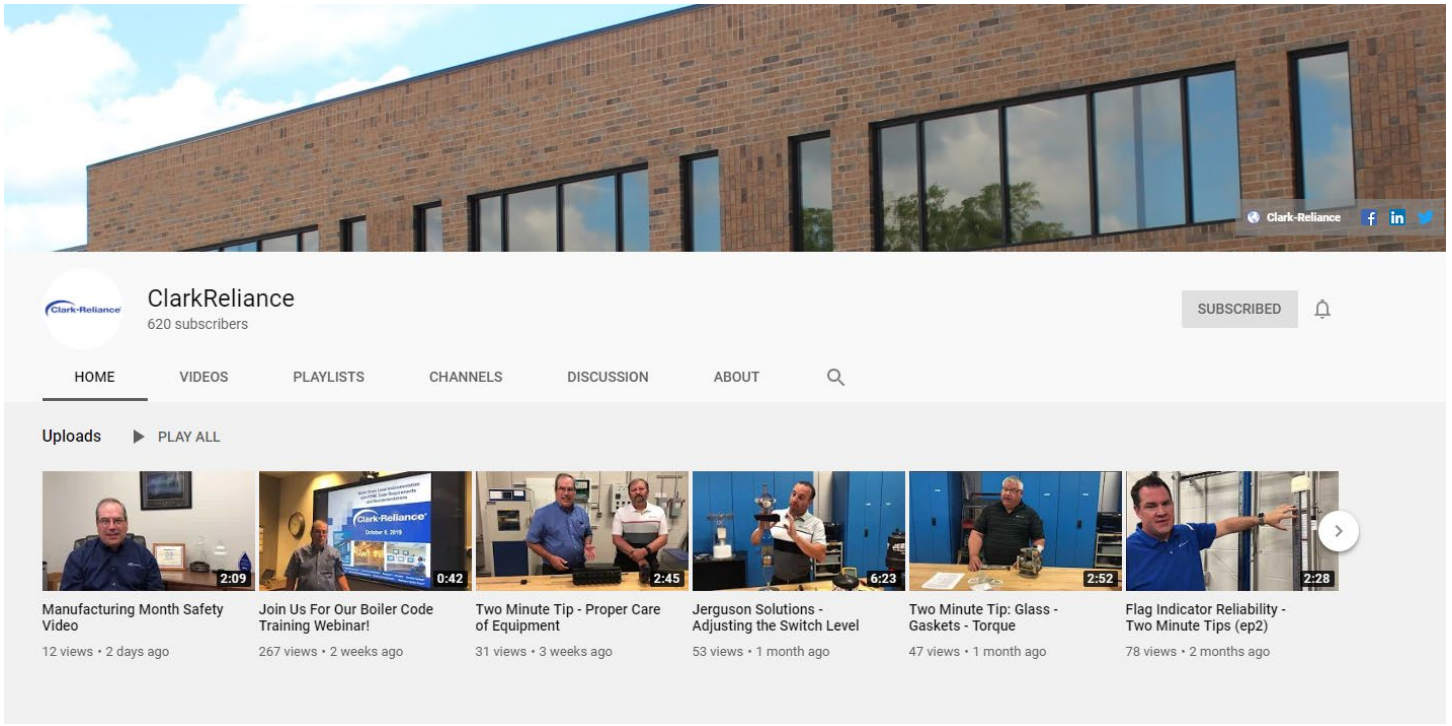



Deaerators **Condensate Tank** **Blowdown Tank** **Feedwater Heater**

- **Inspect and evaluate these applications for safe operation.**
- **Consider reflex or transparent type gage glasses, or magnetic level gages for these applications, as economic solutions to solve level indication issues.**

Clark•Reliance®

Subscribe to our YouTube Channel



Clark·Reliance®

Contact us for a complimentary copy

ASME Requirements

EN Requirements

We Promote Education and Safety!

If you have Questions:

Please contact us at www.clark-reliance.com

Consult a Reliance Applications Engineer @ relianceappeng@clark-reliance.com

Clark·Reliance®

Thank You for your time and attention today!