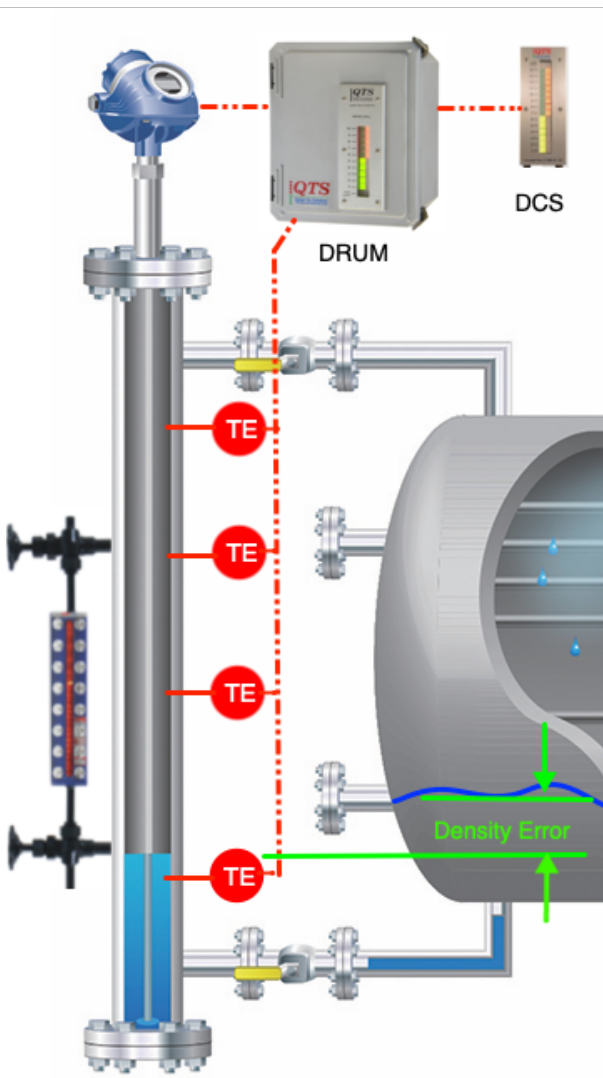


The Challenge: “Remote Level Indicator” (conductivity probes)

- Maintenance
- Density error
- Obsolete



Proven solution:

QuesTec Solutions (QTS)

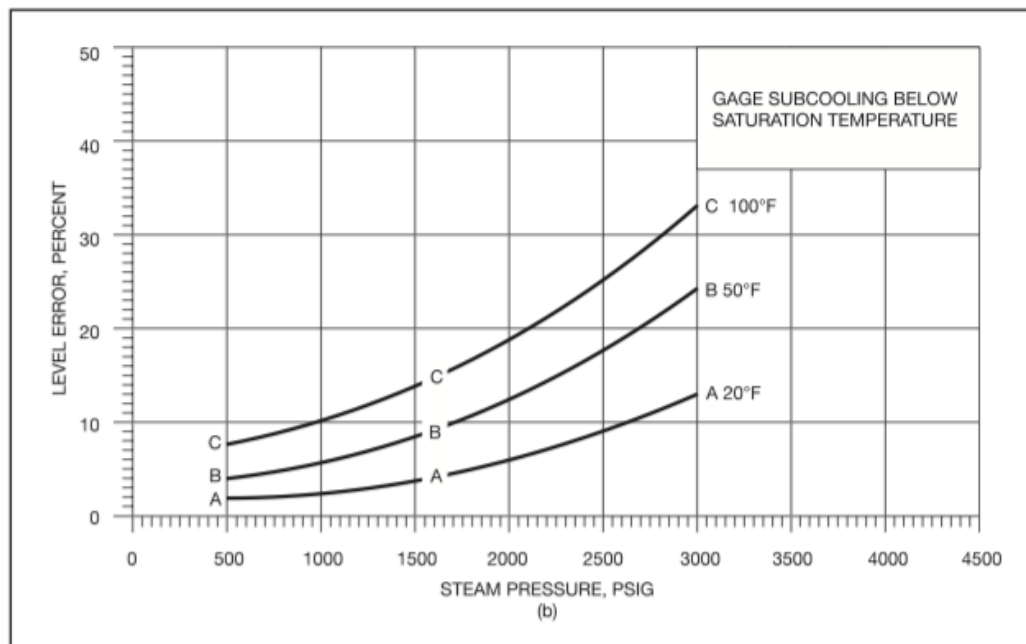
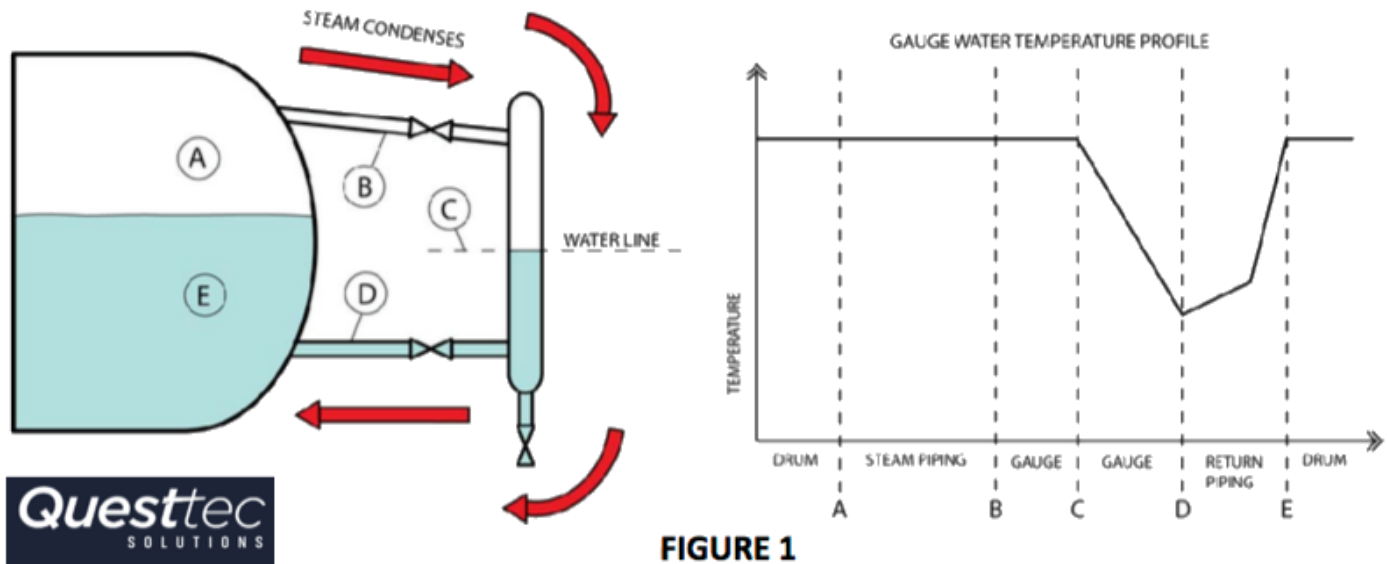
GWR: Guided Wave Radar System

- Local Controller/Indicator
- Performs continuous density error comp.
- Bicolor local and remote indicators always indicates true density compensated drum level, regardless of pressure/temperature
- Meets ASME PG60.1.1.2 (below)
- Level Gauge may be mounted to this column to declutter service area

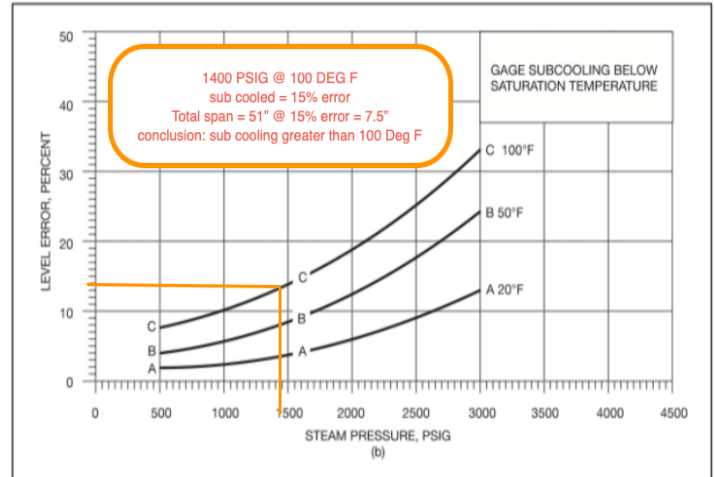
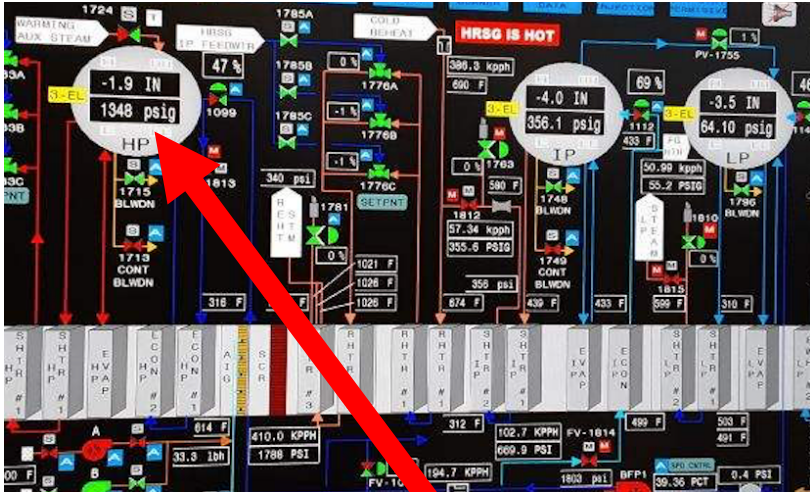
(PG-60.1.1.2) When two independent remote water level indicators are in reliable operation (continuously indicating water level), the one required gage glass may be shut off, but shall be maintained in the serviceable condition.

OPERATING TEMPERATURE ERROR CORRECTION (DENSITY LEVEL ERROR)

Level gages and other remote level indicators connected to the boiler (except dp transmitters) are not in a totally static condition. If they were, the water temperature in the gage would be near ambient. Refer to **FIGURE 1**. As steam condenses in the gage and connecting piping, the condensate flows into the gauge and heats it. A small amount of water is always flowing slowly through the gauge and piping.



What does density error look like?



500mwe 2x1 CCPP
1349 psig HP drum pressure

HP dP level transmitters = (-1.9")
HP RLI probe column = (-12")

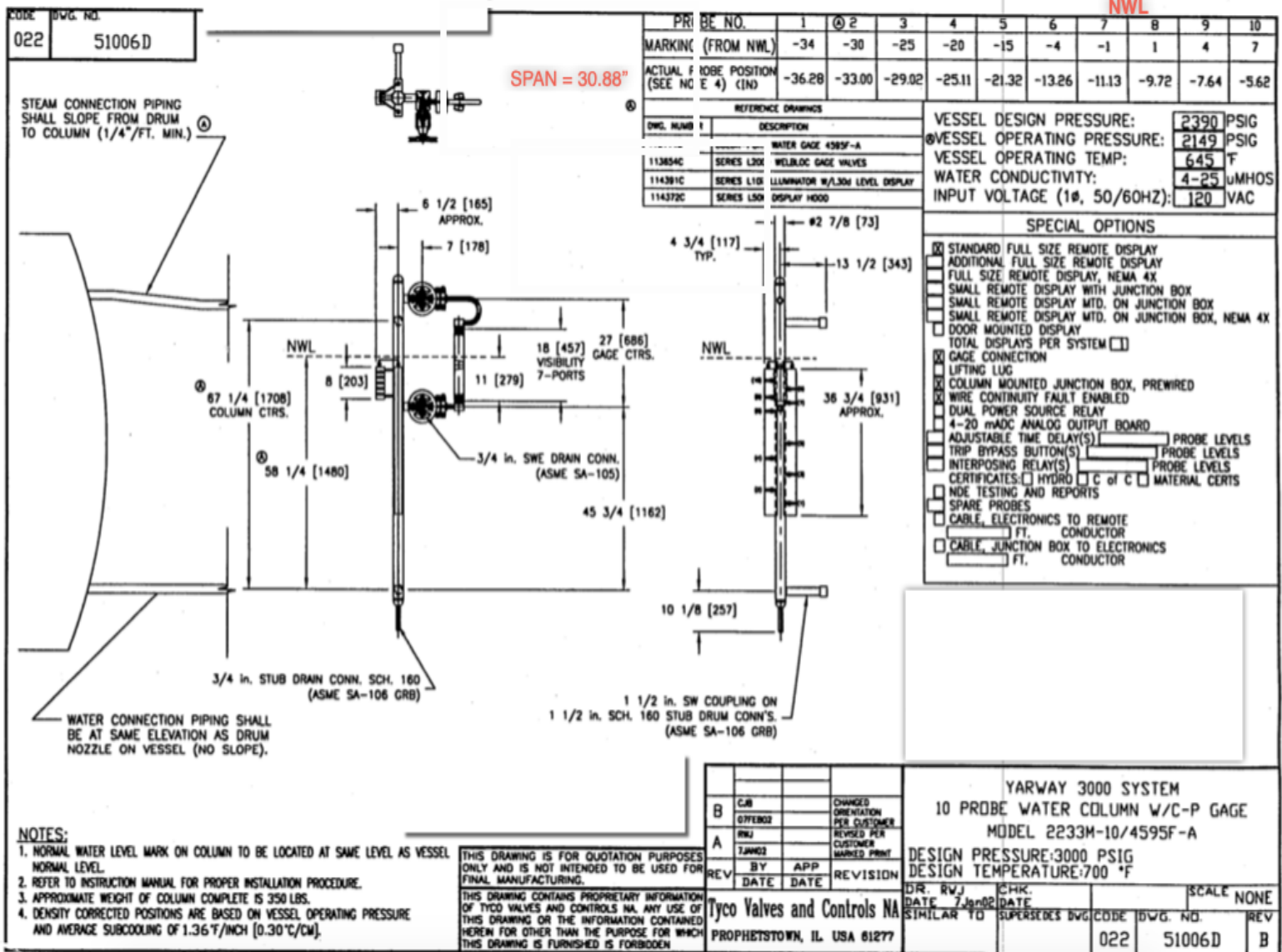
Density error = 10"

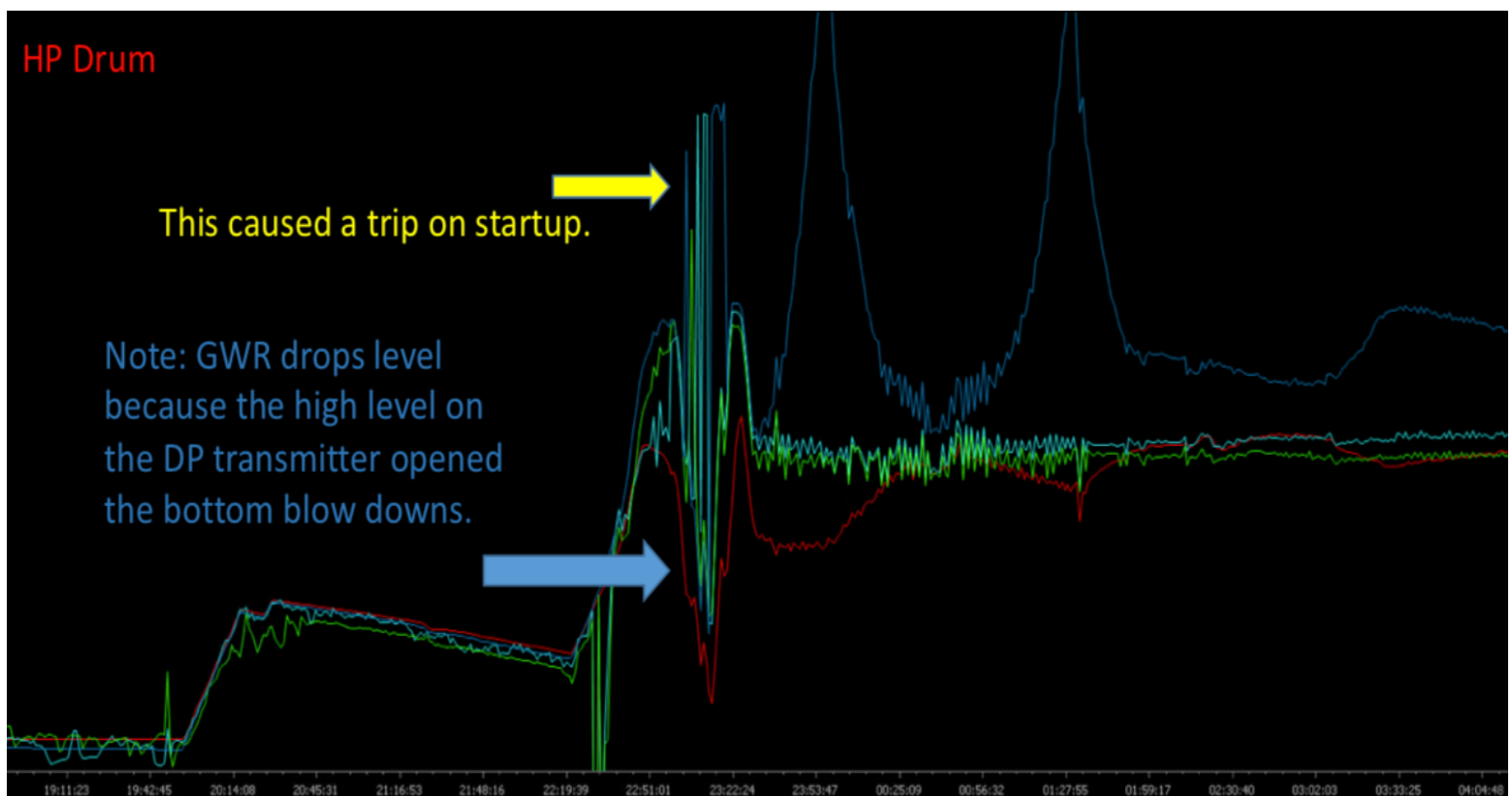
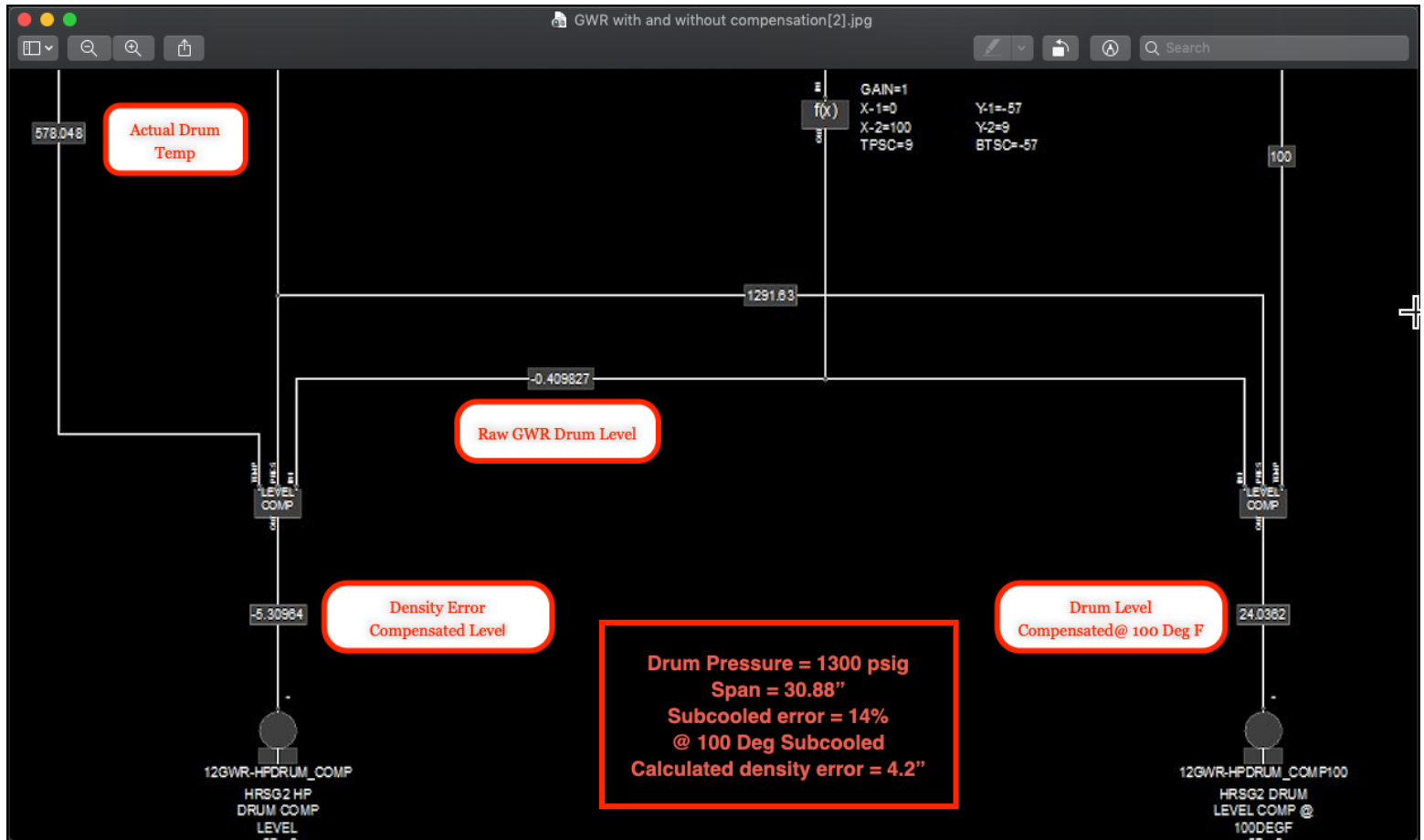


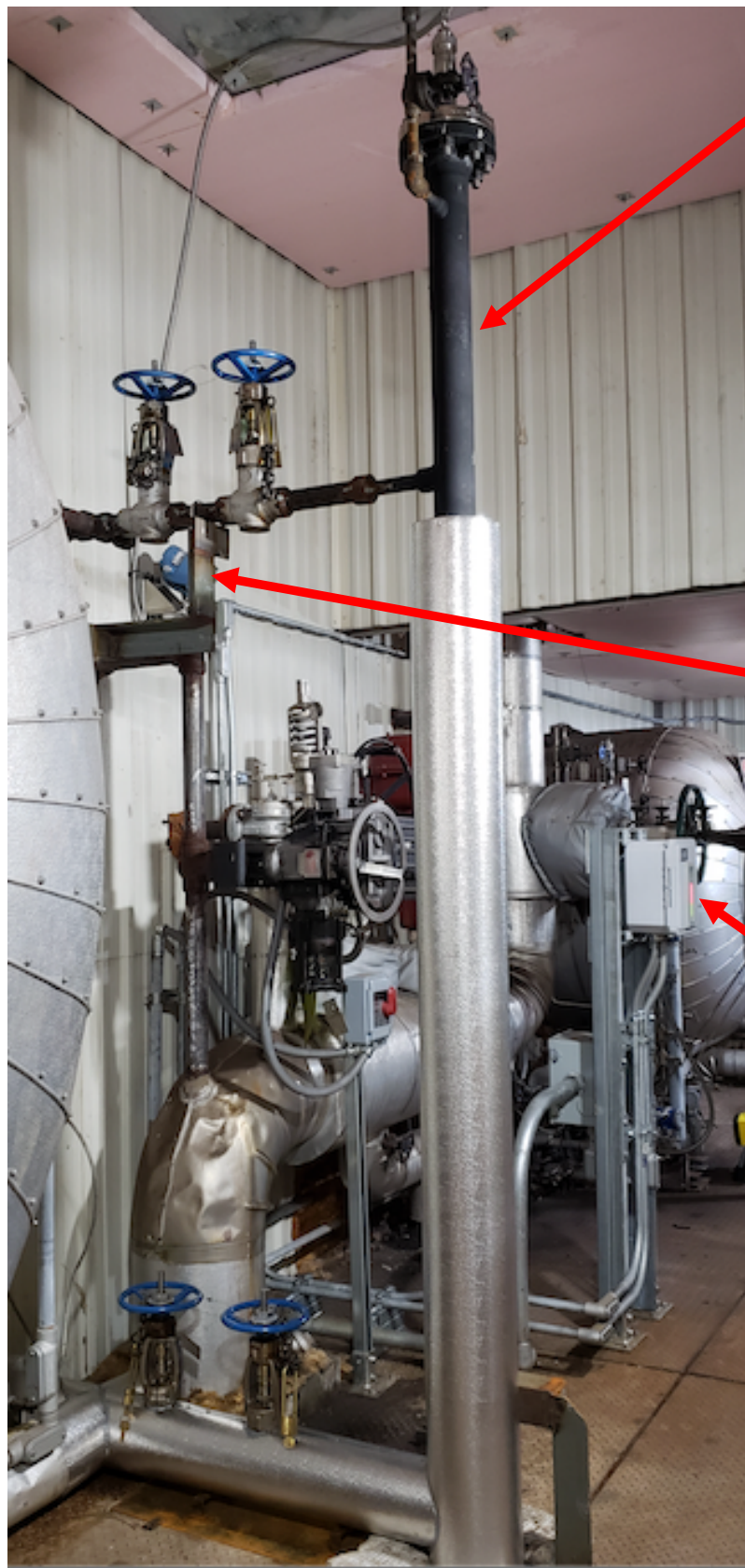
Example of typical Density Error

Original probe style RLI w/10 probes

- Probes #7 and #8 are NWL +1 & -1"
 - ACTUAL probe locations are:
 - #7 (NWL -11.13")
 - #8 (NWL -9.72")
 - Calculated @ 2149 psig
- Unit operates mostly at 1300 psig







Good Practice:
Uninsulated Upper Section

Remote GWR Head

Local Controller /
Level Indicator

The primary requirements in ASME PG-60 (2009) are as follows:

1. (PG60.1) All boilers having a fixed water level (steam and water interface) shall have at least one gage glass (a transparent device that permits visual determination of the water level).
2. (PG-60.1.1) Boilers having a maximum allowable working pressure exceeding 400 psi (3 MPa) shall have two gage glasses. Instead of one of the two required gage glasses, two independent remote water level indicators (two discrete systems that continuously measure, transmit, and display water level) may be provided.
3. (PG-60.1.1) When the water level in at least one gauge glass is not readily visible to the operator in the area where control actions are initiated, either a fiber optic cable (with no electrical modification of the optical signal) or mirrors shall be provided to transfer the optical image of the water level to the control area. Alternatively, any combination of two of the following shall be provided:
 - a. An independent remote water level indicator
 - b. An independent continuous transmission and display of an image of the water level in a gage glass.
4. (PG-60.1.1.2) When two independent remote water level indicators are in reliable operation (continuously indicating water level), the one required gage glass may be shut off, but shall be maintained in the serviceable condition.

INTERPRETATIONS APPLICABLE TO THESE REQUIREMENTS

Note that the ASME code at one time distinguished between level indicators types with the definition "Direct Reading" for visual level gages and "Indirect Indication" for all other types of indicators. That language has been replaced in the current code with simply "gage glass" and "remote water level indicator".

1. I-83-13 Allows gauge glass to be isolated when two remote indicators used
2. I-86-02 A "new Technology" level indicator does not replace the visual gage
3. I-86-50 Gage indication for the "roving operator" is not equal to the control room operator. "Low water alarm and trip" are not considered "indirect indication".
4. I-89-12 The operators work area is where control actions are initiated
5. I-89-72 An "indirect" level device with no power is not a gage glass, but can be considered a "remote level indicator"
6. I-92-15 Viewing a gage glass with mirrors is considered a direct reading
7. I-92-69 A magnetic level indicator may provide an indirect level reading
8. I-92-96 A magnetic level indicator is not considered to be a gage glass
9. I-95-04 A pressure/temperature compensated dp level transmitter is a remote level indicator
10. I-95-07 A DCS CRT screen can be a remote level indication. Two are needed to omit the gage glass, and the indications must be continuous.
11. I-98-14 Boilers with drum safety valves set under 400 psi are not permitted to shut off the visual gage, even with two remote indicators in operation.





STEAM-TRAC STB-3000

Direct Reading Bi-Color Ported Steam/Water Gage

For 3000 PSI Working Steam Pressure (WSP)

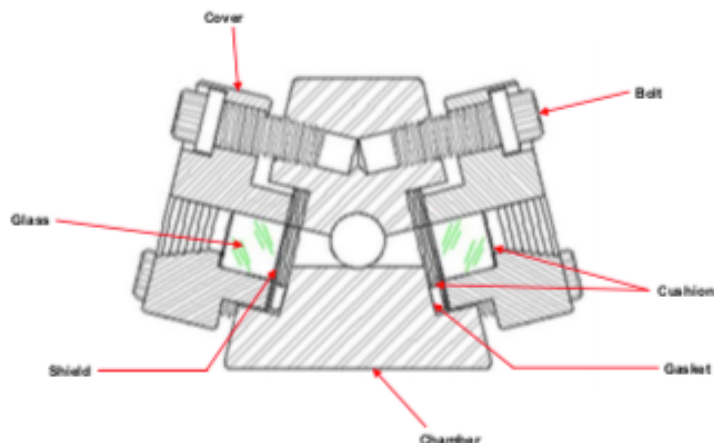
- Fully compliant with ASME as a Direct Reading Water Gage
- Continuous one-piece chamber
- Innovative LED illuminator design
- Custom built per specifications
- Bolts are nickel plated
- High temperature coating

The Steam-Trac STB-3000 Bi-Color Ported Gage must be used with a red/green filter illuminator. The gage chamber is constructed with opposing ports at an angle so that red light will pass unimpeded through the gage in the steam phase. When water is present, refraction will allow green light, only, to pass through. The result is a clear visual indication of water level.

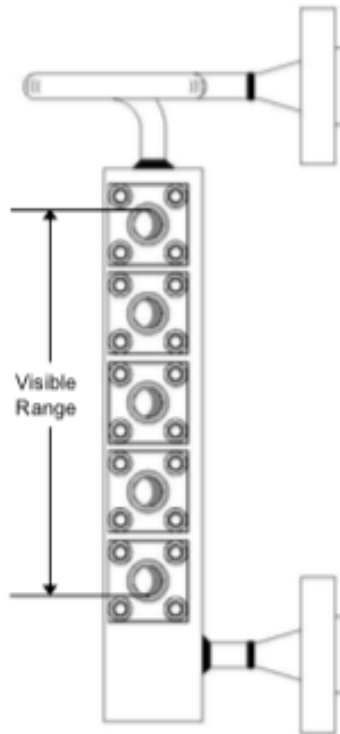
All connections and materials fully comply with ASME requirements, and the gage may be used as a Direct Reading Sight Glass for compliance to ASME PG-60. Since water appears completely different than steam, it is not necessary to have overlapping sections. Multiple section gages will have a continuous chamber constructed of a single piece of bar.



Standard Materials	
Chamber:	304 Stainless Steel
Gasket:	Spiral Wound Grafoil® GHR
Cushions:	Grafoil® GHR
Shield:	Ruby HQ Mica
Glass:	Tempered Aluminosilicate
Cover:	Carbon Steel
Bolts:	A193-B7, Nickel Plated



STB-3000 STEAM-TRAC DIRECT READING BI-COLOR PORTED STEAM/WATER GAGES



Visible Range		Model
inches	mm	
10	254	STB-3000-04
13	330	STB-3000-05
16	406	STB-3000-06
19	483	STB-3000-07
22	559	STB-3000-08
25	635	STB-3000-09
28	711	STB-3000-10
31	787	STB-3000-11
34	864	STB-3000-12
37	940	STB-3000-13
40	1016	STB-3000-14
43	1092	STB-3000-15
46	1168	STB-3000-16
49	1245	STB-3000-17
52	1321	STB-3000-18
55	1397	STB-3000-19
58	1473	STB-3000-20
61	1549	STB-3000-21
64	1626	STB-3000-22
67	1702	STB-3000-23
70	1778	STB-3000-24
73	1854	STB-3000-25

Connection Location

TB = Top/Bottom Connected
SS = Side/Side Connected
SB = Top Side/Bottom End Connected
TS = Top End/Bottom Side Connected

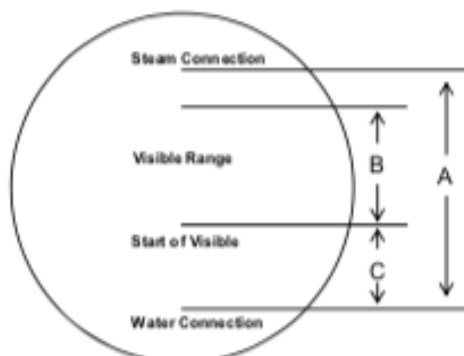
STB - 3000 - 05 - TS - 04 - F - L

Connection Size

04 = 1/2"
06 = 3/4"
08 = 1"
12 = 1 1/2"
16 = 2"

Connection Type

T = Threaded
S = Socket Weld
U = Uniflex Union (1/2" Only)
F = Flanged
N = 304 SS Stuffing Box Nipples (1/4" Top/Bottom Only)
L = Expansion Loop



Dimensional Information Required:

A = Steam Water Centers
Please indicate any valve or expansion loop requirements.
And
B = Visible Range
And
C = Start of Visibility

The following information is required for prompt, accurate cost quotations and order processing:

- Maximum Operating Steam Pressure
- Steam Water Connection Size and Type
- Other Plant Piping Tie-Ins
- Gage Valve Requirements

