FUNDAMENTAL ELEMENTS OF A LOCOMOTIVE TYPE BOILER THAT STEAM LOCOMOTIVE ENTHUSIASTS MUST UNDERSTAND

The engineer of a steam locomotive being in charge of all aspects of its operational management is ultimately responsible for ensuring that the introduction of feedwater into the boiler is regulated to provide for two fundamental conditions.

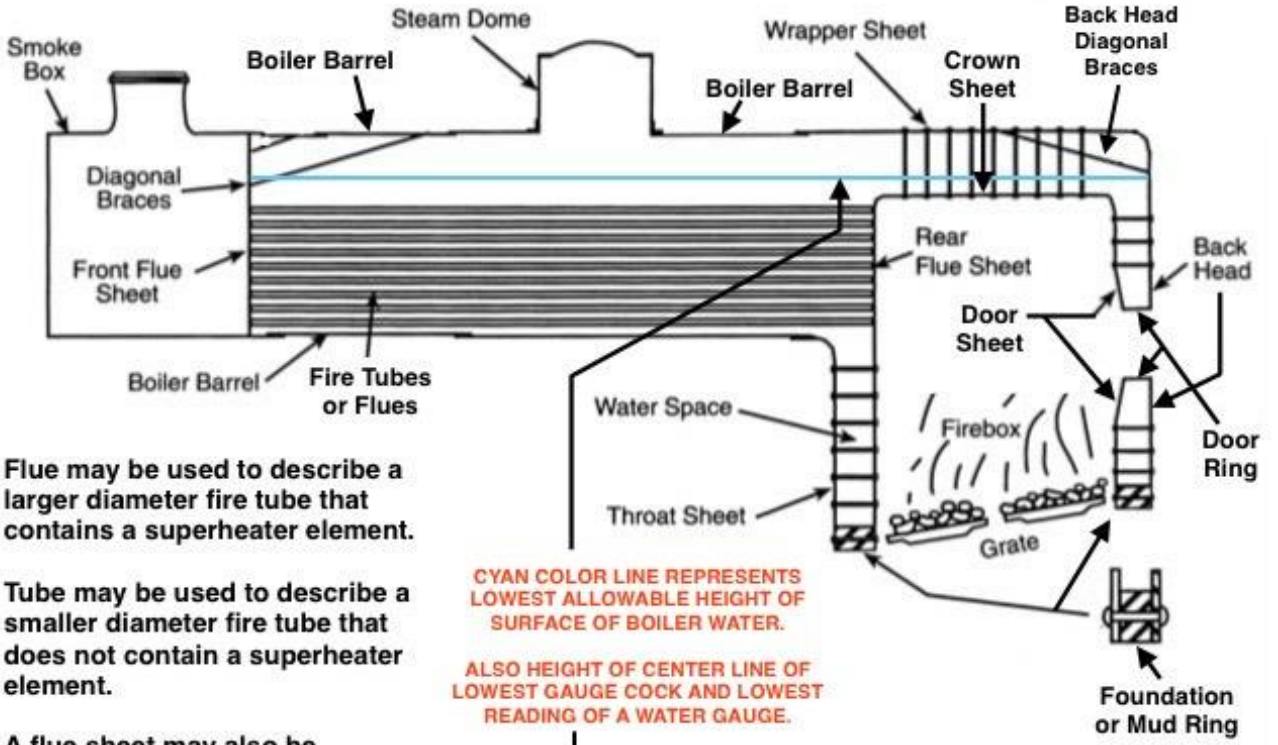
First, under all circumstances the level or height of water in the boiler is such that the components of the firebox, including the combustion chamber if the locomotive is so equipped, subjected to the heat of fuel combustion are sufficiently submerged under the surface of the water in the boiler. Thus, the metal from which these components have been produced is prevented from overheating, that if allowed to occur, would result in a loss of tensile strength and increased possibility of component failure.

Second, and subordinate to the first, the level or height of water in the boiler must be limited in order to reduce the possibility of water being carried over into the throttle, a dry pipe or a steam turret not equipped with a bridge pipe. The foregoing being especially important in preventing the admission of water into the cylinders where it may be trapped and, due to its incompressibility and the motion of the piston, result in a buildup of pressure within the cylinder sufficient to cause damage to the machinery of the locomotive.

FUNDAMENTAL ELEMENTS OF A LOCOMOTIVE TYPE BOILER
THAT STEAM LOCOMOTIVE ENTHUSIASTS MUST UNDERSTAND

BASED ON FEDERAL RAILROAD ADMINISTRATION PART 230
STEAM LOCOMOTIVE INSPECTION AND MAINTENANCE STANDARDS
DRAWING No. 1

Section Through Locomotive Boiler



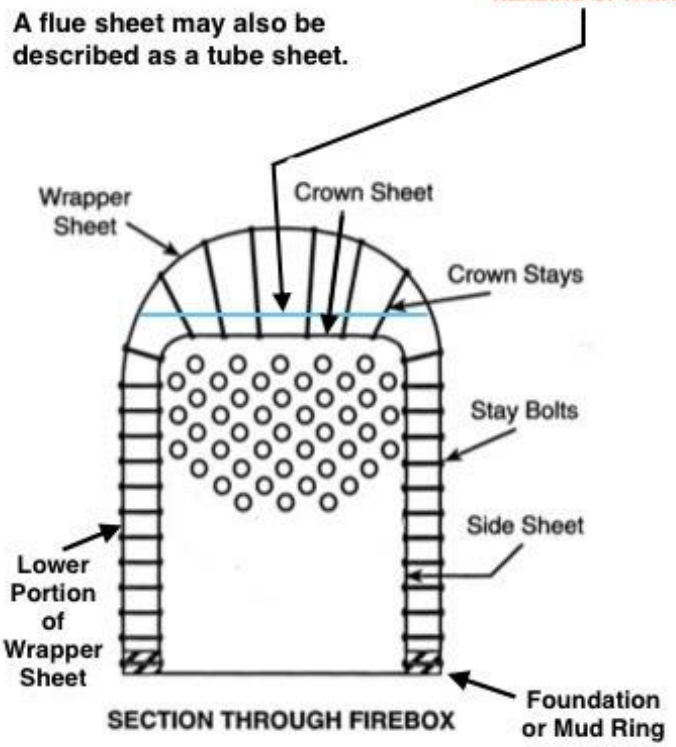
Flue may be used to describe a larger diameter fire tube that contains a superheater element.

Tube may be used to describe a smaller diameter fire tube that does not contain a superheater element.

A flue sheet may also be described as a tube sheet.

CYAN COLOR LINE REPRESENTS LOWEST ALLOWABLE HEIGHT OF SURFACE OF BOILER WATER.

ALSO HEIGHT OF CENTER LINE OF LOWEST GAUGE COCK AND LOWEST READING OF A WATER GAUGE.



SECTION THROUGH FIREBOX

BOILER STAYED SURFACES

- Front Flue Sheet
- Rear Flue Sheet
- Wrapper Sheet
- Door Sheet
- Side Sheets
- Crown Sheet
- Throat Sheet
- Back Head

BOILER UNSTAYED SURFACES

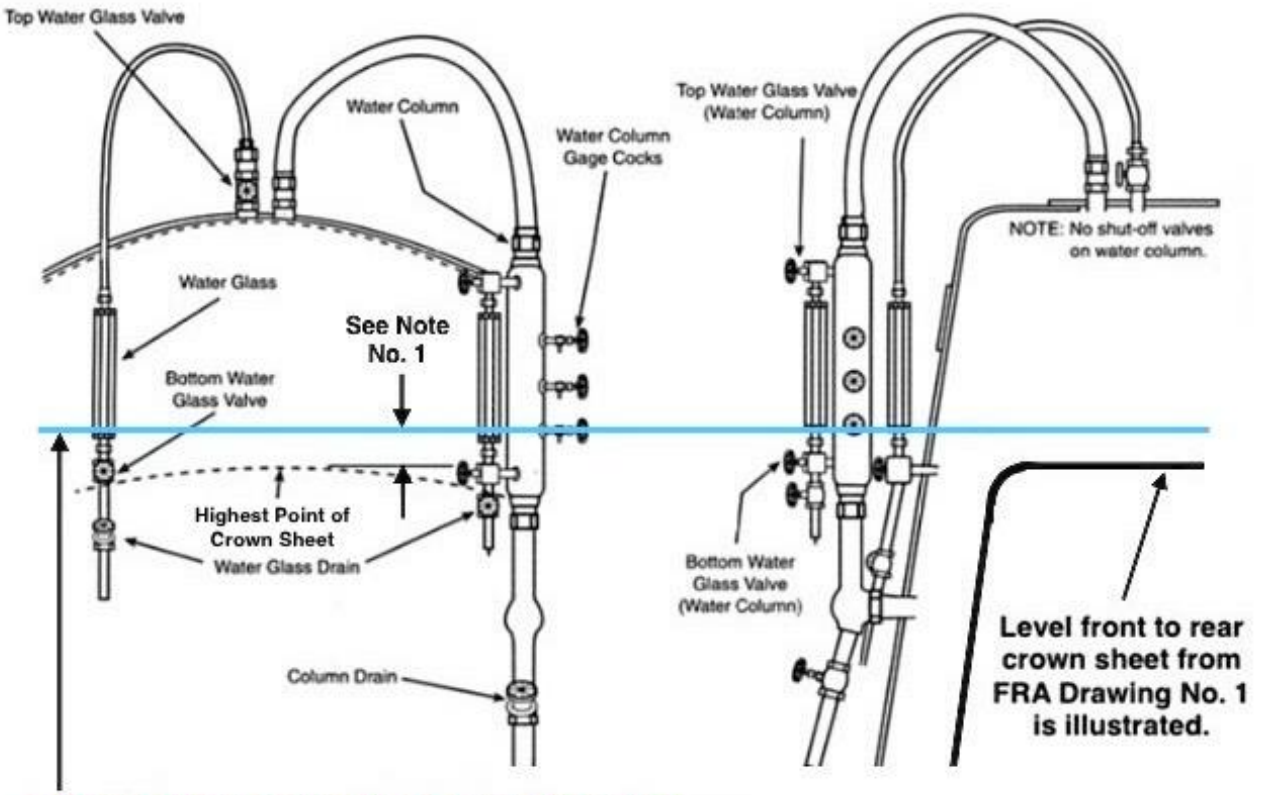
- Boiler Barrel
- Steam Dome

LOCOMOTIVE ILLUSTRATED STANDING ON LEVEL TRACK

Drawing Edited by J G Hook
3-22-2025

FUNDAMENTAL ELEMENTS OF A LOCOMOTIVE TYPE BOILER THAT STEAM LOCOMOTIVE ENTHUSIASTS MUST UNDERSTAND

BASED ON FEDERAL RAILROAD ADMINISTRATION PART 230 STEAM LOCOMOTIVE INSPECTION AND MAINTENANCE STANDARDS DRAWING No. 12



CYAN COLOR LINE REPRESENTS LOWEST ALLOWABLE HEIGHT OF SURFACE OF BOILER WATER, AND, IN ADDITION, HEIGHT OF CENTER LINE OF LOWEST GAUGE COCK AND LOWEST READING OF A WATER GAUGE.

NOTE 1: FRA MINIMUM EQUALS 3.0 INCHES.

NOTE 1: FORMER BALDWIN LOCOMOTIVE WORKS MINIMUM EQUALS 3.0 INCHES OR BLW STANDARD PRACTICE SHEET 12-1C TABLE No. 1 OR SKETCH No. 4 DERIVED DIMENSION.

LOCOMOTIVE ILLUSTRATED STANDING ON LEVEL TRACK

Drawing Edited by J G Hook 3-22-2025

For Further Information See

Lake Forest Live Steamers Railway Museum, Inc. Website at

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and

Fundamentals of Steam Locomotive Boiler Water Level Management