# FAILURES DUE TO THERMAL EXPANSION IN BOILER

**Failures of PRESSURE PARTS, CASING, DUCT, EQUIPMENTS due to Thermal Expansion is normally overlooked. It happened in newly commissioned boilers as well as in old established running boiler but reason is common in both the cases that is STRESS RELATED FAILURES due to "EXPANSION RESTRICTION" and "POOR FLEXIBILITY".**

Expansion Checks is a Least Interested Area in Boiler Erection, Commissioning, Operation, even in Failures Analysis also. Because **There are lot of other points highlighted to cover this fault.**

## TYPE OF EXPANSION & BOILER SUPPORT

Presently, Three types of boiler supporting is adopted by OEM for expansion movement and selection of type of supporting arrangement is being used is generally based on cost control criteria.

1. TOP Supported (Higher Cost)
2. BOTTOM Supported
3. CENTRE (Girth) Supported

Always, Expansion will be take place in Three directions:-

1. X- Axis (Horizontal Direction)
2. Y-Axis (Vertical Direction)
3. Z-Axis (Perpendicular to both X-Axis & Y-Axis)

Expansion Movement requires a sliding / free movement with minimum friction between two joining surfaces.

## CAUSES OF WRONG EXPANSION & FAILURES

In most of the cases this expansion is found locked, No provision for movement is taken in design, high friction between two joining surfaces, wrong erection, temporary fixing arrangements, wrong design of relative expansion, wrong Zero Point marking, Abnormal movement of Pressure Parts and Poor Design for Flexibility of Pressure Parts

Expansion restriction cause over stressing on material. All expansion related failures will be repeated failures taking place in same pattern and at almost same location. It can not be eliminated unless expansion restriction is removed.

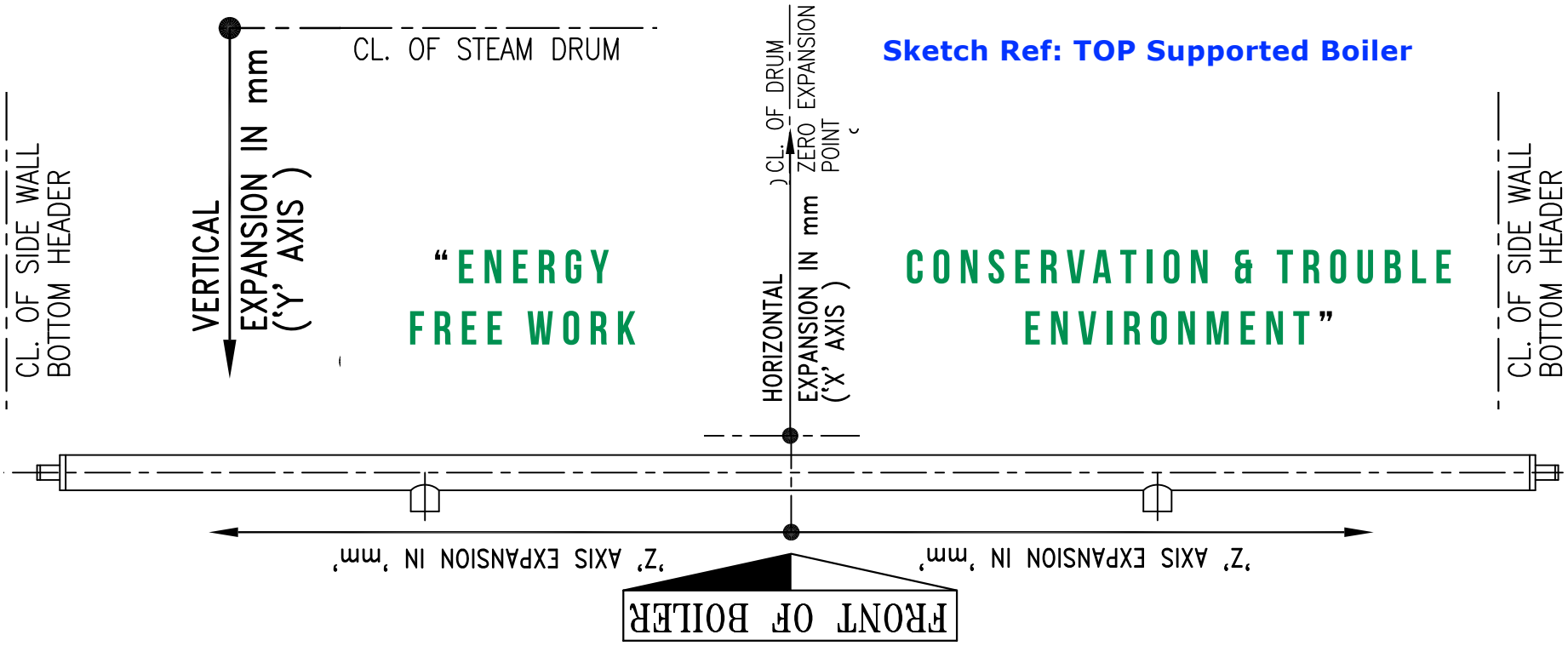
High Fluid/Gas/Air/Steam temperature = High Metal Expansion = High Failure / Deformation, in case of obstruction

## HOW TO CORRECT EXPANSION MOVEMENT & RELATED FAILURES

To Correct Expansion movement and eliminate related failures, need to check followings:-

1. Required Expansion of Material w.r.t. Fluid/Gas/Air/Steam temperature as per ASME B31.1, Appendix-B Thermal Expansion data
2. Start Calculation at Maximum Design Metal Temperature at Zero Point w.r.t. Distance
3. Expansion Movement Diagram for Casing, Ducting, Equipments and Boiler Pressure Parts
4. Zero Point Marking and Locking of Zero Points
5. Rusting / Metal to Metal Irregular surface / Non Fixing of low friction plates in-between two joining surfaces
6. Symmetrical Expansion w.r.t. to Zero Point / Centre line of Boiler
7. Casing (APH/Economiser) Expansion w.r.t. Support Structure, Tube Sheet / Pressure Parts
8. Relative Expansion Movement / Differential expansion of Pressure Parts

# Lets See the Photographs for Expansion Related Failures




**M/s Unite Energy Corporation LLP** is keen to provide the Spares, Sales & service, Retrofit & Repair, Consultancy support to mitigate the irregularities in the plant, minimize breakdown & downtime, improvise design & system performance to improve the overall plant's health and performance.

Regards

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