# IMPACT OF BUCKSTAY ON PRESSURE PARTS FAILURE

Buckstay play a major role in water wall panel strengthening and control guiding of expansion movement of pressure parts in boiler. Any deficiency in buckstay design, erection & routine maintenance leave a huge impact on boiler life and cost.

## BUCKSTAY DESIGN GUIDELINE

BUCKSTAY is designed for furnace pulsation & gas pressure fluctuation (Positive/Negative) to control movement & vibration of furnace water wall panels.

In design phase, buck stay length & spacing, beam sizing, beam strength, wind pressure, natural frequency, seismic loads as per IS 1893 is the main criteria to control movement, pulsation and thermal expansion.

Buck stay is designed for maximum furnace pressure based on type of fuel & boiler configuration. Normally, CFBC Boiler furnace pressure value is +/- 300 to 600 mmwc, for Other Boilers furnace pressure value is +/- 250 to 500 mmwc.

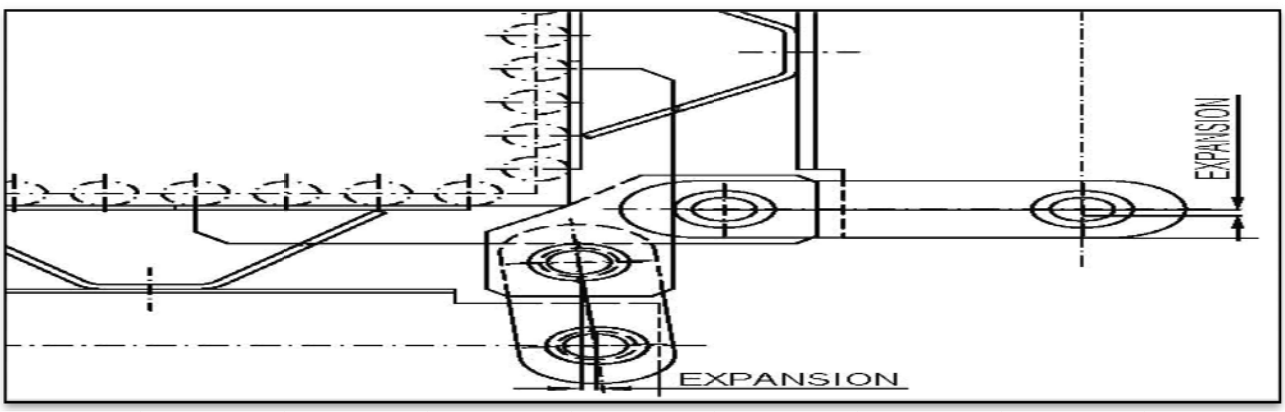
Allowable stress will change w.r.t. buckstay beam temperature; hence sizing of buckstay beam shall required changes. It is an important factor for safe buckstay therefore always tries to maintain & reduce buckstay beam temperature by proper insulation and avoid direct heat from pressure parts.

## TYPE OF BUCKSTAY

Buckstay is of mainly two types, one is Hot Buckstay and another is Cold Buckstay.

In Hot Buck stay, Design temperature of beam considered is Water wall metal temperature. Buck stay beam moves from its zero position w.r.t. furnace water walls in the direction as decided during engineering stage and this movement controlled by buck stay corner link plates.

In Cold Buck stay, Design temperature of beam considered is ambient temperature plus 30 degree C temperature. No movement take place in Buck stay beam from its zero position while plate attached with furnace water walls moves in the direction as decided during engineering stage and this movement controlled by buck stay corner link plates.



# CAUTION FOR BUCKSTAY

Buck stay beam movement at corner link, end connection, sliding link connection, beam metal temperature must be maintained. Any restriction in this movement shall lead to pressure parts failure and repetitive too.

## EXAMPLE

### 1. PULSATION & VIBRATION IN FURNACE WATER WALL PANEL

Water wall panel pulsation & Vibration notice in many boilers and main cause in improper functioning of buck stay due to design constraint and poor strengthen. **In attached video** shown Pulsation & Vibration is extremely dangerous for boiler pressure parts and its life span as well as man – machine safety in critical abnormal time.

A corner link of buckstay is moving since a new start of biomass fired boiler. This movement is neither an erection fault nor a result of loose pin & fabrication fault. This play created due to continual movement of water wall panel, resulting pin-hole elongated along with deflection in beam.

### 2. FAILURES IN CORNER TUBE OF FRONT WATER WALL

In a Sugar Mill, a repeated failure with same pattern occurs in a span of 6 years around 10 times in corner tube of front water wall panel at buck stay corner link.


The root cause is only wrong erection / installation of locking plate in buck stay. The end portion of locking plate was welded over the corner tube while in actual it should be welded with fin plate only. After rectification, problem of tube failures is vanished.

# BASIC BUCKSTAY DESIGN CALCULATION

| | | |
|---|---|---|
| 1. Buckstay beam temperature: | 310 degC | |
| 2. Furnace pressure: | 500 mmwc | |
| **CALCULATION HOT Buckstay** | 1 | 2 |
| 3. Span considered | 6.0 meter | 6.00 meter |
| 4. Buckstay Spacing | 2.6 meter | 2.6 meter |
| 5. ISMB Beam Size | 250 mm | 300 mm |
| 6. Plate width, thickness on ISMB | 140, 10 mm | 160, 10 mm |
| 7. Calculated stress | 815 kg/cm2 | 565 kg/cm2 |
| 8. Allowable stress | 810 kg/cm2 | 805 kg/cm2 |
| 9. Beam checks on Stress basis | **Fail & Unsafe** | **OK & Safe** |

| | | |
|---|---|---|
| 1. Buckstay beam temperature: | 55 degC | |
| 2. Furnace pressure: | 500 mmwc | |
| **CALCULATION COLD Buckstay** | 1 | 2 |
| 3. Span considered | 6.0 meter | 6.00 meter |
| 4. Buckstay Spacing | 2.6 meter | 2.6 meter |
| 5. ISMB Beam Size | 250 mm | 300 mm |
| 6. Plate width, thickness on ISMB | 140, 10 mm | 160, 10 mm |
| 7. Calculated stress | 815 kg/cm2 | 565 kg/cm2 |
| 8. Allowable stress | 1050 kg/cm2 | 1040 kg/cm2 |
| 9. Beam checks on Stress basis | **OK & Safe** | **OK & Safe** |

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