



Penetration Seals

Hot and Cold Re-Heat



Specification, Design & Life

- Review and Develop a new specification requirement
- Temperatures, pressures, movements, adjacent items
- Minimum life maintenance between change

Design for installation

- Retrofitting around existing bellows
- Split ring collars to avoid cutting steam pipes

Retrofit Applications

- Hot and Cold Re-Heat
- Boiler Penetrations with Metallic Bellow Installed
- Boiler Penetrations with Metallic Bellow Removed
- Boiler Penetrations with Labyrinth/Baffle Plate Seal
- Boiler Penetrations – Steam Drum





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OEM Installation

- Large Metallic Bellow
- Double Bellow Type
- Multi-ply Stainless Steel
- Installed on side of the boiler
- Minimal Axial movement
- Large vertical shear
- Varying pre-set, not always in optimum position

Operational Failure

- Significant Convolution Distortion
- Split in Convolutions
- Failure of Internal Insulation

Replacement

- Technically bellow is limited for the movements
- Replacement cost very high





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Fabric Retrofit

Bolsters

- Pipe with clamp bands
- Boiler collar by pins
- Pipe Collar by pins
- Pre-insulation bolster by cuff

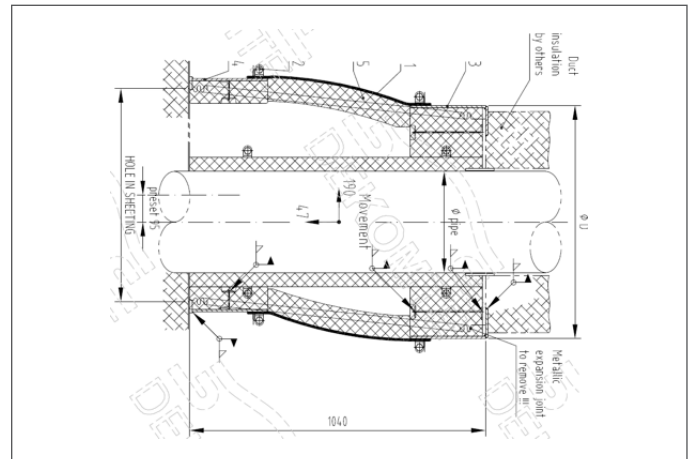
Fabric

- PTFE or Mesh outer layer

Clamp Bands

Advantages

- Cost Effective
- Quick Installation Time
- No NDT or Heat Treatment required post Installation





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OEM Installation

Metallic Bellow

- Single Bellow Type
- Single Ply Stainless Steel
- Suitable for Axial movements
- Minimal Lateral movements acceptable

Fabric Penetration Seals

- Fabric thickness 1-4 layers
- Loose packed insulation
- Simple clamp bands





Problems

Metallic Bellow

- Convolution Distortion
- Splitting of convolutions
- Corrosion

Fabric Penetration Seals

- Over heating of fabric from inside and outside
- Tearing of fabric
- Loosening of clamp bands





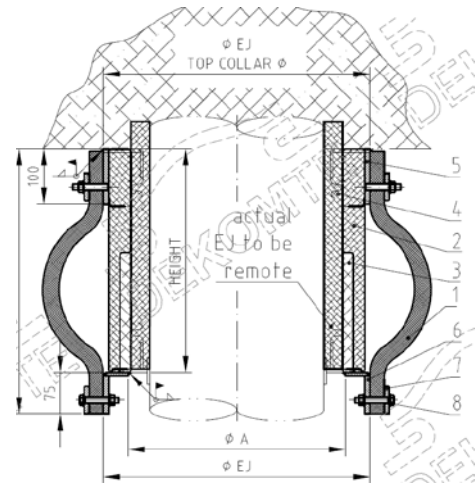
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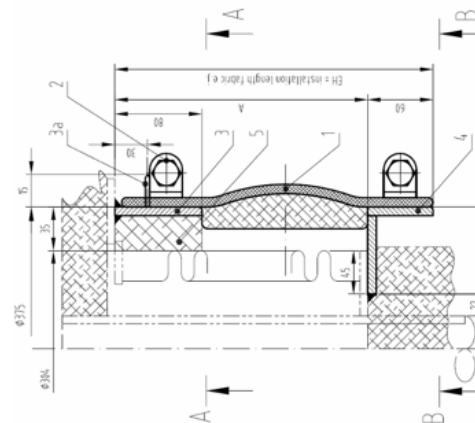
Steel Parts Retrofit

- Boiler Collar
- Pipe Collar
- Plain for clamps and normal operation
- Bolted flanges for long life and two shifting



Fabric Installation

- Formed bolsters
- Formed multi layer fabric with outer stainless mesh



Advantages

- Cost Effective
- Quick Installation Time
- No NDT or Heat Treatment required post Installation

Fabric Joint Installation

- Preparation of Steel Parts
- Installation of Flanges
- Installation of Bolster (1 or multiple Parts)
- Installation of Fabric Joint
- Installation of Clamps / Back Up bars
- External Insulation

