



Piping Technology & Products, Inc. [www.PipingTech.com](http://www.PipingTech.com)

U.S. Bellows, Inc.

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## Expansion Joint Design & Application

This class covers the following topics: Expansion joint design, the different types of expansion joints, metallic bellows and fabric bellows, fabric expansion joint design, expansion joint stress analysis, equilibrium and anchor forces, field services, quality control and detailed information on the manufacturing plant where our expansion joints are created.

### Syllabus

#### Part 1: Introduction –Why Expansion Joints

This section serves as an introductory overview of expansion joints.

1. Thermal Expansion of pipes
2. Piping system designer tools
3. Steps to acquire a metal bellows expansion joint
4. A US Bellows example job

#### Part 2: System Design: Anchors, Guides and Expansion Joints

1. Metal expansion joints
2. Types and applications
  - a. Single bellows
  - b. Multiple bellows
  - c. Slip type

### **Part 3: Fabric Expansion Joints and Bellows Geometry**

1. Refractory lined expansion joints
2. Metal bellows convolution parameters
3. Software and Databases
4. Bellows instability & cycle life
5. Fabric expansion joints

### **Part 4: Fabric Expansion Joints**

1. Metallic vs. Fabric
2. Fabric materials
3. Importance of the belt

### **Part 5: Expansion Joint Stress Analysis**

1. Metallic bellows materials
2. Metallic bellows geometry
3. Type of stresses in metal bellows
4. Design considerations

### **Part 6: Forces and Movements**

Forces and moments on piping systems due to spring and pressure forces of Metal Expansion Joints

1. Equilibrium Conditions
2. Main Anchors
3. Anchor Force Calculations

## **Part 7: Field Services**

Planning major turnarounds and Emergency shutdowns

1. Inspection
  2. Turnarounds
  3. Unscheduled Maintenance
  4. Field Services

## **Part 8: Course Conclusion**

1. Houston plant Facilities
2. Business concerns
  3. Quality Control
  4. Course Review – Continuing Education