

# 7. Steel Members

- Temperature Effects (noun):
  - 800 F ---- start loss of strength
  - 1100 F -- 50-percent strength/stiffness loss
  - 1300 F--- 80-percent strength/stiffness loss
  - 2,200 F– near total steel depletion
- Fire Damage Evidence:
  - Deformation/warping
  - Deflection
  - Local or overall buckling
  - Cracks at bearing wall support point



# 7. Steel Members

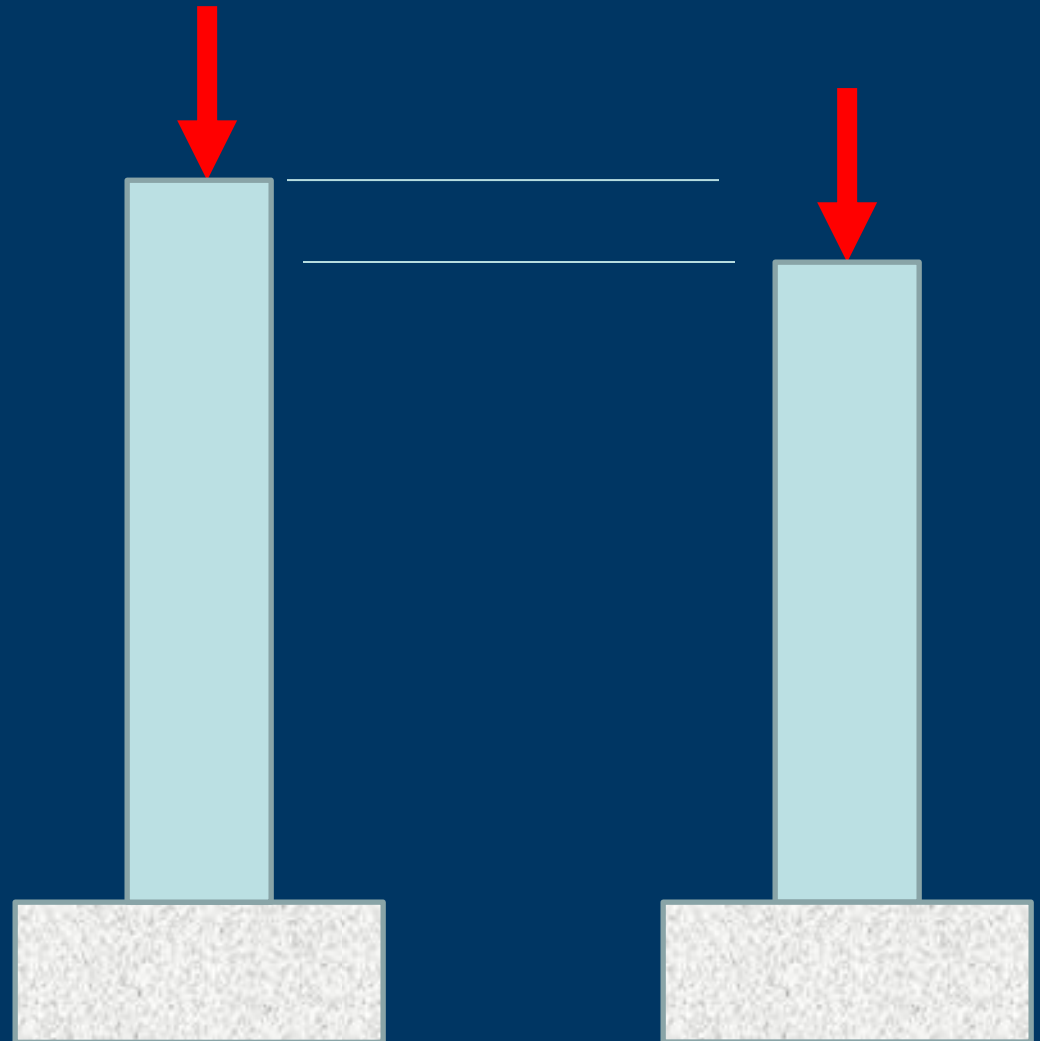
- Thermal expansion
  - Everything contracts when cooled
  - Everything expands when heated
  - If not allowed to expand, internal forces are created



# 7. Steel Members

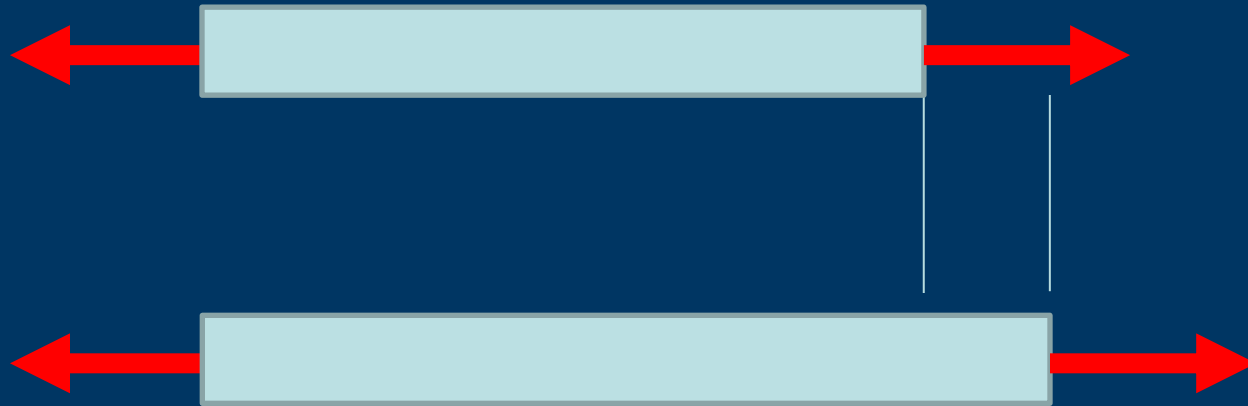
- Internal Force (Tension or Compression)

- Everything shortens when compressed



# 7. Steel Members

- Internal Force (Tension or Compression)
  - Everything lengthens when in tension



# 7. Steel Members

- Thermal expansion
  - If not allowed to expand, internal forces are created



# 7. Steel Members



Heat  
Straightening



# 7. Steel Members

## Curved Members



# 7. Steel vs Welding



**Welding  
temperatures  
ranges roughly  
between  
10,000-15,000  
degrees  
Fahrenheit**



# 7. Steel vs Cutting Torch



The temperature of an acetylene torch is about 5,720 degrees F

Ignition temperature of steel

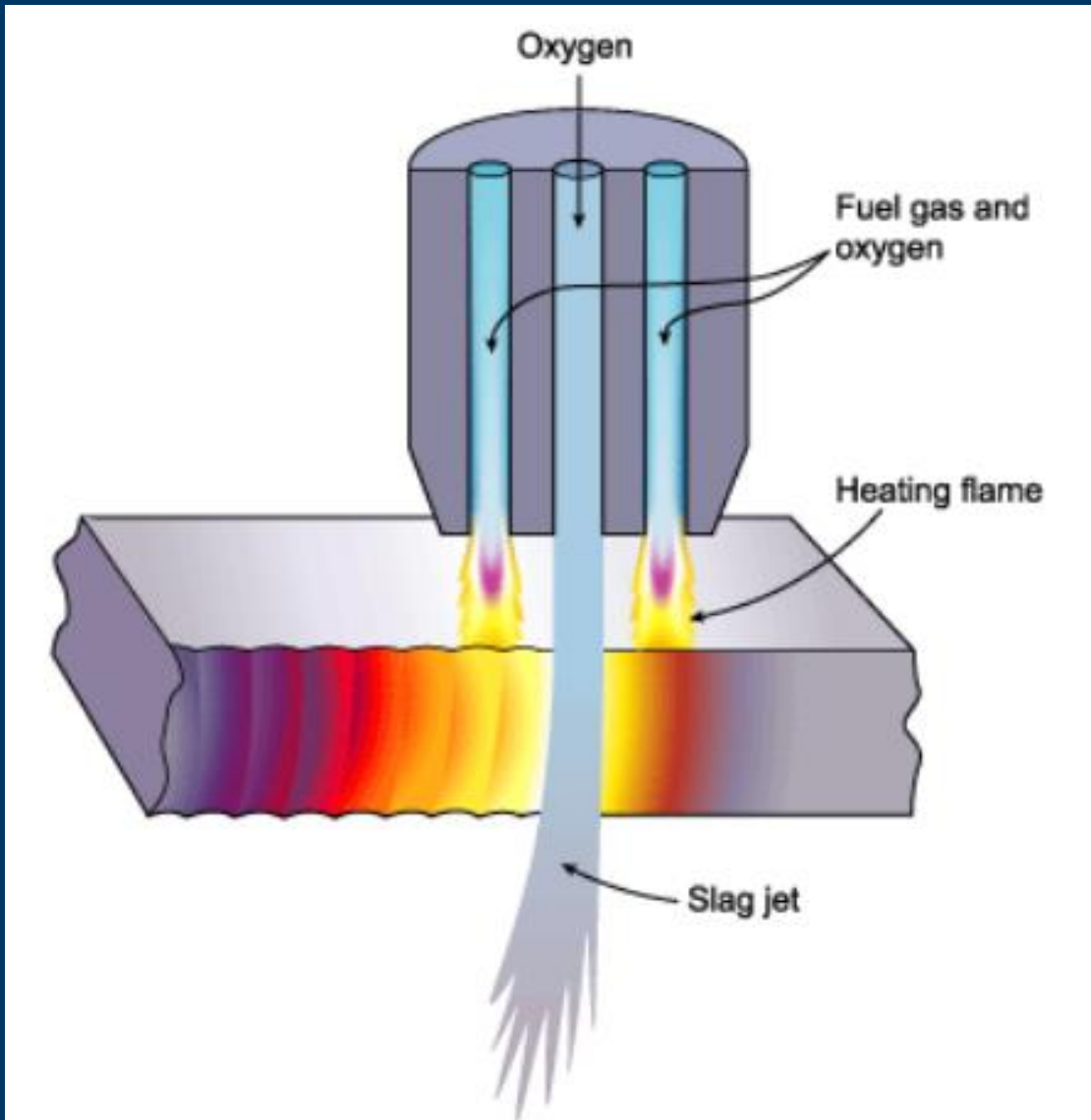
1,652 F

Chemical reaction to produce slag

Melting temperature of steel is 2800 F



# 7. Steel vs Cutting Torch



**Steel is heated**

**A chemical reaction takes place that oxidizes the steel to create slag**

**Slag is blown out of the cut by a jet of oxygen**

# 7. Steel vs Heat



**Hot rolled  
steel**

**Cold formed  
steel**

**Curved  
member**

**Recycled  
steel**



# 7. Steel Member

- Temperature Effects:
  - Below 800 F – no loss of strength
  - Above 1000 we might see deformation
  - When it cools, it is back at full strength
  - Thermal expansion
- Fire Damage Evidence:
  - Deformations
  - Movements at Connections due to thermal expansion

