Penetration Testing

Why do we test penetration systems?

- Part of the Fire Protection Approach within a Structure is Accomplished by Compartmentation
- Compartmentation Achieved by Fire Resistant Barriers
- Services Have to Pass Through the Barriers
  - Requires the Barrier to Breached
  - Overall Fire Resistance Rating has to be Restored
    - Passage of Flame
    - Thermal Transmission
Test Standards

- **Land**
  - ASTM E814
  - UL 1479
  - CAN/ULC S115
  - ISO 6944
  - ASTM E2816
  - ASTM E2307

- **Sea**
  - IMO FTP, Part 3
  - MIL – STD – 3020
  - ISO 22899
Types

- Cable
  - Rise
  - MCT
  - Trays
- Pipe
- Duct
- Structure or Non-Structural Steel
- Perimeter Joint
Cable - Rise
Cable - MCT
Pipe
Duct
Structure
Conduct of Test

- Build a Representative Wall/Floor
- Install the penetrations
- Instrument
- Furnace Exposure
- Hose Stream Test
Wall
Floor
Instrumentation
Instrumentation
Horizontal Furnace - 3.7 x 4.9 m
Vertical Furnace 3.7 x 3.7 m
Furnace Exposure

FURNACE AVERAGE TEMPERATURES

- Standard Curve
- Furn. Avg.

Temperature (°C) vs. Time (min.)
Other Exposures
Other Exposures
Hose Stream Test

- For a 1-hr Rating
  - Play Pipe Nozzle 30 psi
  - 0.60 s/ft²

- Pressure and Duration Increases with Rating
  - 45 psi
  - 3.0 s/ft²
Hose Stream Test
Performance Criteria

- **Two Possible Ratings:**
  - **F Rating**
    - Remain in place
    - No Passage of Flame
  - **T Rating**
    - Temperature rise ≤ 181 °C (325 °F)