2005 Seismic Bracing System
Superstrut Metal Framing
Seismic Bracing Systems

What is Seismic Bracing?

- Seismic Bracing is support systems that account for forces generated by an earthquake
  - *Vertical* – Pipes or Duct hanging overhead normally are only supported vertically, which assumes “Static” load conditions
  - *Transverse & Longitudinal* – In an earthquake, pipes will experience forces that are side to side and along the pipe as well as vertical.
  - Seismic Bracing will provide supports to account for forces in all 3 directions.
Seismic Bracing Systems

What is Seismic Bracing?

- Seismic Bracing systems can be used for piping, conduit, duct, and cable tray:
  - *Piping & Conduit* – Mechanical contractors and plumbers need to brace piping in facilities. Single pipes as well as trapezes.
  - *Cable Tray & Duct* – Often supported with a trapeze type assembly for the vertical loading, also would add additional bracing for Seismic.
  - *Equipment* – Large equipment also has bracing requirements, but these would generally not use strut for such bracing.
Seismic Bracing Systems

What is Seismic Bracing?

• Different Products that can be used to provide Seismic Bracing
  In addition to the vertical loading for the pipe or conduit, additional transverse and longitudinal braces are added using a variety of products:
  – Cable (low product cost, high labor cost)
  – Pipe (readily available for plumbers)
  – Strut (electricians and plumbers, low labor cost) *T&B Recommends*

• Strut is the most cost effective way to provide seismic bracing
  – The most common applications that would use strut are pipe and conduit supports.
  – For such applications, strut is the most cost effective method:
    ➢ More modular and adaptable than pipe
    ➢ Lower labor cost than cable (cable must be attached from two directions to provide the same support as strut)
Seismic Bracing Systems

Where is Seismic Bracing Needed?

• Certain Geographies Have more Seismic Requirements
  – The states with areas coded Green, Yellow, or Red normally have building requirements on the attached map
  – Enforcement in some states is spotty for Seismic Bracing requirements
  – Lack of knowledge by installer and inspectors limit use / enforcement of Seismic Bracing

• Certain Types of Construction have more Seismic Requirements
  – Government facilities and Hospitals are the most rigid in enforcement of Seismic requirements
  – Private Commercial Construction is the least rigid in enforcement of Seismic requirements
  – Schools are generally more rigid in enforcement than private commercial construction
Seismic Bracing Systems
Where is Seismic Bracing Needed?

Earthquake Hazard Map
US Geological Survey
Typical Installations require 3 steps beyond normal construction:

1. Vertical – Stabilize existing vertical supports against seismic forces
2. Transverse – Add new bracing members to account for side to side seismic forces
3. Longitudinal - Add new bracing members to account for seismic forces along the pipe
Seismic Bracing Systems

How Does Seismic Bracing Work?

• Standard Strut and Threaded Rod Products Are Base Products
  – Strut – brace members and rod stiffeners
  – Threaded Rod – vertical supports

• Specialty Brackets and Hardware are Added for Seismic Connections
  – 45 Degree Angle Brackets
  – Rod Stiffener Attachments
Seismic Bracing Systems

What Approvals are Required?

• OSHPD approval only covers California
  – The Office of Statewide Health Planning and Development (OSHPD) is a California agency providing the only pre-approval program in the country
  – OSHPD requires the 2001 California Building Code (CBC) be used
  – Superstrut offers a Bulletin specific to these OSHPD requirements (GM-????)

• Most States use the IBC
  – 44 US States utilize the International Building Code (IBC)
  – Provisions for load calculations and bracing differ between OSHPD and IBC
Seismic Bracing Systems

What Approvals are Required?

- **T&B provides an IBC pre-approved system for non-California customers**
  - Recalculating to IBC from OSHPD not required as with most OSHPD pre-approved systems
  - Directly apply to your installation
  - Superstrut offers a Bulletin specific to these IBC requirements (GM-????)

- **An Engineer’s Stamp is Normally Required**
  - Most states require the “Engineer of Record” for a given project in a given location to stamp the design as meeting the engineering requirements of the city / state.
  - The Superstrut Seismic Bracing Bulletin provides an easy to use reference for the engineers and contractors to use in designing such systems.
Seismic Bracing Systems

Assembly Design Method Example*

• Using the Trapeze Example Shown on Page A14:
  ➢ Three 4” Conduits
  ➢ Supported with Trapeze 2 ½ ft from ceiling
  ➢ Anchor into Concrete Structure

• Use right side of the “Procedure Flow Chart” – Page A1

* All pages referenced here are taken from the Superstrut Seismic Bracing Bulletin – IBC, GM-????
Seismic Bracing Systems
Assembly Design Method Example

• Step 1: Determine the Seismic Factor – Page A3, A4
  - Seismic Factor takes into account the seismic activity for the area, as well as variables related to the facility.
  - For the example, seismic factor = .6
  - Round up to the next higher number to use for the tables to .75

• Step 2: Calculate the Trapeze Assembly Weight
  - Estimate 4” conduit to weigh 16.3 pounds per liner foot (plf), so 3 x 16.3 = 49 plf (round up to 50)
  - Look at “Load Category Table” on page A5, to select Light, Medium, or Heavy loading. (use Medium for the example)
Seismic Bracing Systems
Assembly Design Method Example

- Step 3: Determine Support Spacings – Page B20
  - Since this is a trapeze, with attachment to concrete, go to section B tables (look for the icon in the upper right hand corner).
  - Since the load is 50 plf, go to “Medium” category, and the 50 plf row.
  - Selecting option iii, the spacings for vertical, transverse, and longitudinal bracing are 7 ft, 14 ft, and 28 ft respectively.
Seismic Bracing Systems
Assembly Design Method Example

• Step 4: Select Suitable Anchorage – Page B33
  - As directed on page B20, go to page B33 for the proper Anchorage selection.
  - For “Medium” load, and “option iii”, proper anchorage is detailed:
    - ½” threaded rod
    - Two ½” expansion anchors
    - A1200 as a brace member up to 36 inches long.
Seismic Bracing Systems
Assembly Design Method Example

• Step 5: Anchorage Detail – Page F2
  ➢ For Deck installations, see the first set of Details
  ➢ For Slab installations, see the second set of Details
• Step 6: Trapeze Detail – Page E8
  ➢ This detail applies for the A1200 support member selected in Step 4.
  ➢ Front elevation shows the transverse brace
  ➢ Side elevation shows the longitudinal brace
Seismic Bracing Systems

Advantages - Assembly Design Method

- Component Design Method Requires Iterative Calculations
  - After selecting support members, load capacities are compared.
  - If they are insufficient, you start over with new selections.
  - More time consuming and less consistent.

- Assembly Design Method Provides Pre-Calculated Selections
  - Support members with sufficient load capacities are selected in the tables.
  - Simpler calculations that more customers can utilize.
  - Only Thomas & Betts offers this pre-calculated Assembly Design Method system.
Seismic Bracing Systems

The Superstrut System

• The Superstrut Seismic Bracing System Uses Standard Products
  – A1200 strut
  – 702 straps
  – A100 strut nuts

• Detailed Product Specifications are Provided in Section G
  – Dimensions and load ratings
  – Covers all products in the system
Seismic Bracing Systems

Sales Tools

- Superstrut Seismic Bracing Bulletin – IBC
- Superstrut Seismic Bracing Bulletin – OSHPD
- Superstrut Seismic Flyer
- Superstrut Seismic Bracing CD
- Superstrut Engineering Catalog
- Website: www.tnb.com/superstrutseismic