Objectives

- Identify types of gusset plates for braced frames
- Discuss failure modes of gusset plates
- Identify procedures for design of gusset plates
- Design a gusset plate
Connections – Gusset Plates

Wang Hall, Purdue
Connections – Gusset Plates

Lamar Corp. Headquarters

Images courtesy of Elisabeth Wong, SDI Structures
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CSEL, Purdue

BRACE ELEVATION - LINE 5

LEVEL 4
1.00 BR - 8.5’

LEVEL 3
1.00 BR - 30’

LEVEL 2
1.00 BR - 15’

LEVEL 1
1.00 BR - 15’

WORKPOINT

ERECTION BOLTS
(OPTIONAL)

BRACE WIDTH

GUSSET CONNECTION TO BASEPLATE AND COLUMN (SEE NOTE 3)

SEE COLUMN BASEPLATE SCHEDULE AND DETAILS FOR COLUMN BASE DIMENSIONS AND CONNECTION REQUIREMENTS. SIZE GUSSET GEOMETRY AS REQUIRED.
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STIFFENER AS REQUIRED SEE NOTE 3.2

GUSSET CONNECTION TO BASEPLATE AND COLUMN (SEE NOTE 3)

WORKPOINT

SEE COLUMN BASEPLATE SCHEDULE AND DETAILS FOR COLUMN BASE DIMENSIONS AND CONNECTION REQUIREMENTS. SIZE GUSSET GEOMETRY AS REQUIRED.

ERECTION BOLTS (OPTIONAL)

BRACE WIDTH

SEE NOTE 3.1

BRACE ELEVATION - LINE E

1/8" = 1'-0"
ERECTION BOLTS (OPTIONAL)

GUSSET CONNECTION TO BEAM AND COLUMN (SEE NOTE 3)

FULL-DEPTH DOUBLE ANGLE BEAM CONNECTION (SEE NOTE 4)

PROVIDE SLIP-CRITICAL BOLTS AT GUSSET & BEAM CONN, TYPICAL

BRACE ELEVATION - LINE E

1/8" = 1'-0"
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Erection Bolts (optional)

Brace Width

Lw1 (see note 2)

Gusset Connection to Beam and Column (see note 3)

Full-depth double angle beam connection (see note 4)

Provide slip-critical bolts at gusset & beam conn., typical
Gusset Plates – Critical Stresses?

- Tests on behavior since 1930’s
- Whitmore (1952)
  - Tested aluminum joints
  - Created plots of strain gage measurements showing stress trajectories
- Whitmore Section
  - 30 degree stress distribution giving an “effective area” of the gusset plate
  - Gives good prediction of peak stress
Also see AISC Fig. 9-1

Limit States (Gusset Plate)

- Block Shear (tension)
  - Often controls tensile capacity (based on survey of tests (Cheng, Grondin, Yam))
- Buckling (compression)
- Yield – Whitmore section
- Net section fracture – Whitmore section
  - may be too conservative of a check if not a seismic application
- Bolt bearing
- Failure of connections (welds / bolts) to beam and column
- Buckling of free edge
- Local web crippling / yielding of beams / columns