CODES AND STANDARDS

1. "Manual of Standard Practice" by the Concrete Reinforcing Steel Institute (CRSI).
2. "Load and Resistance Factor Design Specification for Structural Steel Buildings", by American Institute of Steel Construction (AISC).
3. "AISC Code of Standard Practice" by AISC.
4. "Specification for Structural Joints using ASTM A325 or A490 Bolts" by AISC.
5. "Structural Welding Code–Steel (AWS D1.1), Structural Welding Code–Sheet Steel (AWS D1.3), Structural Welding–Reinforced Steel (AWS D1.4), all by the Amy bolts erican Welding Society (AWS).
6. "Standard Specifications for Joist Girders" by the Steel Joist Institute (SJI).
7. "Standard Specifications for Open Web Steel Joists, K Series" by the SJI.
8. "Standard Specifications for Longspan Steel Joists, LH & DLH Series" by the SJI.
9. "Design Manual for Floor Decks and Roof Decks" by the Steel Deck Institute (SDI).
10. All references are latest edition unless noted otherwise.

STRUCTURAL STEEL

1. Rolled wide flange (and built up) sections:
   W8's thru W40's.....A572 Grade 50, or A992GR 50 except where noted thus: * , A36 – 36 ksi
   Rolled channels & angles.....A36 – 36 ksi
   Pipes.....A53 – 35 ksi
   Tubes.....A500 Grade B – 46 ksi
   All else.....A36 – 36 ksi
2. Structural steel has been designed in accordance with Load and Resistance (LRFD) Design procedures as required by "AISC Manual Of Steel Construction Load And Resistance Design", Latest Edition, unless noted otherwise. All beam shears, reactions, member forces, moments, etc. Shown on these drawings are unfactored loads conforming to requirements of AISC Allowance Stress Design (ASD).
3. Connections:
   a. Engineer of Record (EOR) has designed all connections. If a connection design is inadvertently omitted from contract documents the contractor shall request specific written connection design from the Structural Engineer.
   b. Contractor deviations fabricated without written approval of the Structural Engineer will be deemed a contractor design with total design responsibility remaining with the contractor.
   c. Weld or bolt.
   d. Minimum thickness: angles 5/16", plates 1/4 ".
4. Connection design forces: Unfactored ASD values
   a. Moment connections indicated on drawings thus: (H) or (I).
   b. Connection force notation:
      P = axial force in kips; (+) tension, (–) compression
      V = or R = shear, kips
      M = moment, foot–kips
      T = torsion, foot–kips
   c. Loads shown include compensation for code permitted stress increases and load reductions for connection design.
5. Unless noted otherwise, provide stitch plates (or spacer plates) for compression members composed of two or more rolled shapes. Conform to AISC requirements.
6. Bolted connections:
   a. Minimum bolt diameter: ⅞" unless noted.
   b. Two bolts minimum per connected member.
   c. Use fully tensioned A325SC or A490SC bolts for bracing, moment connections, cantilevers, tension members and at oversized or slotted holes where the force on the joint is not normal to the axis of the slot. Use A325N or A490N elsewhere.
   d. Snug tight bolts. Bolts in connections not within the slip critical, nor subject to tension loads nor required to be fully tensioned bearing type connections need only be tightened to the snug tight condition. Snug tight condition is defined as the tightness that exists when all plies in a joint are in firm contact. This may be attained by a few impacts of an impact wrench or the full effort of a man using an ordinary spud wrench.
   e. A307 bolts may be used only where indicated.
   f. Oversized and long slotted holes permitted only where shown.
   g. Alternate design tension control bolts may be used at contractors option.
7. Welded connections:
   a. Electrodes: E70 series electrodes, except E70–T–4 not allowed.
   b. Fillet welds: AISC minimum but not less than 3/16", unless noted otherwise.
   c. Groove welds: full penetration, unless noted otherwise.
   d. Welds are continuous unless noted otherwise.
8. Shear studs: conform to AWS D1.1. Shop weld except where applied through composite deck.
9. Shop Cleaning and Painting
   a. Clean steel in accordance with Steel Structures Painting Council (SSPC):
      * SP–2 "Hand Tool Cleaning"
      * SP–3 "Power Tool Cleaning"
      * SP–6 "Commercial Blast Cleaning"
   b. Coordinate all shop painting of structural steel with Architect's painting requirements as specified on the architectural drawings and specifications. Primer paint shall be compatible with architectural finish paint. Clean structural steel scheduled to receive architectural finish paint in accordance with SP–6 "Commercial Blast Cleaning".
   c. Shop prime all structural steel with primer standard with the fabricator, except as follows:
      i. Structural steel surfaces to be welded or high–strength bolted with slip–critical connections.
      ii. Structural steel surfaces scheduled to receive sprayed fireproofing.
      iii. Structural steel top flange surfaces that are to receive shear connectors field welded through composite metal deck.
      iv. Structural steel members or those members or portions of members to be embedded in concrete or mortar. (Paint embedded steel which is partially exposed on the exposed portion and the initial 2 inches of embedded areas only).
      v. Contact milled bearing surfaces.
      vi. Do not paint surfaces that are to be galvanized.
      vii. Surface Preparation – Unpainted Steel: All structural steel that is not specified to receive a shop coat of primer paint shall be cleaned of oil and grease in accordance with SP2–"Hand Tool Cleaning" or SP3–"Power Tool Cleaning"–contractors option.
   d. Apply two (2) coats of paint to surfaces which are inaccessible after assembly or erection.
   e. Members that are exposed to earth or weather in the finished structure shall be hot–dipped galvanized unless noted otherwise. Galvanizing shall not contaminate or otherwise impede the welding process.
   f. Clean structural steel scheduled to receive standard prime paint. Remove loose rust, loose mill scale, spatter and slag or flux deposits in accordance with SP2–"Hand Tool Cleaning" or SP3–"Power Tool Cleaning"–contractors option.
10. Field correction of fabrication errors in the structural framing will be permitted only when approved by the Structural Engineer. When field correction is permitted finish gas–cut sections in accordance with the requirements of AWS D1.1. The fabricator shall be responsible for errors in fabrication and for correct fit in the field.
11. Unless noted, pocket beams 8" min. into concrete or masonry and bear on 3/4" min. Grout. Anchor with two 3/4" diam. x 1'–4 headed anchor bolts. Slot beam holes 2" parallel to beam span. Infill masonry pockets with matching masonry or grout concrete pockets solid if pockets are exposed to view in the finished structure.
12. No final bolting or welding shall be done until as much of the Structure as will be stiffened thereby has been properly aligned.
13. Shop Drawings.
    a. Submit Shop Drawings including complete details and schedules for fabrication and shop assembly of members, and details, schedules, procedures and diagrams showing the sequence of erection.
       i. Include details of cuts, connections, camber, holes and other pertinent data. Indicate welds by standard AWS symbols, show size, length and type of each weld.
       ii. Provide setting drawings, templates and directions for the installation of anchor bolts and other anchorages to be installed under other Sections of Work.
       iii. Do not use reproducible copies of the Contract documents as erection drawings.
14. Special inspection required, see special inspection program.

DEFERRED SUBMITTALS

1. See sheet S1.01 for Deferred Submittal Requirements.
   a. Structural steel connection calculations and connection detailing if not taken from structural documents.

DEFERRED SUBMITTALS TO PUT ON S1.55 STAIRS

1. See sheet S1.01 for Deferred Submittal Requirments.
   a. Prefabricated stair units and their connections.
   b. Pre–manufactured hand/stair railings and their connections.

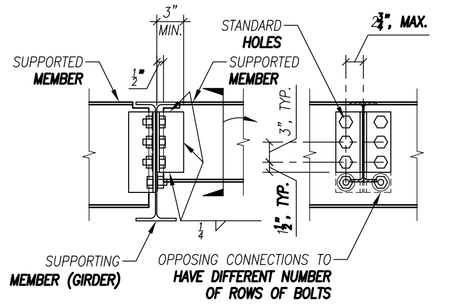
CODES AND STANDARDS

1. "Load and Resistance Factor Design Specification for Structural Steel Buildings", by American Institute of Steel Construction (AISC).
2. "AISC Code of Standard Practice" by AISC.
3. "Specification for Structural Joints using ASTM A325 or A490 Bolts" by AISC.
4. "Structural Welding Code–Steel (AWS D1.1), Structural Welding Code–Sheet Steel (AWS D1.3), Structural Welding–Reinforced Steel (AWS D1.4), all by the American Welding Society (AWS).
5. All references are latest edition unless noted otherwise.

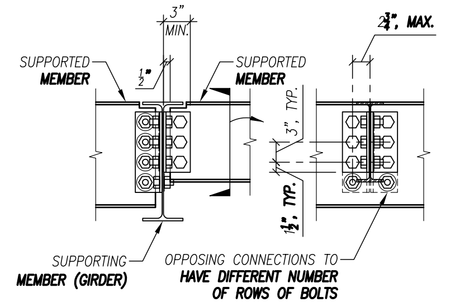
Typ. Double Angle Shear Connections

⅞"ø A325–N BOLTS – E70XX ELECTRODES – Fy = 36 ksi ANGLES – Fy = 50 ksi BEAMS & GIRDERS – ANGLE = (2) ∠4x4x¼

TYPE BA:
CONNECTION TO SUPPORTED MEMBER: WELDED
CONNECTION TO SUPPORTING MEMBER: BOLTED



TYPE BB:
CONNECTION TO SUPPORTED MEMBER: BOLTED
CONNECTION TO SUPPORTING MEMBER: BOLTED



MEMBER DEPTH	ROWS OF BOLTS	CAPACITY (k)	MEMBER DEPTH	ROWS OF BOLTS	CAPACITY (k) (STANDARD HOLES @ BEAM)	CAPACITY (k) (SHORT SLOTTED HOLES @ BEAM)
W8	2	17 (21)	W8	2	11 (15)	17 (21)
W10	2	19 (21)	W10	2	12 (15)	21 (21)
W12	3	30 (36)	W12	3	25 (30)	28 (34)
W14	3	35	W14	3	29	35
W16	4	50	W16	4	48	48
W18	5	73	W18	5	64	64
W21	6	100	W21	6	89	89
W24	7	129	W24	7	116	116
W27	8	168	W27	8	154	154
W30	9	189	W30	9	175	175
W33	10	220	W33	10	230	230
W36	11	238	W36	11	261	272

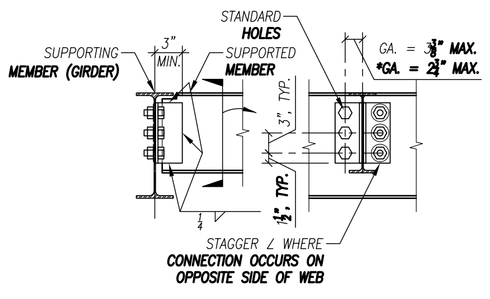
NOTES:
1. CONNECTION CAPACITY MUST MEET OR EXCEED DEMAND SHOWN ON PLAN. OTHERWISE CONTACT STRUCTURAL ENGINEER FOR ALTERNATE CONNECTION.
2. PROVIDE FULL DEPTH ANGLES AT ALL CONNECTIONS UNLESS NOTED OTHERWISE.
3. THE NUMBER OF BOLTS IS THE MAXIMUM NUMBER THAT CAN BE PUT WITHIN THE DEPTH OF THE BEAM BASED ON TYPICAL BOLT SPACING, COPE, AND EDGE DISTANCES.
4. ALL BEAMS ASSUMED TO HAVE A SINGLE COPE. TABULATED VALUES BASED ON GIRDER THAT IS LIGHTEST SECTION ONE SIZE LARGER IN DEPTH.
5. TABULATED VALUES ARE FOR MEMBERS COPED AT TOP FLANGE ONLY. FOR MEMBERS COPED TOP AND BOTTOM, SPECIAL DESIGN IS REQUIRED: SEE TABLE F. MAX. COPE DEPTH = 2" EXCEPT W8 MAX. COPE DEPTH = 1", MAX. COPE LENGTH = 7". FOR LARGER COPES SPECIAL DESIGN IS REQUIRED.
6. TABULATED VALUES DO NOT APPLY TO UPTURNED BEAMS. FOR UPTURNED BEAMS SPECIAL DESIGN IS REQUIRED.
7. NUMBERS IN ( ) ARE FOR BEAM SIZES EQUAL TO OR GREATER THAN W8x15, W10x17 OR W12x19
8. CAPACITIES ARE UNFACTORED.
9. AT DRAG CONNECTIONS, USE (2)∠4x4x¼ WELDED TO BEAM WEBS, TYPICAL NOTE <0> ON PLANS.

B

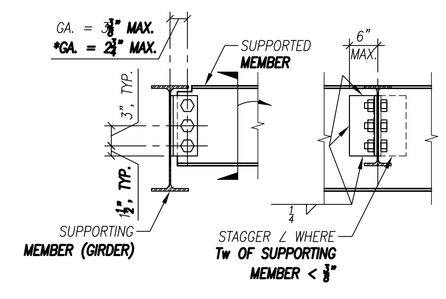
Typ. Single Angle Shear Connections

⅞"ø A325–N BOLTS – E70XX ELECTRODES – Fy = 36 ksi ANGLES – Fy = 50 ksi BEAMS & GIRDERS – ANGLE LEG THICKNESS = ⅜"

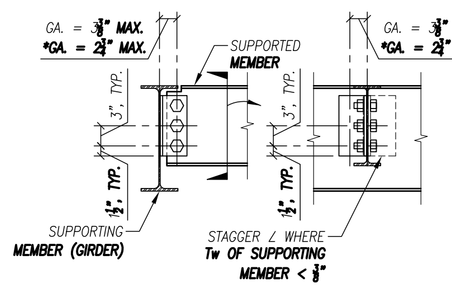
CONNECTION TO SUPPORTED MEMBER: WELDED
CONNECTION TO SUPPORTING MEMBER: BOLTED



CONNECTION TO SUPPORTED MEMBER: BOLTED
CONNECTION TO SUPPORTING MEMBER: WELDED



CONNECTION TO SUPPORTED MEMBER: BOLTED
CONNECTION TO SUPPORTING MEMBER: BOLTED

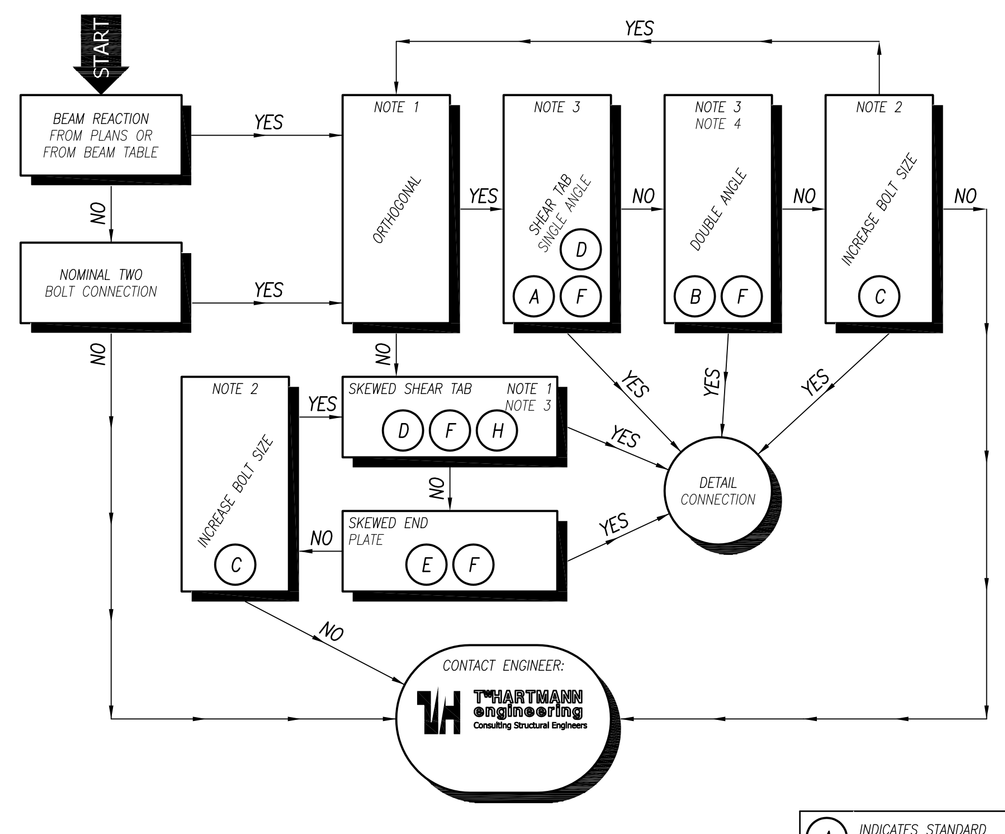


MEMBER DEPTH	ROWS OF BOLTS	CAPACITY (k) (GA = 2½" MAX*)	CAPACITY (k) (GA = ⅜" MAX)	MEMBER DEPTH	ROWS OF BOLTS	CAPACITY (k) (GA = 2½" MAX*)	CAPACITY (k) (GA = ⅜" MAX)	MEMBER DEPTH	ROWS OF BOLTS	CAPACITY (k) (GA = 2½" MAX*)	CAPACITY (k) (GA = ⅜" MAX)
W8	2	10 (10)	8 (8)	W8	2	10 (10)	8 (8)	W8	2	10 (10)	8 (8)
W10	2	10 (10)	8 (8)	W10	2	10 (10)	8 (8)	W10	2	10 (10)	8 (8)
W12	3	23 (23)	19 (19)	W12	3	23 (23)	19 (19)	W12	3	24 (24)	19 (19)
W14	3	23	19	W14	3	23	19	W14	3	24	19
W16	4	37	33	W16	4	30	27	W16	4	30	27
W18	5	51	47	W18	5	49	45	W18	5	49	45
W21	6	64	60	W21	6	62	60	W21	6	64	60
W24	7	77	74	W24	7	71	71	W24	7	78	74
W27	8	86	86	W27	8	80	80	W27	8	91	88
W30	9	95	95	W30	9	89	89	W30	9	104	101
W33	10	103	103	W33	10	98	98	W33	10	117	114
W36	11	112	112	W36	11	107	107	W36	11	130	127

NOTES:
1. CONNECTION CAPACITY MUST MEET OR EXCEED DEMAND SHOWN ON PLAN. OTHERWISE USE ALTERNATE CONNECTION.
2. PROVIDE FULL DEPTH ANGLES AT ALL CONNECTIONS UNLESS NOTED OTHERWISE.
3. THE NUMBER OF BOLTS IS THE MAXIMUM NUMBER THAT CAN BE PUT WITHIN THE DEPTH OF THE BEAM BASED ON TYPICAL BOLT SPACING, COPE, AND EDGE DISTANCES.
4. ALL BEAMS ASSUMED TO HAVE A SINGLE COPE. TABULATED VALUES BASED ON GIRDER THAT IS LIGHTEST SECTION ONE SIZE LARGER IN DEPTH.
5. TABULATED VALUES ARE FOR MEMBERS COPED TOP ONLY. FOR MEMBERS COPED ON TWO SIDES, SPECIAL DESIGN IS REQUIRED, SEE TABLE "F". MAXIMUM COPE DEPTH = 2" EXCEPT W8 MAXIMUM COPE DEPTH = 1", MAXIMUM COPE LENGTH = 7". FOR LARGER COPES SPECIAL DESIGN IS REQUIRED.
6. TABULATED VALUES DO NOT APPLY TO UPTURNED BEAMS. FOR UPTURNED BEAMS SPECIAL DESIGN IS REQUIRED.
7. NUMBERS IN () ARE FOR BEAM SIZES EQUAL TO OR GREATER THAN W8X15, W10X17 OR W12X19
8. CAPACITIES ARE UNFACTORED.
9. USE CONNECTION CAPACITY OF THIS TABULATION FOR SHEAR PLATES AT WIDE FLANGE COLUMNS.

A

Typical Shear Connection Selection Flow Chart



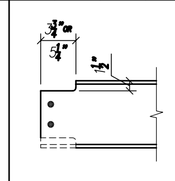
A INDICATES STANDARD CONNECTION SCHEDULE

NOTES:
1. USE ⅞"ø FULL DEPTH CONNECTIONS UNLESS ALTERNATE IS APPROVED BY ENGINEER.
2. USE 1⅛"ø FULL DEPTH CONNECTIONS IF ⅞"ø CAPACITY IS EXCEEDED AFTER SCHEDULE "B" OR DOUBLE ANGLE CONNECTION.
3. CHECK PER TABLE "F" BLOCK SHEAR FOR CAPACITY REDUCTIONS.
4. USE DETAIL "G" FOR SHEAR SPLICES.
5. FLOW CHART IS INTENDED TO MINIMIZE LARGER AND MIXED BOLT SIZES TO GREATEST EXTENT PRACTICAL.
6. COST FOR UNDEFINED CONNECTIONS SHALL BE INCLUDED IN BID.

Standard Beam Cope Schedule

BEAM SIZE	COPE AT TOP FLANGE ONLY: NUMBER OF ROWS OF BOLTS, n							COPE AT TOP AND BOTTOM FLANGE: NUMBER OF ROWS OF BOLTS, n						
	2	3	4	5	6	7	8	2	3	4	5	6	7	8
W8	17													
W10	27.6							14.2						
W12	29	41.4						25	25					
W14		47.7							41.6					
W16		51.8	67.3						51.8	63.7				
W18		62.2	80.8	99.5					62.2	80.8	99.5			
W21			94.3	116	138					94.3	116	138		
W24			106	131	155	180				106	131	155	180	
W27				152	181	210	238				152	181	210	238

NOTES:
1. THE DESIGN HAS BEEN CALCULATED FOR THE LIGHTEST BEAM IN A GROUP, AND IT IS CONSERVATIVE FOR HEAVIER BEAMS IN THE SAME GROUP.
2. THESE TABLES ARE CONSERVATIVE FOR SMALLER COPES.
3. 1½" – VERTICAL DIMENSIONS & 3½" & 5½" – HORIZONTAL DIMENSIONS.
4. ALL VALUES SHOWN ARE IN KIPS.
5. USE SMALLEST CAPACITY FROM CHARTS.
6. SEE G/S1.50 FOR OTHER CONNECTION LIMIT



F

MARK	SCHEDULE	CONNECTION TYPE
A	A/S1.50	SINGLE ANGLE
B	B/S1.50	DOUBLE ANGLE
C	CONTACT ENGINEER	1⅛"ø BOLT TABLE
D	D/S1.50	SHEAR TAB
E	CONTACT ENGINEER	SKEWED END PLATE DETAIL
F	F/S1.50	BLOCK SHEAR COPE TABLE
G	G/S1.50	IN LINE SHEAR SPLICE
H	CONTACT ENGINEER	SKEWED SHEAR TAB

SHEET NOTES

1. Typical details shown on this sheet generally are NOT referenced from any other drawings on the project. It is the general contractor's responsibility to understand and apply typical details where and as applicable on the project as needed.
2. Standard details shown on this sheet MAY be referenced on plans to clarify a particular condition.
3. Detail designations (i.e. 5/SX.X) shown are for convenience in communication between the contractor and engineer.
4. See Structural Notes & General Notes, Sheet S1.0 for additional information.

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TwHartmann Inc.
6790 N. Franklin Ave.
Loveland, CO 80538

TwHartmann Inc. Standard Drawing Sheets

TYPICAL CONNECTION NOTES AND DETAILS (SHEET SIZE: 24x36)

DRAWN BY: NAK
DESIGNED BY: TWH
CHECKED BY: TWH
ISSUED FOR PERMIT:
ISSUED FOR CONSTRUCTION:
FOUNDATION PERMIT:
DRILLED PIER PACKAGE:
FOUNDATION PERMIT PACKAGE:
-
-
-
-

STANDARDS

S1.50a