PREFABRICATION MEETING

The intent of this appendix is to serve as a guide in conducting prefabrication meetings for structural steel.

INTRODUCTION OF PERSONNEL

DETAIL DESCRIPTION OF STRUCTURE TO BE FABRICATED

SPECIFICATIONS

A. Bridge Welding Code (AASHTO/AWS D1.5 M/D1.5:2002).

B. Standard Specifications and / or Supplemental Specifications

PROJECT STATUS

A. Designed by Engineer/Company

B. Status and Distributions of Shop Drawings

C. Prepayment of Structural Steel

D. Tentative Starting Date

E. Tentative Completion Date

F. Plant Working Hours; Number of Shifts

G. Iowa Department of Transportation Scheduled Holidays (Work or No Work).

QUALITY ASSURANCE & QUALITY CONTROL

A. Certified NDT & CWI Inspector Required (Current Approved List)

B. Copy of AWS Certification Required

C. Quality Control Specified Duties (AASHTO/AWS 6.5)

D. Discuss Quality Control Record Keeping System (Description by Plant Personnel).

E. Quality Control Manager is responsible to whom?

F. How many CWI Inspectors does the plant have? Any assigned to 2nd and 3rd shifts?

NON-DESTRUCTIVE TESTING

A. Type of Magnetic Particle Inspection to be used (yoke or prod). Current (AC-DC-DC Rectified).

B. County name and design number must be shown on the radiographs.

C. Marking tension and compression flanges on radiographs

D. Additional radiographs of compression flanges

E. Edge blocks are required to show both top and bottom edges in radiographs

F. Two (2) sets of radiographs are required

G. The maximum number of weld repairs is three.

MATERIAL APPROVAL PROCEDURES

All steel products and coating shall be manufactured in the USA. The fabricator shall certify to the State of Iowa that the materials used are of a domestic origin.

A. Submit copies of the purchase order to Central Materials Structural Materials Engineer.

B. Mill Test Certifications and Charpy Tests - 3 copies are required (1 cc for prepayment, 2 cc at start of fabrication).

C. Material supplied from stock

D. Paint - Top coat Fed. Color 20045 (Semi-gloss)

E. Structural Steel Assurance Sample (Sample from tension flange as first choice, 4” x 4” for Charpee V. Notch Impact Testing second choice may be from the web plate. Rolling direction must be marked on the sample.)

F. Bearings

G. Bolts and Bolting

   1. Source

   2. Sampling for Approval (shop and field bolts, number required)

   3. Rotational Capacity Testing

   4. Turn of the Nut Method of Installation (marking bolts)

   5. Bolt tension Testing Device - calibrated within the last six months

   6. Extra bolts required for RC testing, tension testing, and calibration.

STORAGE, COLOR CODING, & HEAT NUMBERS

A. Steel must be properly supported during storage.

B. Heat numbers must be painted on main members.

C. Steel with Charpy Test requirements are to be identified separately (marked CVN).

D. Steel from stock shall be identified by heat numbers, ASTM Grade, and color codes when multiple grades are required.

E. The Fabricator shall furnish an affidavit in the form of a cutting list, listing heat numbers and grade of steel, and a statement certifying that throughout the fabrication operation the identification of steel has been maintained in accordance with the specification. (Article 2408.04)

F. On all State of Iowa contracts, specifically involving Federal-aid, all products of iron, steel, and/or coating of steel, which are incorporated into the work, must have been melted and manufactured in the USA. The Fabricator shall certify to the Iowa DOT and to the Contractor that all materials used are of domestic origin. (Article 1107.06)

MAIN STRESS-CARRYING MEMBERS (Article 2408.04G)

The main members of steel structures are defined to include rolled sections or flange and web plates in main beams and girders, floor beams, stringers, abutment diaphragms, cross frames carrying direct live loads, lateral bracing in horizontally curved bridges, cover plates, bearing stiffeners, bearing devices, splice plates, gusset plates, and stiffeners connecting live load carrying members to main beam or girder webs. The contract documents may also designate other members as main members.

For members that require Charpy V-Notch tests, see Article 4152.02.

All of the above require Mill Test Certifications and heat number identification.

All of the above members have restrictive specifications governing shearing and hole punching (Articles 2408.11, 2408.17).

SECONDARY MEMBERS & MISCELLANEOUS ITEMS

An approved fabricator must fabricate secondary members and miscellaneous items. See IM 557, Appendix A and B.

SHEARING VS. FLAME CUTTING (Article 2408.11, 2408.12, & 2408.13)

A. All main members shall be oxygen cut, unless otherwise authorized by the engineer (Structural Materials Engineer).

B. Web splice plates and bearing stiffeners 5/8 in. (16 mm) or less may be sheared.

C. Secondary members may be sheared, but sharp corners must be dulled by grinding.

D. Plates shall be cut in the direction of stress in main members except web splice plates may be cut in either direction.

E. Shearing of flange splice plates is not permitted.

HOLE PUNCHING (Article 2408.17)

A. Holes in main stress carrying members shall be subpunched and reamed, subdrilled and reamed or drilled full size.

B. Holes in secondary members may be punched but with restrictions:

   1. Thickness of 3/4 in. (19 mm) and less for carbon steel and 5/8 in. (16 mm) and less for alloy steel.

   2. Any other restrictions are defined in Article 2408.17.

C. Concerning misplaced or damaged holes, DO NOT WELD CLOSED without the approval of the Structural Materials Engineer

D. Deburring of all holes is required.

BENT PLATES (Article 2408.10)

A. The bend line shall be at a right angle to the direction of rolling.

B. Before bending, corners shall be rounded to a 1/16 in. (1.6mm) radius in the bend area.

C. No cracking of the plate is permitted.

D. Bend radii shall be measured to the concave face (See table - 2408.10, Paragraph 2.).

OXYGEN CUTTING (Article 2408.12)

A. Oxygen cutting for main members shall be done only when the temperature is above 40°F (4°C) in the area of the cut, and in a surface-dry condition.

   NOTE: Special preheat requirement may be required in Special Provisions for a specific project.

B. Cut surface shall meet the ANSI value of 1000 µin. (25 µm).

C. Repair of oxygen cut defects by welding is prohibited without approval of the engineer (AASHTO/AWS 3.2.2.1).

D. Mechanical guided radius cuts of 1 in. (25 mm) minimum radius are required unless waived by the engineer (AASHTO/AWS 3.2.2 and 3.2.4).

HEATING OF STEEL (Article 2408.16)

A. Steel heating procedures shall be submitted to Central Materials Structural Materials Engineer prior to fabrication. Heating procedures are required for the following:

   1. Camber correction

   2. Horizontal curving of beams and girders

   3. Correcting of flange tiltage

   4. Web flatness correction

B. The QA Inspector shall be informed when heating of steel is required and the QC Inspector shall be present.

C. Heat shall not exceed 1150°F (620°C).

D. Personnel heating steel shall check temperature frequently, using two (2) different temperature indicators (one higher than the other) suggest 1050°F (565°C) and 1150°F (620°C).

E. Cooling shall be normal air-cooling above 600°F (315°C).

WELD PROCEDURES (AASHTO/AWS 5.1)

A. All welding procedures must be approved before use.

B. Sequence of welding cover plates is a part of welding procedure.

WELDING

A. Welding of main members and welding of attachments thereto shall be performed using only shielded metal arc, flux-cored arc, submerged arc, and/or stud welding processes. Unless otherwise approved by the Structural Materials Engineer, all welding of butt splices, stiffener bars to web and flange to web welds shall be done using the submerged arc process. Shielded metal arc welding may be used for repairs to butt splices and flange to web welds. Refer to Article 2408.13 of the standard specifications, paragraph 1.3.1.1

B. QC Inspector shall make sure that welding personnel read and understand the weld

procedures.

C. Weld procedures shall be posted by the welding station and shall be initialed by the welders.

D. Preheat and interpass temperature (other than A709 Grade 70W, 100, 100W, HPS 70W steel):

Thickness in. (mm)	Temperature °F (°C)
Through 3/4 in. (19 mm)	50°F (10°C)
Over 3/4 in. (19 mm) through 1 1/2 in. (38 mm)	70°F (20°C)
Over 1 1/2 in. (38 mm) through 2 1/2 in. (63.5 mm)	150°F (65°C)
Over 2 1/2 in. (63.5 mm)	225°F (110°C)

E. Use of approved electrodes for all welding.

F. Proper storage of low hydrogen electrodes (AASHTO/AWS 4.5.2).

G. Proper storage of sub arc flux and wire (AASHTO/AWS 4.8.3).

H. Welding size, profile and undercut (AASHTO/AWS 9.21.1.7, 9.21.1.5, 3.6).

I. Preparation of web to flange weld areas (AASHTO/AWS 3.2.1).

J. No intersection welds (see design drawings).

K. The fillet welds connecting the stiffener or connection plate to the web shall be started at the end of the stiffener that is adjacent to the tension flange and progress toward the compression flange, with an option to start at both flanges and end near the center of the web.

The reason for these requirements is to avoid crater cracks at the end of the stiffner weld being in a tension area. By ending the welds near the compression flange or at mid-point of the girder web and if there would happen to be a crater crack it would not tend to propagate.

TACK WELDING (AASHTO/AWS 3.3.7)

A. Tack welds are subject to the same quality requirements as final welds.

B. Tackers are to be qualified per the revised AWS paragraph 5.23.3 and as found in Article 2408.13 of the Standard Specifications.

C. Tack welds outside of weld areas must be authorized, that is, shown on the approved shop drawings.

D. Tacking of fill plates or splice plates is not permitted.

E. Proper positioning as per the tack welder's qualification is required.

F. Arc strikes will be repaired by grinding and NDT tested by acid etching. The QA Inspector must witness these procedures.

STUD WELDING (AASHTO/AWS Section 7)

A. Materials Certification for Studs (AASHTO/AWS 7.3). Approved sources of shear connector studs – see IM 453.10, Appendix A.
B. Operator Qualification (AASHTO/AWS 7.7.4).

C. Quality Control (AASHTO/AWS 7.7).

D. Inspection Requirements (AASHTO/AWS 7.8).

LAYDOWN INSPECTION

A. Camber tolerance at bearing is ±0.

B. Camber tolerance at midpoints is ±1/2 in. (±13 mm).

C. No points shall vary more than ±1/2 in. (±13 mm) from that indicated on erection drawing.

D. Camber is to be shown on erection drawings at bearing points, splice points and at midpoints of beams or girders.

E. Camber may be checked with wire, transit, level, or laser.

F. Maximum 1/2 in. (13 mm) minimum 1/8 in. (3 mm) opening between girders. (2408.22C)

G. Maximum 1/4 in. (6 mm) minimum 1/8 in. (3 mm) opening between beams. (2408.22C)

H. Shop drawings for steel structures shall show accumulated dimensions for each line of beams or girders in laydown. The accumulated dimensions shall be shown at the locations of the following details: bearings, welded or bolted splices, stiffeners, gusset plates, flange defector holes, drain connecting holes, cover plate ends, and holes for abutment, reinforcing bars when required. (2408.02E)

I. The tolerance for the angles of connecting angles or stiffeners, which connect main members, is ±1/2° from specified angle. Refer to Article 2408.13 of the standard specifications paragraph 3.5.1.14

CLEANING & PAINTING

A. See Specifications Article 2408.30 for Cleaning and Painting.

B. Blast cleaning with grit when specified.

C. Abrasive Blast Cleaning – surface preparation requirements:

- SSPC SP6 Commercial Blast for Non-painted Surfaces
- SSPC SP10 Near White Blast for Painted Surfaces

D. The inorganic zinc-silicate paint film will be considered cured and ready for shipment (top coat) after achieving a resistance rating of 4 as verified by 50 MEK rubs as per ASTM D 4752.

E. Certified painters required

F. Water Mist – all unpainted area of outside surfaces of the fascia girders shall receive, after blasting, three uniform applications of water mist at 24 hours interval between applications. Each application shall be applied on dry surfaces.

NOTE 1: The water mist application shall be performed 48 hours after the painted surfaces have been properly cured.

NOTE 2: All water mist application shall be witnessed by the Q.A. inspector.

FINAL INSPECTION

- Final inspection of welding, grinding and general workmanship will be done after blast cleaning and prior to painting.
- All fabricated items shall be stamped with approval stamp prior to shipping.

INSPECTION DUTIES

The QA Inspector is present at the plant to assure the Iowa Department of Transportation that the structure is fabricated in accordance with the applicable specifications. The QA Inspector does not assume the responsibility of quality control for the fabricator.

The QC Inspector shall be present at all times during fabrication and shall be knowledgeable of the specification requirements to ensure that fabrication performance is in accordance with the drawings.

When any phase of the work occurs beyond the normal schedule, it is the fabricator's responsibility to give the QA Inspector sufficient advance notice so he/she may arrange their schedule accordingly.

INSPECTION REQUIREMENTS

The state inspector (QA) shall be provided with a working space (office space) equipped with a phone and a computer line (high-speed if possible) hook-up and access to a fax machine.