

burred. The thread shall not extend into the shear planes of the contact surfaces between the connected parts. In determining whether the bolt threads are excluded from the shear planes, thread length of bolts shall be calculated as two thread lengths greater than the specified thread length as an allowance for thread run out. A washer not thicker than 6 mm (1/4 inch) may be used under the nut. The QCFS shall provide a cover letter documenting QCFS acceptance that shop applied bolts have been performed per specification.

**863.23 Welding.** All welding shall be performed by the shielded metal-arc, submerged arc, flux cored arc, or stud welding process. Consideration will be given to other methods of metal-arc welding if a written request is submitted to the OSE in accordance with CMS 108.05.

In other respects, the AASHTO/AWS Bridge Welding Code, as amended by Supplement 1011 shall govern the work. Welding performed on main members requires procedure testing (PQR) and an approved welding procedure (WPS). The shielded metal arc welding (SMAW) process is considered pre-qualified, and does not require procedure testing (PQR) but requires an approved welding procedure (WPS). The fabricator shall have an approved PQR, WPS and Welder Qualifications prior to Fabricator Pre-qualification.

If after two repairs to the same area of a weld requiring radiographic quality, there is any part of the original defect remaining or there is a new rejectable indication the OSE shall have the right to have the total joint cut apart, all deposited weld metal removed, joint preparation made and the total joint re-welded.

Copies of the accepted shop welding procedures (WPS) shall be posted at each welding location.

The designated QCFS and QA inspectors shall be physically at the facility during all fracture critical (FCM) welding. The fabricator shall not perform FCM welding without prior scheduling with the QCFS and the QA inspectors. The QCFS shall witness at the minimum percentages specified in appendix II, check all welding processes and provide a cover letter with specific check point data. This QCFS acceptance is required for each FCM member weld. For non FCM welds the QCFS shall make frequent inspections, check all welding processes and provide a cover letter with specific check point data documenting acceptance of the welds for each main member.

**863.24 Stud Shear Connectors.** Stud welding shall conform to the requirements of 863.23, to the AASHTO/AWS Bridge Welding Code, as amended by Supplement 1011, and the following.

Stud shear connectors that are to be welded to the top flanges of beams or girders may be placed after the steel has been erected and suitable scaffolding or deck forming has been provided. Studs that are to be welded to beam or girder webs, end dams, bearing

plates, or to other secondary members and detail material may be placed in the shop. In addition to the stud bend tests of Article 7.6.6.1 of the AASHTO/AWS Bridge Welding Code, bend tests of stud shear connectors shall also be made at the start of each work day, when welding has been interrupted for an hour or more, when changing grounds, when changing weld settings or when changing cable loop due to arc blow. In any case, no more than 500 studs shall be welded to a beam or girder without the welds being field bend tested in accordance with the specified procedure. All tested studs that show no sign of failure as determined by the Engineer may be left in the bent position.

**863.25 Threads for Bolts and Pins.** Threads for bolts and pins shall conform to the Unified Standard Series ANSI B1.13M (ANSI B1.1-UNC) Class 6g (2A) for external threads and Class 6H (2B) for internal threads, except that pin ends having a diameter of 35 mm (1 3/8 inches) or more shall be threaded 4.23 mm/thread (6 threads to the inch). The QCFS shall provide a cover letter documenting QCFS acceptance that threading for bolts has been performed per specification.

**863.26 Shop Assembly.** All contact surfaces shall be free of paint, grease, oil, rust, loose mill scale and protruding edges or burrs. The flanges and webs shall not be assembled and welded to form girders or other similar members, nor shall any fabrication or assembly which would interfere with the repair of a butt weld be accomplished until radiographs of all butt welds in the component parts are examined and approved by the QCFS for the A rated fabricators or the QA inspector for B and C rated fabricators unless waived by the OSE.

All fit-up work shall be done with the members assembled in their unloaded position as shown on the shop drawing layout required by 863.08. While assembled in the shop, members shall be adequately supported to prevent misalignment or deflection, especially at joints. Supports shall be designated to prevent settlement during the fit-up, reaming or drilling of connections. The QCFS shall maintain records of the actual dimensions and relative positions of each assembly for each offset required by 863.08 and furnish a copy to the QA inspector, upon request. This provision shall apply to both horizontal and vertical dimensions. Members that become a part of two assemblies shall be repositioned for the second assembly to the dimensions recorded for the first assembly.

All connecting parts assembled in the shop for the purpose of reaming or drilling of holes for field connections or for fit-up of field welded connections shall be match-marked with steel stamps prior to disassembly.

Continuous beam and plate girders including sections adjacent to hinged, pin connected, sliding or rocker bearing joints shall have at least three adjacent segments assembled and holes reamed or drilled while assembled. The fit-up of field welded connections shall be checked by similar shop assembly.

Longitudinal or transverse beams and girders to which diaphragms and floor beams frame