

QUALIFICATION OF GAS METAL ARC (MIG) WELDERS AND PREPARATION AND TESTING OF MIG WELD SPECIMENS

1. SCOPE:

- 1.1. This method, based on modifications of the American Welding Society Structural Code D1.1, current edition, outlines the procedures for qualifying welders for the following positions and types of welds:
 - 1.1.1. 3G: vertical groove
 - 1.1.2. 4G: overhead groove
- 1.2. Qualification in accordance with this method is required prior to performing the following welding operations: grates and frames.
- 1.3. Qualification in accordance with this method has no limitation of thickness that may be welded.

2. LIMITATIONS ON POSITIONS AND TYPES OF WELDING:

- 2.1. Qualification in the 3G position (vertical groove) qualifies a welder for flat, horizontal, and vertical groove and fillet plate welding.
- 2.2. Qualification in the 4G position (overhead groove) qualifies a welder for flat and overhead groove and for flat, horizontal and overhead fillet plate welding.

3. TEST METALS:

- 3.1. The base metal shall be structural steel plates, 1 inch in thickness, conforming to the requirements of ASTM A-36, or ASTM A-36 Modified to include the added requirements of 0.2% copper content. The test specimens shall conform to the dimensions shown in the attachment. Test plates shall be cut to size by means of sawing or shearing only.
- 3.2. The wire size shall be .045" to .063" and it should be equivalent to a 7100 alloy rod or an equivalent flux core wire.

4. AUTHORIZED INSPECTION AND TESTING:

- 4.1. The inspection of welders as they weld test plates in various positions may be performed

by any of the following:

4.1.1. Division of Materials (Division) Physical Section personnel.

4.1.2. Welding instructors at approved vocational tech schools

4.1.3. Welding instructors at approved trade schools

4.1.4. Approved commercial testing laboratories

4.2. Testing of Weld Specimens:

4.2.1. Test specimens of welders inspected by the Division will be tested by the Division.

4.2.2. Test specimens of welders inspected by any of the other agencies listed in 4.1 will be tested by the agency performing the welding inspection.

5. WELDING INSPECTOR'S (Anyone Listed in Section 4.1) DUTIES:

5.1. The inspector shall verify that the wire conforms to the requirements of Section 3.2.

5.2. The inspector shall require strict conformance to the procedures, dimensions, positions, and any other requirements of Section 6.

5.3. After air-cooling and removal of slag from the weld metal, the weld specimens shall be inspected for surface defects and irregularities. The inspector shall examine the weld specimens very closely and reject those containing any of the following:

5.3.1. Undercutting.

5.3.2. Lack of fusion at edges of weld.

5.3.3. Lack of penetration and porosity.

5.3.4. Crater cracks.

5.3.5. Cracks in the weld metal.

5.3.6. Base metal cracks adjacent to the welds.

5.4. The inspector shall verify that the welder has marked each test specimen with either paint or metal stencil to identify the position and type of weld.

5.5. All inspectors shall complete form TC 64-753 for each welder taking the qualification test.

5.5.1. Division inspectors submit completed forms and weld specimens in accordance with instructions and examples provided in the Sampling Manual.

5.5.2. Other inspectors shall submit a copy of the TC 64-753 form to the Physical Section, Division of Materials, upon completion of the qualification testing.

6. WELDER QUALIFICATION PROCEDURES: Welders shall be qualified for groove welds (vertical or horizontal positions), depending upon the required type of welding to be performed on the project.

6.1. Groove Weld: In making tests to qualify for groove welds, the test plates shall be welded in the following positions:

6.1.1. 3G-Vertical Groove: The test plates shall be placed in a vertical position and each groove weld shall be made vertically and with a bottom to top placement. See Attachment No. 1 - Position 3G. The entire welding process shall be done with the plates in the vertical position.

6.1.2. 4G-Overhead Groove: The test plates shall be placed so that each groove weld is deposited on the underside of the horizontal plates. See Attachment No. 1 - Position 4G. The entire welding process shall be done with the plates in the overhead position.

6.3. The gap, in all cases, shall be filled until the weld metal forms a convex surface slightly above the base metal.

6.4. Cleaning between weld passes shall be limited to hand chipping and hand wire brushing. Power chippers or grinders shall not be used during the weld test.

7. PREPARATION AND TESTING OF WELD SPECIMENS:

7.1. Apparatus:

7.1.1. band saw.

7.1.2. milling machine or shaper.

7.1.3. belt sander.

7.1.4 guided-bend test jig, per AWS D.1.1 (1.5 inch diameter plunger).

7.2. Preparation Of Specimen For Side Bend:

7.2.1. Side bend test specimens shall be prepared by cutting the test plate to form specimens rectangular in cross section. All cuts will be made perpendicular to the path of welded material with a band saw. One inch sections will be cut from each

side of the test plate and will be discarded. *Two test specimens 3/8 inches wide will then be taken from the sides of the test plate. The remaining middle section will be discarded. The back up plate shall be removed flush with the base metal. Flame cutting, milling machine, or shaper may be used for the removal of the major portion of the backing, providing at least 1/8" of its thickness is left to be removed by machining or grinding. The final surface should be smooth with no apparent scratches or gouges. Always grind or machine lengthwise on the specimen. The edges of the test specimen shall be rounded a maximum of 1/8" radius with a file. Air cool and do not water quench. In the finished specimen, the weld area and base metal shall be the same dimensions.

* Specimen shall be cut +3/8" to allow for sanding and smoothing the cut surface and saw marks. The finished specimen shall be 3/8" thick by 1" wide with 1/8" maximum radius edges.

7.2.2. Testing Procedure: The Side Bend specimen shall receive a guided bend test in a jig per AWS D.1.1. Any convenient means may be used to move the plunger member with relation to the die member. The specimen shall be placed on the die member of the jig with the weld at midspan. The plunger shall force the specimen into the die until the specimen becomes U-shaped.

7.2.3. Test Results Required: The convex surface of the specimen shall be examined for the appearance of cracks or other open discontinuities. Any specimen in which a crack or other open discontinuity exceeding 1/8" measured in any direction is present after the bending, shall be considered as having failed. Cracks occurring on the corners of the specimen during testing shall not be considered.

8. QUALIFIED STATUS:

- 8.1. If the welder fails to meet the qualification requirements, he may take a re-test provided two test specimens are welded for each specimen that failed. If the re-test specimens do not meet all requirements, the welder must wait 90 days before he can take the test again.
- 8.2. Qualified status shall be limited to two years from the date of completion of testing unless the welder is not engaged in the welding process for which he/she is qualified for a period exceeding 6 months or, in the judgment of the Engineer, there is reason to question the welder's ability.

9. COST OF TESTING:

- 9.1. Division Testing.
 - 9.1.1. The cost of the test plates is always the responsibility of the welder or contractor.
 - 9.1.2. The cost of preparing and testing weld specimens of each welder's first attempt at qualifying will be charged to the project if there is a project.

9.1.3. The cost of preparing and testing weld specimens shall be the responsibility of the welder or contractor if:

9.1.3.1. The welder is taking a re-test.

9.1.3.2. There is no highway project.

9.2. Other Than Division Testing: The welder or contractor shall make their own arrangements with the testing agency.

APPROVED _____
Director
DIVISION OF MATERIALS

DATE 1/4/05

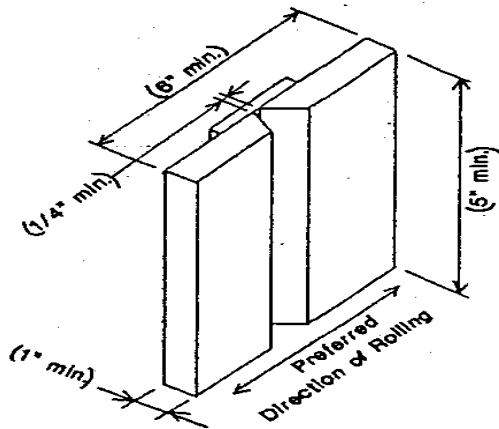
Kentucky Method 64-108-05
Revised 1/4/05
Supersedes 64-108-03
Dated 2/11/03

Attachments

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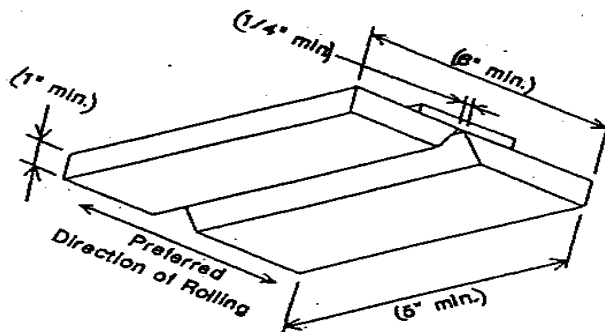
DIMENSIONS, JOINT TYPES & POSITIONS FOR TEST PLATES

Groove



POSITION 3G (Vertical)

1 inch plate, 45 degree single V groove, 1/4 inch root opening, backing 3/8 inch by 1 inch.



POSITION 4G (Overhead)

1 inch plate, 45 degree single V groove, 1/4 inch root opening, backing 3/8 inch by 1 inch.

ATTACHMENT 1
KM 108