

APPENDIX C
WELDING INFORMATION

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APPENDIX C - WELDING INFORMATION

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JANUARY 2003

<i>DIVISION OF STRUCTURE CONSTRUCTION</i>		B00-08
<i>Bridge Construction Records and Procedures Manual</i>		
BRIDGE CONSTRUCTION BULLETIN	File: BCM180-2.1 WELDING	
Approved:  R. P. SOMMARIVA, Chief Division of Structure Construction	Date: June 1, 2000 Expires: None Supersedes: BCB 180-2 (12-16-96)	

Subject: Checklist for Welding Quality Control

For all projects advertised after April 1997 (and in some cases by addendum) a section entitled "Welding Quality Control" was added to the Special Provisions as well as a revision to Section 52-1.08 "Reinforcing". Additional revisions to both sections have occurred since that time.

The Welding Quality Control Section in the Special Provisions, supplements the following sections of the Standard Specifications: Section 49 "Piling," Section 52 "Reinforcement," Section 55 "Steel Structures," Section 56-1 "Overhead Sign Structures," Section 75-1.035 "Bridge Joint Restrainer Units," and Section 86-2.04 "Standards, Steel Pedestals and Post." Other Sections of the Standard Specifications will be supplemented by the welding quality control plan when required. The welding quality control section also addresses field and shop welding requirements.

Attached are checklists to assist you with understanding the requirements of the welding quality control section contained in the contract Special Provisions. These checklists include a list of applicable contract documents to review and an outline of the responsibilities of the Structure Representative, and personnel from the Division of Materials Engineering Testing Service, Office of Structure Materials (OSM) during each stage of welding. In addition to the checklist, there is a list of commonly used terms and definitions.

The Structure Representative is responsible for all welding. OSM personnel are available to provide advice, guidance, review the welding quality control plan, and perform field and shop welding QA inspection (refer to BCM 180-4 and BCM 180-9 for a list of OSM contacts and phone numbers).

Even though the checklists are extensive, you need to review your Contract Documents for the latest specification requirements.

Copies of the Structural Welding Code-Steel (AWS D1.1) have been assigned to every Area Construction Manager, and copies of the Structural Welding Code, Reinforcing Steel (AWS D1.4), and Bridge Welding Code (AWS D1.5) have been assigned to every Senior Bridge Engineer. **Additionally, the Special Provisions now require the contractor to provide the State, as part of their welding quality control plan, the applicable AWS welding codes for the applicable year noted in the Special Provisions.**

Attachments

C: BCR&P Manual Holders
Consultant Firms
PStolarski, OSM
BPieplow, Construction Program Manager

WELDING QUALITY CONTROL CHECKLIST

DEFINITIONS

The following is a list of definitions commonly used within the section "Welding Quality Control" of the Special Provisions and elsewhere in the contract documents. Additional definitions can be found in ANSI/AWS A3.0-94 "Standard Welding Terms and Definitions."

Certified Welding Inspector (CWI) for State Projects – Inspector certified in accordance with AWS QC1. For State projects the Quality Control Inspector will be a CWI.

FCAW – Flux Cored Arc Welding – An arc welding process utilizing a tubular electrode with the flux contained within the core. The electrode is supplied on a reel and is fed continuously to the welder's gun automatically.

FLUX – A material used to hinder or prevent the formation of oxides and other undesirable substances in molten metal and on solid metal surfaces, and to dissolve or otherwise facilitate the removal of such substances.

GMAW – Gas metal arc welding utilizes a bare or a flux-cored electrode. Gas from an external source is used for shielding. Normally a shop welding process. Often referred to as MIG welding.

Non-Conformance Report (NCR) – A written report originated by OSM which addresses a deficiency being performed and the contract documents not being fulfilled. The report will describe the problem, the location, the Quality Control Inspector response, the proposed solution, and OSM recommendation.

Non-Destructive Testing (NDT) – Testing or an inspection method which does not damage the element being tested (e.g. Radiographic (RT), Ultrasonic (UT), Visual (VT), Magnetic Particle (MT), Liquid Penetrant (PT)).

Procedure Qualification Record (PQR) – Documentation indicating testing was performed to qualify a WPS.

Quality Assurance (QA) – This oversight is the prerogative of the Engineer and will be performed by a State representative.

Quality Assurance Inspector (QA Inspector) – The duly designated person who acts for and on behalf of the Engineer. This person is from OSM and will inspect the welding operation and write a welding report for the State.

Quality Control (QC) – Responsibility of the contractor. As a minimum, the Contractor shall perform inspection and testing prior to welding, during welding and after welding as specified in the contract documents and additionally as necessary to ensure that materials and workmanship conform to the requirements of the contract documents.

WELDING QUALITY CONTROL CHECKLIST

Quality Control Inspector (QC Inspector) – The person duly designated by the contractor, to perform inspection, testing, and address welding issues on the project. This person shall be responsible to the contractor for the quality control acceptance or rejection of materials, workmanship, and shall be currently certified as AWS Certified Welding Inspector (CWI) in conformance with the requirements in AWS QC1, “Standard and Guide for Qualification of Welding Inspectors.”

Quality Control Manager (QCM) – A representative, employed by the prime contractor, who is responsible directly to the contractor for the quality of all field welding performed. This includes the materials and workmanship. The QCM reviews, approves, and submits all QC documents to the Engineer.

Quality Control Plan (QCP) or Welding Quality Control Plan (WQCP) – A plan submitted by the contractor to the State for each item of welding work to be performed. This plan contains all welding documents required by the contract (refer to the Special Provisions and QCP 1). No welding can begin until this plan is reviewed by OSM and approved by the Structure Representative.

QCP-1, QCP-5 and QCP-7 – These forms are used by OSM and the Structure Representative, as checklists to ensure the contractor’s Quality Control Plan or Fracture Control Plan are complete.

SAW – An arc welding process utilizing a solid wire electrode that is fed automatically to the welding head from a reel. A granular flux is automatically deposited from a dispenser onto the molten weld deposit (normally a shop welding process).

Resistance Butt Welding (Flash Butt Welding) – A welding process in which the necessary heat is derived from an arc or a series of arcs established between the bars being welded prior to pressure being applied to join the ends together.

SMAW - Shielded Metal Arc Weld – An arc welding process utilizing a solid electrode with an outer flux coating.

Welding Procedure Specifications (WPS) – A document providing the required welding variables for a specific application to assure repeatability by properly trained welders and welding operators.

Welder’s Qualification – Welders must be certified for type and position of weld and weld process. If not certified, tests can be performed to qualify the welders. Welders must be certified and approved by OSM before welding on State projects.

Welding Quality Control Plan (WQCP) – See QCP above.

PRIOR TO BEGINNING ANY WELDING WORK

The following contract documents should be reviewed before starting any welding work:

Specific References:

Standard Specifications Sections:

Section 6-3.02, Testing by Contractor

Sections 49, 52, 55, 56, 75 and 86 (as applicable to the work)

American Welding Society (AWS) - AWS D-1.1, D-1.4, D-1.5 (appropriate year)

AWS D-1.1: Prequalification of WPS, Qualification, and Inspection

AWS D-1.4: Direct Butt Joint Figure 3.2, Workmanship, Technique, Qualifications and Inspection

AWS D-1.5: Figure 2.4, Workmanship, Technique, Qualification, Inspection, Welded Steel Bridge, and Fracture Control Plan

Contract Plans

Contract Special Provisions

Bridge Construction Records and Procedures Manual

BCM 9-1.1

Section 180 – Welding

BCM 145-16

OSM forms QCP 1 & 5 – (attachment 4)

Before starting any welding, three items need to be completed. A pre-weld meeting with OSM personnel only, a pre-weld meeting with the contractor, and the review and approval of the Contractor's Welding Quality Control Plan (WQCP). These and other items are explained further below.

1. Inform OSM immediately after contract approval that welding, including shop welding, will be performed for your project (see BCM 180-4 & BCM 180-9 for a list of OSM contact phone numbers). At this time, set up an initial meeting with **OSM PERSONNEL ONLY** to discuss the welding requirements for the project, and to plan the pre-welding meeting with the contractor.
2. Conduct a pre-welding meeting with the prime contractor for each type of welding to be performed in the shop or in the field for the contract (i.e. piles, column casings, structural steel, reinforcing steel, miscellaneous metal, etc.). OSM will conduct this meeting if you so request. The Resident Engineer, Structure Representative, Prime contractor, QCM, QC Inspector, any welding subcontractor, suppliers or fabricators and the NDT firm should attend this meeting. The State should have their QA Inspector from OSM present to assist with the following discussion topics:
 - a) The submittal and approval process for the WQCP. Supply and explain OSM form QCP-1 (attachment 4) to the contractor. Form QCP-1 is a checklist of the minimum requirements for the WQCP. The contract documents may require additional information to be submitted with the contractor's WQCP beyond those listed on form QCP-1.

OVERHEAD SIGN STRUCTURES

WELDING QUALITY CONTROL CHECKLIST

PRIOR TO BEGINNING ANY WELDING WORK (Cont.)

- b) Discuss the appropriate sections of the AWS code and contract documents as they pertain to the acceptance and approval process of the contractor's WQCP (a OSM welding inspector should cover this portion). The WQCP will be reviewed by OSM and must be approved by the Structure Representative prior to any welding in either the shop or the field. In order for the Structure Representative to accept the WQCP, personnel from OSM will have to review the contractor's WQCP. This acceptance of the WQCP may require OSM personnel to witness the welder(s) welding test plates and the testing of those plates before accepting the WQCP. The same is true of the PQR.
 - c) Remind the contractor to provide adequate notice prior to starting any welding work (request one week minimum advance notice). This will allow time to schedule an OSM QA Inspector.
 - d) Inform the prime contractor they are responsible for QC, and they must hire the QC Inspector (a CWI) and the NDT firm, unless stated otherwise in the Special Provisions (i.e. AISC Quality Certification Program, Category Cbr, Major Steel Bridges).
 - e) Discuss the frequency of inspection, visual and NDT, as well as the frequency of the QCM's submittal of the QC Inspector and NDT reports.
 - f) Establish a method to identify the welds and lot sizes. This needs to be established for traceability purposes.
 - g) Discuss the process to randomly select welds to be NDT (see BCM 145-16 for random selection method).
 - h) Discuss corrective measures when welding does not conform with AWS or the contract documents.
 - i) Discuss OSM agenda items an any additional requirements addressed in the contract documents.
 - j) Confirm all discussions of each pre-weld meeting in writing and send a copy to the contractor.
3. Obtain three copies of the contractor's WQCP. Using form QCP-1 and the contract documents, **review the contractor's WQCP and ensure the submittal is complete before forwarding to OSM - this will save review time.** Once the contractor's WQCP is complete, **send two copies** to OSM for their review. OSM will assist the Structure Representative with the acceptance and approval of the WQCP. Keep the other copy in your project files.
4. If resistance butt welding, or any other shop welding is to be performed, ensure OSM has approved the welding procedure, performed a shop audit if required, and performed any testing that may be required to accept the welding process (see BCM 165-10 "Ultimate Butt Splice").
5. After OSM has completed their review, they will notify you by phone, followed by an acceptance memo (QCP-5 for WQCP and or QCP-7 for the Fracture Control Plan, attachment 4) for your project files.

WELDING QUALITY CONTROL CHECKLISTPRIOR TO BEGINNING ANY WELDING WORK (Cont.)

6. After reviewing OSM acceptance memo, and if it is acceptable, place the standard stamp 5-1.02, on both the WQCP and the approved WPS to be used on the project. **Do not place your PE number on the WQCP, the WPS, or the approval letter to the contractor.**
7. Send the contractor a letter approving their WQCP and request 7 copies of these approved documents.

PROJECT RECORDS FILESWELDING DOCUMENTS ARE TO BE FILED IN CATEGORY 9.

NOTE: To limit duplication and confusion, the Structure Representative may want to use a cross-reference system with the other project record categories (ensuring records can be easily audited). For example, correspondences are filed in Category 5. If the issue is welding, the Structure Representative shall file the document in Category 9 as described in the Construction Manual Section 3-01-2 "Category 5, General Correspondence."

The following is a suggested list for filing welding documents.

1. The WQCP will be submitted for each item of work for which welding will be performed in the shop and field (i.e. piles, structural steel, rebar, etc.). The WQCP shall conform to the requirements of the Special Provisions and shall include, as a minimum, the items listed on form QCP-1. **Remember, welding is not allowed until the WQCP is accepted by OSM and approved by the Structure Representative.** Each approved copy of the contractor's WQCP is to be filed in Category 9 "Welding" along with forms QCP-1, QCP-5 and QCP-7 if required.
2. Structure Representatives and their Assistants shall file their reports/diaries in Category 45 and 46 respectively. If welding item work is included within the report, one of two things shall happen: write a separate report, or place a copy of the report in category 9. The welding report shall include: location and type of welding work, amount of production, welder, QC Inspector, QA Inspector, equipment, comments or observations made by either the QC or QA Inspectors and any other pertinent information.
3. OSM welding inspection reports are to be filed in Category 9. All others inspection reports from OSM should be filed in their appropriate Category as outlined in the Construction Manual.
4. If you receive an OSM Non-Conformance Report (NCR) it is to be filed in Category 9, along with the documentation showing what corrective action was taken (repairs and re-inspections of the non-conformance work). **It is the Structure Representative's responsibility to ensure the non-conformance work is corrected and additional testing and inspection is performed per the contract documents (OSM will only assist in the reinspection when requested and instructed as to the acceptance criteria).**
5. Contractor's QCM is to submit their welding report to the Engineer within 7 days following the performance of any welding. The Engineer shall review the report for completeness and ensure the welding was found to be satisfactory. The completed report is to be filed in Category 9.

WELDING QUALITY CONTROL CHECKLIST

PROJECT RECORD FILES (CONT.)

6. Copies of all welding correspondences are to be filed in Category 9 (reference Construction Manual 3-01-2).
7. Test results of all field and shop welding are to be filed in Category 9.
8. The contractor shall furnish to the Engineer a Certificate of Compliance for all welding and electrodes used, as required by the contract documents and in accordance with Section 6-1.07 "Certificates of Compliance" of the Standard Specification and Section 8 of the Special Provisions. These certificates shall be filed within Category 9 with reference to the appropriate section within the project files.

DURING WELD PRODUCTION

1. Make arrangements so an OSM welding inspector is present at the job site or the shop on the first day of welding (if the first day is not possible, then the next available day - the key is to provide OSM adequate notice). If welding is being performed in the shop, OSM should be informed by a "Notice of Materials To Be Used" (Form CEM 3101). This will ensure the welding for your project gets off to a good beginning and the QC Inspector has a clear understanding of the QA Inspector's role and expectations.
2. OSM is responsible for assisting the Structure Representative with QA inspection on the project. OSM is responsible for welding QA at the fabrication shop. Every effort shall be made to ensure a representative from OSM is present during production welding; however, if OSM is not available, the Structure Representative and/or the Assistant Structure Representative shall provide QA inspection and document their findings in their daily reports. The following items should be discussed with an OSM inspector before the pre-weld meeting with the contractor. This discussion should be done in the event a QA Inspector is not available during production welding.
 - a) Verify the contractor is providing QC inspection and using the appropriate AWS code, Contract Special Provision, and Standard Specification to evaluate the weld and weld procedure. The contractor is to provide a sufficient number of QC Inspectors to perform the inspection prior to, during, and after welding. The inspection interval of each welder's work shall not lapse more than 30 minutes, as stipulated in the contract documents.
 - b) Verify the welder is listed within the approved WQCP and is qualified and was accepted by OSM to perform the specified weld. For example, if the WPS calls for SMAW in the vertical position, make sure the welder is qualified to perform SMAW in the vertical position. Note: the AWS code specifically disallows a vertical downward progression of welding.
 - c) Ensure the welders are following the approved WPS. Items easily verified, include: correct base metals, fit up, joint details (such as bevel angle and root opening), weld process, weld position, electrode type and size, travel speed, voltage and amp settings, preheat and interpass temperature, cleaning/slagging between each weld pass, number of weld passes, and ensuring the welder is placing a string bead and not a weave weld. The QC Inspector should also verify and record these items daily.

WELDING QUALITY CONTROL CHECKLISTDURING WELD PRODUCTION (CONT.)

- d) Review the appropriate AWS code to ensure welding **is not done** when the ambient temperature is too low, when surfaces are wet or exposed to wind, or when welders are exposed to inclement conditions (see the appropriate AWS Code under workmanship or technique).
 - e) Ensure backing plates, if shown in the WPS, are tight against the base metal or rebar (it might be necessary to grind down only the bar deformations that interferes with the tight fit, not the core area of the reinforcing steel). The Special Provisions, for bar reinforcement, requires the backing plate to be a flat plate. Backing plates are not to be removed for radiographing. If the backing plate is for welding a column casing refer to BCM 180-6 and BCM 180-7.
 - f) Ensure the electrodes are properly stored. For SMAW electrodes, once the hermetically sealed container is opened, or after electrodes are removed from drying or storage ovens, the electrode exposure to the atmosphere shall not exceed the times stated in the AWS code (typically 4 hours maximum). For FCAW electrodes, they shall be stored in clean and dry conditions at all times.
 - g) Ensure the welder does not make any errant arc strike (contact between the electrode and the base metal outside the weld area). If an errant strike does occur, the material is subject to rejection, but confer with OSM first.
 - h) Verify NDT and destructive testing, when required, is being performed properly an in accordance with the Special Provisions and other contract documents (OSM may be of assistance in this regard).
 - i) Keep an eye on the production and failure rate. A dramatic increase in production and a drop in the failure rate generally result in non-conformance with the WPS.
3. Obtain the QCM welding reports within 7 days or as specified by the contract documents, following performance of any welding. Review this report with the assistance of OSM to determine if the contractor is in conformance with their WQCP. Except for steel piling, this report must be reviewed and a written response approving or rejecting the report must be returned to the contractor within 7 days (your time frame may vary, read your Special Provisions). For piling, this review time will be specified in the Contract Special Provisions.
4. Review all reports regarding NDT, destructive testing, and radiographing. As described in the contract documents, all reports shall have the appropriate signature of the reviewer. For radiographs - the NDT technician, the person performing the review and the QCM shall sign these reports. The reviewers name shall be clearly printed or type written next to their signature. If they are not, return them to the QCM.
5. All radiographic envelopes shall have clearly written on the outside the names of the: QCM, NDT firm, radiographer, date, contract number, complete part description, and include the weld numbers or a report number as detailed in the WQCP. In addition, all innerleaves shall have clearly written on them the part description and include weld numbers, as detailed in the WQCP.

WELDING QUALITY CONTROL CHECKLIST

WELD ACCEPTANCE

1. There are different forms of NDT (VT, UT, RT, MT, and PT) that may be performed on weld elements, but the contractor's QC Inspector will always perform a visual inspection (VT) and write up a daily report. The contractor is responsible to ensure all necessary and required NDT is performed. The contractor is also responsible to ensure all welding fulfills the requirement of the contract documents and the appropriate AWS codes. It is the Engineer's prerogative to perform QA inspection. If the QC Inspector identifies a defect it is to be noted in the welding report along with the corrective action taken. If the QA Inspector identifies a defect, a Non-Conformance Report will be written and given to the Structure Representative that day. **These reports are not to be given to the contractor. It is the Structure's Representatives responsibility to notify the contractor in writing and ensure the defect is repaired and any additional testing is performed and evaluated. Inform OSM of the repair and request an inspection of the repaired weld.**
2. Welds can be accepted if both the Contractor's QC and OSM QA Inspectors find the welding quality to be acceptable by visual inspection and/or NDT, in accordance with the appropriate AWS code.
3. In addition to the inspection, the contractor shall furnish to the engineer, in accordance with Section 6-1.07 "Certificate of Compliance," of the Standard Specifications and Section 8 of the Special Provisions, a Certificate of Compliance for each item of work for which welding was performed. This certificate shall state that all of the materials and workmanship incorporated in the work, and all required tests and inspections of this work, have been performed in accordance with the details shown on the plans, and the requirements of the Standard Specifications and the Special Provisions.

PROJECT CLOSE OUT

1. The location of all splices need to be show on the as build drawings per BCM 9-1.1.
2. Met with the OSM representative to confirm all NCR and any other details are resolved before accepting the project.

REINFORCING STEEL CHECKLIST

PRIOR TO BEGINNING ANY WELDING WORK

The following items are in addition to those listing in Attachment 2 and are intended to assist you with the inspection of reinforcing steel welding on your project. Therefore, **before starting any welding, review the section entitled “Prior to Beginning any Welding Work” within the “Welding Quality Control Checklist” (attachment 2).**

Specific References:

Standard Specifications Sections:

52-1.08B, Butt Welded Splices

52-1.08D, Qualifications of Welding and Mechanical Splices

Structural Welding Code - Reinforcing Steel, AWS D1.4 (appropriate year)

Welding Procedure Qualification

Welder Qualification

Direct Butt Joints - Figure 3.2

Inspection

An approved WQCP is required before any welding is allowed. Review the requirements outlined in form QCP-1, contract documents and AWS D-1.4. AWS D 1.4 does not provide for prequalified welds; therefore, all WPS's and welders must be qualified by testing. You will need a copy of the PQR for each WPS that will be used on the project and the qualification test for the welder(s). The PQR and the welder qualification test must be witnessed by either a lab approved by OSM or by OSM personnel. This should be discussed at the meeting with the OSM representative and also related to the contractor at the pre-welding meeting.

PROJECT RECORDS FILES

In addition to those items listed in Attachment 2, the following items also need to be filed in Category 9 for reinforcing steel welding:

1. The contractor's QCM and OSM QA reports. These reports shall also include the following information when rebar welding and NDT is being performed:
 - a) Evidence showing at least 25% of all butt welds were radiographed by the Contractor.
 - b) Evidence the Contractor evaluated the results, corrected deficiencies, radiographed repaired welds and radiographed additional welds as required (review your Special Provisions for specific details on additional testing requirements when welds are rejected).
 - c) If more than two repairs of any weld are required, the Contractor must submit a repair plan detailing the problem and their proposed solution. This will prevent excessive heat damage to the reinforcing steel in the vicinity of the weld (heat affected zone).
2. A summary sheet recording when radiographs were submitted to and reviewed by OSM personnel and the response to the contractor.
3. Test reports of destructive testing performed for resistance butt welds. OSM will review the testing and perform QA.

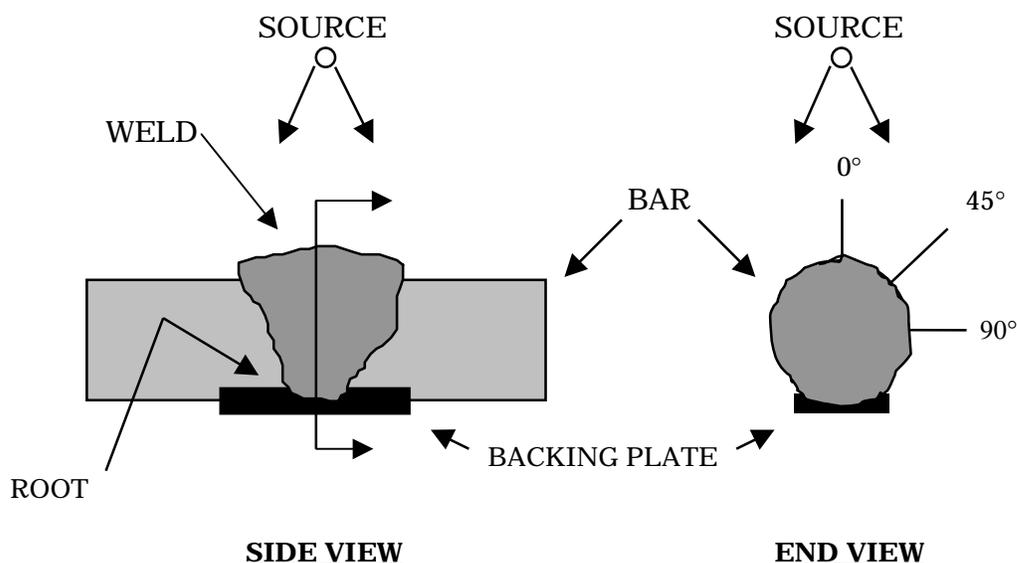
REINFORCING STEEL CHECKLIST

DURING WELD PRODUCTION

In addition to Attachment 2, the following items shall also be reviewed by the Structure Representative and/or their Assistant:

1. Preheat and interpass temperatures. Ensure the proper temperatures are being used for the grade of steel or Carbon Equivalent (CE) being used. Refer to the your Special Provisions, and AWS D-1.4-92 table 5.2 or contact OSM personnel.
2. Bar alignment is within allowable tolerances. For example, AWS D-1.4-92 Section 4.2.3 states, for bars No. 10 or smaller the allowable offset is 1/8 inch. Additionally, Section 52-1.08 of the Standard Specifications states, the deviation in alignment of reinforcing bars at a welded splice shall not be more than 1/4 inch over a 3-1/2 foot length of bar.
3. When specified, a minimum of 6 inches on either side of the welded splice is covered with an insulated wrapping to control the rate of cooling after welding is complete. The method of protecting the weld area from heat loss shall be addressed in the approved WQCP.
4. Randomly select welds to be radiographed (for the random selection process, see BCM 145-16). Verify radiographs are being taken on at least 25% of the randomly selected production lot. If welds or radiographs are rejected, verify additional welds are being radiographed and re-shots of the repaired welds are taken in accordance with the Special Provisions.
5. Verify tests are being performed properly in accordance with the Special Provisions and other contract documents (assistance from OSM is required). Radiographs are to be taken at zero degrees from the top of the weld and perpendicular to the root of the weld as shown below.

TOP



REINFORCING STEEL CHECKLIST

WELD ACCEPTANCE

The Contractor should be encouraged to submit radiographs in a timely manner. This will allow the Contractor the opportunity to make corrections if necessary before the work progresses too far. Since the quality of the welding and the radiographing is the responsibility Contractor, the Contractor may choose to continue the work without waiting for OSM review and comment. If so, the contractor proceeds at his own risk and should be informed in writing.

The following items and those in Attachment 2 need to be obtained before accepting any reinforcing steel welding.

1. The contractor shall evaluate the radiographic film and the weld for acceptability and make any necessary repair to the weld and perform additional testing per the contract documents if required.
2. All radiographs, approved, reshot and/or rejected by the QC Inspector, must be reviewed by OSM. When the film is delivered to the Structure Representative, the Structure Representative should prepare a cover memo (attach to the radiograph film) requesting a review by OSM personnel. Before sending your memo and the film, check with your local OSM office for direction and proper sending instructions. On the memo, please include the Structure Representative's name, telephone number and fax number. Each piece of film shall include the contractor's name, date of radiograph, name of NDT firm, initials of the radiographer, contract number, part number, and weld number. The letter "R" and repair number shall be placed directly after the weld number to designate a radiograph of a repaired weld.
3. OSM personnel will review radiographs submitted by the contractor and phone the results to the Structure Representative within seven (7) calendar days after the review or as stated in the contract documents. A written report will follow within 10 working days. To ensure a complete review of the contractor's QC inspection, the radiographs of welds rejected by the contractor's QC Inspector will be reviewed by OSM. OSM will report their findings or the rejections to the Structure Representative as information only. These findings will be reported as either:
 - a) "Reviewed film and interpretations submitted by the Contractor are consistent with the Office of Structural Materials findings."

Or

 - b) "Reviewed film and interpretations submitted by the Contractor are inconsistent with the Office of Structural Materials findings and we recommend the Contractor review the QC procedures currently in use."
4. The Structure Representative can accept welds if both the QC Inspector and the QA Inspector agree the welding quality is acceptable by visual inspection and NDT in accordance with AWS D1.4.

REINFORCING STEEL CHECKLIST

WELD ACCEPTANCE (Cont.)

5. In addition to the inspection, the contractor shall furnish to the Engineer, in accordance with Section 6-1.07 "Certificate of Compliance," of the Standard Specifications and Section 8 of the Special Provisions, a Certificate of Compliance for each item of work for which welding was performed. This certificate shall state that all of the materials and workmanship incorporated in the work, and all required tests and inspections of this work, have been performed in accordance with the details shown on the plans, and the requirements of the Standard Specifications and the Special Provisions.

PROJECT CLOSE OUT

1. The location of all splices need to be show on the as build drawings per BCM 9-1.1.
2. Met with the OSM representative to confirm all NCR and any other details are resolved before accepting the project.

CONTRACTOR'S QCP SUBMITTAL FOR WELDING

To: _____, Resident Engineer **Date of this Submittal:** _____
Tel. No.: _____ **Fax No.:** _____
From: _____ **Contract No.:** _____
Welding Firm: _____ **NDT Firm:** _____

Materials to be Welded: Struct. Steel Misc. Rebar Col. Casings H-Piles Pipe Piles
NDT Required : RT UT MT Visual Only
Specifications : D1.1 (yr) D1.4 (yr) D1.5 (yr) D1.6 (yr)

Our Quality Control Plan for welding to be performed on the subject contract is submitted for your review and approval.
 The items checked below are submitted herewith.

QCP ITEMS TO BE SUBMITTED AS A MINIMUM	SUBMITTED	N/A	For R.E. Use
1. Organization Chart showing all QC Personnel & their duties.			
2. Name & Qualifications of Quality Control Manager (QCM).			
3. QC Inspectors - Provide copy of current AWS CWI Certification and eye exam for each Inspector to be used in the work # of submittals _____,			
4. Names & Qualifications of Asst. QC Inspectors – Provide current AWS Assoc. CWI Certification or resume. # of submittals _____,			
5. Procedure Manual of NDT firm: certified personnel, NDT equipment, test procedures, calibration methods, methods and frequencies of tests, safety procedures and report forms to be used.			
6. Certifications for Level II NDT Technicians. # of submittals _____,			
7. Methods and frequencies of NDT Inspections.			
8. List of Visual Insp. Tools (weld gages, tempstiks, lights, etc.).			
9. Procedures frequencies and extent of Visual Inspections.			
10. Method of tracking and identifying weld joints & welders.			
11. Daily Production & Inspection Log of Welds by QC Inspector.			
12. Action Plan for reporting non-conforming welds.			
13. Prequalified WPS (PQR not required). # of submittals _____,			
14. WPS' requiring PQR testing. (PQR tests Must be State Witnessed) # of submittals & tests _____,			
15. Standard Weld Repair Procedures.			
16. Electrode & Shielding Gas Certs. for each weld process. # of submittals _____,			
17. Welder Qualifications for each process & position that each welder will perform. (Must be State Witnessed) # of submittals _____,			
18. Sample Certificate of Compliance form to be used.			
19. One copy each of applicable AWS Welding Codes			
20. Other			

QCM Signature: _____

_____ (Printed Name)

OVERHEAD SIGN STRUCTURES
METS LETTER OF TRANSMITTAL
REVIEW OF CONTRACTOR'S WELDING QUALITY CONTROL PLAN

To: _____, Resident Engineer
 Tel. No.: _____

Date of this Transmittal:
 Fax No.:

From: _____, Branch Chief

Contract No.:

Date of Receipt (R.E.): _____

Date of Receipt (METS):

The Contractor's Quality Control Plan Submittal #: _____ Rev. # _____ has been reviewed.

QCP substantially **complies** with specification requirements and approval is recommended.

QCP **needs to be resubmitted** and unacceptable (reject) items corrected as per comments.

(See attached QCP5-NC for Non-Conforming Item Comments)

General Contractor: _____

Contractor's QCM:

Welding Firm: _____

NDT Firm:

Materials to be Welded: Struct. Steel Misc. Rebar Col. Casings H-Piles Pipe Piles

NDT Required : RT UT MT Visual Only

Specifications : D1.1 (yr) D1.4 (yr) D1.5 (yr) D1.6 (yr)

QCP ITEMS REVIEWED	COMPLIES	DOESN'T COMPLY	N/A
1. Organization Chart showing all QC Personnel & their duties			
2. Name & Qualifications of Quality Control Manager (QCM)			
3. QC Inspector-AWS CWI Certification and eye exam for each. # of submittals			
4. ASST QC Inspector - AWS CAWI Certification for each. # of submittals			
5. Procedure Manual of NDT firm: certified personnel, NDT equipment, test procedures, calibration methods, methods and frequencies of tests, safety procedures and report forms to be used.			
6. Certifications for Level II NDT Technicians # of submittals			
7. Methods and frequencies and extent of NDT Inspections			
8. List of Visual Insp. Tools (weld gages, tempstiks, lights, etc.)			
9. Procedures frequencies and extent of Visual Inspections			
10. Describe method of tracking and identifying weld joints and welders production			
11. Daily Production & Inspection Log for Welds for use by QC Inspector			
12. Action Plan for reporting non-conforming welds			
13. Prequalified WPS (PQR not required) # of submittals			
14. WPS' requiring PQR tests. # of submittals			
15 Standard Weld Repair Procedures			
16. Electrode & Shielding Gas Certifications for each process # of submittals			
17. Welder Qualifications # of submittals			
18. Sample Certificate of Compliance form to be used			
19. Other :			

METS REVIEWER: _____
 Form METS QCP-5 rev. 4

Date Review Completed:
 file: Loc: XX.20. A or B

CONTRACTOR'S FRACTURE CONTROL PLAN (FCP) SUBMITTAL FOR WELDING

To: _____, Resident Engineer

Date of this Transmittal:

Tel. No.: _____

Fax No.:

From: _____, Branch Chief

Contract No.:

Date of Receipt (R.E.): _____

Date of Receipt (METS):

The Contractor's Fracture Control Plan Submittal #: _____ Rev. # _____ has been reviewed.

FCP substantially **complies** with specification requirements and approval is recommended.

FCP **needs to be resubmitted** and unacceptable (reject) items corrected as per comments.

(See attached QCP7-NC for Non-Conforming Item Comments)

General Contractor: _____

Contractor's QCM:

Welding Firm: _____

NDT Firm:

Specification: D1.5 (yr)

FRACTURE CONTROL PLAN (FCP) ITEMS TO BE SUBMITTED AS A MINIMUM	COMPLIES	DOESN'T COMPLY	N/A
1. Base Metal used meet the project and code requirements			
2. Consumable meet the requirements of heat or lot testing by the manufacturer			
3. Weld metal strength and ductility conform to tables 4.1 or 4.2			
4. Weld metal toughness meets table 12.1 requirements or the undermatching yield strength of a minimum toughness of 25ft-lb @ -20°F.			
5. WPS' requiring PQR test (according to section 12.7). # of submittals:			
6. Prequalified WPS (PQR not required) (According to section 12.7.1) # of submittals:			
7. Base metal repair procedure			
8. Tack weld procedures (According to section 12.13). # of submittals:			
9. Lead QC name, qualifications, and resume. Work history needs to show a minimum of 3 years experience in steel bridge fabrication inspection.			
10. NDT methods, personnel qualifications, eye exams, frequency of testing, reports to be used, and written practice of NDT firm. (see Sec. 12.16.1.2-5)			
11. Electrode & Shielding Gas Certs. for each weld process and base metal combination. # of submittals:			
12. Welder Qualifications for each process & position that each welder will perform. Welder Qualification tests shall be within 6 months of FCM work and shall be qualified by both mechanical (bend) and radiograph tests according to section 12.8.2 and 5 Part B. # of submittals:			
13. Daily Production & Inspection Log of Welds by Lead QC Inspector			
14. Noncritical Repair Welding Procedures such as surface discontinuities. Nocrical repair WPS shall meet the requirements of Section 12.17.2 and 12.17.2.1			
15. Critical Repair Welding Procedures (According to Section 12.17.3).			
16. Other:			

METS REVIEWER: _____

Date Review Completed:

Form METS QCP-7 FCP rev. 4

File Location: XX.20.A or B

Bridge Construction Bulletin 180-2.1

Attachment 4

Sheet 3 of 3