

ERASCO SERVICES INCORPORATED

WATERFORD STEAM ELECTRIC STATION - UNIT NO 3

D.

PROCEDURE FOR: INSPECTION OF CONCRETE REINFORCING
STEEL MECHANICAL SPLICES (CADWELDS)

PROC. NO. QCIR-9

ISSUE SUMMARY

NOTATIONS IN THIS COLUMN INDICATE WHICH CHANGES HAVE BEEN MADE

ISSUE/DATE	PREPARED	APPROVED	REMARKS
"A" 10/30/72	M G Vinson	<i>M G Vinson</i>	
"B" 1-18-74	M G Vinson	<i>M G Vinson</i>	Complete Revision
"C" DRAFT 8/19/75	E. L. Boyd <i>E. L. Boyd</i>	<i>J. O. Booth</i>	Edited and updated QC 4.2.1-1
C 9/5/75	E. L. Boyd <i>E. L. Boyd</i>	J. O. Booth	
"D" DRAFT 1/29/76	<i>R. A. Roffe</i> R. A. Roffe	<i>J. O. Booth</i>	
"D" 2-19-76	<i>R. A. Roffe</i> R. A. Roffe	J. O. Booth	

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NOTATIONS IN THIS COLUMN INDICATE WHICH CHANGES HAVE BEEN MADE

1.0 PURPOSE

To define the procedure to be followed to control the quality of mechanical splices in reinforcing steel, generally called Cadwelds.

2.0 SCOPE

This procedure covers receiving inspection of materials, qualification of splicers, general inspection of splices, User's Testing of splices, recording of splice locations and documentation of the Cadweld program.

3.0 REFERENCES

- 3.1 Ebasco Specification LOU-1564.479, for Mechanical Splicing of Concrete Reinforcing Steel
- 3.2 Ebasco Specification LOU-1564.473, for Concrete Reinforcing Steel Furnishing, Fabrication and Delivery
- 3.3 ASP-III-14, Receiving, Handling and Storage
- 3.4 ASP-III-11, Inspection

4.0 DEFINITIONS

- 4.1 Cadweld - used interchangeably with "mechanical splice", and denoting a splice formed with a sleeve which is placed over the end of a reinforcing bar and filled with molten metal to form a mechanical (shear) means of transmitting longitudinal force from the bar to the member to which the sleeve is attached.
- 4.2 Installation equipment - non-expendable tools.
- 4.3 Materials - splice sleeves, chemicals and other components of splice kits, the condition of which may be critical for the quality of the splice.

5.0 RESPONSIBILITY

- 5.1 The Senior Quality Control Supervisor shall be responsible for ensuring that this procedure is implemented.
- 5.2 The Material Control Supervisor shall be responsible for verifying that the materials and kits delivered to the site are acceptable as to quality and condition. He shall also be responsible for verifying that handling, storage and documentation conform to the requirements of this and other applicable procedures.

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5.3 The Quality Control Welding Supervisor shall be responsible for supervising the inspection and testing of splices and for reviewing the documentation. He shall also be responsible for ensuring that the intent of the program of tests by owner has been fully implemented.

5.4 The Inspector, who reports to the Quality Control Welding Supervisor, shall be responsible for performing visual inspections of the splices and documenting the inspection results.

5.5 The Construction Superintendent shall be responsible for coordinating all activities that require participation of field personnel in departments other than Quality Control.

5.6 The Contractor shall be responsible for qualifying his splicing crews.

6.0 PROCEDURE

6.1 Receiving Inspection

6.1.1 Receiving Inspection shall be in accordance with ASP-III-14. The following details in this Section 6.1 are intended to draw attention to particular features applying to Cadweld material.

6.1.2 The Material Control Supervisor or his designee, when notified by the Materials Supervisor of the arrival of materials and installation equipment, shall verify that the following documents have been received:

6.1.2.1 Mill certifications applying and traceable to the sleeves delivered

6.1.2.2 Manufacturer's batch certification on cartridges

6.1.2.3 Erasco Vendor Quality Compliance Report, Release for Shipment

6.1.3 If certifications for the sleeves or cartridges are missing, the corresponding material shall be treated as "Hold" material until the discrepancy is resolved.

6.1.4 If the Release for Shipment is missing, the Material Control Supervisor or his designee shall make a random visual inspection to verify that the material delivered corresponds to the certification and to the procurement documents in accordance with ASP-III-14.

6.1.5 The Material Control Supervisor shall verify that cartons, packages, plastic bags or other containers are undamaged, particularly with respect to piercing and bursting, and that powder material is dry. With respect to sleeves, they are not required to be entirely free of rust; but any gross case of corrosion shall be reported as a discrepancy. The corroded sleeves shall be treated as "Hold" material.

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6.1.6 Results of Receiving Inspection shall be recorded on Form No. ASP-III-14-1, and discrepancies shall be reported on Form No. ASP-III-11-1.

6.2 Qualification of Splicers

6.2.1 The Quality Control Welding Supervisor or his designee shall ensure that the Contractor's qualification or requalification of splicers is performed according to Specification LOU 1564.479 and is recorded on "Cadweld Operator's Qualification Test Record", Form No. QCIP-9-1 (sample attached). The tensile tests related thereto shall be performed, according to the Specifications, at the site laboratory, with the results recorded on Form No. QCIP-9-3, "Report of Tensile Tests - Cadweld Splices." The forms shall be retained for files.

6.2.2 The Quality Control Welding Supervisor shall ensure that a file of qualified operators and their qualification test records is maintained at the site.

6.3 Control of Workmanship

6.3.1 The Q. C. Welding Supervisor shall ensure that the Contractor prepares and submits a written procedure for Cadwelding, that the procedure is reviewed and approved prior to start of Cadwelding, and that work follows the procedure.

6.3.2 The Q. C. Welding Supervisor shall assign to an Inspector the duty of maintaining a "Cadweld Daily Inspection - Visual" log, Form No. QCIP-9-2 (attached).

6.3.3 Cadweld Inspectors shall observe the following points carefully:

6.3.3.1 That bar ends are thoroughly cleaned by wire brush to remove all loose mill scale, dirt and other foreign matter and are heated to remove all moisture.

6.3.3.2 That, in order to confirm correct centering of bar ends in the splice sleeve, permanent reference marks are made equidistant from the bar ends - the distance shall be recorded on Form No. QCIP-9-2.

6.3.3.3 That splice sleeves are free of foreign material or serious rust on the inside surfaces.

6.3.3.4 All graphite parts except crucible covers shall be cleaned as required, using a material or tool that will not damage the graphite.

6.3.3.5 That special attention is given to maintaining the alignment between sleeve and guide tube thus ensuring a proper fill.

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6.3.3.6 That shortly before ignition all possibility of moisture in the uncompleted splice is avoided by reheating - this would apply particularly in cold, damp weather or sub-freezing temperatures.

6.3.3.7 That no Cadwelding takes place during periods of precipitation unless performed under adequate protection.

6.3.4 The Inspector shall record on Form QCIP-9-2 whether workmanship as discussed in this Section 6.3 was satisfactory.

6.4 Splice Identification

6.4.1 The Q.C. Welding Supervisor shall obtain from the Contractor, a copy of the Cadweld Map on which shall be shown to an adequately large scale for the purpose described in this section the locations and identification of the Cadwelds produced in a portion of the work to be defined by the Contractor.

6.4.2 Cadweld Maps shall have the following information:

6.4.2.1 Placement number

6.4.2.2 Bar size

6.4.2.3 Layer of steel

6.4.2.4 Location dimensions

6.4.2.5 Cadweld operator identification and sequential number

6.4.3 Daily cadweld visual inspection report shall have the following information:

6.4.3.1 Cadweld operator identification and sequential number

6.4.3.2 Splice position and bar size

6.4.3.3 Sleeve lot number

6.4.3.4 Powder lot number

6.4.3.5 "Comments" (cut out for test, visual reject, replaced by, etc.)

6.4.3.6 Map number

6.4.4 The following information shall be permanently marked on the Cadweld splice sleeve using a low-stress die stamp:

6.4.4.1 Cadweld Operator Identification

6.4.4.2 Sequential number

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- D 6.4.5 The Inspector shall verify by the use of a copy of the Contractor's daily visual inspection report and Cadweld map the following:
- 6.4.5.1 The location of each splice
 - 6.4.5.2 The sizes of the bars spliced
 - 6.4.5.3 The symbol indicating the assigned identification letter (s) of the operator or crew, the sequential number of the splice (starting from the first splice made by the operator or crew and continuing without interruption), a suffix "s" if the splice is a sister splice of the splice with the same number, the size (s) of the bars spliced, and the horizontal or vertical position of the bars spliced.
 - 6.4.5.4 Inspection Status (Sign-off)
 - 6.4.5.4.1 Pre-Equipment Set-up acceptance
 - 6.4.5.4.2 Final visual acceptance
 - D 6.4.6 At the time of visual inspection of the splice, the Inspector shall copy the ID symbol of the splice on Form No. QCIP-9-2, record his approval or otherwise on the form, and spray the sleeve with paint according to the color code:

Approved	-	white
Test specimen	-	yellow
Rejected	-	red
 - D 6.4.7 All Cadwelds within a pour must be approved, and therefore painted white, before concrete may be placed.
 - D 6.5 Visual Inspection and Testing of Production Splices
 - D 6.5.1 The Inspector shall carry out visual inspection in accordance with Specification LOU-1564.479. He shall record the results, on Form No. QCIP-9-2, and report discrepancies on Form No. ASP-III-11-1 in accordance with ASP-III-11, Inspection.
 - D 6.5.2 The Inspector shall ensure that the frequency of production splice testing defined in Specifications is satisfied.
 - D 6.5.3 The Quality Control Welding Supervisor shall ensure that the splice test samples are placed at the disposal of the site testing laboratory. The site testing laboratory shall collect the samples, test them for yield point and ultimate tensile strength, and record the results on Form No. QCIP-9-3, Report of Tensile Tests (sample attached) which shall be filed. Identification of the samples shall be by the identification symbol described above (6.4.2.3). Criteria for acceptance shall be those stated in Specification LOU-1564.479. Discrepancies shall be resolved in accordance with ASP-III-11.

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7.0 ATTACHMENTS

- 7.1 Cadweld Daily Inspection - Visual (Form No. QCIP-9-2)
- 7.2 Cadweld Operator's Qualification Test Record (Form No. QCIP-9-1)
- 7.3 Report of Tensile Tests - Cadweld Splices (Form No. QCIP-9-3)

CADWELD OPERATOR'S QUALIFICATION TEST RECORD

OPERATOR'S NAME _____ BADGE NO. _____ ID SYMBOL _____

DATE QUALIFIED _____

MATERIAL INFORMATION:

REINFORCING STEEL: ASTM A-615 GRADE 60

TYPE OF SPLICE: "T" SERIES CADWELDS

BAR SIZE _____ SLEEVE TYPE _____ FILLER METAL LOT NO. _____

BAR SIZE _____ SLEEVE TYPE _____ FILLER METAL LOT NO. _____

TEST RESULTS - BAR SIZE _____

<u>POSITION</u>	<u>VISUAL INSPECTION</u>	<u>TENSILE (PSI)</u>	<u>FRACTURE POSITION</u>	<u>COMMENTS</u>
VERTICAL	_____	_____	_____	_____
	_____	_____	_____	_____
HORIZONTAL	_____	_____	_____	_____
	_____	_____	_____	_____

TESTING LAB REPORT NO. _____

TEST RESULTS - BAR SIZE _____

<u>POSITION</u>	<u>VISUAL INSPECTION</u>	<u>TENSILE (PSI)</u>	<u>FRACTURE POSITION</u>	<u>COMMENTS</u>
VERTICAL	_____	_____	_____	_____
	_____	_____	_____	_____
HORIZONTAL	_____	_____	_____	_____
	_____	_____	_____	_____

TESTING LAB REPORT NO. _____

WITNESSED BY ERASCO Q.C.: _____ CADWELD INSTRUCTOR: _____

REMARKS:

CONTRACTOR'S REPRESENTATIVE: _____

WATERFORD STEAM ELECTRIC STATION
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REPORT OF TENSILE TESTS - CADWELD SPLICES

Portion to be Completed by Inspector Requesting Test

Cadweld Operator and Sequential Number _____

Date Cadweld Splice Completed _____

Position of Splice - Vertical - Horizontal - Other _____

Size of Rebar Spliced _____

Filler Material Cartridge No. _____

Inspector Signature _____ Date _____

Portion to be Completed by Testing Laboratory

Lab Report Number _____

Total Load, lbs.	Strength, PSI	Position of Failure
Yield -		
Tensile -		

Lab. Tech. Signature _____ Date _____

Remarks _____

Portion to be Completed by Ebasco Q.C.

Does Test Results Comply with Applicable Specifications? Yes No

Remarks: _____

Signature _____ Date _____