

3.8A.0 MECHANICAL SPLICING OF REINFORCING BARS
USING THE CADWELD PROCESS

3.8A.1 SCOPE

Mechanical splicing of deformed reinforcing bars for full-tensile loading is accomplished with Cadweld connectors, and the procedure used is in accordance with Regulatory Guide 1.10, "Mechanical (Cadweld) Splices in Reinforcing Bars of Category I Concrete Structures," January 1973, except as noted in the Qualification of Operators and Joint Acceptance Standards. The average tensile strength of the Cadweld joints is greater than the minimum tensile strength for the particular grade of reinforcing steel as specified in the appropriate American Society of Testing Materials (ASTM) standard. The minimum tensile strength of the splices exceeds 125 percent of the minimum yield strength for each grade of reinforcing steel as specified in the appropriate ASTM standard.

3.8A.2 PROCESS

All splices are made by the Cadweld process (Erico Products, Inc.) using clamping devices, sleeves, charges, etc., as specified by the Cadweld instruction sheets for T series connections. The C series and C-16 series materials are not permitted.

3.8A.3 QUALIFICATIONS OF OPERATORS

Prior to the production splicing of reinforcing bars, each operator or crew, including the foreman or supervisor for that crew, prepares and tests a joint, in place of two joints required by Regulatory Guide 1.10, for each of the positions used in production work. These splices are made and tested in strict accordance with the specification, using the same ASTM grade and size of bar spliced in the production work. To qualify, the completed splices must meet the Joint Acceptance Standards for workmanship, visual quality, and minimum tensile strength. A list containing the names of qualified operators and their qualification test results is maintained at the jobsite. The qualified crew was not required to requalify in accordance with Regulatory Guide 1.10.

3.8A.4 PROCEDURE

All joints are made in strict accordance with the manufacturer's instruction as presented in Erico Products, Inc. Bulletin RB10M-670, "1970 Cadweld Rebar Splicing," plus the following additional requirements:

- A. A manufacturer's representative, experienced in Cadweld splicing of reinforcing bars, is present at the jobsite at the outset of the work to demonstrate the equipment and techniques used for making quality splices. He is also present for at least the first 50 production splices to observe and verify that the equipment is being used correctly and that quality splices are being obtained.
- B. The splice sleeves, cartridges, asbestos wicking, ceramic inserts, and graphite parts are stored in a clean, dry area with adequate protection to prevent absorption of moisture.
- C. Each splice sleeve is visually examined immediately prior to use to ensure the absence of rust and other foreign material on the inner surface.
- D. The graphite molds are preheated with an oxyacetylene torch to 300°F minimum to drive off moisture immediately prior to use.
- E. Bar ends to be spliced are in good condition with full-size undamaged deformations. The bar ends are power brushed to remove all loose mill scale, rust, concrete, and other foreign material. Prior to power brushing, all water, grease, and paint are removed by heating the bar ends with an oxyacetylene or propane torch.
- F. A permanent line, marked 12 in. back from the end of each bar, serves as a reference point to confirm that the bar ends are properly centered in the splice sleeve.
- G. Immediately before the splice sleeve is placed into final position, the previously cleaned bar ends are preheated with an oxyacetylene or propane torch to ensure complete absence of moisture.
- H. Special attention is given to maintaining the alignment of sleeve and guide tube to ensure a proper fill.

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- I. When the temperature is below freezing or the relative humidity is above 65 percent, the splice sleeve is externally preheated with an oxyacetylene or propane torch after all materials and equipment are in position.
- J. The reinforcing bar deformations which become engaged in the Cadweld splice are not ground, flame-cut, or altered in any way except for the longitudinal ribs which are ground to a diameter not less than the other bar deformations.
- K. An adequate escape route is provided for gases generated during the casting of horizontal splices. For splices in bars smaller than No. 11, this is done by inserting a hairpin piece of soft twisted wire at the top of the splice between the rebar and the sleeve.
- L. The packing material at the ends of the horizontal splices and at the top of the vertical splices is not hard packed. The material is firmly in place but loose enough to allow the escape of gases.

3.8A.5 ONSITE USER TESTS

The onsite user test program for reinforcing steel splices is described below:

- A. Every operator is required to pass a qualification test.
- B. All splices are visually inspected. As indicated in section 3.8A.7 of this supplement, unsatisfactory splices are replaced.
- C. For each crew, after qualification, tests are made for each position as follows:

Sister Splice Program

The following tensile program is used:

- One out of the first lot of 10 production splices for each position, bar size, and grade of bar
- One production splice and 3 "sister splices" from the next 90 splices for each position, bar size, and grade of bar.
- Three splices out of the next and subsequent lots of 100 splices for each position, bar size, and grade of bar; one-fourth of these splices from production splices and three-fourths from "sister splices"

A "sister splice" is defined as a 3-ft-long test bar spliced in sequence with, and in an otherwise identical manner as, the production splices.

3.8A.6 JOINT ACCEPTANCE STANDARDS

The following criteria are used for judging the acceptability of Cadweld joints:

- A. Sound nonporous filler metal must be visible at both ends of the splice sleeve and at the tap hole in the center of the splice sleeve. Filler metal, which is usually recessed 1/4 in. from the end of the sleeve due to the packing material, is not considered as poor fill.
- B. Splices which contain slag or porous metal in the riser, tap hole, or at the ends of the sleeves (general porosity) are rejected. A single shrinkage bubble present below the riser is not detrimental and is distinguished from general porosity as described above.
- C. The Cadweld splices, both horizontal and vertical, may contain voids at either or both ends of the Cadweld splice sleeve. At the end of the Cadweld splice sleeves, the acceptable size void for a No. 18 splice does not exceed 3² in. per end of splice sleeve. The area of the void is assumed to be the circumferential length as measured at the inside face of the sleeve multiplied by the maximum depth of wire probe minus 3/16 in.
- D. The average tensile strength of the Cadweld joints is greater than the minimum tensile strength for the particular grade of reinforcing steel as specified in the appropriate ASTM standard. The minimum strength of the Cadweld joints must be greater than 125 percent of the specified minimum yield strength for the particular bar. If any of the tested specimens failed, two additional random splices of the same lot were tested, and if both passed the test, the lot was accepted. If one or both failed, the entire lot was rejected. This criterion is more conservative than the one described in Regulatory Guide 1.10.

3.8A.7 REPAIRS

Joints which do not meet the quality acceptance standards of section 3.8A.6 are rejected and completely removed. The bars are then rejoined with a new splice.