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REINFORCING BAR USING THE
CADWELD PROCESS

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APPENDIX 5C

SPECIFICATION FOR SPLICING REINFORCING BAR USING THE CADWELD PROCESS

1.0 SCOPE

This specification covers the mechanical splicing of deformed concrete reinforcing bar for full tensile loading. The average tensile strength of the splices shall be equal to or greater than the ultimate strength of the rebar. Eighty-five percent of the splices shall have a minimum tensile strength equal to or greater than the ultimate strength of the rebar. The minimum acceptable tensile strength of any splice shall be 125 percent of the specified minimum yield strength for the particular bar size and ASTM specification.

2.0 PROCESS

All splices shall be made by the Cadweld Process using clamping devices, sleeves, charges, as specified by the Cadwell Instruction Sheets for "T" series connections. "C" series materials shall not be permitted.

3.0 QUALIFICATIONS OF OPERATORS

Prior to the production splicing of reinforcing bars, each operator or crew, including the foreman or supervisor for that crew, shall prepare and test a joint for each of the positions to be used in production work. These splices shall be made and tested in strict accordance with this specification. To qualify, the completed splices shall meet the acceptance standards of Paragraph 6.0 for workmanship, visual quality and minimum tensile strength. A list containing the names of qualified operators and their qualification test results shall be maintained at the job site.

4.0 PROCEDURE SPECIFICATION

All joints shall be made in accordance with the manufacturer's instruction sheets "Rebar Instructions for Vertical Column Joints," plus the following additional requirements.

- a. A manufacturer's representative, experienced in Cadweld splicing of reinforcing bar, shall be present at jobsite at the outset of the work to demonstrate the equipment and techniques used for making quality splices. He shall also be present for at least the first 25 production splices to observe and verify that the equipment is being used correctly and that the quality splices are being obtained.
- b. The splices sleeves, exothermic powder, and graphite molds shall be stored in a clean dry area with adequate protection from the elements to prevent absorption of moisture.

- c. Each splice sleeve shall be visually examined immediately prior to use to ensure the absence of rust and other foreign material on the ID surface.
- d. The graphite molds shall be preheated with an oxyacetylene or propane torch to drive off moisture at the beginning of each shift when the molds are cold or when a new mold is used.
- e. Bar ends to be spliced shall be power brushed to remove all loose mill scale, rust, concrete and other foreign material. Prior to power brushing all water, grease and paint shall be removed by heating the bar ends with an oxyacetylene or propane torch.
- f. A permanent line shall be marked 12 inches back from the end of each bar for 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 shall be preheated with an oxyacetylene or propane torch to ensure complete absence of moisture.
- h. Special attention shall be given to maintaining the alignment of sleeve and guide tube to ensure a proper fill.
- i. When the temperature is below freezing or the relative humidity is above 65 percent, the splice sleeve shall be externally preheated with an oxyacetylene or propane torch after all materials and equipment are in position.

5.0 JOINT TESTING

- a. All completed splices shall be visually inspected at both ends of the splice sleeve and at the tap hole in the center of the splice sleeve.
- b. Selected splices shall be tensile tested in accordance with the following schedule for each position, bar size and grade of bar.
 - 1 out of first 10 splices
 - 2 out of the next 100 splices
 - 3 out of the next and subsequent units of 100 splices
- c. Test splices as noted in a. above may be made by having test bars of 3-foot length spliced in sequence with the production bars. This will eliminate the need for cutting out test splices from the production work and replacing them with 2 additional splices while still maintaining actual on-site conditions.

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6.0 JOINT ACCEPTANCE STANDARDS

- a. Sound, nonporous filler metal shall be visible at both ends of the splice sleeve and at the tap hole in the center of the splice sleeve. Filler metal is usually recessed $\frac{1}{2}$ inch from the end of the sleeve due to the packing material, and is not considered a poor fill.
- b. Splices which contain slag or porous metal in the riser, tap hole or at the ends of the sleeves (generally porosity) shall be rejected. A single shrinkage bubble present below the riser is not detrimental and should be distinguished from general porosity as described above.
- c. There shall be evidence of filler material between the sleeve and the bar for the full 360 degrees; however, the splice sleeves need not be exactly concentric or axially aligned with the bars.
- d. The average strength of the Cadweld joints shall be equal to or greater than the specified minimum tensile strength for the particular bar size and ASTM Specification. Eighty-five percent of the splices shall have a minimum tensile strength equal to or greater than the ultimate strength of the rebar. The minimum acceptable tensile strength of any splice shall be 125 percent of the specified minimum yield strength for the particular bar size and ASTM Specification.

7.0 REPAIRS

- a. Joints which do not meet the visual quality acceptance standards of Section 6.0 shall be rejected and completely removed. The bars shall then be rejoined with a new splice made in accordance with these specifications.
- b. No failures of Cadweld splices below the required minimum tensile strength are expected; however, in the unlikely event that one should occur it would be sent to an independent testing laboratory for analysis of failure. Based on the testing laboratory's report, additional samples would be taken to ensure that there are no other defective splices.

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