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APPENDIX 5CSPLICING REINFORCING BARUSING THE CADWELD PROCESS1. SCOPE

These procedures cover 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 specified minimum tensile strength of the rebar. The minimum acceptable tensile strength of any splices shall be 125 per cent of the specified minimum yield strength for the particular bar size and ASTM specification.

2. RECORDS

Adequate records shall be maintained of all splices made by the Cadweld Process for "T" series connections. Records will include splice location, splicing crew and material used.

3. 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 procedure. 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. PROCEDURE

All joints shall be made in accordance with the manufacturer's instruction sheets, "Rebar Instructions for Vertical Column Joints," plus the following 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 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, 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 insure the absence of rust and other foreign material on the I.D. 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 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 oxacetylene 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 oxacetylene or propane torch to insure complete absence of moisture.
- h. Special attention shall be given to maintaining the alignment of sleeve and guide tube to insure 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 oxacetylene or propane torch after all materials and equipment are in position.
- j. Splice sleeves are wrapped in a special rust inhibiting paper. Sleeves shall not be unwrapped until they are to be used in the joining procedure.

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TESTING

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. For purposes of quality control, production splices representing the work of each splicing crew shall be tensile tested for each position, bar size and grade of bar. The number and frequency of tests for each splicing crew shall be as follows:

- a. One out of the first lot of ten splices for each position, bar size and grade of bar.
- b. Two out of the next and subsequent lots of one hundred splices for each position, bar size and grade of bar.

The first five tensile test specimens shall be made by cutting out randomly selected production splices. Thereafter, at least one of every twenty tensile tests shall be made from production splices. At least one tensile test specimen shall be cut out from an actual production splice for each position, bar size and grade of bar. The remainder of the required tensile tests may be made from three feet long test bars spliced in sequence with and in an otherwise identical manner as the production splices.

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6 ACCEPTANCE STANDARDS

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 1/4 inch from the end of the sleeve due to the packing material, and is not considered a poor fill.

Splices which contain slag or porous metal in the riser, tap hole or at the ends of the sleeves (general 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.

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.

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 an 18S splice shall not exceed three (3) square inches per end of splice sleeve. The area of the void shall be assumed to be the circumferential length as measured at the inside face of the sleeve times the maximum depth of wire probe minus 3/16".

The average tensile strength of the Cadweld joints shall be equal to or 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 shall be equal to or greater than 125 percent of the specified minimum yield strength for the particular bar.

7 REPAIRS

Splices which do not meet the visual quality acceptance standards of Paragraph 6.0 shall be rejected and completely removed. The bars shall then be rejoined with a new splice made in accordance with these procedures.

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 Test Lab's report, additional samples would be taken to ensure that there are no other defective welds.

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