WIRE REINFORCEMENT INSTITUTE®

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Technical Blog

Effectively Specifying Welded Wire Reinforcement

The design professional typically has two primary choices when it comes to specifying welded wire reinforcement (WWR). The Wire Reinforcement Institute refers to these choices as Direct or Pre-Approved.

With **Direct Specification**, the design professional is obligated to annotate and/or detail – at a minimum - the following attributes on the construction documents:

1. Wire yield strength
2. Wire size
3. Wire spacing
4. Wire orientation and geometric layout (bent geometries, positioning within the concrete element)
5. Wire development and lap splicing

The **Direct Specification** approach is desirable from the standpoint of giving the design professional explicit illustrative control over the usage and extents of WWR on a given project. On the flipside, by preemptively defining WWR in this way, there are two possible disadvantages: first, it is possible that the specified configurations end up not being the most economical and appropriate solution when viewed through the lens of manufacturer producibility, and second, the engineer is potentially restricting the contractor's ability to identify and propose reinforcement applications that – from a constructability and workflow standpoint – may (or may not) be a good fit for the WWR product.

In contrast to Direct Specification, WWR can be specified as a **Pre-Approved Equal**. This method builds off of the likelihood that most structural construction documents, by default, present details and annotations in terms of deformed reinforcing bars as the primary reinforcement. By then specifying WWR as a Pre-Approved Equal, the design professional establishes prescriptive material equivalencies to rebar, as well as application inclusions (or exclusions) to provide guidance to the contractor on those usages for which a WWR substitution in place of rebar are pre-approved.

The **Pre-Approved Equal** method is attractive for a number of reasons. First, it limits the design professional's WWR detailing obligation to only the most basic typical detailing and scheduling (i.e., no project-specific WWR detailing or annotations). Second, it affords the contractor the ultimate flexibility on when and where to leverage the use of WWR, with due consideration for a project's schedule, spatial demands, and overarching means and methods. Third, and perhaps most importantly, the **Pre-Approved Equal** method brings the WWR manufacturer's technical staff into the loop, a value-added asset who is best-positioned to define the most appropriate WWR solution that ensures manufacturability without compromise to the engineer's structural design intent.

An example of **Pre-Approved Equal** language is shown below in the form of simple prescriptions introduced as part of the general notes section of the construction documents.

MILD REINFORCING STEEL

1. TYPICAL DEFORMED REINFORCING BARS (REBAR) SHALL BE ASTM A615, GRADE 60. SPECIAL MOMENT FRAME BEAM AND COLUMN LONGITUDINAL REINFORCEMENT AND SHEAR WALL BOUNDARY VERTICAL REINFORCEMENT SHALL CONFORM TO ASTM A706, GRADE 60.
2. BARS SHALL BE PROVIDED AS CONTINUOUS, UNINTERRUPTED PIECES WHERE MANUFACTURE AND TRANSPORT PERMIT SUCH LENGTHS, UNLESS PROJECT DETAILS EXPLICITLY ILLUSTRATE OTHERWISE. DETAILED LAP SPLICE POSITIONING SHALL NOT BE ALTERED.
3. WELDED DEFORMED WIRE REINFORCEMENT SHALL CONFORM TO ASTM A1064 (GRADE 70) AND SHALL BE PROVIDED IN SHEET FORM, UNLESS OTHERWISE NOTED. LAP SHEETS PER THE WELDED WIRE REINFORCEMENT LAP SPLICE TYPICAL DETAIL, UNLESS OTHERWISE NOTED.
4. MILD STEEL REINFORCING BARS SPECIFIED ON THESE STRUCTURAL CONTRACT DRAWINGS ARE PERMITTED TO BE REPLACED BY ASTM A1064 WELDED DEFORMED WIRE REINFORCEMENT (WWR) IN ALL APPLICATIONS, WITH THE FOLLOWING EXCEPTIONS:
   A. SPECIAL MOMENT FRAME LONGITUDINAL REINFORCEMENT
   B. SPECIAL STRUCTURAL WALL (SHEAR WALL) VERTICAL REINFORCEMENT
   C. COUPLING BEAM DIAGONAL REINFORCEMENT
5. WWR SUBSTITUTIONS SHALL NOT ALTER THE REINFORCEMENT UNIT CROSS-SECTIONAL AREA, MAXIMUM DETAILED SPACING, ALIGNMENT, AND GEOMETRIC CURTAILMENT AS PRESENTED IN THE STRUCTURAL CONTRACT DRAWINGS.
6. FABRICATOR DETAILING OF WWR SHALL REFLECT POSITIONING OF STRUCTURAL WIRES AND NON-STRUCTURAL HOLDING WIRES THAT BEST MINIMIZES INTERFERENCE WITH OTHER STRUCTURAL COMPONENTS.
7. MANUAL (STICK) WELDING OR TACK WELDING OF REBAR OR WELDED WIRE REINFORCEMENT IS STRICTLY PROHIBITED UNLESS EXPLICITLY DETAILED OTHERWISE AS AN INTENTIONAL CONNECTION ON THESE DRAWINGS. STRUCTURAL WELDING OF REINFORCING BARS SHALL CONFORM TO AWS D1.4. STRUCTURAL WELDING OF WELDED

In next month's blog entry we will explore in greater detail the expanded role played by the WWR manufacturer's detailer when a design professional elects to specify WWR as a Pre-Approved Equal.

For more information on WWR specification methodology, refer to the WRI Manual of Standard Practice and the WRI Welded Wire Reinforcement Design and Detailing Guide, both found at www.wirereinforcementinstitute.org.