

# Placing Drawings – The Detail Drawings for Reinforcing Bars in Site-Cast Reinforced Concrete Construction

## Introduction

The terminology regarding the detail drawings for reinforcing bars in site-cast reinforced concrete construction is often misused in contract documents\* and is not an accurate description of the detail drawings. The issue of terminology is real. It is not a trivial nor a scholarly matter of semantics. Rather, the inappropriate “labeling” of the detail drawings for reinforcing bars can result in:

- Unnecessary added costs to the Reinforcing Bar Fabricator, which are ultimately passed on.
- Issues regarding responsibility and ethics.
- Time delay due to drawing submission protocols.

## Objective of This Report

The aim of this report is to:

- Define and describe “placing drawings” - the detailed drawings for the reinforcing bars in site-cast reinforced concrete construction.
- Dispel the notion that “one size fits all” in the descriptions of the detail drawings for construction materials and products.

## What are Placing Drawings

Placing drawings are working drawings akin to erection or assembly type drawings, instructing the field Ironworker (Placer) where to place the reinforcing bars within the formwork. Placing drawings may also indicate the bar support layout and a placing sequence, thus facilitating the efficient installation of the reinforcing bars.

Placing drawings are prepared by Detailers, trained technicians who are extremely proficient in interpreting the structural information shown by the contract documents. At no time does a Detailer make an engineering decision. In fact, in today’s litigious society, a Detailer would be foolish to accept this responsibility.

Figure 1 shows an example of a placing drawing.

A Detailer prepares a list of the reinforcing bars that are shown on the placing drawings. A bar list is a listing of reinforcing bars making up a bill of materials. The bar list contains the quantities, sizes, lengths, and bending dimensions of the reinforcing bars. These lists serve several purposes. The Fabricator uses a bar list for shearing and bending, tagging, shipping, and invoicing. The Ironworker Foreman and the placing crew use a bar list for checking delivery quantities, sorting bundles of bars in the job-site lay-down area, and hoisting of proper bundles to the placing area.

Figure 2 shows an example of a bar list.

\*See the Terminology section for definitions of certain terms used in this report.

Placing drawings are **not used** in the fabricating shop, per se. Thus, the generic term “shop” when applied to the detail drawings for reinforcing bars in site-cast concrete construction is extremely inappropriate.

## Responsibility Issues

Responsibility for the preparation, review, and approval of placing drawings is established in the ACI detailing standard and in the ASCE quality manual.

**ACI 315 Detailing Standard.** The USA consensus standard for detailing reinforcing bars for site-cast reinforced concrete construction is promulgated by the American Concrete Institute: “Details and Detailing of Reinforcement (ACI 315-99).”

ACI 315 clearly addresses the responsibilities of the Architect/Engineer regarding placing drawings:

*“The responsibility of the Architect/Engineer is to furnish a clear statement of design requirements to the Detailer. The Architect/Engineer’s project specifications or structural drawings must not merely refer the Detailer to an applicable building code for information to use in preparing the placing drawings. Instead, this information shall be interpreted by the Architect/Engineer and shown in the form of specific design details or notes for the Detailer to follow. Where omissions, ambiguities, or incompatibilities are discovered, additional information, clarifications, or corrections shall be requested by the Detailer and provided by the Architect/Engineer. The Architect/Engineer should require in the project specifications that placing drawings be submitted for approval.”*

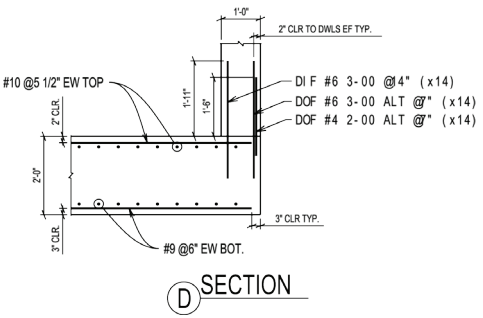
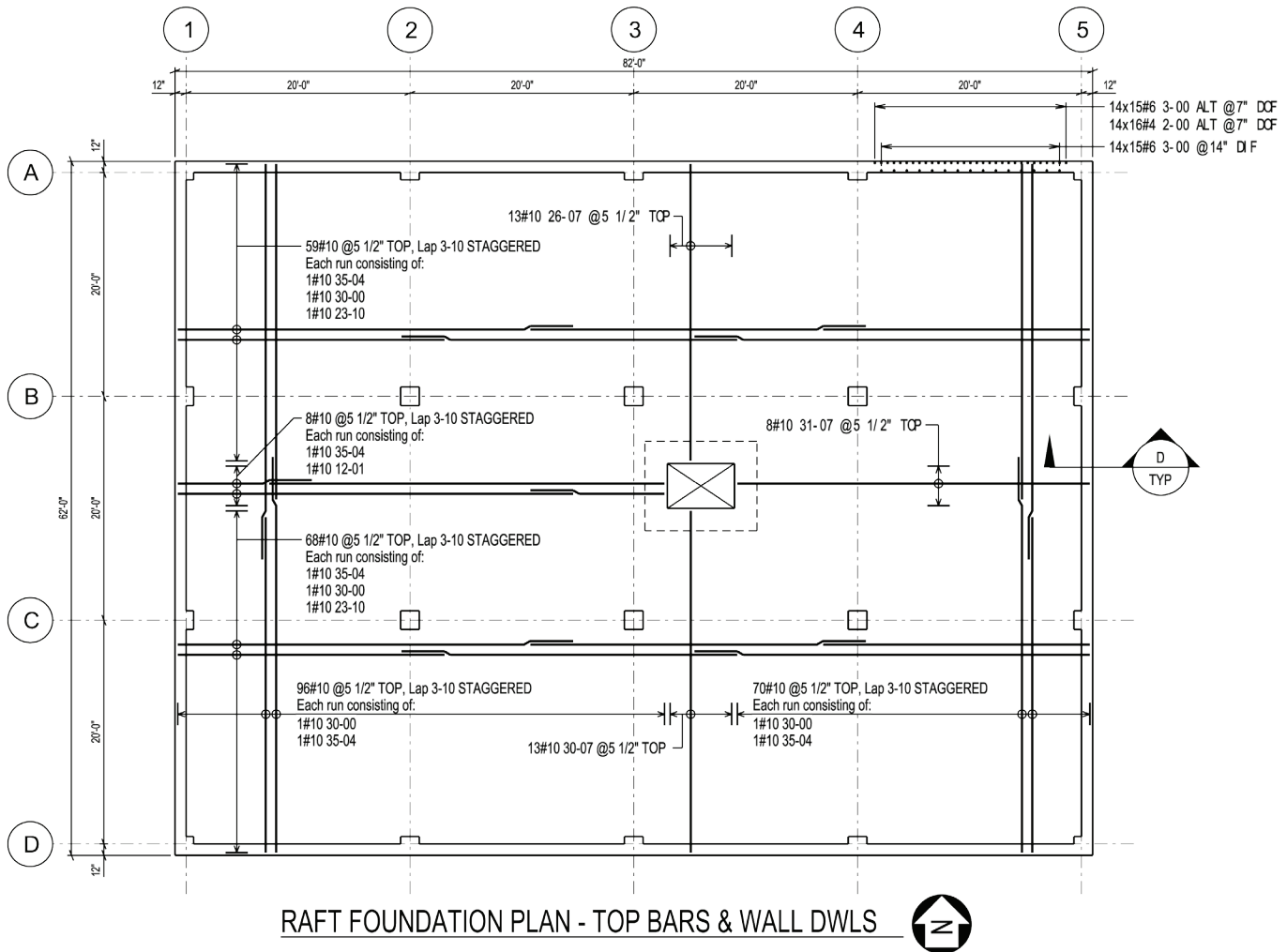
Regarding the Detailer’s responsibility, ACI 315 states:

*“The responsibility of the Detailer in preparing placing drawings is to carry out all instructions on the Contract Documents.”*

**ASCE Quality Manual.** ASCE’s Manual No. 73, *Quality in the Constructed Project*, addresses the role of placing drawings for reinforcing steel in cast-in-place concrete construction. Chapter 17 of the manual is titled Construction Contract Documentation and Submittals. Article 17.3.8 (Placing Drawings for Concrete Reinforcing Steel) states in part:

*“... The design professional has authority and responsibility for overall design of the completed structure and for the review and approval of the placing drawings for conformance with the project design concept and the information in the construction contract documents.”*

*The constructor and subcontractors have responsibility for preparing the placing drawings, providing the materials specified, and completing the fabrication and construction process. This work is carried out in accordance with the construction contract documents, approved placing drawings, and accepted industry standards.*



**Figure 1 - Example of a placing drawing**

*In most cases, placing drawings for reinforcing steel in cast-in-place concrete do not need design services and it is not necessary or appropriate for the contract documents to call for certification by a licensed engineer. For post-tensioned, pre-stressed, cast-in-place concrete structures, the design professional may delegate certain design activities to ... "*

## Design Responsibility

**Structural Detailing of Reinforcement.** Proper structural detailing of reinforcement is critically important to attain the desired level of performance of reinforced concrete structures. Adequate anchorage or embedment lengths and splices of reinforcing bars are crucial.

Since the structural details of reinforcement are critically important, it is unrealistic for the Architect/Engineer to require or expect the Detailer to perform the structural detailing - the Detailer is not qualified to do so.

The ACI 318 Building Code properly assigns certain responsibilities to

the Architect/Engineer regarding the structural detailing of anchorage or embedment lengths and splices of reinforcement. In Chapter 26 of the Code, Section 26.6.1.1 states:

*"Design information that the licensed design professional shall specify in the construction documents:*

- *Type, size, location requirements, detailing, and embedment length of reinforcement*
- *Location and length of lap splices*
- *Type and location of mechanical and welded splices"*

This point is further emphasized in Section 26.6.2.2(c), which states:

*"Splices in reinforcement shall be made only as permitted in the construction documents, or as authorized by the licensed design professional."*

In his presentation at the October 1998 PCI Convention and Exhibition, Norman L. Scott, an eminent Structural Engineer, included comments on the issue of design responsibility. Mr. Scott was actively involved with the ASCE Committee on the development of Manual 73 and the ACI Board Committee that prepared "ACI Guidelines for Authorities and Responsibilities in Concrete Design and Construction".

Regarding placing drawings, Mr. Scott stated:

*"... The reinforcing steel fabricators who supply reinforcing bars for cast-in-place concrete say they never do any design work and, therefore, it is not necessary to sign their submissions, which they prefer to call placing drawings. The ACI responsibility committee looked at this practice very carefully and concluded that they [the reinforcing steel fabricators] are right. There are essentially no reinforcing bar suppliers who do design work; they just do the detailing."*

Lengths in Imperial Job#: ET859933 Asby Laboratories Weights in Imperial (lb)  
 Cust#: 584929 Duckworth Construction Co.  
 Release: 01000 Basement Elevator Pit

Bid: 001 (HOTEL BUILDING)  
 Sac: 650 MISC., PITS  
 Code: Cust Late Order (Bill Adj: 1)

MTR: Yes  
 Lab: N/A  
 Status: Fabbled

Item#	Type	Qty	Part	Grade	TotLgt	Mark	Bend	A	B	C	D	E	F	G	H	K	R	J	O	Weight
<b>Color</b>																				
<b>Remarks</b>																				
<b>FOUNDATIONS</b>																				
Item#	Type	Qty	Part	Grade	TotLgt	Mark	Bend	A	B	C	D	E	F	G	H	K	R	J	O	Weight
0002	Str	17	6+	A706/	16-10															430
0003	Str	17	6+	A706/	16-9															428
0004	Str	4	8+	A706/	16-0															171
0005	Str	4	8+	A706/	17-9															190
0006	Str	4	8+	A706/	19-9															211
0007	Str	4	8+	A706/	22-3															238
0008	Str	4	8+	A706/	25-0															267
0009	Str	11	5+	A706/	16-6															189
0010	Str	12	6+	A706/	15-6															279
0011	Str	12	6+	A706/	16-6															297
0012	Lig	30	4+	A706/	7-3 1/2	4A21	26S	1-0	2-0	1-2 3/4	0-10	1-2 3/4	2-0	1-0						146
0013	Hea	44	6+	A706/	9-0 3/4	6A60	2		7-0 3/4											599
0014	Hea	12	8+	A706/	36-4 1/2	8A34	3		1-4	9-11 1/2	13-9 1/2	9-11 1/2	1-4		7-1 1/4	6-11 3/4			30-5	1165
0015	Hea	12	8+	A706/	36-1 1/4	8A35	3		1-4	9-11 3/4	13-5 3/4	9-11 3/4	1-4		7-1 1/2	7-0			30-1 3/4	1157
0016	Hea	20	8+	A706/	16-0	8A36	17		8-0	8-0										854
				282-66		-Hash	Totals -	1-0	19-8	27-24	26-24	19-24	4-8	1-0	14-2	13-11	0-0	0-0	60-6	

Size	Total #	Total Pcs	Total Weight	Stock Weight	Straight Pcs	Straight Weight	Heavy #	Heavy Pcs	Heavy Weight	Light #	Light Pcs	Light Weight	Medium Pcs	Medium Weight	Spiral Pcs	Spiral Weight	Thread Pcs	Thread Weight
Rebar-Black	A706/6																	
4/13 Bar	1	30	146	0	0	0	0	0	0	1	30	146	0	0	0	0	0	0
5/16 Bar	1	11	189	0	11	189	0	0	0	0	0	0	0	0	0	0	0	0
6/19 Bar	5	102	2033	0	58	1434	1	44	599	0	0	0	0	0	0	0	0	0
8/25 Bar	8	64	4253	0	20	1077	3	44	3176	0	0	0	0	0	0	0	0	0
Size Tot:	15	207	6621	0	89	2700	4	88	3775	1	30	146	0	0	0	0	0	0
RptTot:	15	207	6621	0	89	2700	4	88	3775	1	30	146	0	0	0	0	0	0

Figure 2 - Example of a bar list

## Approval of Placing Drawings

Some project specifications require that reinforcing steel placing drawings be sealed by a licensed Professional Engineer employed by the Fabricator. The application of a licensed Professional Engineer's seal implies that the Engineer was "in responsible charge of," not merely a contributor to, the work. In some states, a contributor may seal a drawing only if the registrant in responsible charge also seals the drawing.

Also some states, in their statutes on professional engineering practice, specifically prohibit the sealing of any drawings except those prepared under the supervision of the "design professional" or "Engineer-of-Record" in responsible charge. One way in which a licensed Professional Engineer employed by the Fabricator could ethically seal the placing drawings would be to, in effect, redesign or re-engineer the structure. This redesign effort by the Fabricator's licensed Professional Engineer would not, however, necessarily relieve the Fabricator's licensed Professional Engineer of violations of applicable state statutes governing engineering practice. Another way would be if the Engineer-of-Record was directly involved in the process of preparing placing drawings - being in responsible charge by supervising the process and reviewing the results.

Since the Fabricator's Detailers make no engineering decisions but only determine the number of bars from pre-established spacings, bar lengths, and bar positioning from instructions provided in the Architect/Engineer's project specifications and structural drawings, there is nothing to be in responsible charge of to seal. All directions of structural importance are provided by the Architect/Engineer.

Occasionally, there are errors in these instructions and opportunities for misinterpretations, as there also can be on the Fabricator's placing drawings. The desire for error-free construction is of importance to all. Requiring the Fabricator to have a licensed Professional Engineer seal the placing drawings, however, does not satisfy this desire.

Aside from possible ethical violations, if a licensed Professional Engineer employed by the Fabricator were to seal the placing drawings, it would be most likely after a review of drawings prepared by others. Since this engineer was not in responsible charge and has little knowledge of the Architect/Engineer's intentions other than what is shown on the structural drawings and project specifications, the placing drawings must still be reviewed and approved by the Architect/Engineer in responsible charge. The result is another layer of engineering expense but certainly not another layer of engineering protection for society. The Architect/Engineer of record, in responsible charge, must be the one to review and approve reinforcing steel placing drawings.

It is important to recognize the difference between a structural steel Fabricator's service, such as designing structural steel connections, where engineering decisions may be required and a reinforcing steel Fabricator's service preparing reinforcing steel placing drawings where engineering decisions are never required. Even the decision as to whether a structural steel Fabricator's drawings shall be sealed by a licensed Professional Engineer employed by the Fabricator must be made on the basis of whether independent engineering decisions that the Fabricator was in responsible charge of appear on the drawings.

**Who Should Approve Placing Drawings?** Unequivocally, the final decision-maker—the Architect/Engineer. Only the Architect/Engineer has performed the analyses for all loading effects on the structure and knows the effective area of reinforcing steel required at all points, and thus is the only party that should provide interpretations of Code requirements.

## Placing Drawings - Other Aspects

Placing drawings are prepared specifically for each individual structure. They are not produced from a general collection of drawings and sketches. Therefore, the project specifications should allow for an adequate time frame for submission, correction, and approval of the placing drawings.

Exchanging drawings electronically, as CAD or PDF files, is a way to save time and improve the accuracy of placing drawings. CRSI's *Manual of Standard Practice* (Section 6.4.1) describes the electronic exchange of drawings and the responsibility of the Detailer in such a process:

*"When both the Architect/Engineer and Detailer have CAD (Computer-Aided Design) capability, the electronic exchange of drawings using, for example, disks or phone lines, is highly recommended. Such exchange of electronic files can further assure that the Architect/Engineer's intentions are conveyed to the Detailer with less need for further interpretation. In turn, the Detailer is able to provide accurate, quality placing drawings. It should be noted that when CAD files are obtained from outside sources, it is the responsibility of the Detailer to remove all information not directly relevant to the creation of placing drawings as well as all references to the outside sources of the files. It is also the responsibility of the Detailer to adhere to the original and revised project drawings and project specifications while detailing the reinforcement for the structure."*

## Closing Comments

This report has presented the following arguments:

- The detail drawings for reinforcing bars in site-cast reinforced concrete construction are called placing drawings.
- Since there is no design involved in the preparation of placing drawings, it is unnecessary for a licensed professional engineer to seal placing drawings. Plus, the imposing of such a requirement in the contract documents raises questions of responsibilities and ethics.

As a public service, technical organizations that disseminate model project specifications should adopt the proper terminology, viz., placing drawings for the reinforcing bars in site-cast reinforced concrete construction.

Likewise, architects/engineers and public agencies should adopt the term "placing drawings" in their project specifications. **The term "shop" as applied to reinforcing bar placing drawings is not only inappropriate, but obsolete and inaccurate.**

## Terminology

The source of the following terms and their definitions is "Specifications for Structural Concrete (ACI 301-10)":

**Architect/Engineer or Engineer/Architect** - Architect, Engineer, architectural firm, engineering firm, or architectural and engineering firm issuing Contract Documents or administering the Work under Contract Documents, or both.

**Contract Documents** - A set of documents supplied by Owner to Contractor as the basis for construction; these documents contain contract forms, contract conditions, specifications, drawings, addenda, and contract changes.

**Project Drawings** - Graphic presentations of project requirements.

**Project Specifications** - The written document that details requirements for Work in accordance with service parameters and other specific criteria.

**Work** - The entire construction or separately identifiable parts thereof required to be furnished under Contract Documents.

The ACI 315 detailing standard is the source for the following definition of Detailer:

**Detailer** - Drafter who prepares reinforcing bar placing drawings and bar lists.

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