October 28, 2008

Memorandum to: Members ACI-CRSI Committee 315 - Details of Concrete Reinforcement

Gregory P. Birley  
Richard H. Birley  
Charles K. Davidson  
Ronald D. Flach  
Garrick N. Goldenberg  
Paul Gordon  
Todd R. Hawkinson  
Jay A. Hetherington  
Bruce H. Hirsch  
David F. Horton  
Dennis L. Hunter  
David W. Johnston  
Mahamoud E. Kamara  
David G. Kitttridge  
James S. Lai  
Douglas D. Lee  
Amadeus L. Magpile  
Javed B. Malik  
Peter Meza  
Donald E. Milks  
Paul Nims  
Christopher J. Perry  
Roy H. Reiterman  
Scott Richardson  
Dale Rinehart  
Thomas G. Schmaltz  
Clifford W. Schwinger  
William G. Sebastian  
Milton R. Sees  
Avanti C. Shroff  
Richard D. Thomas  
David M. Vout

From: Anthony L. Felder  
Secretary

Subject: Meeting Notice and Agenda  
November 2, 2008  
Renaissance Grand & Suites Hotel  
St. Louis, Missouri

Our next meeting will be held on Sunday, November 2, 2008 from 2:00 p.m. to 5:00 p.m. in the Portland Room of the Renaissance Grand & Suites Hotel.

A proposed agenda is attached.

Copy to: Daniel W. Falconer, ACI Technical Director
AGENDA
ACI/CRSI COMMITTEE 315 - DETAILS OF CONCRETE REINFORCEMENT

November 2, 2008

1. 2:00 p.m. - call meeting to order

2. Approval of minutes of last meeting, March 30, 2008, distributed July 9, 2008

3. Committee membership changes since last meeting. See Exhibit 1, current roster.

4. ACI/CRSI 315 Standard
   a. Continue discussion of 315 Standard’s future: submission of revisions to ACI 318 and 301
   b. General discussion of remaining parts of the current 315 Standard:
      Chapter 4 Fabricating Practice Standards
      Chapter 5 Supports for Reinforcing Steel
      Chapter 6 Computer-Assisted Detailing
      Chapter 7 Recommended Practices for Location of Bars Designated Only by Size/Spacing
      Figs. 1 to 19 Various Details
      Table 1 Standard Hooks
   c. CRSI’s Reinforcing Bar Detailing. See Exhibit 2.
   d. Reapproval of ACI 315-99


Secretary’s Note: Subcommittee B is scheduled to meet on Sunday, November 2, 2008 from 8:30 a.m. to 11:30 a.m. in the Landmark 2 Room of the Renaissance Grand.

6. New business
ACI/CRSI COMMITTEE 315 ROSTER
October 2008

Dennis L. Hunter, Chairman
Gerdau Ameristeel
3915 Riga Blvd
Tampa, FL 33619
Tel: 813/740-3301
Fax: 813/740-3401
E-mail: dhunter@gerdauameristeel.com

Ronald D. Flach
Titusville Fabricators, Inc.
221 7th St, Ste 303
Pittsburgh, PA 15238-3206
Tel: 412/826-8140
Fax: 412/826-8141
E-mail: rflach@titusvillefab.com

Anthony L. Felder, Secretary
Concrete Reinforcing Steel Institute
933 N. Plum Grove Road
Schaumburg, IL 60173-4758
Tel: 847/517-1200
Fax: 847/517-1206
E-mail: afelder@crsi.org

Garrick N. Goldenberg*
Goldenberg Associates, Inc.
24 Fairfax Road
Needham, MA 02492-4021
Tel: 617/444-9944
Fax: 617/444-3464
E-mail: garrickg@bigfoot.com

Gregory P. Birley
Condor Rebar Consultants
1128 Hornby Street
Vancouver, British Columbia V6Z 2L4
Tel: 604/692-2168
Fax: 604/689-9206
E-mail: greg.birley@condor-rebar.com

Paul Gordon
Paul Gordon Chartered, SE
6515 N Drake Ave.
Lincolnwood, IL 60712-4017
Tel: 312/943-3700
Fax: 312/943-3701
E-mail: pgchtd@aol.com

Richard H. Birley
Condor Rebar Consultants
1128 Hornby Street
Vancouver, British Columbia V6Z 2L4
Tel: 604/692-2165
Fax: 604/689-9206
E-mail: dick.birley@condor-rebar.com

Todd R. Hawkinson
Wire Reinforcement Institute
323 Fox Briar Lane
Ballwin, MO 63021
Tel: 314/807-4386
Fax: 806/277-3776
E-mail: todd@hawkinsonassociates.com

Charles K. Davidson
Rockford Fabricators, Inc.
6448 Irene Road
Belvidere, IL 61008-8780
Tel: 815/547-8998
Fax: 815/547-0727
E-mail: chuck@rockfordfab.com

Jay A. Hetherington**
CMC Steel Texas
PO Box 911
Seguin, TX 78156-0911
Tel: 830/372-8200
Fax: 830/372-855
E-mail: jay.hetherington@cmcsa.com

* - Associate Member
** - Consulting Member
Donald E. Milks
Consultant
PO Box 1005
Chautauqua, NY 14722-1005
Tel: 716/357-5828
Fax:
E-mail: donace@netsync.net

Paul L. Nims, Chairman
CMC Steel Group
970 Parkdale Dr
New Braunfels, TX 78130-8377
Tel: 830/606-6843
Fax:
E-mail: pnims@satx.rr.com

Christopher J. Perry
Perry & Associates, LLC
221 N LaSalle St.
Chicago, IL 60601-1206
Tel: 312/364-9112
Fax: 312/364-9163
E-mail: cjperry@PerryLLC.com

Roy H. Reiterman
Roy H. Reiterman & Associates
2266 Deer Path Ct.
Troy, MI 48098-4142
Tel: 419/348-3505
Fax: 248/641-1464
E-mail: rreiterman@sbcglobal.net

Scott Richardson**
CMC Rebar Carolinas
PO Box 1928
Gastonia, NC 28053-1928
Tel: 704/865-8571
Fax: 704/865-2713
E-mail: scott.richardson@cmcsig.com

Dale Rinehart**
JD Steel Company
4456 Cherokee St.
Denver, CO 80216-2627
Tel: 303/477-5029
Fax: 303/477-9499
E-mail: drinehart@jdsteel.com

Thomas G. Schmaltz**
Precision Rebar & Accessories, Inc.
1712 NE 99th Street
Vancouver, WA 98665-9018
Tel: 360/574-1022
Fax: 503/224-7414
E-mail: jerry@precision-rebar.com

Clifford W. Schwinger
Cagley Harman & Associates
900 W Valley Forge Rd
King of Prussia, PA 19406-4525
Tel: 610/337-3360
Fax: 610/337-3359
E-mail: cschwinger@cagleyharman.com

William G. Sebastian
Barker Steel Company
543 Wright Loop
Williamstown, NJ 08094-1224
Tel: 856/728-6645
Fax: 856/728-0088
E-mail: wsebastian@comcast.net

Milton R. Sees
Illinois Dept of Transportation
2300 S. Dirksen Pkwy, Ste 300
Springfield, IL 62764
Tel: 217/782-2151
Fax: 217/782-1186
E-mail: seesmr@dot.il.gov

* - Associate Member  ** - Consulting Member
Avanti C. Shroff  
Edwards and Kelcey  
5 Penn Plaza, 16th Floor 
New York, NY 10001-1810  
Tel: 212/944-2000  
Fax: 212/302-4645  
E-mail: avantishroff@comcast.net

Richard D. Thomas**  
CMC Rebar Florida  
2665 Prince St.  
Fort Myers, FL 33916-5527  
Tel: 239/337-3480  
Fax: 239/337-3542  
E-mail: dale.thomas@cmcsig.com

David M. Vout*  
CADS-USA  
268 W Beaver St, Ste 108  
Hallam, PA 17406-1307  
Tel: 717/757-2025  
Fax: 717/757-7095  
E-mail: dvout@gds-rightfirsttime.com

* - Associate Member 
** - Consulting Member
REINFORCING BAR DETAILING
Prepared under the Direction of the
CRSI Committee on Engineering Practice by
The CRSI Committee on Reinforcing Bar Detailing

Bruce H. Hirsch, Chairman ......................................... Dalco Industries, Inc.
David F. Horton, Vice-Chairman .............................. Barker Steel Company, Inc.
John J. Tekus, Secretary ........................................ Akron Rebar Company
Charles H. Beutnagel .............................................. Capitol City Steel Company, Inc.
Carlos A. Bonacich ................................................. Hausman Corp.
Don Bruex .............................................................. Viking Steel, Inc.
Lee Buchholz .......................................................... Ambassador Steel Corp.
Larry Campbell ....................................................... Rebar Services & Supply Co.
Ian Chambers .......................................................... CADS
Robert Christine ..................................................... SMI Rebar-Virginia
Larry Ciarkowski ..................................................... The Lofland Company
Joseph J. Clinton Jr .................................................. Rockford Fabricators, Inc.
Charles Davidson .................................................... Rockford Fabricators, Inc.
Keith Davis ............................................................ Davis Detailing Service
John R. Deibert .......................................................... ABCO Inc.
Milo O. Elston ......................................................... Fox-Howlett Industries
Gustav G. Erlemann ................................................... Consultant
William J. Farzley ..................................................... The Lofland Company of Arkansas
Robert Fitzpatrick .................................................... Consultant
Ronald D. Flach ...................................................... Titusville Fabricators, Inc.
Dennis J. Fontenot .................................................. Capitol City Steel Company, Inc.
Dennis L. Hunter ..................................................... AmeriSteel
Blake Irwin .............................................................. The Lofland Company
Mark R. Kluver ....................................................... Klein Reinforcing Services
Amadeus Magpile .................................................... Barlines Rebar Estg. & Dtlg., Inc.
Ron McCleary ........................................................... Ambassador Steel Corp.
William McKernan ................................................ Upland Contracting, Inc.
Peter Meza .............................................................. PM Consulting
Eli Nabors ............................................................... Dalco Industries, Inc.
Paul L. Nims ........................................................... Structural Metals, Inc.
Robert Orcutt .............................................................. Rio Grande Rebar Services Division
Roy H. Reiterman .................................................... Wire Reinforcement Institute
Greg Rohm .............................................................. SMI Rebar - Virginia
Thomas G. Schmitz ................................................ Precision Rebar & Accessories, Inc.
Scott D. Stevens ..................................................... Dimension Fabricators, Inc.
S. Van Taylor .............................................................. AmeriSteel
Thomas Terry .......................................................... CoMet Steel, Inc.
Dale Thomas ............................................................. SMI Rebar-South Carolina
Johnnie B. Thompson ............................................. Rebar Services & Supply Co.
Charley M. Turner ..................................................... RESCO Steel Products Corporation
Ronald J. Watson .................................................... Barsplice Products, Inc.
Anthony L. Felder, Editor ......................................... Concrete Reinforcing Steel Institute

ACKNOWLEDGMENT

This 4th edition is dedicated to those individuals listed below. Their lives were marked by diligence, hard work, and a willingness to share their knowledge with others.

William C. Black
Peter D. Courtois
Glenn D. Joyce
Leon A. Kendall,
Bertrand K. Thornley, Jr.
Copyright 2000
© Concrete Reinforcing Steel Institute
Printed in the United States of America

FOURTH EDITION, 2000

This book, or parts thereof, may not be reproduced in any form without permission of the Concrete Reinforcing Steel Institute.

The sample structural and placing drawings in this book are shown as examples of presenting information. They are not intended to establish standards for design. It is the responsibility of the Architect/Engineer (A/E) to furnish a clear statement of design requirements on the structural drawings. It is the responsibility of the Detailer to carry out these requirements. The A/E’s project specifications and drawings should not merely refer the Detailer to an applicable building code for information to use in preparing the placing drawings. Instead, this information should be interpreted by the A/E and shown in the form of specific structural details or notes for the Detailer to follow. Where omissions, ambiguities, or incompatibilities are discovered, additional information, clarifications or corrections should be requested by the Detailer and provided by the A/E. Locations of cutoff points, and amount of reinforcing steel are shown as examples of how the A/E conveys the needed information, and not as design recommendations for a specific structure.
Foreword

The Concrete Reinforcing Steel Institute is a cooperative, non-profit organization comprised of firms engaged in the production and fabrication of reinforcing bars and accessories, together with persons or entities otherwise involved in steel reinforced concrete construction.

The Institute was organized in 1924 by firms in the reinforcing bar industry for the purpose of providing industry representation before any and all individuals, groups, or agencies, in matters affecting the welfare of the industry and to carry on work in research, specifications, codes and standardization, in order to keep the industry abreast of the times and in a favorable competitive position with other types of materials used in construction work.

This book provides practical technical information in an easy-to-use and how-to-do-it manner. It is a textbook for reinforcing steel Detailers. In particular, it is an integral part of the CRSI Reinforcing Bar Detailer Training Program which supplements a working on-the-job training program.
Preface

This book provides the basic knowledge for a Detailer of reinforcing bars, bar supports and welded wire fabric. Detailing, described briefly, is the preparation of placing drawings complete with bills of material with sufficient information for: (1) the Fabricator to cut and bend the bars and to order, when required by the Contract, the bar supports and welded wire fabric; and (2) the Ironworkers to install these products at the jobsite.

The reader is shown how to translate and transfer the requirements presented on structural drawings and other documents onto a workable placing drawing. The language and form of the information are emphasized to achieve simplicity and efficiency for the end users—the Ironworker and the Fabricator.

This book is intended for use by technical schools, junior colleges, and for on-the-job training programs. It is assumed that the reader has completed basic courses in high school mathematics, including elementary algebra and plane geometry. Trigonometry is desirable for the beginner and is necessary for more advanced training. The reader should have completed a course in elementary drafting and have some knowledge of blueprint reading. A course in computer-aided drafting (CAD) is recommended and will most likely be required by companies where CAD is in use. It is also recommended that the reader possess basic computer skills such as those used in data entry, word processing, and spreadsheet type applications.

Each reinforcing steel company may use somewhat different detailing practices and different formats for its placing drawings and bills of materials to suit its particular operation. This book represents basic and generally accepted practices. Adjustments to a particular company’s system should be minor.

After completing Part I, the Detailer should have an overall perspective to prepare for Part II. In Part II, the actual study of rebar detailing begins.

ACKNOWLEDGMENTS

Figures 4-2a through 4-16 are reproduced with permission from the publication *Formwork for Concrete*, a copyrighted publication of the American Concrete Institute.

A special note of appreciation to the following companies, who kindly donated their time and expertise to updating the figures in Chapters 16 through 23.

* Akron Rebar Company*
* AmeriSteel*
* Barker Steel Company, Inc.*
* The Lofland Company*
* Rockford Fabricators, Inc.*
* Structural Metals, Inc.*
PART I—Fundamentals

Chapter 1—Reinforcing Bars ..........1-1 to 1-4
  Introduction ..........................1-1
  Coated Reinforcing Bars ...........1-3

Chapter 2—Concrete .................2-1 to 2-2
  Introduction ..........................2-1
  Concrete Strength ....................2-1

Chapter 3—Reinforced Concrete
  Structures ...........................3-1 to 3-14
    General ................................3-1
    Stresses in Concrete .................3-2
    Loads and General Reinforcing
    Steel Location .......................3-4
    Individual Reinforced Concrete Members ...3-4

Chapter 4—Formwork ..................4-1 to 4-8
  General ................................4-1
  Footings ................................4-1
  Columns ................................4-3
  Beams, Girders and Slabs ............4-5
  One-Way Joists .........................4-5
  Two-Way Joists or Waffle Slab .......4-6
  Flat Slab and Flat Plate ............4-6
  Metal Deck ............................4-7

Chapter 5—Contract Drawings ........5-1 to 5-2
  General ................................5-1
  Structural Drawings ....................5-1

Chapter 6—Project Specifications ...6-1 to 6-2
  Introduction ..........................6-1

Chapter 7—Placing Drawings ........7-1 to 7-2
  Introduction ..........................7-1

Chapter 8—Splices of Reinforcing
  Bars ..................................8-1 to 8-6
    General ................................8-1
    Length Limitations ...................8-1
    Types of Splices .....................8-2
    Bundled Reinforcing Bar Splices ....8-4

Chapter 9—Bar Supports ..............9-1 to 9-2
    General ................................9-1
    Wire Bar Supports ....................9-1
    Precast Concrete Bar Supports ....9-2
    All-Plastic Bar Supports ............9-2
    Bar Supports for Epoxy-Coated Bars ...9-2

Chapter 10—Welded Wire
  Fabric ................................10-1 to 10-4
    Introduction ........................10-1
    ASTM Specifications ................10-1
    Style Identification .................10-1
    Common Styles .......................10-1
    Lap Splicing ........................10-1
    Detailing ............................10-2
    Epoxy-Coated Wire and WWF ..........10-2

Chapter 11—Drafting Room Practices and
  Organization ........................11-1 to 11-6
    General ................................11-1
    Calculators and Computers ..........11-4

Chapter 12—Estimating
  Practices ............................12-1 to 12-4
    Introduction ........................12-1

Chapter 13—Detailing Practices 13-1 to 13-2
  General ................................13-1

Chapter 14—Bar Fabricating
  Practices ............................14-1 to 14-4
    General ................................14-1

Chapter 15—Construction
  Practices ............................15-1 to 15-2
    General ................................15-1

PART II—Applications of Bar Detailing

Chapter 16—Detailing of Footings and
  Foundations ..........................16-1 to 16-28
    Introduction ........................16-1
    Foundations ........................16-1
    Square or Rectangular Column Footings ...16-2
    Drilled Piers ........................16-7
    Wall Footings, Between Columns ....16-8
    Wall Footings, Continuous ............16-9
    Grade Beams ........................16-11
    Combined Footings ....................16-12
    Truss-Bent Bars in Foundation Mats ...16-15
    Pile Caps ............................16-19
    Mat or Raft Foundation ..............16-21
    Strap Footing .......................16-25
Contents

Chapter 17—Detailing of Walls ........................................... 17-1 to 17-32
  Introduction .................................................. 17-1
  Foundation Walls ........................................ 17-1
  Area Wall and Stair Details ............................. 17-5
  Shearwalls .................................................. 17-13
  Tilt-up Walls ................................................ 17-17
  Masonry Walls .............................................. 17-28

Chapter 18—Detailing of Columns ................................. 18-1 to 18-32
  General ...................................................... 18-1
  Detailing Dowels for Columns ......................... 18-20
  Tied Columns with Lap-Spliced Vertical Bars ........ 18-22
  Columns with Butt-Spliced Vertical Bars—General ............................................................................. 18-24
  Columns with Butt-Spliced Vertical Bars—Compression and Tension .............................................. 18-25
  Columns for Earthquake-Resistant Construction ................................................................................. 18-25
  Special Shaped Tied Columns ......................... 18-30

Chapter 19—Floor and Roof Systems .................................. 19-1 to 19-36
  Introduction .................................................. 19-1
  One-Way Solid Slab ......................................... 19-1
  Beams and Joists ............................................ 19-6
  Flat Slab .......................................................... 19-15
  Flat Plate ....................................................... 19-19
  Waffle Flat Slab ............................................ 19-23
  Stair Slabs ....................................................... 19-30
  Girders .............................................................. 19-33

Chapter 20—Special Structures ....................................... 20-1 to 20-24
  Introduction .................................................. 20-1
  Cantilever Retaining Wall .............................. 20-1
  Counterfort Retaining Wall ............................ 20-7
  Open Channel or Canal .................................. 20-8
  Stack Foundation .......................................... 20-11
  Circular Tank ............................................... 20-16
  Turbine Foundation ....................................... 20-21

Chapter 21—Bar Lists ....................................................... 21-1 to 21-14
  General ......................................................... 21-1
  Footings and Dowels ..................................... 21-2
  Columns ......................................................... 21-2
  Floors .............................................................. 21-5
  Combined Listing—Straight and Bent Bars .......... 21-5
  Separate Listing—Straight and Bent Bars ......... 21-11
  Special Conditions ......................................... 21-11
  Accessories ................................................... 21-11
  Computer-Assisted Bar Listing ........................ 21-11

Chapter 22—Computer Detailing ..................................... 22-1 to 22-12
  General ......................................................... 22-1
  Listing Programs .......................................... 22-1
  Computer-Scheduling Programs ..................... 22-2
  Computer-Aided Detailing Programs ................. 22-2
  Tag and Production Programs ......................... 22-11

Chapter 23—Metric Rebar Detailing ................................ 23-1 to 23-10
  Introduction .................................................. 23-1
  Metric Units of Measurement ......................... 23-1
  Metric Reinforcing Bars ............................... 23-1
  Metric Rebar Detailing .................................. 23-1

Appendix A—Mathematical Tables and Formulas .................. A-1 to A-2

Appendix B—Drafting Notes ...................................... B-1 to B-4

Appendix C—Detailing Reference Data ............................ C-1 to C-22

Appendix D—Glossary ........................................ D-1 to D-10