October 10, 2014

To: Members ACI/CRSI Committee 315 - Details of Concrete Reinforcement

Voting Members:

Gregory P. Birley       Dennis L. Hunter       Mustafa A. Mahamid
Richard H. Birley       David W. Johnston    Javed B. Malik
David A. Grundler      Mahmoud E. Kamara   Christopher J. Perry
Robert W. Hall          William M. Klorman  Curtis Yokoyama
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Larry Campbell          James S. Lai         Avanti C. Shroff
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Christopher Evans       David R. Maul       Richard D. Thomas
Dennis J. Fontenot      Harold E. Reed      Farahad Zahedi
Peter Fosnough

From: Anthony L. Felder  Secretary

Subject: Meeting Notice and Agenda
          October 26, 2014
          Washington Hilton
          Washington, D.C.

Our next meeting will be held on Sunday, October 26, 2014 from 2:00 p.m. to 5:00 p.m. in the Jay Room of the Washington Hilton in Washington, D.C.

A proposed agenda is attached.

Copy to: Eldon Tipping, TAC Contact
          Daniel W. Falconer, ACI Technical Director
AGENDA
ACI/CRSI COMMITTEE 315 - DETAILS OF CONCRETE REINFORCEMENT
Washington Hilton, Washington, D.C.
October 26, 2014

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

2. Approval of minutes of last meeting, March 23, 2014, distributed July 18, 2014

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

   Secretary’s Note: As reported in the March 23, 2014 minutes, Subcommittee B has been folded back into the main Committee.

4. Committee 315 – Details of Concrete Reinforcement – General Discussion
   a. ACI Detailing Manual – 2004 – Future direction and activities
   b. 315-B Forums – Re-write and re-publish. See Exhibit 2, Forums Published in CI

5. Bend Diameters and Tolerances: Progress report by Task Group (Hall, Hunter, Perry, and Zdgiebloski)

6. Nuclear Verbatim Compliance – Robbie Hall

7. Status Reports
   a. ACI 318-14 – Greg Zeisler, ACI Staff
   b. ACI SP-17 – Greg Zeisler, ACI Staff
   c. ACI 131 and BIM - Pete Zdgiebloski

8. Constructability:
   a. Review new Forums. See Exhibit 3, (Forum #46)
   b. Review volunteer’s progress. See Exhibit 4, Index of Forums
   c. Review “Forums for Discussion”. See Exhibit 5.

9. New Business

10. Motion to Adjourn
ACI/CRSI COMMITTEE 315 ROSTER
September 2014

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## 315B Forums Published in Concrete International

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**Introduction**

In nearly every building construction project, mechanical pads and machine bases are utilized to support equipment, such as air handlers, pumps, generators, transformers, switch gears, motor control centers and so forth. More commonly called, Housekeeping pads, these items are difficult to construct as the concrete placer must be aware of their locations, place steel reinforcement where needed and ensure finishing is done properly so as the area around the housekeeping pads (HK Pads) is complete correctly.

Seismic concerns are also important in seismic regions. Engineers must ensure that not only is the equipment securely anchored to the HK Pads but that the HK Pads are anchored to the floor slab/system.

Below is a typical housekeeping pad detail. This shows drilling and grouting

![INTERIOR EQUIPMENT PAD DETAIL](image)

**Figure 1: Typical Detail of a Housekeeping pad**

Before we touch on the reinforcement detailing, it is important to note a concrete concern in this detail and one that presents itself in many construction projects; that is the height of the pad. In Figure 1, you see the Engineer called for a 4” minimum thick HK Pad. This requires the contractor use 2x6” lumber and cut down to 4 plus inches or use chalk lines inside the forms to note the height at or above 4”. In some cases Engineers and Architects will call for 4” nominal, this typically means a 2”x4” can be utilized. Repeating, typically this means one can use dimension lumber when nominal is used. If the floor slab is sloped then minimums may be required to ensure the proper depth is utilized. Later, the author will discuss other options for HK Pad thicknesses.

**General Notes: ???</b>
Cast-in-Place, Embedded Dowel Reinforcement Steel

In this situation pre-planning is required. Reinforcement is placed on the main slab steel prior to pouring the main slab. Steel “Z” bars are shown to the left in Figure 2 below show the placement of the dowels which must occur in a regular pattern around the HK pad. This can be difficult to construct. Securing the “Z” bars is difficult to maintain their position while placing the remaining steel. Once in place and the mat of steel is tied to the top, here welded wire reinforcement is shown, the system is somewhat secure but may move as concrete is poured. Additional reinforcement steel cross framing may have to be used to stabilize the set.

One-piece steel reinforcement can be utilized in this case. The Z bar then would take the shape of a top hat. Both ends would be embedded into the main slab, refer to Figure 3 below.

Figure 2: Cast-in-Place Embedded Dowels - Housekeeping pad

Drilled and Grouted

In Figure 2 above, drilled and grouted anchors can be utilized as well. Refer to the right side of Figure 2. Here, the installation of the main slab steel and concrete is not concerned with the HK Pad placement. The main slab can be finished and after curing, can be drilled for HK Pad placement. A concern here is care may have to be exercised so as not to drill into slab steel that may be present where drilled and grouted anchors are to be placed.

Another concern with the drilled and grouted system is with regards to seismic. The capacity of the drilled and grouted anchor must be checked for all conditions including uplift. Tension capacity of these anchors is an issue to be watchful of.

Sleeves and Grouted

Another option the contractor could utilize is placing sleeves into his forms at the locations where steel would be used to anchor the HK Pads. This option would require planning initially prior to pouring the main slab. Questions arise that should be asked of oneself. Are the sleeves corrugated to provide anchorage to the main slab concrete and grout internally? What type of anchor would be used? How is the area under the sleeve closed off for grouting? This method would work for anchors that would be bolted into the main slab and extend up into the HK Pad.
Seismic Concerns

Anchorage to the main slab is critical for seismic forces from the equipment and HK Pads to be transferred to the main supporting members. The engineer designing housekeeping pads should ensure the details provided address seismic forces.

Occasionally HK Pads are installed without dowels to the main slab, aren't provided with drilled and grouted anchors. Such instances may occur if a piece of equipment is added after the main slab and all other HK Pads are poured.

In this case post installed anchors can be used. Refer to Figure 3

Figure 3: Post-Installed Anchors - Housekeeping pad

Here one can see the thickness of the pad has been changed to the small dimension of the dimensional lumber. By doing so, the post-installed anchors can be ordered a bit shorter.

Engineers must check the seismic forces, if earthquakes are an issue in the area installed.

One point to this installation is the anchors can be utilized to secure the equipment at the same time, if the number of anchors provided is adequate for the design conditions.

Todd Hawkinson
2014
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<td>Wrapping Structural Steel</td>
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<td>Preassembly of Boundary Elements and Coupling Beams</td>
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<td>Limitation of Rebar Modelling</td>
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<td>Todd Hawkinsen</td>
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<td>Standard use for Bar Supports</td>
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<td>Forum #68</td>
<td>Rust on Rebar</td>
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<td>Introduction to Steel Reinforcing Bar Splices</td>
<td>Robbie Hall</td>
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**Code:** White - available; Pink - in process; Green - draft submitted; Yellow - reviewed & complete
#19 - Minimum Requirements for Drawings [Todd Hawkinson]
- Hold until the new code comes out

#25 - Mandrel Sizes and Bend Diameters [Dennis Hunter]
- A research project is underway at NC State University that is re-assessing the current bend diameters used in the industry. Due to be completed in May 2014

#33 - Slab Steps [Javed Malik]
- Usually slabs are too thin for standard hooks
- Within 20% of slab support, steps are not a big issue
- Otherwise, step needs design attention
- Use straight bars and laps rather than hooks and offsets
- Use thicker slabs to avoid stepping bottom soffit; step top only

#34 - Top of column configuration [Robbie Hall]
- Hook verticals
- Use hooked bars lapped with verticals; do not need bending capacity or development lengths
- Terminators or T-heads if possible; cannot be in the same plane
- Congestion in beams or slabs
- Round columns
- Columns at edge of slabs – where to hooks go?
- Provide lots of sketches

#35 - Top of Pile configuration [Javed Malik]
- Hook verticals
- Use hooked bars lapped with verticals; may need bending capacity or development lengths
- Terminators or T-heads
- Difficulties in confined pile caps
- Make cap thicker to develop straight bars
- Provide lots of sketches

#36 - Wrapping structural steel [Javed Malik]
- Interference of ties with 135° hooks
- Problem with bars that must penetrate I-beam web; use two lapped "J"-bars
- Use smaller structural steel and avoid the use of cross-ties as much as possible
- Composite columns are an item that has not been completely settled among engineers

#37 - Mixing grades of steel in a project [Greg Birley]
- Avoid if at all possible; price difference is minimal
- Mixing grades may cause expensive problems
- In a project
- In a member
- Segregation is difficult
- Difficult to trace grade once in concrete
- Some steel is not easily identified

October 2012
#40 - Location of offsets on column vertical bars  (Robbie Hall)
- Place offsets below beam soffit
- Note that moment is at the top of columns
- Offset of column verticals passing through beams
- Inverting column offsets, i.e. offset at bottom of column rather than at top

#41 - Alternating hooks on ties in columns and beams  (Robbie Hall)
- Extra labor
- Vibrators get caught on the hooks
- More difficult to place cages over dowels
- More difficult to install corbels and embeds
- Is alternating of 135° hooks necessary

#44 - Direction of hooks on wall and column dowels and vertical bars  (Peter Zdziebloski)
- Hook inward wherever possible
- Simpler for pre-assembly
- Walls get better development
- Use 'U'-bars for dowels

#46 - Mechanical pads and machine bases  (Todd Hawkinson)
- Provide option for embedded dowels or drill-and-grout dowels (best)
- Use dowels rather than one-piece bars
- General notes often do not apply to site situations
- Grout dowels in sleeves
- Consider seismic issue

#48 - Preassembly of Boundary elements and Coupling Beams  (Paul Brienen)

#52 - Interpreting Engineering Drawings

#53 - Sharing of CAD files  (Dave Grundler)

#55 - Interpreting Beam Schedules  (Peter Zdziebloski)
- Javed will send a sample to person who does this forum

#56 - Interpreting Beam Schedules  (Peter Zdziebloski)
- Pete is asking for someone to rewrite this forum

#67 - Standard Use of Bar Supports  (Robbie Hall)
- Reviewing CRSI document in order to write draft

#68 - Rust on Rebar  (Robbie Hall / Dennis Hunter)
- Collating various documents in order to write draft