ACEC/MaineDOT Bridge Design Subcommittee

MEETING MINUTES

June 7, 2015

Attendees:		**Location:** MaineDOT Conf. Rm 317A/B
Jeff Folsom	MaineDOT	
Laura Krusinski	MaineDOT	**Time:** 1:00 to 2:30 PM
Rich Myers	MaineDOT	
Leanne Timberlake	MaineDOT	
Jack Burgess	Becker	
Keith Donington	PB	
Tom Kendrick	MJ	
Tim Merritt	Stantec	
Mike St. Pierre	S.W. Cole	**Notes Taken By:** Mike St. Pierre

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This was the second quarter ACEC/MaineDOT Bridge Design Subcommittee meeting for 2016.

- **Introductions**
  - March 8, 2016 Meeting Minutes were accepted
  - Tom Kendrick informed this is his last meeting. Jack Burgess to become subcommittee chair through Q1 2017.

- **Information from MaineDOT (Jeff Folsom)**

  Contracting/GCA Processing Update:
  - Overview of GCA contracts was provided.
  - The Department wants to spread workload more evenly to all GCA contract holders. One or two firms have not received assignments yet but they should be issued shortly.

  2016-2017-2018 Work Plan Update:
  - Active/Inactive Projects: ±40 projects to kick-off or hand out in the coming months. Projects are heavily focused on preservation.
  - MaineDOT looking at next year's Work Plan. The work will focus heavily on preservation.

  Workload/Staffing Update:
  - Brian Reeves transferred to Multimodal
  - Mark Gray hired as CE2
  - Marcel Moreau has retired and Rick McKenna has filled his spot (Appraiser I)
  - Joel Stillwell promoted to CE2
  - Ben Walz promoted to inspector/resident

- Dan Glen and Sandy McKechie retired. One additional retiree expected in August.
- Open Positions: Assistant Technician, Senior Technician, A/E Design and Field

Group inquired about amount of retirees. No specific reason for timing of increased retirements.

- **Designers Meetings (Rich Myers)**

Rich highlighted key items from the Designer Meetings held on March 16th and April 27th, 2016.

PCINE Committee Update (3/16/2016):

- Revised NEXT Beam details and confirm latest PCINE detail are referred to in MaineDOT documents. Revisions include:
  - F-beam top flange detail to add #4 @ 12" may be substituted for the 4x4 WWF to relieve difficulty for fabricators with stirrup conflicts.
  - Bridge rail assumptions in load chart changed to concrete barrier type
  - Additional transverse reinforcing bars in top flange of F-beams inappropriately copied to D-beam details. These additional bars are not needed in D-beams.
  - Decked bulb tee details forthcoming. Closure pour details will be consistent with NEXT Beams. McFarland-Johnson doing a project in South Thompson.
  - Cracking of prestressed beams following prestress release concern in fabrication shop. Above 200psi, beams typically cracking at ends and fabricator has to crack seal. AASHTO limit is 200psi without additional reinforcing however, with additional reinforcing the limit increases to 600psi. Noted as design consideration.
  - Avoid dapped beam ends (top flange cut out) if possible as they have created diagonal cracking at corners of flange cut out and stem on few projects (ex. Pine Point Crossing in Scarborough, Maine).

NEXT Beam / Integral Abutment End Reinforcement (3/16/2016):

- Minor inconsistencies with transverse end diaphragm reinforcing at the front face of diaphragm. Transverse reinforcing have been shown as: 1) anchored to or threaded through NEXT beam stem to directly tie beam to end diaphragm or 2) placed between stems only. Consensus: Direct tie-in of end diaphragm and NEXT beam with transverse reinforcing steel not necessary and may cause constructability issues.
- Considering the tension limits and cracking at ends of prestressed beams, fixed end connections of NEXT beams may be contributing to the issue. Consideration should be given to moving from fixed to pinned connections, even on integral abutment projects.

Partial Depth Bridge Deck Panels (4/27/2016):
- Group discussion on detailing reinforcing steel in the cast-in-place portion of superstructure slabs placed over pre-cast deck panels. The designer needs to check that there will be adequate cover over the top of the reinforcing steel, especially when using slab reinforcing bars larger than #6 in the negative moment areas over pier.

NHI Micropile Training (4/27/2016):
- Garrett Gustafson and Nate Sherwood attended NHI training.
- Rule of Thumb for estimating time on ABC projects is to use 200LF or 5 micropiles per day, whichever is less.

Software Updates (4/27/2016):
- HEC-RAS 5.0.1 released. Major changes in new release include:
  - Ability to perform 2D analyses
  - Analysis types (dams/levees, sediment transport)

Temporary Detours (4/27/2016):
- Included in 2014 Standard Specifications Manual
- Concern is with who is responsible for review of temporary detour bridges? And what is the risk associated with review?
- MaineDOT Bridge to review current level of review and detail required in design.

- **Discussion Topics**

Brownville (Jeff Folsom and Rich Myers):
- Pile driving in Pleasant River
- Issue arose when discovered that contractors were calculating the cumulative vibration threshold incorrectly which is the value of concern.
- MaineDOT is finding that thresholds are being exceeded, as the monitoring is not real time.
- Cumulative threshold may limit pile driving to few strikes/day.
- Governing agencies moving toward minimizing fish injury
- MaineDOT currently addressing concerns with use of:
  - Bubble curtains. Method requires the use of a large compressor that creates a column of bubbles around the pile reducing attenuation of vibrations. Reed & Reed used a “bubble pile” made from a larger diameter pipe pile surrounding the driven pile.
  - Pile Cushions
  - Moving to single spans to eliminate in-water work, use more drilled pile types to reduce noise.
  - UNH has developed 2 real-time monitoring set ups
- Tim Merritt and Mike St. Pierre to reach out to colleagues on west coast on current state of practice.

Camber Special Provision (Total Camber):

- Trial on less critical single span bridges
- MaineDOT to require the contractor to have a camber management plan and to document the total camber at project milestones. Working drawings shall be submitted with calculated camber at release and at the time of beam erection based on the Contractor's and Fabricators anticipated schedule.
- MaineDOT passed out a sample camber management SP from the Naples project and asked for consultant feedback
- Tom Kendrick highlighted the use of a camber management plan on the decked bulb tee project due to differential camber concerns.
- Precasters can mitigate differential camber problems provided that they are directed to in the specs but it costs them money.

TRB Webinar (Tom Kendrick):

- Life-Cycle Cost Analysis
- Analysis methods presented are tedious and time consuming. Preference toward the straight-line simplified approach
- Jeff indicated that Bridge Maintenance is trying to establish LCCA at the bridge element level. He sees consultants approach Residual Value differently. Jeff would like the BDG to be updated to reflect a straight line Residual Value.

- **Questions from Consultant Community for MaineDOT**

Multiple Presence Factor for One Lane Load Condition:

- MaineDOT noticing inconsistencies in the use/non-use of the multiple presence factor for one lane conditions. The MBE does not allow a reduction in the multiple presence factor based on ADTT. If a bridge is posted and traffic is restricted to one lane, can the multiple presence factor be reduced from 1.2 to 1.0? No, the MaineDOT's preference is to apply the multiple presence factor per the code. (Note: Code states multiple presence factors are embedded in LL Distribution Factor Equations but that the engineer must manually apply if a sketch is required to compute the LL Distribution Factor.) MaineDOT ultimately wants consistent practice.

- **Questions from MaineDOT for Consultant Community:**

Scour:

- Regulators in some States prefer additional temporary impacts and riprap over cable mats unless the cable mats can be buried. It is very difficult to provide a natural bed over cable mats that will remain over time and there have been issues with cable mats shifting/bulging and cables breaking.
- Further follow up from Tim Merritt – NCHRP 587 has images of "G-blocks" that have a more substantive profile on the exposed side that regulators might be more receptive to.

Bare Decks:

- Tim Merritt contacted colleagues:
  - WisDOT's practice is for bare decks with integral wearing surface
  - MassDOT uses on bridges with increased grades due to constructability/maintenance concerns with asphalt on steep grades, use tranverse grooving (sawcut) & HPC
- VTrans uses stainless steel fibers in mix and restricts the use of MMFX due to poor corrosion resistance (Tom Kendrick)
- Contacted agencies general concern is with shrinkage cracking
- Keith Donington contacted colleagues:
  - VTrans design directive (SEI 12-001) lists 3 different levels of rebar corrosion resistance to be used depending on the bridge application. Level 1 is black bar or epoxy. Level 2 is stainless clad or dual coated (e.g. ZBar), Level 3 is solid stainless.
  - Based on their own corrosion test results MMFX rebar is not accepted by VTrans. They are evaluating continuous galvanized coated rebar (Blue Bar), and GFRP. They are experiencing a supply issue with ZBar.
  - In recent I-91 VTrans design build projects, bare concrete decks with solid stainless steel rebar have been specified in the Base Technical Proposal. The Life 360 computer program has been used by design build teams to compare the estimated design life of alternate systems (i.e. concrete strength and additives, rebar types, cover etc.)
  - For the NHDOT I-93 Widening Project, a bare concrete deck with solid stainless steel rebar has been specified for a new steel girder interchange bridge with high traction forces from turning traffic
  - VDOT's practice is to use shrinkage reduction admixtures and limit percentage of cement in mix.

- **Training Agenda**

  No specific training scheduled. Topics for consideration include:
  - NHI LRFD Substructure
  - Drilled Shaft / Micropile course

- **Subcommittee Rotation for Consultants (Tom Kendrick)**

  (2-year rotations for new members joining 2014 and later)
  Tom Kendrick retiring from committee and was thanked for his service.

a.	Keith Donington	Q4 2013 thru Q3 2016
b.	Jack Burgess	Q2 2015 thru Q1 2017
c.	Tim Merritt	Q1 2016 thru Q4 2017
d.	Mike St. Pierre (Geotech)	Q1 2016 thru Q4 2017
e.	Vacant	Q3 2016 thru Q2 2018
f.	Vacant	Q4 2016 thru Q3 2018

- **Next Meeting Date**
  - Tuesday September 13, 2016 from 1.00 to 3:00 pm

Attachments: Designer Meeting Minutes from March 16, 2016 and April 27, 2016 and Special Provision 535 – Precast, Prestressed Concrete Superstructure (Camber).

I have attempted to summarize discussions held during this meeting as accurately as possible. If there are any items discussed herein that are misrepresented in any way, please contact me within ten working days. In the absence of any corrections or clarifications, it will be understood that these minutes accurately summarize the discussions at the meeting.

Respectfully Submitted,

Michael St. Pierre, P.E.

Designers Meeting Minutes

March 16, 2016

Conference Room 317 A&B

1:00-2:00 PM

1. **Standard Notes- the mater list, who updates it and informing the Technicians**
   David Sullivan

   It was determined that there is no 'master list' for the Standard Notes. Garrett has already started compiling the Standard Notes as they are now. Dana provided him with a print out of all the Standard Notes from MicroStation which has become the official list and place to keep them. Garrett will review, update if necessary and save the list as a word document in a location yet to be determined. Any changes from the Designers will be forwarded to the Technician in charge of the Standard Notes, presently Dana, to update the MicroStation files.

2. **PCINE Update**
   Rich Myers

   Discussed issues brought up at the latest PCINE subcommittee meeting held March 10, 2016.

   - Received a copy of two PCI National documents:
     1. Recommended Practice for Lateral Stability of Precast, Prestressed Concrete Bridge Girders
     2. Manual for the Evaluation and Repair of Precast, Prestressed Concrete Bridge Products
   - Revised NEXT Beam details
     1. Make sure the latest PCINE details are being referred to; the guide details on the web were updated in January, 2016. More updates coming this spring, some of which will be mentioned here.
     2. NEXT F beams: a note will be added to the details that #4 @ 12" may be substituted for the 4x4 WWF in the top flange. Fabricators have difficulty placing the WWF over the hooked shear stirrups coming out of the beam stems.
     3. Bridge rail assumption in the load charts and details was changed to a concrete barrier type (it was previously steel bridge railing).
     4. The extra transverse reinforcing bars in the top flange at the ends of NEXT F beams were inappropriately copied over to the NEXT D details. It was

determined that these extra bars are not needed in the NEXT D beams because there is already plenty of reinforcing (2 mats) in the full depth flanges.

5. Decked bulb tee details will be forthcoming; closure pour details for NEXT beams and decked bulb tee beams will be made consistent.
6. Tension in the top of the beams at the ends after prestress release has been an issue in the shop, particularly when tension stress exceeds 200 psi. Above 200 psi, the beams are typically cracking and the fabricator has to crack seal. Without additional reinforcing, the AASHTO limit is about 200 psi, but if additional reinforcing is added, the limit goes up to about 600 psi. Just a consideration in design.
7. Dapped beam ends (top flange cut out) has caused some diagonal cracking at the corner of the flange cut out and stem on a few projects, including Pine Point Crossing here in Maine. Avoid dapped beam ends if possible.

- Decked bulb tees:

  Asked about how many of these have been fabricated – there was one town project in Vermont and one MassDOT project. J.P. Carrara, Strescon, and NPP can make the product. They are apparently popular in the northwest states. Certainly can be considered in design; cost estimating may still be a wild card. Feel free to check with these suppliers or our fabrication group for feasibility and cost studies.

3. **NEXT Beam/Integral Abutment End Reinforcing**
   Rich Myers

We have had a minor inconsistency with transverse end diaphragm reinforcing on NEXT beam projects. Transverse reinforcing bars on the front face of the end diaphragm have been shown in one of two general ways:

1. Anchored to by inserts, or threaded through the NEXT beam stems to tie the NEXT beams to the end diaphragm directly
2. Placed only between stems

Consensus in the room was that it is not necessary to directly tie the end diaphragm to the NEXT beams with the transverse reinforcing steel. It is believed that it poses constructability issues. The front face transverse bars, which typically resist positive moment in the end diaphragm from passive pressure due to bridge expansion, do need to be properly developed. This can typically be accomplished with hooked ends.

On a related note, a question was raised about whether or not we should be trying to tie everything together at the end of NEXT beams on integral abutment bridges, essentially creating more of a fixed end. Considering note #6 above in topic #1, if we are struggling with tension limits/cracking at the ends just from prestressing, a fixed end condition

may exacerbate the issue in the final condition. Strong consideration should be given to pinning the NEXT beams to the abutments, similar to MaineDOT standards for other precast concrete type beam IABs.

Designers Meeting Minutes

April 27, 2016

Conference Room 317 A&B

1:00-2:00 PM

1. **Detailing CIP Portion of concrete over top of the pre-cast deck panels**
   Guy Hews/ Group Discussion- Please see attached email
   - The issue is with the larger bars (e.g. GFRP in Thomaston)
   - If using rebar larger than No. 6, you should check that they will fit for the precast deck panels

2. **Software Updates**
   Josh Hasbrouck
   - HEC-RAS 5.0.1 has been released. The biggest change is that the software now does 2D hydraulic analysis. Most of the other major changes are to types of analysis like dams and levees or sediment transport that we don't typically use, so there is no rush to update from version 4 for most people. The release notes on what is new are available at: http://www.hec.usace.army.mil/software/hec-ras/whats_new.aspx
     An installer can be found at: \\oit-isaefsemc01.som.w2k.state.me.us\dot-general\BridgeApps\HEC-RAS\

   - Mathcad Prime sometimes displays matrix brackets and other visual lines as broken lines instead of solid. This is caused by some versions of the Windows .NET libraries and can be fixed by updating them. It is a display problem only, no calculations are affected. Talk to Josh Hasbrouck if you have the problem and want it fixed.

3. **Micropiles - NHI Training Summary**
   Garrett Gustafson & Nate Sherwood
   - Background
     - "Micropiles are replacement piles of small diameter (typically less than 12 in) that are drilled and grouted and reinforced. The reinforcement supports all or most of the load."
     - Typical installation: Advance a steel casing and drill bit a nominal distance into bedrock, advance the drill string further into bedrock to form a bedrock socket (bond zone), place internal reinforcement and tremie grout pile.

    - Advantages
        - High capacity
        - Minimal disturbance to adjacent structures, soil, and environment (noise and vibrations)
        - Can be installed in access-restrictive environments
        - May be installed in all soil conditions (no need to re-tool)
        - Any angle other than horizontal
        - Can be installed through existing foundations
    - Disadvantages
        - Limited lateral capacity
        - High cost per linear foot
- Applications
    - Structural Support
        - New structure foundations, underpinning existing structures, and seismic retrofits.
        - MaineDOT Question: Are references or case studies available for use of micropiles on integral abutment bridges? Answer summary: No.
        - MaineDOT Question: Are there any rules of thumb for estimating installation time on ABC projects? Answer: Use 200 LF or 5 micropiles per day, whichever is lower.
    - Soil Slope Stabilization
- Design
    - Consider allowable locations for casing threaded splices. The Contract documents should indicate where threaded splices will be allowed and require the Contractor to advance the casing to move the casing splice if necessary.
    - Consider strain compatibility
    - Internal reinforcement is frequently referenced by ultimate strength. ASTM A722 150 ksi reinforcement has a yield strength of 127 ksi.
    - Load for load testing is typically applied to internal reinforcement. Design internal reinforcement for load test (usually 1.5 * factored design load)
- Inspection
    - Record grout takes and bond lengths
- Cost estimating
    - Linear foot costs should be calculated to the top of the bond zone (casing length)
    - Cost is typically equal parts labor, materials, and equipment. Additional information on factors influencing cost available.
    - Headroom below 9 feet requires very specialized equipment.

- Specifications
    - Additional guidance from FHWA regarding use of “prime” pipe is pending.
        - Prime pipe prices are dependent on the oil market.

Please feel free to discuss any questions you have regarding micropiles with Garrett and Nate.

4. **Brownville Junction, Brownville Junction Bridge #3222, WIN 20503.00 (Route 11 over Pleasant River) – Pier option discussion**
   Mike Wight
    - Background: The project team is investigating alternatives besides a pile bent to minimize issues with noise monitoring and noise attenuation. Options being considered are as follows: drill shafts (3-5’diameter), micropiles with mass type pier, pipe pile bent done inside a dry cofferdam, pipe pile with reinforced concrete, pipe pile driven below scour depth with H pile driven to refusal,

    - For more information, contact Mike Wight

5. **Temporary Detour Design – Level of review/ Design computations**
   Mike Wight
    - Bridge committee will review the level of detail put in the design

    - For more information, contact Mike Wight

6. **Training Opportunity- NSBA Night School**
   Jeff Folsom
        - Contact Jeff if you are interested in the NSBA training.

SPECIAL PROVISION
SECTION 535
PRECAST, PRESTRESSED CONCRETE SUPERSTRUCTURE
(Camber)

The following is added to Standard Specifications Section 535:

535.01 Description This work shall include submittal of calculated beam camber, submittal of a Camber Management Plan, measurement of actual beam camber, management of beam camber, survey of erected beams, adjustment of dimensions and elevations shown on the Plans, and all labor and equipment necessary to meet the requirements specified herein. All camber adjustments shall allow for construction of the bridge to the Profile shown on the Plans.

All Work specified herein is the responsibility of the Contractor unless otherwise specified.

535.011 Definitions

Adjustment Value The difference between the assumed Final Camber shown on the Plans and the anticipated Final Camber.

Camber Management Plan An outline of proposed means and methods for adjusting or mitigating camber growth and adjusting bridge geometry for beam camber at erection.

Final Camber The beam camber in the completed bridge i.e. beam camber after deflections due to deck, curb and bridge rail weights have occurred. Anticipated Final Camber will be considered the measured beam camber at the time of beam erection minus the deflection due to superimposed loads.

The acceptable range of Final Camber is 0 inches to 3.5 inches. The Final Camber represents the variation in the final deck thickness from each Abutment Centerline of Bearing to midspan.

535.03 Working Drawings The Working Drawings shall include calculated camber at release and at the time of beam erection based on the Contractor's and fabricator's anticipated schedules.

The Working Drawings shall include a Camber Management Plan. The Camber Management Plan may include:

Application of temporary load prior to beam erection. The Camber Management Plan shall include proposed location and magnitude of temporary loads, location of beam support points, and proposed means of load application e.g. temporary concrete barrier.

Adjustment of beam support points prior to beam erection.

Addition of shims or grout pads between the precast concrete abutment elements and Elastomeric Bearing Pads. Shims shall be steel; no other material will be accepted.

Other means and methods may be submitted for review.

The Camber Management Plan shall include procedures for varying the camber management techniques relative to the degree in which the camber varies from the camber values on the approved Working Drawings. The Camber Management Plan shall include procedures for addressing over and under cambered beams.

535.221 Camber Tolerance Beam camber at release and beam camber at erection shall be within the tolerance permitted in the Precast/Prestressed Concrete Institute Manual for Quality Control for Plants and Production of Structural Precast Concrete Products (MNL-116). Use Double Tee tolerances for NEXT Beams. Camber tolerance will be measured from the camber values on the approved Working Drawings.

535.24 Installation of Slabs, Beams and Girders Measure beam camber no more than 3 days prior to Precast Abutment element installation. Calculate the Adjustment Value based on the measured camber:

Assumed Final Camber shown on the Plans	2.0 in
Measured beam camber	-
Calculated deck deflection	+ 1.0 in
Calculated curb and bridge rail deflection	+ 0.1 in
Adjustment Value (in inches)	
Unit Conversion	x 1 ft / 12 in
Adjustment Value (in feet)	

Adjust dimensions and elevations as follows:

Bottom of Abutment No. 1 elevation shown on the Plans	265.70
Adjustment Value (in feet)	+
Final Bottom of Abutment No. 1 elevation	

Bottom of Abutment No. 2 elevation shown on the Plans	269.00
Adjustment Value (in feet)	+
Final Bottom of Abutment No. 2 elevation	

Prior to precast concrete abutment element erection, final bottom of abutment elevations will be subject to the approval of the Department.

Deck thickness at the Abutment Centerline of Bearings shown on the Plans	10.5 in
Adjustment Value (in inches)	-
Final Deck thickness at each Abutment Centerline of Bearing	

At each Abutment Centerline of Bearing, the minimum deck thickness is 8 inches and the maximum deck thickness is 11.5 inches. The deck thickness at midspan shall be 8 inches. Survey the beams after erection and adjust deck thicknesses as necessary to provide a tangent final Profile. Prior to deck concrete placement, final deck thicknesses will be subject to the approval of the Department.

535.26 Method of Measurement The Work specified herein will not be directly measured.

535.27 Basis of Payment The Work specified herein is included under Item No. 535.622, Prestressed Structural Concrete NEXT Beam. No separate payment will be made.