Structural Engineering Guidance No. 17-01

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Distribution: All Engineering Resources

SUBJECT: NEW GALVANIZED CIP CONCRETE PILE STANDARD DRAWINGS

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EPG Status: NA

Std. Drawing Status: Completed

Effective Date: For All Jobs With CIP Piles To Be Designed/Detailed

**Background and Development:**

1. Current practice requires that only Standard Plan 702.02 for CIP piles be used/referenced for showing pile pipe details for typical CIP piles. It associates the thickness of the pipe with the CIP pile type shown which is either “Trestle” or “Foundation”. (*Practice has changed to specifying thickness on bridge plans but may not be consistent.*)
2. Bridge Standard Drawing “PILE01\_Cast\_in\_Place” was eventually developed for showing supplementary details. It is now included in most bridge plans that require CIP piles replacing use of the standard plan.
3. Both Standard Plan 702.02 and Standard Drawing PILE01\_Cast\_in\_Place are outdated. It is desirable to insert a pile sheet into the bridge plans set for archiving and to allow quickly recalling specific pile details w/o need of a standard plan. Therefore, there is no longer a need for SP 702.02 and it will be deleted; BSD PILE01\_Cast\_in\_Place will be deleted and replaced.
4. New Standard Drawings PILE01\_CECIP and PILE02\_OECIP incorporate CIP pile updates. New standard drawings are based on the following pile types: Galvanized Closed Ended Pile and Galvanized Open Ended Pile. CIP pile data is shared between the pile sheets and the table of Foundation Data.
5. CIP Pile design updates and new detailing features include:
6. Galvanized pipe is standard for all types of CIP piling. (*See EPG 751.1.2.20 for guidance.*)
7. One embedment depth (18”) shall be required for all applications of CIP concrete piles instead of 12”, 15” and 18” currently used for pile cap footings, pile cap bents and integral pile cap end bents, respectively. While not assuring fixity, it improves pile resistance. Uniform details and increased performance should result. *AASHTO LRFD requires 12” min. when unreinforced connection is used (no embedded bars) and 6” min. when a reinforced connection into cap is used.*
8. A CIP concrete pile reinforced connection into cap (embedded bars) (check beam and footing clearances to reinforcement) will now be required. Uniform details and increased performance should result such as fixity, redundancy and an alternate connection should pipe corrode near cap which should now more closely reflect better match assumptions made when designing.
9. A pipe pile splicing detail is shown. It is not optional and supersedes standard specifications.
10. Pile point reinforcement is shown for each pile type.
11. The table of Foundation Data is updated for inserting related CIP pile data (and HP pile in some cases) like:
    * 1. Minimum Galvanized Penetration (Elev.)
      2. Minimum Cleanout Penetration (Elev.) when required
      3. Pile point reinforcement type and quantity when required
      4. Est. Maximum Scour Depth 100 (Elev.). (*Instructions will follow in a bulletin release.)*
12. A new table of CIP Data will be included on the standard drawings. CIP pile type, diameter, grade, thickness and reinforcing steel will now be reported in this table (supported by Development Section Bulletin *16-06-DSB CIP Pile Thickness* requiring pipe thickness to be reported on the plans).

**Instructions:**

1. Do not use or reference Standard Plan 702.02; obsolete and to be deleted from Standard Plans.
2. Use the foundation data table and CIP data table on the standard drawings to report the details.
3. Pay item for CIP concrete piles is the same for both types of pile, CECIP and OECIP, until further notice from the Preliminary and Review Section.
4. On using Pile Point Reinforcement (PPR):

*Use PPR and PPR type should be as recommended by the Geotechnical Section on the Foundation Investigation Geotechnical Report, or if not given, collaboratively otherwise.*

For Closed Ended Cast-In-Place Concrete Pile (CECIP):

1. Two types are available.
   * + 1. “**Cruciform**” type should be used as recommended and for hard driving into soft rock, weathered rock, and shales. It will continue to develop end bearing resistance while driving since an exposed flat closure plate is included with this point type. The closure plate acts to distribute load the pile cross sectional area.
       2. “**Conical**” type should be used as recommended and when there is harder than typical driving conditions, for example hard driving through difficult soils like heavily cobblestoned, very gravelly, densely layered soils. Severely obstructed driving can cause CIP piles with conical points to deflect. Conical pile points are always the more expensive option.
2. Closed ended pile shall continue to use a closure plate. It will still be considered completely covered by the pay item for CIP concrete piles unless otherwise shown.
3. Closure plate is not considered pile point reinforcement. It is a bearing plate.
4. Closed ended piles are used as combination piles engaging both friction and end bearing and may be considered for bearing on rock if necessary using appropriate PPR.
5. When required, PPR should be indicated on the Design Layout where their cost should be included. If undecided until final design, costs can be significant.

For Open Ended Cast-In-Place Concrete Pile (OECIP):

1. One type is available.
   * + 1. “**Open Ended Cutting Shoe**” type should be used as recommended and when protection of the pipe end during driving could be a concern. It is also useful if uneven bearing is anticipated since a reinforced tip can redistribute load and lessen point loading concerns.
2. Open ended piles are not recommended for bearing on hard rock since this situation could create inefficient point loading that could be structurally damaging.

EPG revisions will follow as appropriate. Minimum intermediate pile cap bent beam thickness and pile cap footing thickness will be addressed but checking clearances to pile reinforcement should be part of CIP pile design. Be cautious of pile notes that may be supplementary or that no longer apply.

For any questions, see Development Section.