Permanent Reference Elevations

Revision and Approval

Revision	Date	Nature of Changes	Approved By
0	09-30-2021	Original Issue	Richard Foley

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Background

This process establishes Structure Construction (SC) roles, responsibilities, and procedures for establishing permanent reference elevation points on bridge structures.

Permanent reference elevation points are required at designated locations on structures on the State highway system to determine future settlements and deflection.

Process Inputs

1. Completed bridge structure(s)

Procedure

1. All work associated with this process is charged as Project Direct – Construction.
2. Inspection of field work for this process is Benchmark.
3. SC Staff:
   a. Secure safe access to the work in accordance with the *Contract Specifications*, including the use of traffic control, if required. Complete Fall Protection Training prior to performing work on a bridge where fall hazards exist.
   b. Perform the following tasks to establish permanent reference elevations:
      i. Unless otherwise instructed, permanent reference points must be established along both sides of the structure at pier and abutment

centerlines, at the mid-point of all spans over 50 feet in length, and at the ends of cantilevered wingwalls.

ii. Permanent reference elevation points must be placed so that they can be easily located such that a level rod can be placed on the point when making future elevation determinations.

iii. Obtain copper nails (Catalog Item Number 5315-2240-1) through the local District warehouse.

iv. To promote uniformity of locating permanent reference points, comply with the following guidelines:

    1. On barrier railings having a metal rail element, use the top of the outside rail anchor bolt nearest the designated location as a permanent reference point. Bolts used as reference points must be marked by chiseling a cross (x) in the top of the bolt.

    2. Where structures have other types of rail with no vertical anchor bolts, or where the anchor bolts will be inaccessible, use copper nails as permanent elevation points. Place these nails in the top of the sidewalk or curb, in the top of deck, or in the top of a concrete barrier rail. If located in curbs or sidewalks, place the nails about six inches from the curb face. If located in the deck surface, set the nails about six inches from the edge of deck.

    3. The elevation and location of all permanent reference elevation points must be documented on the as-built plans. Document on the bridge general plan if possible; otherwise, add a reference note on the general plan to indicate the sheet where the permanent reference elevations are documented.

v. At the completion of the job, the Structure Representative must take survey elevations accurate to 0.005 foot on all permanent reference elevation points using a peg-tested level. The level circuit taken must be tied to a permanent benchmark; do not use assumed elevations. If safe access is not available, District survey crews may be called to establish safe access and complete the survey.

vi. On new construction, prior to concrete placement, inform the contractor that SC staff will need to place permanent reference elevation points (copper nails) at the time of concrete placement. The copper nail should be placed after final finish, but prior to set of concrete.

vii. On structures where a special deflection study is required, instructions concerning the location of permanent reference elevation points and accuracy and frequency of reading elevations will be given to the Resident Engineer or Structure Representative at the beginning of the job. Since

the purpose of these deflection studies is to provide information for the Research Section, the special instructions must be strictly followed.

c. Perform surveys in accordance with best practices identified in the *Bridge Construction Survey Manual*.

d. Document permanent reference locations and elevations on the as-built plans.

4. SC Supervisors:

   a. Verify that staff received Fall Protection Training prior to performing tasks.

   b. Provide training to SC staff as necessary to perform the tasks for this process.

Process Outputs

1. Permanent reference elevations (physical)
2. Document permanent reference elevations on the as-built plans

Attachments

None