SECTION 585 – STRUCTURAL LIFTING OPERATIONS

I. GENERAL
The structural lifting item is used to either raise and support a structure or to temporarily shore a bearing point where a shim tight installation is designated on the plans. This item requires the contractor to engage the services of a Professional Engineer to develop design computations and working drawings to perform the structural lifting operation and/or temporary shoring.

A. Common lifting methods used in structural lifting operations:

1. Lifting from temporary columns
2. Lifting from diaphragms
3. Lifting off the pedestal/bridge seat in front of or behind the existing bearings
4. Lifting from a corbel/bracket secured to the front of an abutment or pier with concrete anchors

II. DETAIL

A. Submittal Process
The contractor is required to submit their design computations and working drawings to the DCES for review and approval. The DCES will delegate review responsibility to the Bridge Foundations and Construction Support Unit within the Office of Structures. As with all submittals, if they are initiated by the Contractor or their Professional Engineer, the EIC should always be copied.

1. The contractor shall submit their design computations and working drawings in a time frame that allows the Department ample review time, and considers time needed for resolution of comments. It is important to remember that the review clock is reset when the Department disapproves a submittal. The Department’s review time shall be in accordance with §585-3.03 – WORKING DRAWINGS.

2. Submittals can be made electronically to the shared email inbox for the Bridge Foundations and Construction Support Unit at dces.construction@dot.ny.gov

B. Submittal Requirements

1. Verify the status of the Professional Engineer’s registration at http://www.op.nysed.gov/opsearches.htm
2. Verify the design computations are thorough and have a clear indication of the design methodology (i.e. ASD, LFD, or LRFD) used.
3. Ensure a narrative is included which describes how lateral and longitudinal stability of the system is maintained. The Contractor may accomplish this stability in several ways. As an example, stability can be maintained by lifting approximately half of the bearing points at a time, and leaving the other half down. It is common to use wood blocking between ends of girders or backwalls to maintain longitudinal stability.
4. For connections designed with high strength bolts, any temporary A490 bolts must be replaced with A325 bolts after the structural lifting operation has been completed. Paint the connection to match existing conditions.
5. Verify catalog cut sheets for jacks, and any other proprietary equipment, have been included in the submittal package.
C. Field Conditions

Verify the conditions in the field match the assumed conditions and the approved working drawings. If field conditions do not match, the Contractor and the Professional Engineer shall be contacted immediately. In addition, notify the Department reviewer/approver of the change in field conditions.

1. Check the condition of the structural components in the load path of the structural lifting system. It is important to make sure that actual field condition matches the stated assumptions in the submittal (i.e. computations assumed no section loss, yet field conditions show deterioration). If any field conditions do not match the design assumptions, it is imperative that the Contractor and Professional Engineer be contacted immediately. In addition, notify the Department reviewer/approver of the actual field conditions.
   a. Verify the condition of the concrete. If the Contractor is using any part of the existing substructure for support, it is likely the design computations assume the concrete is in good condition, (i.e. not spalled, delaminated, or cracked). This is particularly important for common lifting methods numbers 2, 3, & 4 listed above in Part I.A.
   b. Verify the condition of the steel. The design computations are to account for steel section loss, if any exists. It is not uncommon for full section capacity to be assumed (i.e. no section loss of the member) in the design computations. Check the condition of any steel in the load path of the structural lift, not just the existing girders or beams.

2. Take note of any utilities that are not shown on the approved working drawings. If field personnel are aware of any unaccounted utilities in the vicinity of a structural lift, the Department reviewer/approver should be contacted before allowing the Contractor to proceed. For a spread footing, “in the vicinity” can be taken to mean any utility that is within a distance B from the edge of a temporary footing, where B is the width of the footing. The allowable soil bearing pressure near the utility is generally dictated by the utility owner.

3. Ensure the jacks installed are the make and model specified on the approved working drawings. The rated jack capacity must be clearly shown on the manufacturer’s name plate affixed to the jack. The approved lifting pressures are based on the specified jack properties. Using a different jack would render the lifting pressures provided on the working drawings invalid.

4. Field verify the lifting system has lateral and longitudinal stability as stated in the aforementioned narrative in Part II.B.4. Maintaining stability is critical for bridges on a grade or a horizontal curve as these bridges could shift or slide once the fix bearings are lifted.

5. Should concrete anchors be used to attach the lifting system to the substructure, it is imperative the anchors be installed as per the manufacturer’s instructions with a certified installer. Some of the anchors, particularly those in the upper rows of a bracket mounted systems, could be subject to sustained tension loads. In addition, the grout chosen must be on the Materials Approved List. The DCES will determine the need for pull-out testing based on The New York State Bridge Manual. The DCES will call-out the particular anchors to be pull-tested on the approved working drawings.

D. Operations

The Contractor shall not perform any lifting operations without an approved lifting submission signed by the Department reviewer/approver.

The DCES approval memo will direct the EIC to notify the Bridge Safety Assurance (BSA) group 14 days prior to the start of the structural lifting operation. The BSA group, within the Office of Structures, approves overload permits and their associated routes. To avoid overload permit vehicles from crossing a temporarily supported structure, notifying the BSA group is extremely important. The BSA group will
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ensure permit routes do not contain lifted structures. Equally important is to notify the BSA group when structural lifting operation has been completed to once again allow permit loads to cross the structure.

Structural lifting systems and structural supports in place for a period exceeding a year shall be inspected. This inspection is to be done by a Professional Engineer hired by the Contractor. In general, the structural lifting system should be inspected by field personnel monthly to ensure proper fit up and functionality. For instance, should a lifting system or structural support be installed in hot weather and still in service during colder months, the system will have contracted. This thermal contraction may have disengaged the lifting system from the structure requiring support.

III. SUBMITTALS
Refer to Exhibit 585-1 for flowchart on submittal process.
Inspector Checklist

Inspector:  
Date:  
BIN:  

Lifting stage number:  

Lifting location:  ☐ Begin Abutment  ☐ End Abutment  ☐ Pier  
   Pier Number(s):_______________________________________

Number of points lifted in this stage:  

Preparing for the structural lifting operation:  
Have you read section 585 in the Standard Specifications? ☐ Yes ☐ No

Have you reviewed contract plans, details, and notes related to the structural lifting operation? ☐ Yes ☐ No

Have you reviewed the DCES approved structural lifting submittal? ☐ Yes ☐ No

Has the Bridge Safety Assurance group been notified of the start date 14 days prior to the structural lifting operation? ☐ Yes ☐ No

What is the structural lifting submittal approval date? __________

Contractor’s Lifting Method:  ☐ Temporary Columns  
☐ Lifting off Diaphragms  
☐ Lifting off Pedestal/Bridge Seat  
   ☐ Front of Ex. Bearings  ☐ Behind Ex. Bearings  
☐ Lifting off Corbel/Bracket  
   ☐ Abutment  ☐ Pier  
☐ Other: ____________________________________________

Existing field conditions:  
Have you performed pre-lift inspection of designated lift area(s)? ☐ Yes ☐ No
☐ Acceptable Condition  ☐ Unacceptable Condition
If Unacceptable, what repairs are required prior to Structural Lift? ________________________________

Were photos taken of the unacceptable condition(s)? ☐ Yes ☐ No ☐ N/A

Have all existing utilities been identified/relocated in vicinity of structural lift? ☐ Yes ☐ No
Inspector Checklist

Have all bridge components that could hinder the lifting operation (such as railing joints, utility lines, joints) been disconnected? ☐ Yes ☐ No

Prior to the structural lifting operation:
Does the Contractor have a copy of the approved structural lifting submission on-site? ☐ Yes ☐ No

Do the installed jacks match the make and model specified on the approved working drawings? ☐ Yes ☐ No

Are the jacks calibrated (calibration certificates or other documentation received)? ☐ Yes ☐ No

Are all the structural lifting system components installed as per the approved lifting submittal? ☐ Yes ☐ No

Does the lifting system have lateral and longitudinal stability? ☐ Yes ☐ No

Are concrete anchors being used? ☐ Yes ☐ No

If yes, were the anchors installed by a certified ACI/CRSI Adhesive Anchor Installer? ☐ Yes ☐ No

Is the grout on the Approved List? ☐ Yes ☐ No

If required, were pull-out tests performed on anchors? ☐ Yes ☐ No

Structural lifting system in service:
Does the lifted structure have lateral and longitudinal stability? Refer to the stability narrative in approved lifting submittal. ☐ Yes ☐ No

Has the structural lifting system been inspected on a monthly basis? ☐ Yes ☐ No

Completion of the structural lifting operation
Has the Bridge Safety Assurance group been notified of the end date of the structural lifting operation (refer to lifting submittal approval memo)? ☐ Yes ☐ No

If applicable, have temporary A490 bolts been replaced with A325 bolts and painted to match? ☐ Yes ☐ No
Contractor's PE Prepares Computations & Drawings

Contractor Submits Drawings and Calculations to Railroad

Railroad Involved

Contractor Submits Electronic Copy to DCES with a Copy To EIC

DCES has Longest of following to Review (as per specification)
1. Fifteen (15) Working Days
2. Two (2) Working Days / Drawing
3. One (1) Working Day / 4 Computation Sheets

DCES Approved Plans and Calculations Returned to Region to incorporate any Regional Comments

Comments Indicated on Return Plans

Comments, if Necessary, are Added to Submission

Region Approves Plans and Calculations. Contractor and EIC receive electronic copies of approved submission

Contractor Completes Work as Approved