Introduction

This memo provides Structure Construction (SC) guidelines on the administration of the “weight limitation” provisions of a construction contract. These guidelines are to ensure uniform review and proper allowance for movement of construction equipment over structures that are within the project limits and are not open to traffic.

For structures that are either open to traffic or partially open to traffic, within the project limits, these guidelines can also be used for reinforced concrete slab bridges and culverts, and for reinforced concrete bridges with girders provided that:

1. The bridge has three or more girders. Non-redundant 2-girder systems or bridges with girder spacing greater than 14 feet must be forwarded to SC headquarters (HQ) for further analysis.

2. Clear spacing between overload vehicle and the edge of travelled way open to adjacent traffic must be a minimum of 10 feet or actual girder spacing, whichever is greater.

Overload cases that vary from the guidelines provided herein must be forwarded to SC HQ in Sacramento for further analysis. Structure Construction HQ will refer the request to the Structure Design Engineer for new structures or structures being modified by contract, and to Structure Maintenance & Investigations (SM&I), Permit/Rating Office for existing structures.

Standard Specification Weight Limitations

The Standard Specifications (SS)\(^1\), sets forth weight limitations for earthmovers, trucks, and truck and trailer combinations. It identifies what vehicles will be permitted to cross the existing, new, partially completed, or partially demolished bridge structures that are not open to traffic. This also provides that other construction equipment may be permitted to cross bridge structures subject to the weight limitations and conditions of the California Department of Transportation Permit Policy (see Transportation Permits Manual\(^2\)), whether open to the public or not.

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\(^1\) 2015 SS, Section 5-1.37B, Load Limits.

\(^2\) Transportation Permits Manual, Section is dependent on the equipment.
The provisions of SS³ apply only within the project limits. The California Vehicle Code⁴ governs operation of vehicles (including construction equipment) on State highways beyond the project limits.

**Overloads**

Overloads on bridge structures within construction contracts may be either repetitive, occasional, or stationary. When reviewing overloads, consideration should be made for the potentially reduced capacity of a partially completed or demolished structure. Listed below are guidelines for evaluating common overloads:

**A. Repetitive Overloads**

Repetitive overloads usually occur in connection with an earthmoving operation, and thus usually involve earthmoving equipment; aka Material Hauling Equipment (MHE).

1. **Bridge Structures Designed and Rated for HS20⁵ and Permit Live Loading or for HL93 and Permit Live Loading:**
   According to SS⁶, load limits are only applicable for bridges that have the capacity to handle HS20 live loading. Any new structure that is designed for either HS20 and permit live loading or HL93 and permit live loading and any existing structure that has an inventory level load rating factor of 1.00 or higher for either HS20 or HL93 loading and permit ratings of “PPPPP,” has adequate capacity for the load limits.

   The following must be submitted to SC HQ for review, when using earthmoving equipment on:
   - A new or partially completed structure that exceeds the limitations specified in the SS⁶.
   - An existing structure that:
     - Does not have an HS20 Operating Rating Factor of 1.67 or an HL93 Operating Rating Factor of 1.30 or higher, and
     - Does not have permit ratings of “PPPPP”.

2. **Structures Designed for Overloads**
   Under the provisions of SS⁷, the Contractor may request the redesign of a structure to increase its load carrying capacity to accommodate heavy construction vehicles such as earthmoving equipment. The Contractor must be willing to pay for the cost of redesign and increased cost of construction, and the Contractor’s equipment cannot exceed the

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³ 2015 SS, Section 5-1.37B, Load Limits.
⁴ California Vehicle Code, Division 15, Size, Weight and Load.
⁵ HS20 = HS20-44 = HS20-S16 = HS20-S16-44; Note H20 is not equal to HS20.
⁶ 2015 SS, Section 5-1.37B(1), Load Limits-General.
⁷ 2015 SS, Section 5-1.37B(2), Increased Load Carrying Capacity.
stresses produced by the following construction (design vehicle). Additional information relative to construction overload design is given in Memo to Designers 8 15-15.

At the present time, the design vehicles used to represent the construction equipment loading are:

- A three-axle vehicle having a maximum axle load of 130 kips and a total gross load of 330 kips for spans greater than 54 feet.
- A two-axle vehicle having a maximum axle load of 130 kips and a total gross load of 200 kips for spans of 24 to 54 feet.
- For spans under 24 feet, the design is based on a single 130 kip axle.

The following are the procedures to be followed when the Contractor requests a redesign of a structure, or structures, to increase the load carrying capacity:

a. The Contractor submits a letter to the Resident Engineer requesting that the structure be designed to increase its load carrying capacity. In this letter, the Contractor must name the structure or structures to be redesigned, give specific details of the loads, and the positioning of the loads on the structure. The Contractor must also state that they are willing to pay the cost of redesign and the increased cost of construction.

b. The Structure Representative submits a copy of the Contractor’s letter to the Deputy Division Chief of Structure Construction and if appropriate forwards it to Structure Design along with a memo requesting that the structure be redesigned. The Structure Representative should also request that the Contractor be advised of the estimated cost of redesigning the structure. At this point, the Contractor should be informed of the estimated cost and a formal agreement should be reached prior to proceeding with the redesign.

c. After the redesign has been completed, and upon receiving revised contract documents and the estimated maximum cost of redesigning the structure, the Structure Representative will prepare a Contract Change Order. The Contract Change Order will authorize the structural alterations to accommodate the construction overloads. If the final cost to the Contractor for the redesign is known, then the credit to the State should be included. Otherwise, a supplemental Contract Change Order should be written when the final costs are completed. (See Attachment 1 for a sample of this type of Contract Change Order).

B. Occasional Overloads

Occasional overloads will include the movement of construction equipment (concrete trucks, cranes, paving equipment, etc.) across structures from one work site to another. Also included for consideration are track equipment overloads, such as pavement grinders and excavators.

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1. **Concrete Trucks**

Concrete trucks traveling on the highway with full loads generally need to use booster axles to meet the axle weight requirements in Division 15 of the *California Vehicle Code* (*CVC*). When discharging concrete, the booster wheels need to be raised, which increases the loads on the remaining axles, resulting in axle loads that exceed the legal load allowed by the Permit Policy. The SS\(^9\) allows trucks over legal (exceeding *CVC* weight limitations) limit on bridges, not open to traffic, with up to 28,000 pounds for single axles and 48,000 pounds for the tandem axles. This limits most trucks to hauling a maximum 7 1/2 to 8 cubic yards. These trucks should be weighed to confirm allowable specification loading.

Any exception to the guidelines should be referred to SC HQ. (See *Processing Requests for Construction Equipment Overloads* below for further details.)

2. **Cranes and Concrete Pumps**

Fully equipped truck cranes are permitted to cross HS20, Operating Rating Factor of 1.67; HL93, Operating Rating Factor of 1.3 or greater; and full purple rated permit capacity rated (PPPPP) bridge structures on construction projects provided they conform to Permit Policy. Full purple rated permit capacity must be for all the 5, 7, 9, 11, and 13 axle vehicles. The following general guidelines may be used to determine if truck cranes or concrete pumps traveling on the bridge meet Permit Policy, as follows:

- Tandem axle weights less than 54,000 pounds.
- Single axle weight less than 28,000 pounds.
- No group of three axles within an 18 foot distance (see table diagrams below).
- Three axle groups less than 18 feet are treated as a tandem axle group limited to 54,000 pounds.

Cranes are often stripped down (counterweights and other components removed) and sometimes the boom is supported on a trailer in order to achieve allowable permit weights. The Engineer should verify that the crane is configured in its traveling condition when moving on the bridge.

Any exception to the guidelines should be referred to SC HQ (See *Processing Requests for Construction Equipment Overloads* below for further details.)

\(^{9}\) *2015 SS*, Section 5-1.37B, *Load Limits.*
3. Track Equipment

Track Equipment, such as pavement grinders and excavators, occasionally need to cross or work on a bridge. For bridges designed and/or rated for HS20 or HL93HS-20 loading, the Engineer may approve this equipment, provided that it meets the following conditions:

a. Maximum gross weight is less than 66,000 pounds.

b. Maximum load on 12”-wide, or larger, tracks is less than 6,000 lb per foot.

c. Maximum load on 10” tracks is less than 5,000 lb per foot.

Any exception to the guidelines should be referred to SC HQ. (See Processing Requests for Construction Equipment Overloads below for further details.)

In addition, when track equipment crosses or works on a bridge, considerations must be given to the track type and its effect to the deck surface. Protective covers maybe required to protect deck surface.
4. Material Transfer Vehicles (MTV’s)

The Construction Manual\textsuperscript{10} discusses the Resident Engineer’s responsibility to protect Caltrans’ structural assets when the contract requires the use of MTVs or other types of heavy paving equipment. MTVs are being specified more frequently since Standard Specifications Section 39, \textit{Hot Mix Asphalt}, was revised in April 2014 to require the use of MTVs. The most commonly used MTVs have axle loading double the legal limit when empty, and triple the legal limit when loaded.

MTV’s typically exceed the load limits specified in the SS\textsuperscript{11} and thus must be submitted to SC HQ for review. Field review and approval may be allowed provided that the request from the Contractor meets the following conditions:

a. MTV is either a Roadtec SB2500 or a Weiler E2850 or lighter.

b. MTV carrying a maximum of 5 Tons of asphalt in hopper.

c. MTV is traveling 5 mph or less when crossing the bridge.

d. MTV is the only construction equipment on the bridge. Adjacent legal traffic is \textbf{not} allowed.

e. Bridge(s) to be crossed are rated to meet or exceed HS20 Operating Rating Factor of 1.67 or HL93 Operating Rating Factor of 1.30 and a 5-axle permit P5 permit rating of 1.00 or greater. Any new structure that is designed for permit loading will meet this requirement.

f. The bridge structure is an RC slab, an RC culvert-type structure, or a multi-girder type where girder spacing is between 7 and 9 feet.

g. If the bridge is a multi-girder type structure meeting the 7 to 9 feet girder spacing, the MTV wheel lines must be aligned with the bridge’s girder lines during the crossing.

Note: The MTV models noted above are assumed to have an 8-foot center-to-center wheel gage. Wheel lines should be equally spaced off girder lines within the allowable 7 to 9 foot range. Girder lines must be determined and marked out on the deck by the Structure Representative (SR) or Assistant Structure Representative (ASR) prior to the MTV crossing(s) and must be monitored by Caltrans (CT) field personnel at all times.

C. Stationary Cranes and Concrete Pumps

Cranes are also used in a stationary position to do work from bridges, including pile driving, lowering falsework, and lifting girders. Cranes lifting in a stationary position cause high outrigger loads. Outrigger loads greater than 40,000 pounds should be referred to SC HQ (see \textit{Processing Requests for Construction Equipment Overloads} below for further details). The Engineer may review proposals for outrigger loads less than 40,000 pounds provided that the bridge is designed for permit loads and/or has full permit capacity (PPPPP). The Contractor must be required to provide calculations for outrigger loads. Outrigger loads may be distributed in one of three methods:

\textsuperscript{10} \textit{Construction Manual, 3-519B, Load Limits.}
\textsuperscript{11} \textit{2015 SS, Section 5-1.37B(1), Load Limits-General.}
a. Outriggers that produce loads less than 25,000 pounds may be placed on timber mats. The mats should be 12” by 12” minimum and placed parallel to the girders. The minimum length of the mat is 5 feet; the minimum width must be equal to or greater than the outrigger plate width.

b. Outriggers that produce loads greater than 25,000 pounds should be placed on beams that distribute the load fairly equally to two girders.

c. Outriggers placed upon concrete bent caps of box girder bridges do not require mats or beams to distribute loads.

Submittals for stationary loading to be referred to SC HQ should include the following information:

- Location of crane outriggers tied into reference locations (CL bent or abutment, CL bridge, or edge of deck etc.).
- Calculations for outrigger loads.
- Manufacturer’s information for the crane and a description of how the crane will be outfitted and configured (boom length and counterweights).
- Weight of what will be lifted and maximum extension of the boom.
- Proposed method for distribution of outrigger loads.
  - How the configured crane will be moved into position while complying with SS¹².

**Processing Requests for Construction Equipment Overloads**

As previously noted, requests from Contractors to utilize construction equipment not exceeding the limitations presented above may be approved at the job level by the Structure Representative. All other requests are to be forwarded by the Structure Representative to the SC HQ. Structure Construction HQ will forward the necessary information to the Structure Design Engineer for new structures or structures being modified by contract, and to Structure Maintenance & Investigations (SM&I), Permit/Rating Office, for existing structures, to make a decision.

Prior to referring the request to SC HQ, complete the appropriate *Bridge Overload Analysis Transmittal* form (see Attachments 2 & 3).

Include a letter requesting overload analysis and a complete description of the equipment. The Contractor’s request must be explicit as to the nature of the overload and the conditions under which it will be moved. The information required includes:

- The type, the make, and the model of equipment.
- The axle spacing, axle width out and out of tires.

¹² [2015 SS](#), Section 5-1.37B, *Load Limits.*
• The axle loads (obtained by scale weight if possible).
• The width and number of tires.
• Operating conditions, etc.

It is imperative that CT Engineers and the Contractor make all efforts to submit any overload request in a timely manner. Review time of an overload submittal can take from several days to several weeks or more depending on the completeness of the submittal and the complexity of the overload scenario. There is currently no contractual language regarding overload review time.

Permission to cross bridge structures with construction equipment that does not exceed the limitations presented above will also be granted by means of a letter to the Contractor from the Resident Engineer (see Attachment No. 4 for an example letter). However, if special conditions or limitations are to be imposed, they should be incorporated into a letter similar to the example letter authorizing the use of earthmoving equipment.

Since construction overloads will often affect areas of responsibility of both the District and SC, it is important that both be fully informed. Particular care should be taken by the Structure Representative to ensure that copies of all correspondence related to overloads are furnished to interested District personnel.