



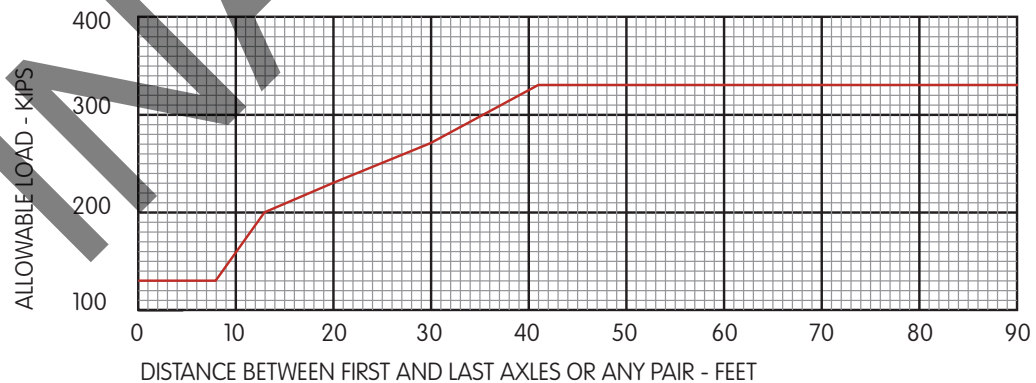
15-15 MATERIAL HAULING EQUIPMENT LOADING

“Material Hauling Equipment” (MHE) is a general name for construction equipment such as dump trucks, trailers, earthmovers, and transit-mix trucks. The *Standard Specifications* conditionally allow for MHE that exceeds the size or weight limitations set forth in Division 15 of the California Vehicle Codes to cross bridge structures during construction. This Memo provides the design guidelines for MHE that exceeds the loading limitations set forth in the *Standard Specifications* but not exceeding 330 kips.

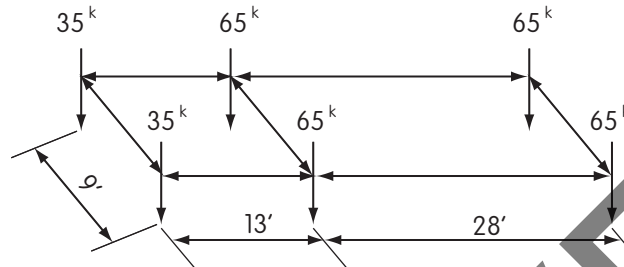
The District has the responsibility of identifying structures to accommodate Material Hauling Equipment loading. See Topic 110.1 of the *Highway Design Manual*. It is the Design Engineer’s responsibility to contact the District in the early planning stages to discuss material hauling including the fact that MHE must weigh more than Vehicle Code limitations in order to be a consideration. If MHE loading is required, design and criteria will be as follows:

1. The Material Hauling Equipment design loading consists of the load represented by the chart and loading diagram shown below:

Axle pairs less than 8 feet will be considered as a single axle.
Maximum single axle load = 130 kips
The gross axle loads, in pairs or in total, must be within the limits shown below.



MATERIAL HAULING EQUIPMENT LOADING CHART



MATERIAL HAULING EQUIPMENT DESIGN LIVE LOADS DIAGRAM

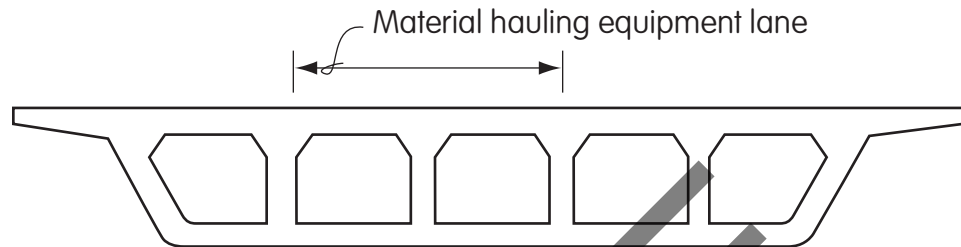
2. Show this chart and loading diagram on the plans. CADD cells are available as are standard CADD Patterns.

3. Revise the live loading note on the General Plan thus:

Live Loading: HL 93 and Permit Design Vehicle (LRFD)

For Material Hauling Equipment loading, see chart and diagram on “___” sheet for permissible axle spacings and corresponding loadings.

4. For MHE design vehicle, use the axle configurations and loadings shown in the MHE Design Live Loads diagram. Use Strength II, Load and Resistance Factor Design (LRFD) for girders as well as slab design. Include Dynamic Load Allowance, IM = 33%.
5. Earth cover is normally not placed on deck.
6. Design for 200 feet minimum distance between Material Hauling Equipment loads.
7. Delineate the MHE lane as illustrated below in the Typical Section of the General Plan and on the Typical Section Sheet. If possible locate the lane away from the exterior girders. A MHE lane is normally 20 feet wide.



8. Obtain the factored $DL+ADL+LL_{MHE}$ shear and moment demand envelopes in the individual girders or unit width (slab-type structure) using three dimensional modeling software tools with the loading anticipated at the time of construction in addition to the MHE truck configuration. For example, there will be no added dead load due to AC Overlay but the structure may be subjected to the weight of both permanent and temporary barriers. For prestressed concrete structures, add the average final prestressed secondary effects to the moment and shear demand envelopes. The individual girders or unit width shall be designed such that the ultimate capacity equals or exceeds the controlling maximum demand generated by the HL93 with “low-boy”, Permit or the MHE design vehicle load. See *Memo to Designers 15-20 “Using Refined Analysis of Live Loads with Two-Dimensional Design Tools”* for additional design guidelines.
9. For prestressed concrete members determine the prestressing force from loads at the service level. Use normal stresses. Design for ultimate moment capacity and shear using the *AASHTO LRFD Bridge Design Specifications* as amended by Caltrans.
 The additional mild steel or prestressing steel (or P_j) shall be distributed equally within the girders considered as supporting the MHE loading. When defining P_j for MHE lane girders, also consider the variation in force allowed between girders by *Memo to Designers 11-1*.
10. The deck design shall be checked for resistance to the MHE wheel loads.
11. HL93 or Permit live load may govern part or all of design depending on configuration of structure.
12. All components of the structure must be designed to consider the effects of the MHE loads.



The *Standard Specifications* allow contractors to request redesign of proposed structures to carry overloads. If the Office of Structure Construction requests redesign, the procedures will be as stated in this memo. The maximum vehicle size allowed will be the MHE design load.

Kevin J. Thompson
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