

## 3.1 DESIGN FOR MATERIAL HAULING EQUIPMENT LANE ON BRIDGES

### 3.1.1 GENERAL

This policy specifies the design requirements for bridges intended to carry material hauling loads beyond the pneumatic-tired truck and trailer combinations or 2- and 3-axle pneumatic-tired earthmovers described in the *Standard Specifications*.

### 3.1.2 DEFINITIONS

*Material hauling equipment* – a general term for construction equipment such as dump trucks, earthmovers, and transit-mix concrete trucks that frequently exceed the maximum loading allowed by the *Standard Specifications*. In the context of this policy, material hauling equipment (MHE) describes a notional design vehicle that represents this class of special vehicles.

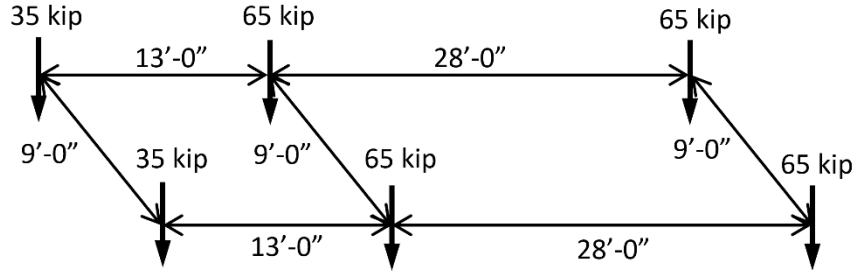
$LL_{MHE}$  = MHE vehicular live load

$LL_{permit}$  = special design vehicular live load

### 3.1.3 DESIGN CRITERIA

The bridge design criteria are as follows:

- MHE shall be evaluated as a special design vehicle at the Strength-II limit state.  $LL_{MHE}$  shall be applied in lieu of  $LL_{permit}$ , and all load factors associated with the Strength II limit state shall be applied.
- The distribution of MHE live load shall be based on refined methods of analysis.
- The axle weight and configuration of the MHE design vehicle is shown in Figure 3.1.3-1.
- The dynamic load allowance shall be taken as  $IM = 25\%$ .
- The multiple presence factor shall be taken as  $m = 1.0$ .
- For centrifugal forces, the MHE design speed shall be taken as 25 mph.
- Dead load shall include the weight of two lines of temporary railing along the full bridge length.
- MHE live load shall be placed in a single design lane, taken as 20 ft. wide.
- The deck shall be designed for the MHE wheel loads using the methods described in AASHTO-CA BDS. The tire contact area of a wheel consisting of one or two tires shall be assumed to be a single rectangle 35 in. wide by 20 in. long.



**Figure 3.1.3-1 MHE Design Vehicle**

Figure 3.1.3-2 describes the gross MHE vehicle load and axle spacing allowed on bridges designed using the MHE design vehicle.

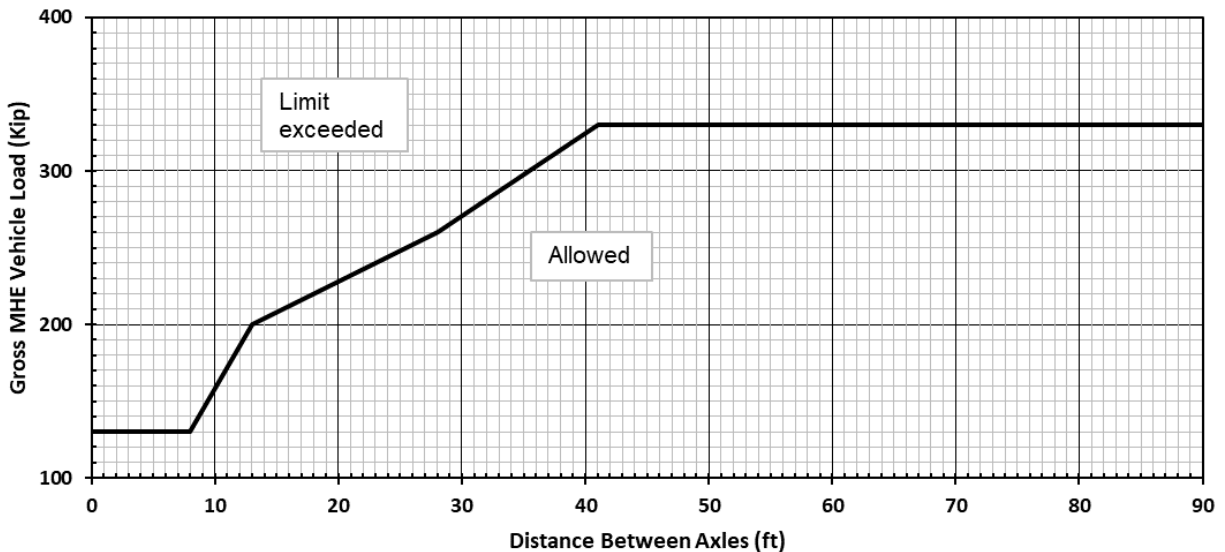


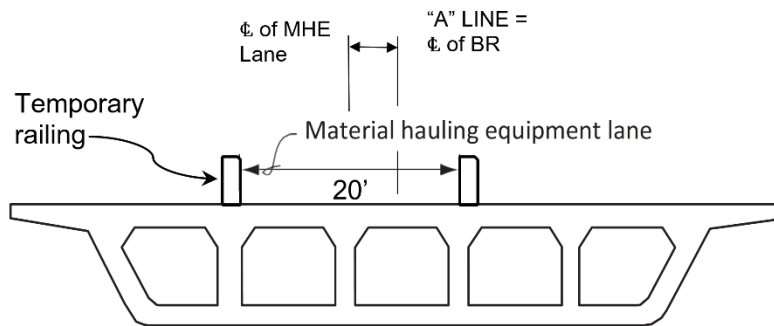
Chart Notes:

1. The gross axle loads, in pairs and in total, shall not exceed the limit shown in the MHE Loading Chart
2. Axle pairs less than 8 feet center-to-center shall be considered as a single axle.
3. Maximum single axle load = 130 kips
4. Placement of earth cover will reduce the allowable MHE load on the bridge and thus will require a revised chart from the Engineer.

**Figure 3.1.3-2 MHE Loading Chart**

### 3.1.4 CONTRACT PLANS

- The MHE loading chart and chart notes shall be shown on the plans.
- The MHE design vehicle shall be added to the Live Loading note in the General Notes:
  - Live Loading: HL-93, permit design load, and material hauling equipment per STP 3.1
- The MHE lane, as illustrated below, shall be delineated on the contract plans.



**Figure 3.1.4-1 Typical Section Location of Material Hauling Lane**

### 3.1.5 REFERENCES

1. AASHTO. (2017). *AASHTO LRFD Bridge Design Specifications*, 8<sup>th</sup> Edition, American Association of State Highway and Transportation Officials, Washington DC.
2. Caltrans. (2019). *Highway Design Manual*, 7<sup>th</sup> edition, California Department of Transportation, Sacramento, CA.
3. Caltrans. (2018). *Standard Specifications*, California Department of Transportation, Sacramento, CA.
4. Caltrans. (2019). *California Amendments to AASHTO LRFD Bridge Design Specifications*, 8<sup>th</sup> Edition, California Department of Transportation, Sacramento, CA.