Truck Loading for Expansion Joint Design

AASHTO T-2 2017

14.5.6.9.4—Loads and Load Factors

AASHTO Design Section 14 (modular design)

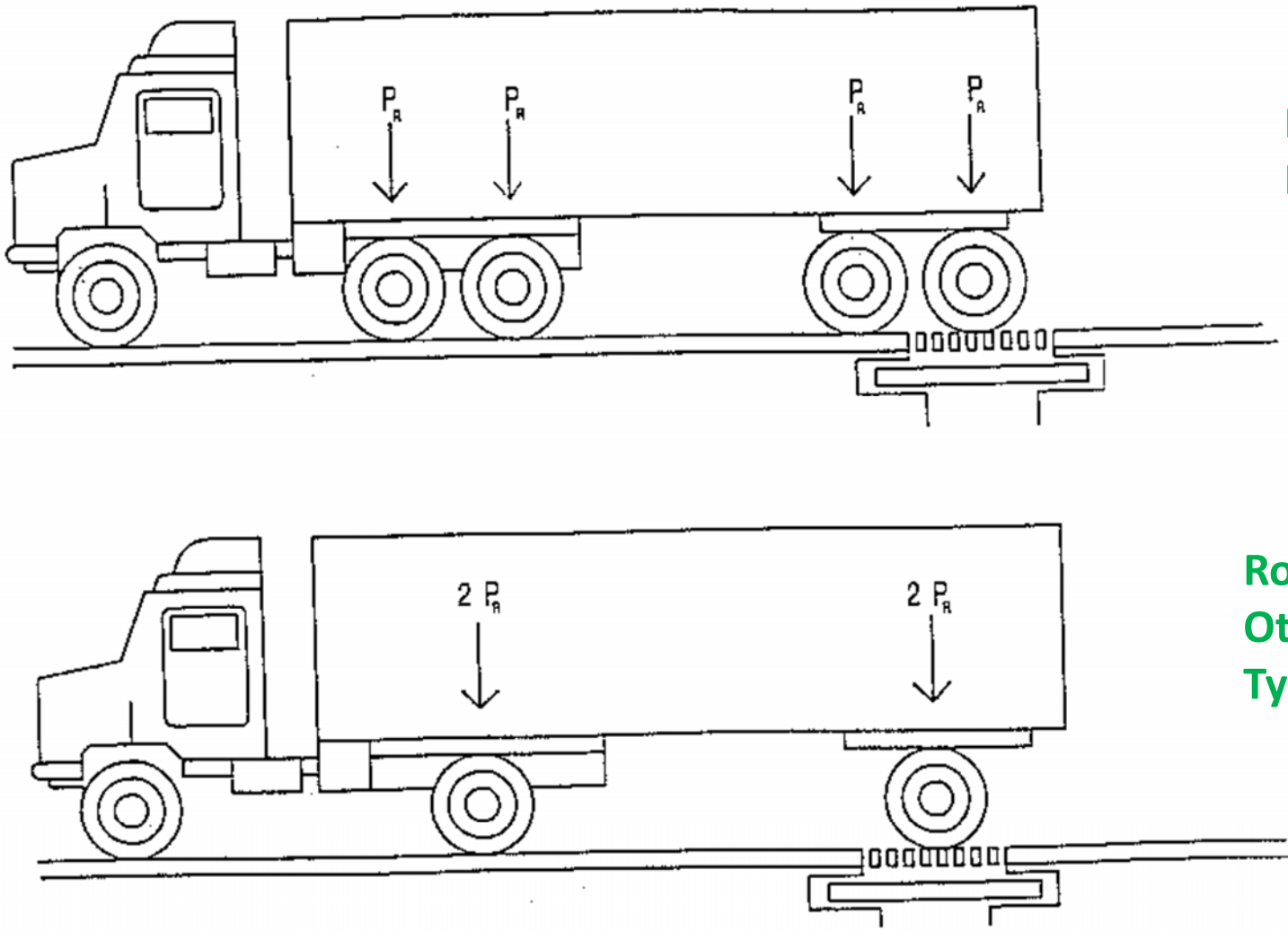
The vertical wheel load ranges for the fatigue limit state shall be from the largest axle load from the three-axle design truck specified in Article 3.6.1.2.2. For fatigue limit state design of MBJS, this axle load shall be considered as the total load on a tandem, i.e., the total load shall be split into two axle loads spaced 4.0 ft apart. Both of these tandem axles shall be considered in the design if the joint opening exceeds 4.0 ft. The vertical load range shall be increased by the dynamic load allowance specified for deck joints in

AASHTO Design Section 14

C14.5.6.9.4

The vertical axle load for fatigue limit state design is one-half the 32.0-kip axle load of the design truck specified in Article 3.6.1.2.2 or 16.0 kips. This reduction recognizes that the main axles of the design truck are a simplification of actual tandem axles. The simplification is not satisfactory for MBJS and other expansion joints because expansion joints experience a separate stress cycle for each individual axle.

NCHRP-402



Modular Design

Roadway & Other Joint Types Design

Figure 2.13. Five-axle truck idealized as an equivalent three-axle truck.

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Incidentally, the simplification of the HS rear axles as single axles is probably also not appropriate for other deck elements. Grid deck elements, the transverse diaphragms in orthotropic decks, and even floor beams may be subjected to

AASHTO Design Section 3

3.6.1.4—Fatigue Load

3.6.1.4.1—Magnitude and Configuration

The fatigue load shall be one design truck or axles thereof specified in Article 3.6.1.2.2, but with a constant spacing of 30.0 ft between the 32.0-kip axles.

The dynamic load allowance specified in Article 3.6.2 shall be applied to the fatigue load.

For the design of orthotropic decks and wearing surfaces on orthotropic decks, the loading pattern as shown in Figure 3.6.1.4.1-1 shall be used.

C3.6.1.4.1

For orthotropic steel decks, the governing 16.0-kip wheel loads should be modeled in more detail as two closely spaced 8.0-kip wheels 4.0 ft apart to more accurately reflect a modern tractor-trailer with tandem rear axles. Further, these wheel loads should be distributed over the specified contact area (20.0 in. wide × 10.0 in. long for rear axles and 10.0 in. square for front axles), which better approximates actual pressures applied from a dual tire unit (Kulicki and Mertz, 2006; Nowak, 2008). Note that the smaller 10.0 in. × 10.0 in. front wheels can be the controlling load for fatigue design of many orthotropic deck details.

This loading should be positioned both longitudinally and transversely on the bridge deck, ignoring the striped lanes, to create the worst stress or deflection, as applicable.

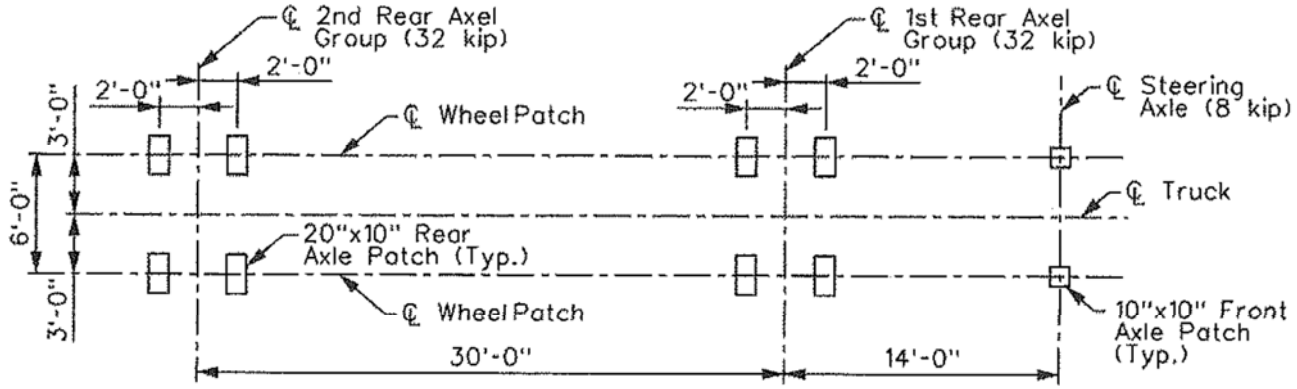

Figure 3.6.1.4.1-1—Refined Design Truck Footprint for Fatigue Design of Orthotropic Decks

Options

- **Do Nothing**
- Section 14 **Pointer** to Orthotropic Steel Deck Section 3
- Request **5 axle** truck be **included** in Loads Section 3
- Request **5 axle truck replace 3 axle** truck in Loads Section 3 (ala CSA S6-14)
- Include sketch of truck in **Section 14**, similar to Figure 3.6.1.4.1-1
- **Do Almost Nothing**, this is just a clarification improvement topic. But make the tandem axle design applicable to all joints, not just modulars.