

BRIDGE LOADING AND RATING

LOADS

Types of Loads

Bridges are subjected to many different types of loads.

There are three important types of bridge loads:

- Dead load
- Live load
- Other loads

Dead Load

Dead load consists of the self-weight of the bridge.

The load is usually stationary and permanent.

Typical dead loads are:

- Beams and girders
- Concrete deck
- Asphalt wearing surface
- Curbs
- Railing

Live Load

Live loads are usually temporary and are applied in a short duration of time.

The loads are usually moving.

Typical types of live loads are:

- Truck load
- Dynamic load allowance (impact)
- Pedestrian load
- Longitudinal live load

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Other Loads

The bridge is subjected to other loads beside dead and live load.

Other typical bridge loads are:

- Wind load
- Earth pressure
- Ice pressure
- Temperature effects
- Collision loads

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Rating Bridges

- Many older bridges were designed to carry smaller and lighter trucks.
- Are these older bridges capable of carrying today's heavier and longer legal truck configurations?
- Bridges are rated to determine the load carrying capacity of the bridge.
- Generally only the superstructure is load rated.
- The ratings normally assume that the bridge is in good structural condition.

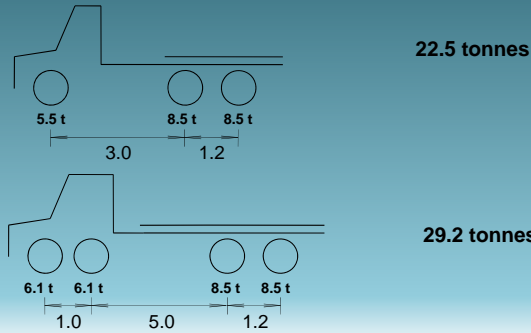
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Real Truck Configurations

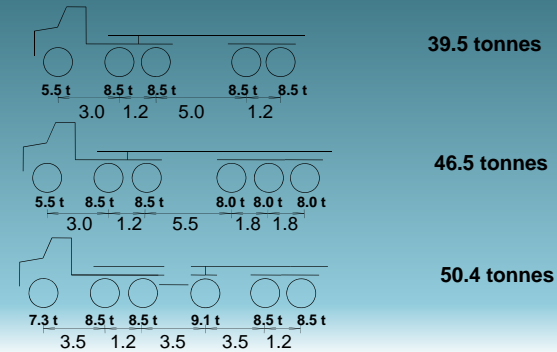
- There are many truck configurations that can legally travel on Alberta roads.
- The truck configurations are grouped into three categories:
 - Single unit trucks
 - Tractor semi-trailers
 - Truck trains
- Within each of the categories there are many different weights and axle configurations.

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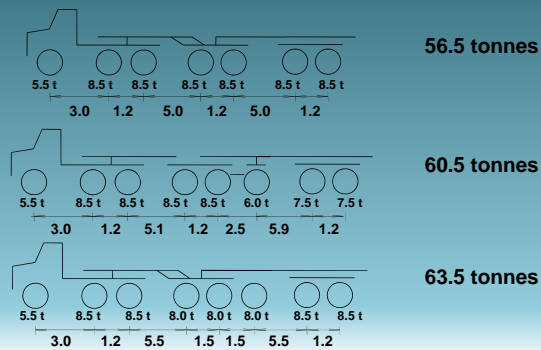
Typical Legal Single Unit Trucks



Typical Legal Single Unit Trucks



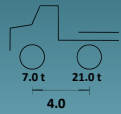
Typical Legal Truck Trains



Rating Truck Models

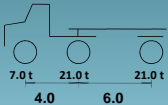
- Each one of the trucks produces unique forces and stresses in the bridge.
- It is not practical to load rate the bridge for each one of the real truck configurations.
- A model truck is used to represent each one of the truck configuration categories.
- CS1 Rating Truck Model - Single unit trucks
- CS2 Rating Truck Model - Tractor semi-trailer
- CS3 Rating Truck Model - Truck trains

Rating Truck Models



CS1 Rating Truck Model

28 tonnes



CS2 Rating Truck Model

49 tonnes



CS3 Rating Truck Model

63.5 tonnes for Primary & Secondary Highways

54 tonnes for Local Roads

Load Rating a Bridge

Step 1

- calculate load carrying capacity of critical member

Step 2

- calculate Dead Load this member is required to carry

Step 3

- member capacity less Dead Load, etc. is Live Load that the member can carry

Rating Equation

Rating Equation
$$LLRF = \frac{R - D}{L(1 + I)}$$

Where:

- LLRF = live load rating factor (fraction of the rating truck the bridge can safely carry)
- R = load the bridge can safely carry
- D = dead load of the bridge
- L = live load due to the rating truck model
- I = impact factor

Rating Equation (Cont'd)

Live load rating factor (LLRF) is calculated for each rating truck model.

A LLRF of 1.0 or greater indicates that the bridge is capable of safely carrying the current legal load for the particular truck category.

