

# BRIDGE LOADING AND RATING



Technical Standards Branch  
Class B Bridge Inspection Course



0

# LOADS



Technical Standards Branch  
Class B Bridge Inspection Course



1

# 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



Technical Standards Branch  
Class B Bridge Inspection Course



2

# 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



Technical Standards Branch  
Class B Bridge Inspection Course



3

## 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

## 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

## 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.

## 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.

Bridge Load Rating

## Typical Legal Single Unit Trucks

**22.5 tonnes**

**29.2 tonnes**

Alberta Transportation Technical Standards Branch Class B Bridge Inspection Course BIM Bridge Inspection and Maintenance

Bridge Load Rating

## Typical Legal Single Unit Trucks

**39.5 tonnes**

**46.5 tonnes**

**50.4 tonnes**

Alberta Transportation Technical Standards Branch Class B Bridge Inspection Course BIM Bridge Inspection and Maintenance

Bridge Load Rating

## Typical Legal Truck Trains

**56.5 tonnes**

**60.5 tonnes**

**63.5 tonnes**

Alberta Transportation Technical Standards Branch Class B Bridge Inspection Course BIM Bridge Inspection and Maintenance

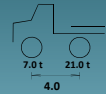
Bridge Load Rating

## 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

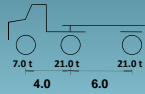
Alberta Transportation Technical Standards Branch Class B Bridge Inspection Course BIM Bridge Inspection and Maintenance

## 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.

## Legal Loads

Highway Type	CS1 Truck Single Unit	CS2 Truck Semi-Trailer	CS3 Truck Truck-Trains
Primary	28	49	63.5
Secondary	28	49	63.5
Local	28	49	54

Note: Loads are expressed in tonnes

## Bridge Load Evaluation Manual

For further information refer to Alberta Transportation "Bridge Load Evaluation Manual" at:

<http://www.transportation.alberta.ca/4824.htm>