

# 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

## 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

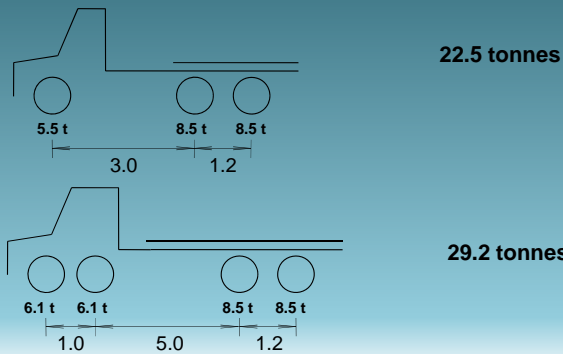
## Rating Bridges

- 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.

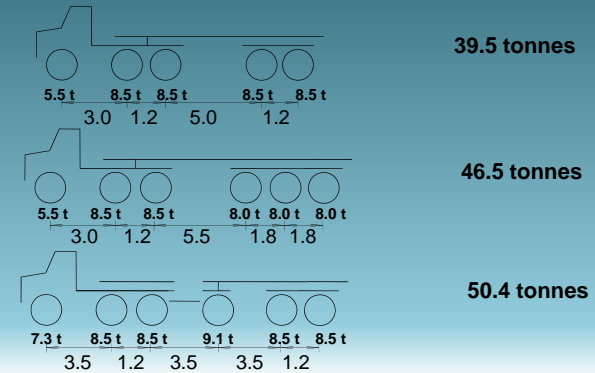
## Real Truck Configurations

- 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.**

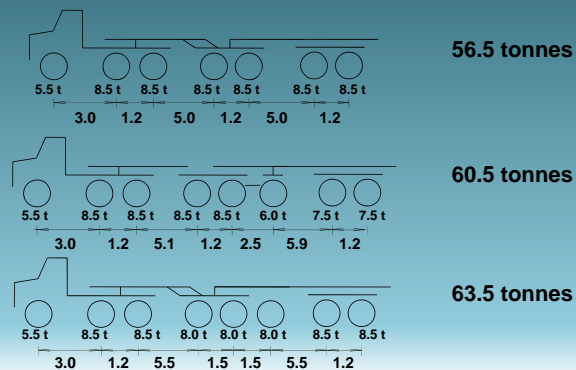
## Typical Legal Single Unit Trucks



## Typical Legal Single Unit Trucks



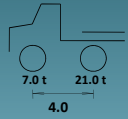
## Typical Legal Truck Trains



## Rating Truck Models

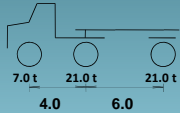
- Each one of the trucks produces unique forces and stresses in the bridge.
- It is not practical to load rate the bridge for each one of the real truck configurations.
- A model truck is used to represent each one of the truck configuration categories.
- CS1 Rating Truck Model - Single unit trucks
-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

## Rating Truck Models



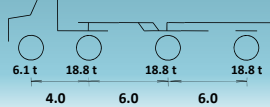
### CS1 Rating Truck Model

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.

# 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



Technical Standards Branch  
Class B Bridge Inspection Course



Alberta Transportation Bridge Inspection & Maintenance System (M03 2005) 00371 - 1 Bridge

**Bridge Inspection**

Bridge File Number: 00371 - 1 Bridge  
Year Built/Year: 1953/1953  
Location: SUNNYVILLE  
Local Name: HNEEHILLS CREEK 3.86 WATERCROSS-ST  
Local Road: LOCAL ROAD  
Water Body ID/Year: /  
Nearest City/Town: /  
Legal Land Location: 16 SEC 26 TWP 31 RGE 26 W04W  
Longitude, Latitude: -113.3436, 51.4041  
Road Authority: HNEEHILLS COUNTY  
Contract Area: LINDSEY/CO. DVA  
Clear Roadway/Width: 8.4 /  
Road Classification: 60 (2011)  
Design Length (km): 0.8  
ADITY Year: /  
Road Classification: 60 (2011)  
Design Length (km): 0.8

Inspector Name: G. Roberts  
Inspector Class: /  
Assistant Name: /  
Inspection Date: 2/15/11  
Assess Time: 8:30 AM  
Check Time: /  
Date Entry By: /  
Date Entry Date: /  
Revisor Name: /  
Revision Date: /  
Dist. Revisor Name: /  
Dist. Revisor Date: /  
Follow-Up By: /

Allowable Load (t): Single 23.0, Semi 49.0, Truck 63.5  
Design Length (m): 840

Assigned Load Posting (t): Single 23.0, Semi 49.0, Truck 63.5  
Truck Train 100.0

Problems: /  
Notes: /

Remarks: /

Other Sign Types: /

Utility Attachments: /

Approach Road:

Horizontal Alignment: /  
Vertical Alignment: /  
Roadway Width (m): 8.600  
Approach Ramp: /  
Overhead (Y/N): No  
Guardrail: /  
Length (m): /  
Current Standard (Y/N): /  
Termination Type: /  
Clearance: /

Approach Road General Rating: /

2. Ins. update required  
2. NOTIFICATION THIS BRIDGE AT  
ATTEMPT TO FURNISH

Page 011 of 212

# Bridge Load Evaluation Manual

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

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



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