Introduction of
Load and Resistance Factor Rating (LRFR)

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What Is Bridge Load Rating?

The safe live load carrying capacity of a highway bridge is called as bridge load rating .

It is usually expressed as a (rating) factor (RF) of a defined vehicle or as a gross tonnage for a defined vehicle axle configuration.

Three Different Load Rating Methods

- Allowable Stress Rating (ASR)
- Load Factor Rating (LFR)
- Load & Resistance Factor Rating (LRFR)

Basic Equation of Rating Factor for the LFR Method

A load rating can be expressed in terms of a "rating factor" for a particular vehicle.

How to calculate the rating factor (RF)

$$RF = \frac{C - A_1 D}{A_2 L(1 + I)}$$

Rating Level	A1	A2
Inventory	1.3	1.3
Operating	1.3	2.17

A_1 = Factor for dead loads

A_2 = Factor for live load

C = Capacity of the bridge

D = Dead load effect

I = Impact factor

L = Live load effect

Basic Equation of Rating Factor for the LRFR Method

$$RF = \frac{C - \gamma_{DC} DC - \gamma_{DW} DW \pm \gamma_P P}{\gamma_L LL(1 + IM)}$$

C is the structural capacity ($=\phi_c \phi_s \phi R$; c: condition, s: system)

DC is the dead-load effect of structural components and attachments

DW is the dead-load effect of wearing surfaces and utilities

P is the permanent loading other than dead loads

LL is the live-load effect

IM is the dynamic load allowance

γ_{DC} is the load factor for structural components and attachments

γ_{DW} is the LRFD load factor for wearing surfaces and utilities

γ_P is the load factor for permanent loads other than dead loads

γ_L is the evaluation live-load factor

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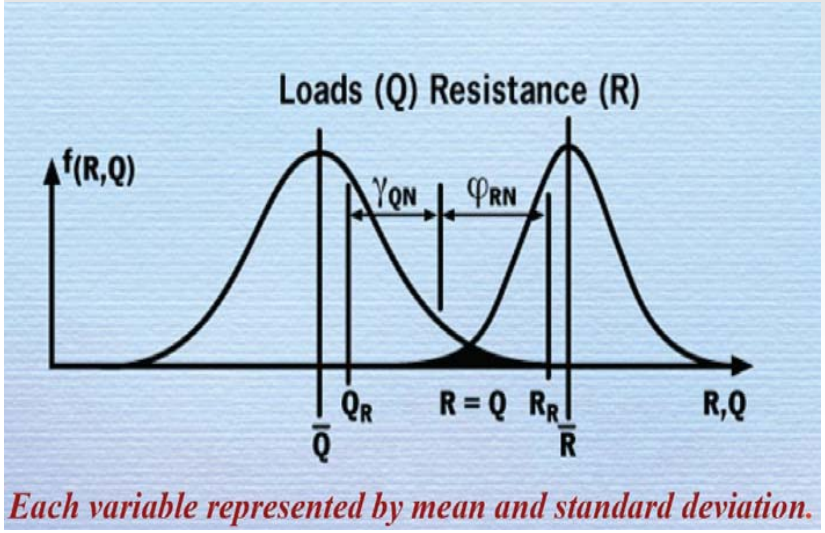
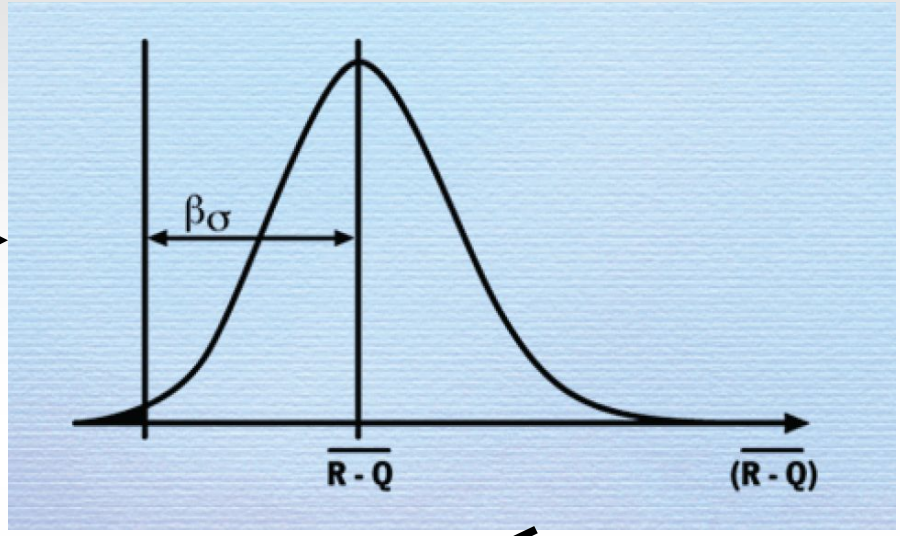
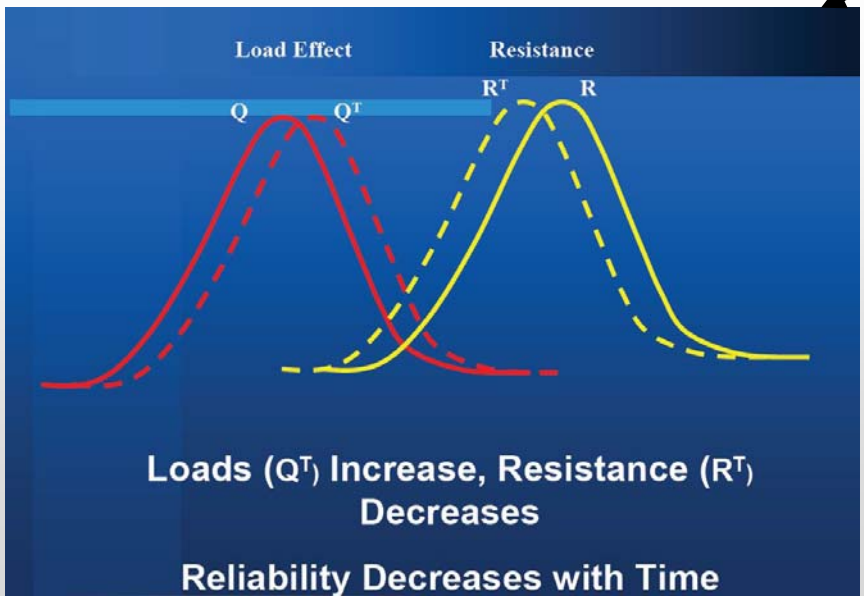
Load Factors for the LRFD/LRFR

Bridge Type	Limit State*	Dead Load DC	Dead Load DW	Design Load 6.4.3.2.1		Legal Load 6.4.4.2.1	Permit Load 6.4.5.4.1
				Inventory	Operating		
				LL	LL	LL	LL
Prestressed Concrete	Strength I	1.25	1.50	1.75	1.35	Table 6-5	-
	Strength II	1.25	1.50	-	-	-	Table 6-6
	Service III	1.00	1.00	0.8	-	1.00	-
	Service I	1.00	1.00	-	-	-	1.00

PROBABILISTIC DESIGN & EVALUATION







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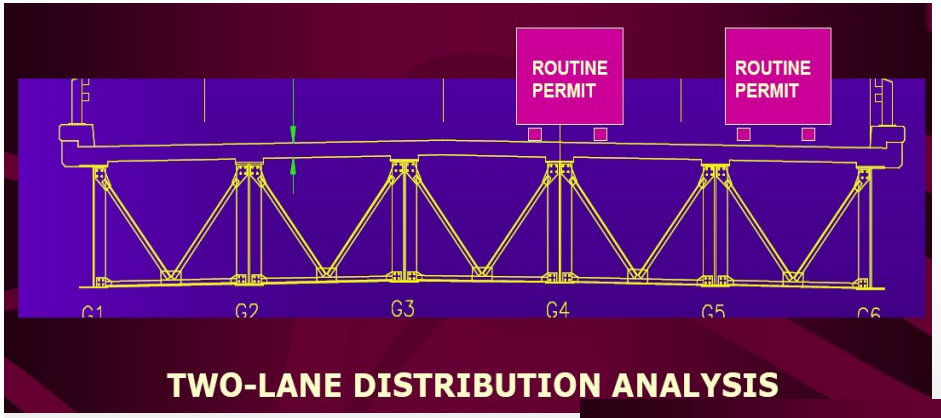
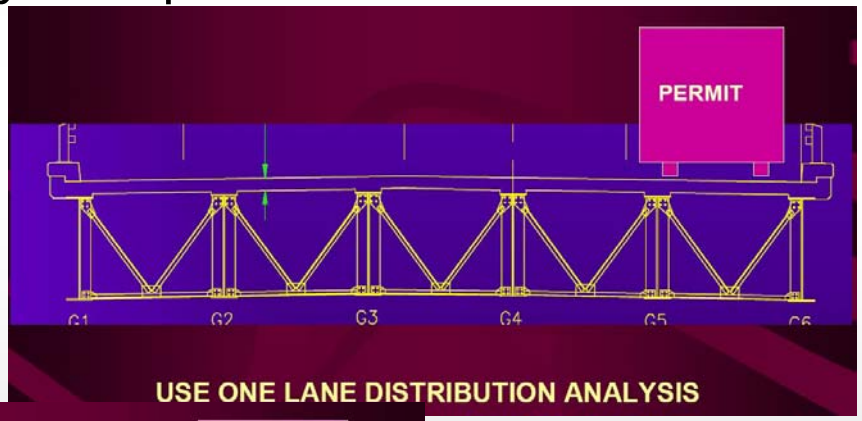
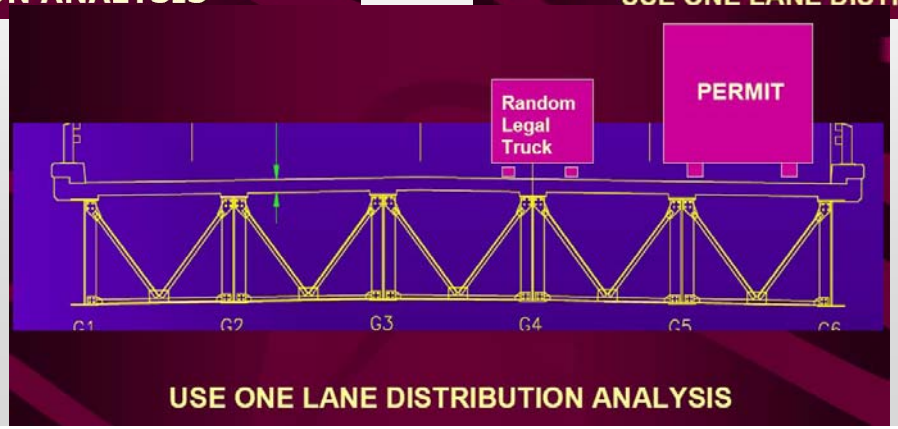
Special Permit Review using Refined Analysis

- 3D FEM analysis of Special Permits allos the input of different trucks and live load factors in each lane.
- Requests for guidance on appropriate adjacent live load and permit load factors for use in 3D analysis
- Need to maintain consistent safety in all permit evaluations.







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