2008
Bridge Load Rating Class 101

Workshop Agenda

I. Introductions
II. Load Rating Basics
III. General Equations
IV. Load Rating Procedure
V. Incorporating Member Distress
VI. Posting, SHV's and Permitting
VII. Load Rating Example #1
- Simple Span Non-composite Steel

Incorporating Member Distress

It is EXTREMELY important to consider distress!

$$\text{Rating} = \frac{\text{Capacity} - \text{Dead Load}}{\text{Live Load}}$$

What is Causing Distress?

- Bridge hit
- Corrosion or rot
  - How much and can you stop?
  - Critical location??
- Thermal movement
- Serviceability problem
- Scour
- Illegal overload

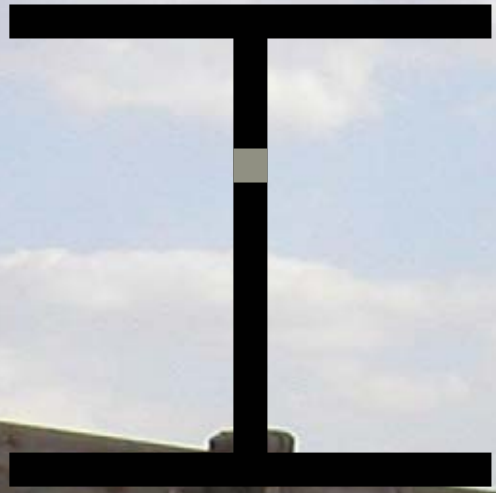
Condition of Bridge

- Bridge ratings should be based on a recent and thorough bridge inspection
- Adequate data should be available to evaluate the affect of damage.
  - Description
  - Location
  - Extents

Inspection Requirements

Incorrect Report

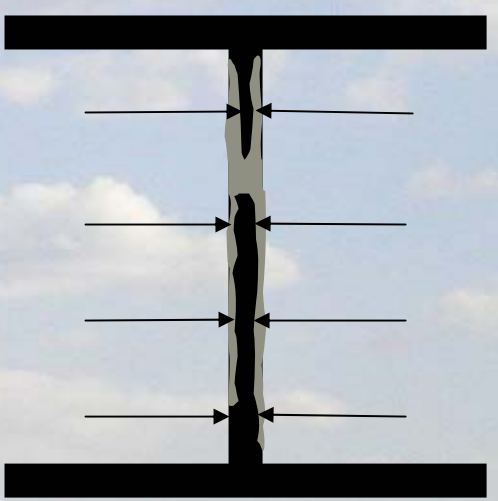
1” diameter section loss in web



Correct Report

Original $t_w = 5/16$”

Average thickness in 4 places is 0.15”



Inspection Requirements

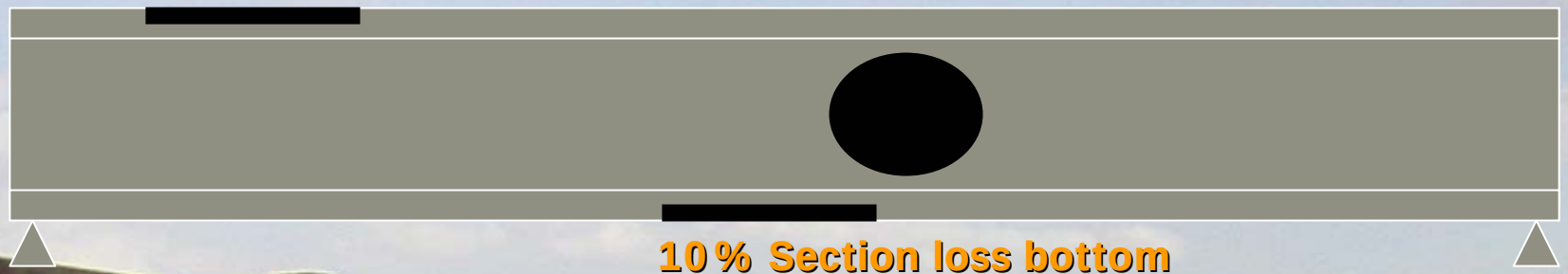
Incomplete Report

40 % Section loss on beams

Accurate Report

40 % loss on top flange 2’ to 6’ from south bearing

20 % section loss centered on web from 16’-18’ from north bearing



10 % Section loss bottom flange for 4’ in center of span

High Stress Areas (Beams)

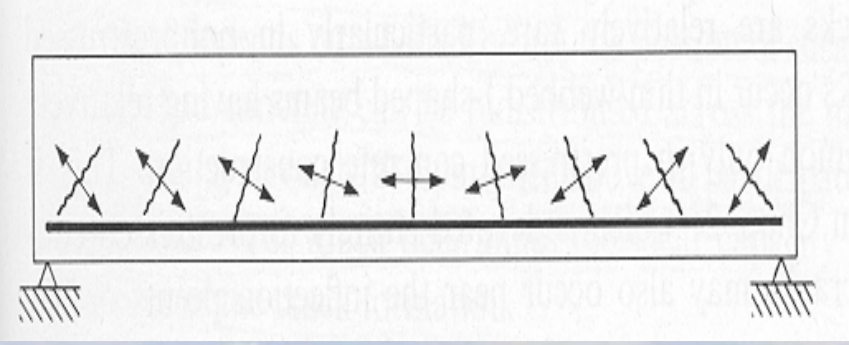
- **Moment**
  - Beam flanges or primary tension rebar in center span (continuous at piers for -M)
- **Shear**
  - Webs near support points
- **Bearing**
  - At support locations, integrity of flanges and webs

High Stress Areas

- **Compression**
  - Top flange in simple span
  - Find in truss (lattice bracing)
  - Make sure braced properly (LTB)
- **Tension**
  - Bottom flange simple span
  - Look at net section (Ag-bolt holes)
  - Find in truss

Trusses

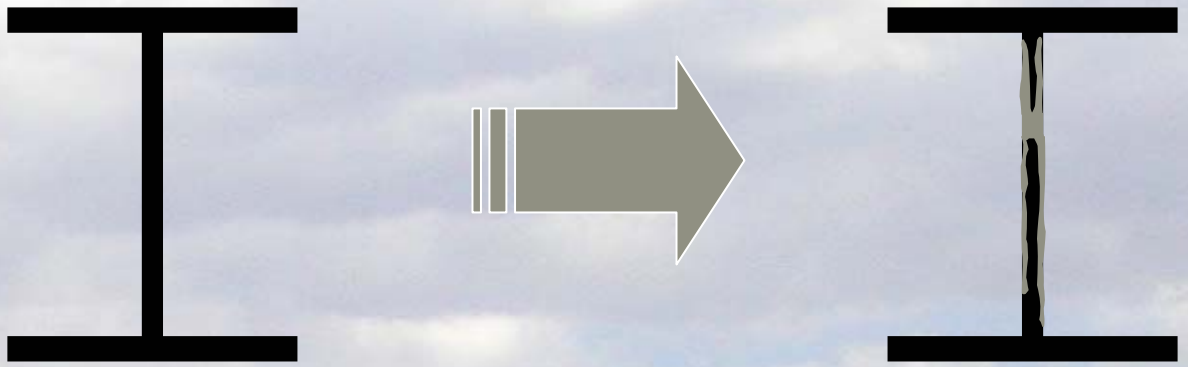
Critical Regions



How to Incorporate Distress

- **Change cross-sectional properties to reflect loss of section**
  - Concrete sections
    - Reduce area of reinforcement
    - Loss of concrete area in compression
  - Steel or Timber axial member
    - Tension reduce area (net section)
    - Compression reduce area (loss of bracing)
  - Steel or Timber beam
    - Moment of inertia

Structural Distress Example



$$A_{rating} = A_{design} - A_{distress}$$

$$I_{rating} = I_{design} - (I_{distress} + A_{distress} d^2)$$

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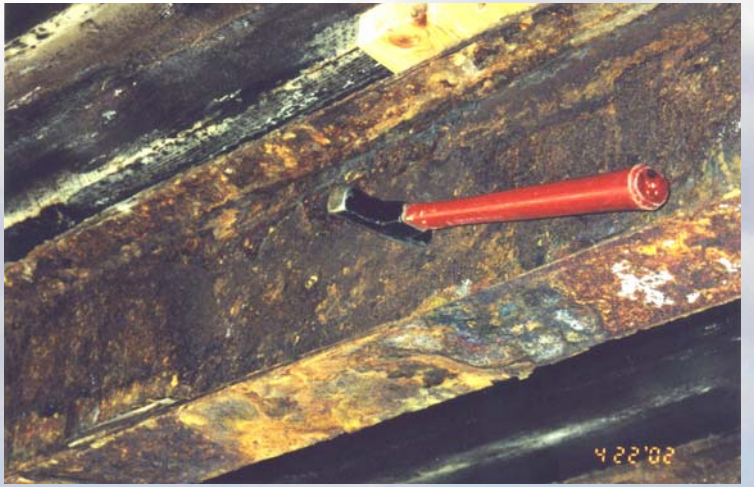

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Repairs

Impact of Distress at Critical Location

Rating	Original	2” Overlay	Steel I Beam 20% Section Loss
Inventory	HS11.6	HS10.8	HS5.0
Operating	HS19.4	HS18.1	HS10.0

Time to Move on