Supplemental Treatment of Wood Bridges with Borate Rods
QUESTIONS:

• Why are ties and timbers failing prematurely and what is the financial burden?
• What is being done now to address the problem?
• What is fungal decay and what causes it?
• How can we extend the life cycle of our ties and timbers?
Approximately 23 million ties are replaced every year at a cost of over $150 million
Tie Replacements is relative easy in the track.
30% of all Railroad Bridges are Wood

• The majority of bridges are over 50 years old
• Railroads spend about $80 million per year on bridge replacement
• Bridge Timbers are not easy to replace
• Many bridges are at capacity because they were designed to carry smaller loads per car than what the average is now
• Bridge designs are based on sound timbers without any rot.
Treated or not, all Wood is Vulnerable to Biodegradation

• Creosote is only an envelope treatment
• Wood checks as it seasons exposing untreated heartwood and sapwood
• Through boring and hardware attachments expose untreated wood in the middle of the timber
• Field cuts are not always field treated
• Contact with dirt or concrete.
Causes of Biodegradation

• Fungal Decay
• Termites
• Beetles
• Carpenter Ants.
Rot needs 4 conditions to survive

• 1. Moisture
• 2. Food
• 3. Oxygen
• 4. Temperature between 40 and 90.
Characteristics of Fungal Decay

- Microscopic thread-like organisms
- Ubiquitous in nature – present everywhere
- Brown Rot and White Rot
  - Below and above ground
  - Can degrade wood in a relatively short time
- Soft Rot
  - Prefers warmer and wetter climates
  - Very slow and only affects the outer shell.
Causes of Decay

- Hardware attachments and condensation
- Checks that collect water
- Field cuts that were not field treated
- Alternate wet and dry cycles
- Empty bolt or spike holes that allow water into the center.
Life Cycle of Fungal Decay

• Spore - microscopic but in quantity looks like orange dust
• Hyphae – Fine white threadlike strands
• Mycelium – Large fleshy mass
• Fruiting Body – brackets or mushrooms which produce and release spores.
• Rot is like Wood Cancer
Termites

• Usually follow the rot in creosoted hardwoods
• Damage can be rapid and substantial
• Mostly in the southeast, southwest and Hawaii
• Formosan termites are the biggest threat and are hitchhiking their way north as stowaways inside of used crossties being repurposed as landscape timbers.
Beetles and Carpenter Ants

• Can cause notable damage in some situations but their overall significance is nothing compared to Decay and Termites
Effects of Climate

• Moisture and Temperature and the two most important considerations for fungal decay.
Fused Boron Rods

- Very high concentration of borate wood preservative
- Inserted into drilled holes
- Boron Rods slowly dissolve when moisture content is high enough to support decay
- Provides a “time released” preventative treatment if the wood is dry
- There are over 40 technical papers showing the efficacy of boron rods
- Boron Rods are EPA registered pesticides but do not require an applicators license
- They protect wood against termites, beetles, carpenter ants and wood rot for over 10 years.
Boron Diffusion from Rods
Treatment of Decay using Boron Rods

- Boron Rods are a way to treat specific locations of timbers while they are in place
- Safe and easy to use - no risk of spillage compared to liquids or granular fumigants
- Exact dosage – no guesswork. 1 hole, 1 rod
- Extends the life of timbers a decade or more
- Cost effective
- With plastic reusable plugs, ties can be easily retreated periodically
15 Year Exposure Report

- Cordele and Jessup Georgia in 1989
- One end of ties treated with rods, then compared after 15 years
  - Treated ends still had enough borate to be above the toxic threshold to prevent and kill fungi
  - Decay had advanced in untreated ends of ties
  - Treated ends had no rot
  - Best results on ties with one Boron Rod placed on either side of the tie plate.
Boron treatments can keep spikes and bridge hardware from corrosion
Wood Inspection for Decay and Placements for Boron Rods

• Look for visible clues like mold, algae or checks
• Sound and Bore
• When rot is found, insert Boron Rods
• Check pilings at 2 feet above ground down to 2 feet below groundline
• Check piling in water at 2 feet above mean water line
• Take several borings since rot pockets are very irregularly shaped.
Summary

- Railroad ties and timbers have gotten very expensive to replace.
- Railroad ties and timbers rot from the inside, mostly due to high moisture.
- Track ties are easy to replace compared to bridge timbers.
- The cost of disposal of ties is expected to skyrocket if EPA bans their use as fuel.
- Thorough inspection will identify problems before they become catastrophic problems.
- Boron Rods stop and prevent biodegradation.
Thank you for your attention