The Case for the Stainless Steel Underframe

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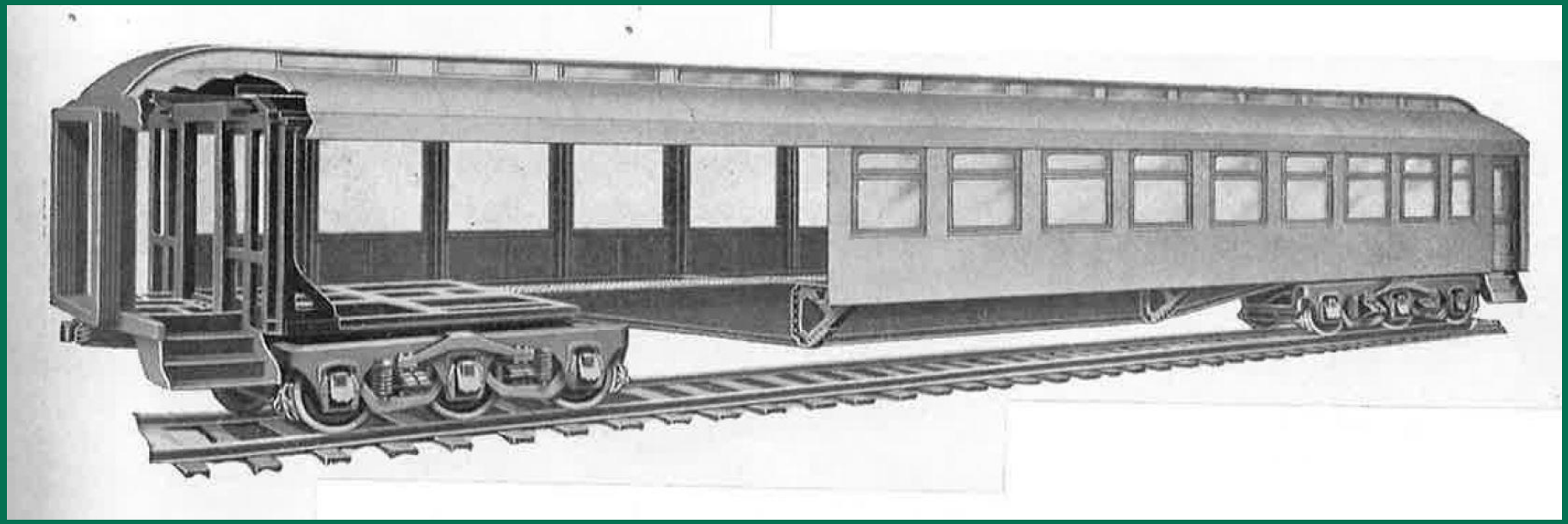
Traditional End Underframe (EUF) Construction

- Primarily HSLA steel
- Welded structure
- Coatings provide corrosion resistance
  - Base metal
  - Dissimilar welds, HSLA to stainless

EUF Performance Requirements

- Static strength
- Fatigue resistance
- Corrosion resistance
- Modern CEM requirements
  - Transmittal of forces
  - Replacement of expended CEM parts

Historical View of Passenger Car Design



The Duties and Responsibilities of the Underframe

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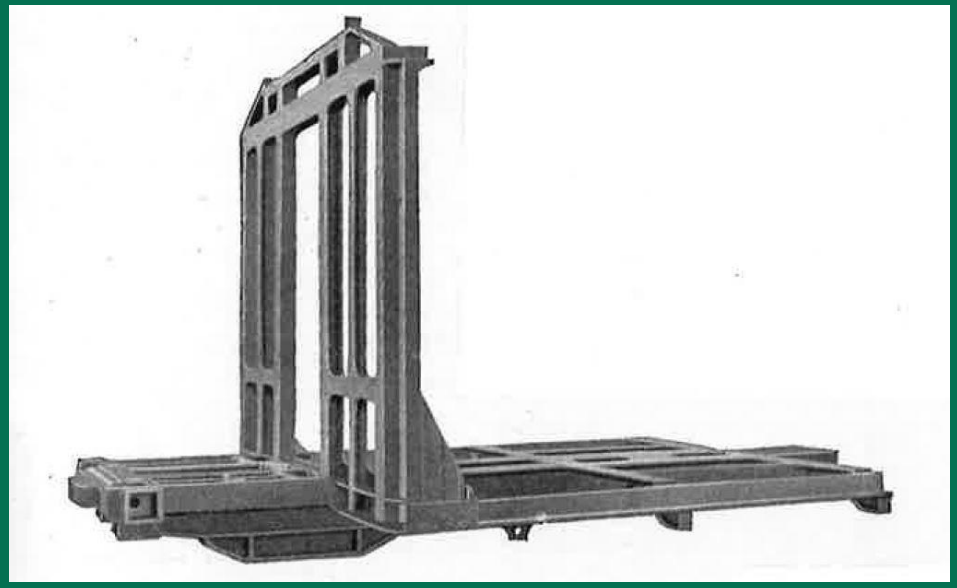
- Carry passengers, crew, and equipment
- Buff/Draft forces from couplers
- Truck connection at bolsters
- Anchor end-frame collision structure
- Normal service and emergency loads

The Ends of the Underframe

- Multiple duties
  - Fatigue resistant for normal service loads
  - Strong and tough for emergency loads



General Requirements

- Materials – light, durable, high strength
- Ease of manufacturing
- Industry state of the art
  - Primarily HSLA
  - Stainless steel interface to balance of underframe
- But, why not a Stainless Steel End Underframe?

HSLA End Underframes

- HSLA meets General Requirements
- But, HSLA corrodes at connections, hidden cavities

HSLA Case Histories

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Rethinking the use of Stainless Steel in the End Underframe

- Benefits of current low-carbon grades of stainless steel
  - Arc welded fabrication
  - Connections simplified
  - Corrosion issues practically eliminated
- Simplify design and production
- So . . .

A Modest Proposal . . .

- Why not build Stainless Steel cars entirely of low-carbon Stainless Steel, including the End Underframe Units?

Characteristics of an Austenitic Stainless Underframe

- Redesign, not a material substitution
  - Put joints in low stress areas
  - Use cold rolled stainless as much as possible
  - Redesign connections and transitions
    - Continuous members from EUF through side sill
    - Eliminate ring welds where possible

Characteristics of an Austenitic Stainless Underframe

- Use low carbon grades
  - Prevents sensitization
  - Improved atmospheric corrosion resistance
- Mixture of grades and strength levels is possible
  - Welding is compatible with all combinations
  - Appearance not a factor in undercar area

Advantages of an Austenitic Stainless Underframe

- No coating necessary
  - Eliminates preparation and material
  - No stripping and recoating at overhaul and no waste concerns
- Carshell lifetime greatly extended
- Fully recyclable carshell
  - No mixed scrap
  - No disassembly of structural parts

Path to Implementation

- Owner commits to SS EUF in Tech Spec (Option, not base requirement)
- Life cycle cost evaluation
- Vendor selection based on best value, not lowest initial cost
  - "Green" value to be considered

Additional Contributors

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