TSCF

Guidance Notes on High Tensile Steel

Daniel Cronin
TSCF/ABS

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Why is HTS Used?

- Weight reductions
  - Steel cost
  - Yard crane limits and block handling
- Reduced welding and manpower costs
- EEDI
- Increased cargo carrying capacity
- Reduced draught

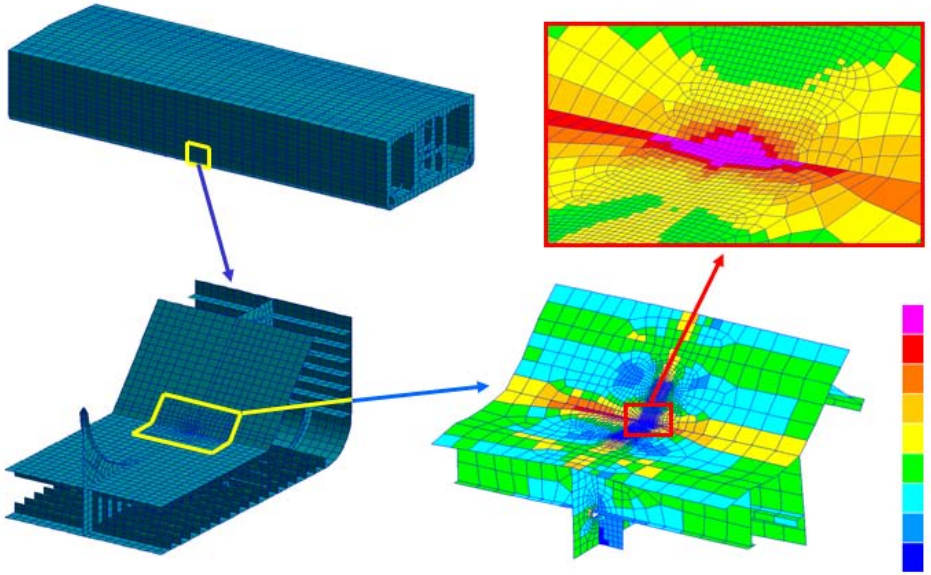
Historical Use of HTS

- Tankers built in 1960s generally limited HTS to top and bottom flange
- Many HTS rich designs of the 1980 built with extensive HTS
- Many of these vessels experienced fatigue cracking and other problems
- HTS limits were commonly introduced to limit HTS use to top and bottom flange

Technical Issues

- Fatigue
- Vibration
- Buckling
- Coating Flexibility
- Traceability

Fatigue



- CSR limits the locations requiring fatigue analysis
  - Stiffener end connections analyzed in the midbody region
  - If standard details are used for main supporting members, stress screening used instead of fatigue analysis
- Fatigue Prone areas are discussed in TSCF publications:
  - Outfitting Related Structural Defects
  - Guidance Manual for Tanker Structures

Vibration

- HTS structures are more flexible and more likely to experience vibration effecting
  - Crew comfort
  - Mechanical or structural damages
- HTS is typically not used in the deckhouse and engine room
- The extent of HTS should be limited to service proven levels
- Otherwise additional attention should be given to the stiffness of structure near the excitation source

Buckling

- Higher allowable stresses and thinner scantlings make buckling more critical
- CSR addresses buckling with:
  - Proportion checks
  - Detailed stress analysis
- CSR-H increases the required extent of finite element analysis to include fore and aft structure

Corrosion and Coatings

- CSR requires strength analysis be carried out based on the minimum thickness to renewal
- In CSR the corrosion margin is specified as a number and not a percentage
- Therefore the corrosion allowance is not reduced when HTS is used
- Higher flexibility of HTS may reduce the effectiveness of coating systems
- Coating flexibility test recommended – PSPC Appendix 1 and ASTM D4145:1983

Traceability and Materials

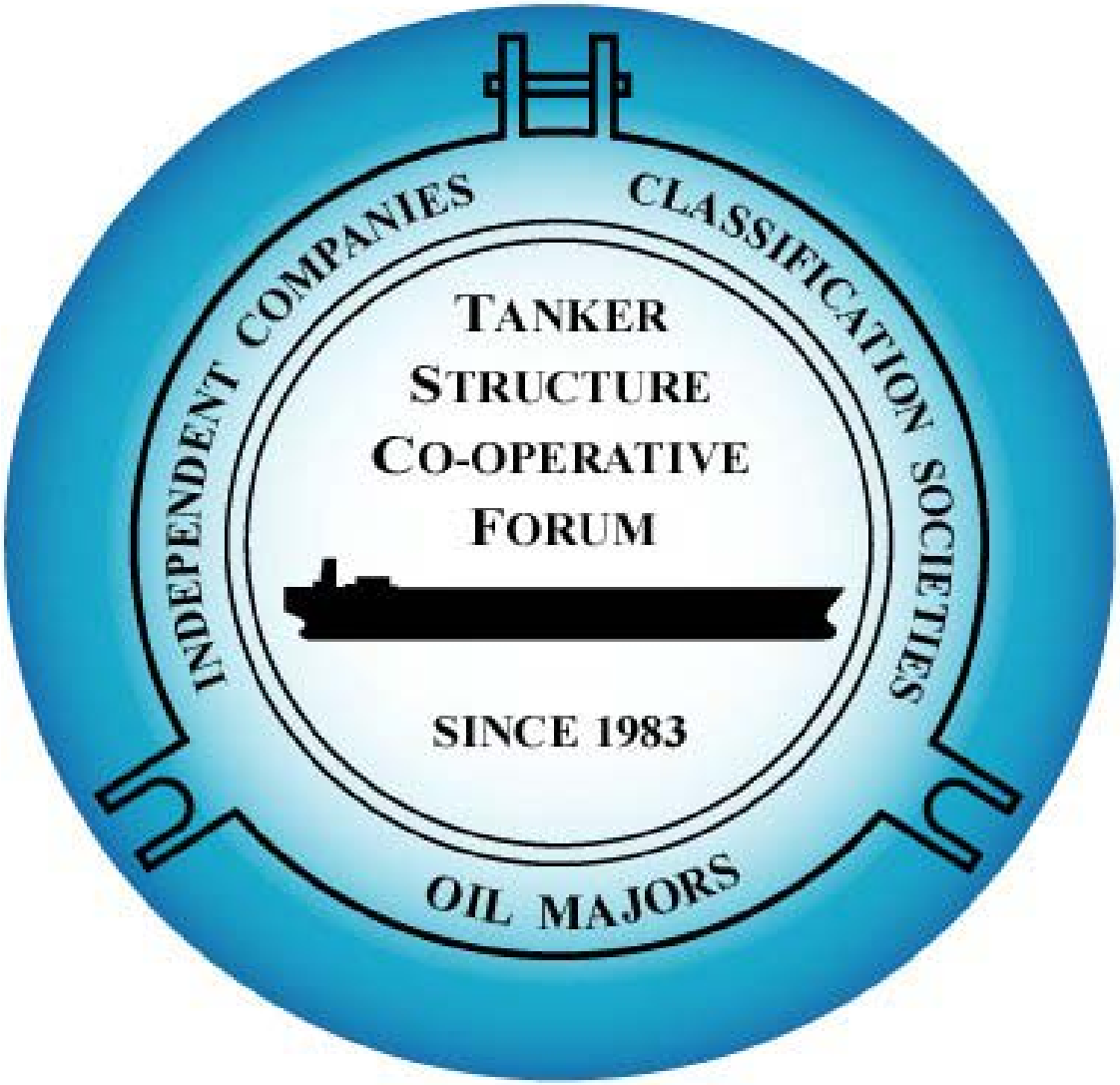
- The more grades of material that are introduced in the design will increase the potential for shipyard errors during construction
- Several mills may provide multiple cutting shops; subcontracted blocks increase potential for errors
- A robust procedure must be in place to trace all materials through all stages of construction at each facility
- Critical locations may subject to additional quality control

Other Issues

- Availability for repairs
- Welding – approved welding procedures should be followed
- Alignment of critical areas
- Cross ties
- Enhanced Surveys – HTS may increase number of critical locations

Considerations for Use

- TSCF does not recommend an HTS percentage limit
- Instead the paper outlines considerations for use:
  - Additional finite element or fatigue analysis
  - Procedures to address traceability
  - Additional vibration analysis
  - Coatings to be subjected to flexibility test
- Additional considerations listed in the Guidance Notes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