



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

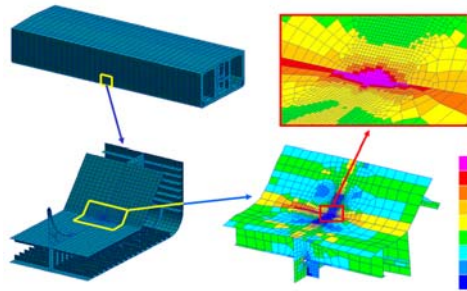
- Stiffener end connections analyzed in the midbody region

- 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

