



Adopted by

IACS
INTERNATIONAL ASSOCIATION
OF CLASSIFICATION SOCIETIES

*Common Structural Rules
for Double Hull Oil Tankers*



COMMON STRUCTURAL RULES FOR DOUBLE HULL OIL TANKERS

These Rules enter into force on 1st April 2006.

The Rules contain two parts, one part that is for information and does not constitute specific requirements and one part giving structural rules for double hull oil tankers of 150m or greater.

Subjects for information are given in Section 1 – Introduction and Section 2 – Rule Principles.

Specific rule requirements are given in Sections 3 to 12 and the Appendices.

„General Terms and Conditions“ of the respective latest edition will be applicable
(see Rules for Classification and Construction, I – Ship Technology, Part 0 – Classification and Surveys).

Copyright in these Common Structural Rules is owned by each IACS member as at 15 January 2006.
Copyright © 2006

Reproduction by printing or photostatic means is only permissible with the consent of Germanischer Lloyd.

Germanischer Lloyd Aktiengesellschaft

Head Office

Vorsetzen 35, 20459 Hamburg/Germany

Phone: +49 40 36149-0

Fax: +49 40 36149-200

headoffice@gl-group.com

www.gl-group.com

SECTION 1 INTRODUCTION

- 1 Introduction to Common Structural Rules for Oil Tankers**
- 1.1 General
- 1.2 Application of Individual Classification Rules
- 1.3 Guidance on Rule Structure

SECTION 2 RULE PRINCIPLES

- 1 Introduction**
- 1.1 Rule Principles
- 2 General Assumptions**
- 2.1 General
- 3 Design Basis**
- 3.1 General
- 4 Design Principles**
- 4.1 Overall Principles
- 4.2 Loads
- 4.3 Structural Capacity Assessment
- 4.4 Materials and Welding
- 4.5 Assessment/ Acceptance Criteria
- 4.6 Principle of Safety Equivalence
- 5 Application of Principles**
- 5.1 Overview of the Application of Principles
- 5.2 Structural Design Process
- 5.3 Minimum Requirements
- 5.4 Load-capacity Based Requirements
- 5.5 Materials
- 5.6 Application of Rule Requirements

SECTION 3 RULE APPLICATION

- 1 Notations**
- 1.1 Notations
- 2 Documentation, Plans and Data Requirements**
- 2.1 Documentation and Data Requirements
- 2.2 Submission of Plans and Supporting Calculations
- 3 Scope of Approval**
- 3.1 General
- 3.2 Classification
- 3.3 Requirements of National and International Regulations
- 4 Equivalence Procedure**
- 4.1 General
- 5 Calculation and Evaluation of Scantling Requirements**
- 5.1 Determination of Scantling Requirements for Plates
- 5.2 Determination of Scantlings of Stiffeners
- 5.3 Calculation and Evaluation of Scantling Requirements for Primary Support Members
- 5.4 Rounding of Calculated Thickness

SECTION 4 BASIC INFORMATION

1 Definitions

- 1.1 Principal Particulars
- 1.2 Position 1 and Position 2
- 1.3 Type 'A' and Type 'B' Freeboard Ships
- 1.4 Coordinate System
- 1.5 Naming Convention
- 1.6 Symbols
- 1.7 Units
- 1.8 Glossary

2 Structural Idealisation

- 2.1 Definition of Span
- 2.2 Definition of Spacing and Supported Breadth
- 2.3 Effective Breadth of Plating
- 2.4 Geometrical Properties of Local Support Members
- 2.5 Geometrical Properties of Primary Support Members
- 2.6 Geometrical Properties of the Hull Girder Cross-Section

3 Structure Design Details

- 3.1 Standard Construction Details
- 3.2 Termination of Local Support Members
- 3.3 Termination of Primary Support Members
- 3.4 Intersections of Continuous Local Support Members and Primary Support Members
- 3.5 Openings
- 3.6 Local Reinforcement
- 3.7 Fatigue Strength

SECTION 5 STRUCTURAL ARRANGEMENT

1 General

- 1.1 Introduction

2 Watertight Subdivision

- 2.1 Watertight Bulkhead Arrangement
- 2.2 Position of Collision Bulkhead
- 2.3 Position of Aft Peak Bulkhead

3 Double Hull Arrangement

- 3.1 General
- 3.2 Double Bottom
- 3.3 Double Side

4 Separation of Spaces

- 4.1 Separation of Cargo Tanks
- 4.2 Cofferdam Spaces

5 Access Arrangements

- 5.1 Access Into and Within Spaces in, and Forward of, the Cargo Tank Region

SECTION 6 MATERIALS AND WELDING

1 Steel Grades

- 1.1 Hull Structural Steel
- 1.2 Application of Steel Materials
- 1.3 Aluminium Alloys

2	Corrosion Protection Including Coatings
2.1	Hull Protection
3	Corrosion Additions
3.1	General
3.2	Local Corrosion Additions
3.3	Application of Corrosion Additions
4	Fabrication
4.1	General
4.2	Cold Forming
4.3	Hot Forming
4.4	Welding
5	Weld Design and Dimensions
5.1	General
5.2	Butt Joints
5.3	Tee or Cross Joints
5.4	Lapped Joints
5.5	Slot Welds
5.6	Stud Welds
5.7	Determination of the Size of Welds
5.8	Weld for Structures Subject to High Tensile Stresses
5.9	Reduced Weld Size
5.10	End Connections of Pillars and Cross Ties
5.11	Alternatives

SECTION 7 LOADS

1	Introduction
1.1	General
1.2	Definitions
2	Static Load Components
2.1	Static Hull Girder Loads
2.2	Local Static Loads
3	Dynamic Load Components
3.1	General
3.2	Motions
3.3	Ship Accelerations
3.4	Dynamic Hull Girder Loads
3.5	Dynamic Local Loads
4	Sloshing and Impact Loads
4.1	General
4.2	Sloshing Pressure in Tanks
4.3	Bottom Slamming Loads
4.4	Bow Impact Loads
5	Accidental Loads
5.1	Flooded Condition

- 6 Combination of Loads**
- 6.1 General
- 6.2 Design Load Combination
- 6.3 Application of Dynamic Loads
- 6.4 Dynamic Load Cases and Dynamic Load Combination Factors for Strength Assessment
- 6.5 Dynamic Load Cases and Dynamic Load Combination for Scantling Requirements

SECTION 8 SCANTLING REQUIREMENTS

- 1 Longitudinal Strength**
- 1.1 Loading Guidance
- 1.2 Hull Girder Bending Strength
- 1.3 Hull Girder Shear Strength
- 1.4 Hull Girder Buckling Strength
- 1.5 Hull Girder Fatigue Strength
- 1.6 Tapering and Structural Continuity of Longitudinal Hull Girder Elements
- 2 Cargo Tank Region**
- 2.1 General
- 2.2 Hull Envelope Plating
- 2.3 Hull Envelope Framing
- 2.4 Inner Bottom
- 2.5 Bulkheads
- 2.6 Primary Support Members
- 3 Forward of the Forward Cargo Tank**
- 3.1 General
- 3.2 Bottom Structure
- 3.3 Side Structure
- 3.4 Deck Structure
- 3.5 Tank Bulkheads
- 3.6 Watertight Boundaries
- 3.7 Superstructure
- 3.8 Miscellaneous Structures
- 3.9 Scantling Requirements
- 4 Machinery Space**
- 4.1 General
- 4.2 Bottom Structure
- 4.3 Side Structure
- 4.4 Deck Structure
- 4.5 Machinery Foundations
- 4.6 Tank Bulkheads
- 4.7 Watertight Boundaries
- 4.8 Scantling Requirements

- 5 Aft End**
 - 5.1 General
 - 5.2 Bottom Structure
 - 5.3 Shell Structure
 - 5.4 Deck Structure
 - 5.5 Tank Bulkheads
 - 5.6 Watertight Boundaries
 - 5.7 Miscellaneous Structures
- 6 Evaluation of Structure for Sloshing and Impact Loads**
 - 6.1 General
 - 6.2 Sloshing in Tanks
 - 6.3 Bottom Slamming
 - 6.4 Bow Impact
- 7 Application of Scantling Requirements to Other Structure**
 - 7.1 General
 - 7.2 Scantling Requirements

SECTION 9 DESIGN VERIFICATION

- 1 Hull Girder Ultimate Strength**
 - 1.1 General
 - 1.2 Rule Criteria
 - 1.3 Hull Girder Bending Moment Capacity
 - 1.4 Partial Safety Factors
- 2 Strength Assessment (FEM)**
 - 2.1 General
 - 2.2 Cargo Tank Structural Strength Analysis
 - 2.3 Local Fine Mesh Structural Strength Analysis
 - 2.4 Application of Scantlings in Cargo Tank Region
- 3 Fatigue Strength**
 - 3.1 Fatigue Evaluation
 - 3.2 Fatigue Criteria
 - 3.3 Locations to Apply
 - 3.4 Fatigue Assessment Methods

SECTION 10 BUCKLING AND ULTIMATE STRENGTH

- 1 General**
 - 1.1 Strength Criteria
- 2 Stiffness and Proportions**
 - 2.1 Structural Elements
 - 2.2 Plates and Local Support Members
 - 2.3 Primary Support Members
 - 2.4 Other Structure
- 3 Prescriptive Buckling Requirements**
 - 3.1 General
 - 3.2 Buckling of Plates
 - 3.3 Buckling of Stiffeners
 - 3.4 Primary Support Members
 - 3.5 Other Structures

4 Advanced Buckling Analyses

4.1 General

SECTION 11 GENERAL REQUIREMENTS**1 Hull Openings and Closing Arrangements**

1.1 Shell and Deck Openings

1.2 Ventilators

1.3 Air and Sounding Pipes

1.4 Deck Houses and Companionways

1.5 Scuppers, Inlets and Discharges

2 Crew Protection

2.1 Bulwarks and Guardrails

2.2 Tank Access

2.3 Bow Access

3 Support Structure and Structural Appendages

3.1 Support Structure for Deck Equipment

3.2 Docking

3.3 Bilge Keels

4 Equipment

4.1 Equipment Number Calculation

4.2 Anchors and Mooring Equipment

4.3 Emergency Towing

5 Testing Procedures

5.1 Tank Testing

SECTION 12 SHIP IN OPERATION RENEWAL CRITERIA**1 Allowable Thickness Diminution for Hull Structure**

1.1 General

1.2 Assessment of Thickness Measurements

1.3 Categories of Corrosion

1.4 Renewal Criteria of Local Structure for General Corrosion

1.5 Renewal Criteria of Hull Girder Sectional Properties for General Corrosion

1.6 Allowable Material Diminution for Pitting, Grooving and Edge Corrosion

APPENDIX A HULL GIRDER ULTIMATE STRENGTH**1 General**

1.1 Definitions

1.2 Application

1.3 Assumptions

1.4 Alternative methods

2 Calculation of Hull Girder Ultimate Capacity

2.1 Single Step Ultimate Capacity Method

2.2 Simplified Method Based on an Incremental-iterative Approach

2.3 Stress-strain Curves σ - ϵ (or Load-end Shortening Curves)**3 Alternative Methods**

3.1 General

3.2 Methods

APPENDIX B STRUCTURAL STRENGTH ASSESSMENT

- 1 General**
 - 1.1 Application
 - 1.2 Symbols, Units and Definitions
- 2 Cargo Tank Structural Strength Analysis**
 - 2.1 Assessment
 - 2.2 Structural Modelling
 - 2.3 Loading Conditions
 - 2.4 Application of Loads
 - 2.5 Procedure to Adjust Hull Girder Shear Forces and Bending Moments
 - 2.6 Boundary Conditions
 - 2.7 Result Evaluation
- 3 Local Fine Mesh Structural Strength Analysis**
 - 3.1 General
 - 3.2 Structural Modelling
 - 3.3 Loading Conditions
 - 3.4 Application of Loads and Boundary Conditions
 - 3.5 Result Evaluation and Acceptance Criteria
- 4 Evaluation of Hot Spot Stress for Fatigue Analysis**
 - 4.1 Application
 - 4.2 Structural Modelling
 - 4.3 Loading Conditions
 - 4.4 Boundary Conditions
 - 4.5 Result Evaluation

APPENDIX C FATIGUE STRENGTH ASSESSMENT

- 1 Nominal Stress Approach**
 - 1.1 General
 - 1.2 Corrosion Model
 - 1.3 Loads
 - 1.4 Fatigue Damage Calculation
 - 1.5 Classification of Structural Details
 - 1.6 Other Details
- 2 Hot Spot Stress (FE Based) Approach**
 - 2.1 General
 - 2.2 Corrosion Model
 - 2.3 Loads
 - 2.4 Fatigue Damage Calculation
 - 2.5 Detail Design Standard

APPENDIX D BUCKLING STRENGTH ASSESSMENT

- 1 Advanced Buckling Analysis**
 - 1.1 General
- 2 Advanced Buckling Analysis Method**
 - 2.1 General
- 3 Application and Structural Modelling Principles**
 - 3.1 General

4	Assessment Criteria
4.1	General
4.2	Utilisation Factors
5	Strength Assessment (FEM) - Buckling Procedure
5.1	General
5.2	Structural Modelling and Capacity Assessment Method
5.3	Load Application
5.4	Limitations of the Advanced Buckling Assessment Method
6	Ultimate Hull Girder Strength Assessment
6.1	General
6.2	Load Application
6.3	Structural Modelling and Buckling Assessment