

BI-WR01 — EVALUATE STRUCTURAL REPAIR PROPOSALS

WR01.1- Parent Cite:

These subchapter D (Tank) references kick to ABS Rules for Building and Classing Steel Vessels (ABS SVR). These rules contain 7 parts and are sometimes also known as "ABS Steel Vessel Rules". All can be found on Eagle.org (ABS website). Parts 3 and 7 are common references for barge inspectors.

All ABS Rules for Building and Classing Steel Vessels parts:

- Part 1: Conditions of Classification
- Part 2: Materials and Welding
- Part 3: Hull Construction and Equipment
- Part 4: Vessel Systems and Machinery
- Part 5: Specific Vessel Types
- Part 6: Specialized Items and Systems
- Part 7: Survey After Construction

POS Listed Cites:

- 46 CFR 31.10-1
 - Subchapter D: Tank Vessels
 - Part 31; Inspections and Certification
 - Subpart 31.10: Inspections
 - §31.10-1: Standards established by ABS Rules for Building and Classing Steel Vessels shall be accepted as standard by CG.
- 46 CFR 32.60-1
 - Subchapter D: Tank Vessels
 - Part 32; Special Equipment, Machinery and Hull Requirements
 - Subpart 32.60: Hull requirements for tank vessels constructed 01JUL1951
 - §32.60-1: Tank vessels construction/conversion shall at least be equivalent to ABS standards (or other recognized class)

WR01.2- Evaluate extent of damage and/or wastage/corrosion:

Over to subchapter E (Load Lines) for a catch all cite; tab this one as a deficiency reference. Sub E is applicable to all international barges and domestic barges of 150GT or more. This states that no changes are to be made to vessel after survey; i.e. no damage repair or alterations without a new survey from CG and/or RO.

The ABS SVR reference is from Part 7: Survey After Construction. Find it in Part 4 of the appendix, page 273. Entitled Additional Thickness Measurements and Substantial Corrosion, the cite details gauging for wastage and defines substantial corrosion; essentially 75% of the max allowable (25%) limit for wasted material. Substantial Corrosion is defined as, "an extent of corrosion such that assessment of corrosion pattern indicates wastage in excess of 75% of the allowable margins, but within the acceptable limits". Gauging and understanding when to stop or proceed with



measurements is also detailed in this small appendix entry. It pays to know your barge nomenclature from framing to plating before getting too far into ABS SVR.

NVIC 7-68 section IV is entitled Notes on Repair and details drill stops, cracks, doublers and much more. This section should become familiar quickly as it's the backbone for much of our steel repair guidance. Find a copy of an easy to navigate, reformatted 7-68 here: https://www.dco.uscg.mil/Portals/9/DCO%20Documents/5p/5ps/NVIC/1960s/n7-68.pdf

PQS Listed Cites:

- 46 CFR 42.09-50
 - Subchapter E: Load Lines
 - Part 42: Domestic and Foreign Voyages by Sea
 - Subpart 42.09: LL Surveys and Assignments General Requirements
 - §42.09-50: Repairs or alterations to a vessel after it has been surveyed
 - No change shall be made... without approval of assigning and issuing authority (RO)

- ABS 7-A-4/17
 - ABS Rules for Building and Classing Steel Vessels Part 7: Survey After Construction
 - Appendix Section 4 / #17
 - Page 273
- NVIC 7-68 IV
 - Notes on Inspection and Repair of Steel Hulls
 - Part IV: Notes on Repair (p.13)
 - Crack repair, drill stops, temporary repair and the tried and true "crop and renew".

WR01.3- Review repair proposal:

Back to Sub E and Load Lines for that same cite for no change after survey. Tab this as a great catch all for damage related deficiencies.

ABS is also still in the appendix of Part 7, section 4. This entry; Wastage Compensation and Repair details methods of repair to include pitting and partial plate renewal, as well as deeming doublers not acceptable: "Local doublers are not acceptable as a permanent repair or wastage compensation. If such doublers are found, the plating underneath should be carefully investigated and repaired, where found necessary". It also lists two additional resources from IACS as well, see below.

Page A1-14 of MSM II entitled "Coast Guard Concerns" states that the burden for proposing acceptable repairs lands on the owner. It's not up to us or the shipyard to facilitate the ideas or proposals; but often times the shipyard will have their own recommendations; likely sorted and filtered by \$\$\$ > \$. Also note that "some repairs can be safely delayed and can be more economically accomplished at a different place and time". Jump to page A5-13 for deinitions of Class 1, 2, and 3 structural failures; all requiring different levels and timeliness for repair proposals / documentation. Hint; class 1 structural failure is the worst; threatening safety or pollution, and requires immediate corrective action. A class 1 leaves a vessel inoperable until OCMI is satisfied with repair. Take this time to let MSM define a few items, starting on page A5-12 and including main strength member. A5-15; "Tank Vessel Restrictions" mentions that damaged



tanks may be omitted from use if the vessel can demonstrate to OCMI that the other intact tanks can be loaded without placing additional stress on the hull; damaged tank being either in ballast or empty.

NVIC 7-68 reference shows the same repair guidance we know and love. It will come up often, so get familiar.

PQS Listed Cites:

- 46 CFR 42.09-50
 - Subchapter E: Load Lines
- ABS 7-A-4/29
 - o ABS Rules for Building and Classing Steel Vessels Part 7: Survey After Construction
 - Appendix Section 4 / #29
 - Page 280
- MSM II/A.1.F.2.a
 - o Page A1-14 "Coast Guard Concerns"
- NVIC 7-68 IV
 - Notes on Inspection and Repair of Steel Hulls

WR01.4- Verify repair materials:

Back to Sub E; Load Lines for a reg that states any existing vessel that undergoes modification of a major character shall meet the requirements for a new vessel. Another good catch all deficiency cite.

ABS SVR Part 7 cite is repeated from above, Wastage Compensation and Repair in the appendix.

ABS SVR Part 2 cite takes us into *Materials and Welding* and details the foundation of verifying repair materials. Metals are certified via test reports at the mills that they are produced in. These samples are verified and retained by ABS to prove that the materials used in repairs are certified. Worth a read, note that not any metal is authorized and numerous testing methods have been implemented to ensure replacement material is in kind or better.

PQS Listed Cites:

- 46 CFR 42.09-50(c)
 - Subchapter E: Load Lines
- ABS 7-A-4/29 (page 280)
- ABS 2-1-1/7
 - o ABS Rules for Building and Classing Steel Vessels Part 2: Materials and Welding
 - Chapter 1 Section 1 / #7
 - Page 11

WR01.5- Verify welding procedures:

Back to Sub E; Load Lines same as above.

Second reference is within Subchapter A; states that the appropriate subchapter for your vessel will determine the welding procedures required. See additional references below for each vessel type. Wouldn't you know it; this brings us back to our parent cite in Sub D: §32.60-1(a) *Tank vessels construction/conversion shall at least be equivalent to ABS standards (or other recognized class)*. Sub I does the same, and so do the rest of the mentioned subchapter cites.



The ABS SVR reference here takes us to Part 2: Materials and Welding for an intro to procedures. This doesn't delve into Weld Procedure Specification (WPS) or Procedure Qualification Record (PQR); instead detailing the plans and specifications required to include:

- Welding processes
- Filler metal
- Electrodes used
- Joint design
- Welding techniques
- Positions proposed
- Heat treatment

See ABS SVR Part 2; Appendix 9 and Appendix 10 for WPS and PQR, as well as welder testing.

PQS Listed Cites:

- 46 CFR 42.09-50(c)
 - Subchapter E: Load Lines
- 46 CFR 2.75-70
 - Subchapter A: Procedures Applicable to the Public
 - Kicks to appropriate **subchapter** for guidance on weld procedure
 - Each chapter then kicks to ABS
 - o ABS then kicks to AWS, EN, ISO, ASME, MIL and JIS
- ABS 2-4-1/1.3
 - ABS Rules for Building and Classing Steel Vessels Part 2: Materials and Welding
 - Chapter 4 Section 1 / #1.3
 - Page 267

Definitions:

- Main strength member
- OIL TIGHT ENVELOPE
- OUTER SHELL
- BUCKLE
- CLASS 1 STRUCTURAL FAILURE
- CLASS 2 STRUCTURAL FAILURE
- CLASS 3 STRUCTURAL FAILURE
- SUBSTANTIAL CORROSION
- Welding Procedure Specification (WPS)
- PROCEDURE QUALIFICATION REPORT (PQR)
- AMERICAN WELDERS SOCIETY (AWS)
- International Organization for Standardization (ISO)
- AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

Additional References:

• IACS: "Shipbuilding and Repair Quality Standard"



- Tanker Structure Co-operative Forum: "Guidance Manual for Tanker Structures"
- Welding procedures by 46 CFR subchapter:
 - D: Tank §32.60-1(a)
 - O H: Pax §72.01-15
 - o I: Cargo §92.01-10
 - o F: Engineering Part 57 Welding and Brazing
- ABS SVR Part 2 Appendix 9: Welding Procedure Qualification Tests (p. 440)
- ABS SVR Part 2 Appendix 10: Qualification for Welders and Welding Operators (p. 463)
- MIL / NAVSEA Welding Standards (be aware these exist)
- European Standards / Japanese Industrial Standard (EN / JIS) (be aware these exist)

TABLE 1 Individual Wastage Allowances, Conventional Vessels 90 M and Over Built to ABS Class (2014)

(See Note 11, 12, 13 and 14)

Ordinary and High Strength Steel	BUILT 2005 OR LATER Double Bottom Tankers	BUILT BETWEEN 1962 AND 2005 Double Bottom Tankers	BUILT 1962 OR LATER		Long'ly framed vessels built prior to 1962. Transv'ly framed vessels of all ages (See Note 9). Dry cargo
			Single Bottom Tankers	Bulkers, OBOs, and Containerships	barges 90 meters and over. Tank barges 90 to 122 meters (295-400 ft) (See Note 10).
Strength Deck Plating	20%	20%	20%	20%	25%
Continuous Long'l Hatch Coamings & Above Deck Box-Girders	20%	20%		20%	25%
Deck Plates within Line of Hatches and at Ends.	30%	30%	30%	30%	30%
Forecastle, Poop and Bridge Deck Plates; Superstructure End Bulkheads	30%	30%	30%	30%	30%
(2008) Tween Deck Plates					30%
Sheer Strake Plates	20%	20%	20%	20%	25%
Side Shell Plates	20%	25%	25%	25%	25%
Bilge Strake Plates	20%	25%	20%	25%	25%
Bottom Plates	20%	25%	20%	25%	25%
Keel Plates (See Note 4)					
Outermost Strake of Inner Bottom (See Note 5)	20%	20%		20%	30%
Other Plates of Inner Bottom (See Note 5)	20%	25%		25%	30%
Top Strake of Longitudinal Bulkheads and Top Strake of Topside Tank Sloping Plating	20%	20%	20%	20%	25%
Bottom Strake of Longitudinal Bulkheads	20%	25%	20%	25%	25%
Other Plates of Longitudinal Bulkheads, Topside Tank Sloping Plating, Hopper Tank Sloping Plating and Transverse Bulkheads (See Notes 6 and 7)	20%	25%	25%	25%	25%
Internals including Longitudinals, Girders, Transverses, Struts, Bulkhead Webs and Stringers, Brackets and Hatch Side Girders	20%	25%	25%	25%	25%
Plates in way of Top of Tanks	25%	30%	30%	30%	30%
Underdeck Box Girders (Long'l or Transverse)	20%	20%		20%	20%
Hatch Covers (See Note 8). Hatch coamings and brackets	30%	30%	30%	30%	30%

ABS RULES FOR SURVEY AFTER CONSTRUCTION · 2014



Part 7 Rules for Survey After Construction

Appendix

Section 4 Additional Information for Hull Thickness Measurement

7-A-4

FIGURE 5 Pitting Intensity Diagrams (1 July 2013)

