

Inspection Grading Criteria for the ABS Hull Inspection and Maintenance Program (HIMP)



NOTICE

This manual and the inspection regime described herein are for use solely within the ABS Hull Inspection Maintenance Program (HIMP). The grading and actions to be taken on those gradings are of a suggested nature only. They are not to be construed as representative of ABS class criteria or the actions taken by class upon discovery of the various types of defects noted in this hull inspection grading manual.

Owner inspections carried out utilizing this manual do not replace or substitute the classification survey requirements as stated in IACS PR-33.

IACS PR-33 Owner's Hull Inspection and Maintenance Schemes

Owner's hull inspection and maintenance schemes are to be encouraged as means for maintaining compliance with classification and statutory requirements between surveys. However, these schemes are not to be accepted as an alternative to, or a substitute for, the performance of required classification and/or statutory surveys of the hull by the surveyors of the society, or of another duly authorized society. The surveyors may be assisted, where appropriate, by service suppliers as defined in UR Z17.

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Introduction

This manual should be utilized in accordance with the Hull Inspection and Maintenance Program (HIMP) outlined in the *ABS Guide for Hull Inspection and Maintenance Program*. Vessels enrolled in the program will be eligible for the HIMP class notation.

This hull inspection grading manual details a program for hull structural inspections to be performed by qualified inspectors in order to comply with the ABS HIMP Guide. It outlines the work scope and reporting requirements for this vessel and contains the information to be collected by the vessel crew or superintendents. Staff executing the HIMP inspection regime are to be formally qualified by successfully completing the ABS approved HIMP training. The hull condition is to be assessed and rated in accordance with a set of six general condition criteria coupled with selected targeted inspections of identified critical areas for this design series.

This manual draws on the information available from IMO, IACS and ABS publications. It is intended to support the sound judgment of qualified inspectors and assist owners with the development and application of a reliable maintenance program based on inspection and reporting techniques that are in conformance with the ABS HIMP Guide requirements.

This manual is to be used in conjunction with the following ABS publications:

- *Guide for Hull Inspection and Maintenance Program*
- *Rules for Building and Classing Steel Vessels, Part 7: Surveys after Construction*
- *Guidance Notes for Inspection, Maintenance and Application of Marine Coatings*

Attention should also be paid to the IACS guidelines for surveys, assessment and repair of hull structures for relevant ship types.

The inspector is required to grade each particular zone on each of the six criteria. The scoring for a particular zone should not be influenced by the scoring of other inspection criteria in that compartment.

Inspection Criteria

This manual identifies six different criteria to be addressed during the inspections. These are to be documented based on a traffic light point rating system (0 through 6 scale) on “zones” for each compartment (space or tank). The score assigned to a compartment will denote the compartment’s condition as good, fair or poor and will correspond to one of three colors, green, yellow or red.

Table 1. Traffic Light Condition Scoring

GOOD CONDITION	
FAIR CONDITION	
POOR CONDITION	

The six inspection criteria cover:

- Coating condition
- Presence of general corrosion
- Presence of pitting or grooving or other localized linear corrosion
- Presence of deformation
- Presence of fractures
- Compartment or space cleanliness (housekeeping and fabric maintenance such as anode replacement, etc.)

Coating Condition

The coating condition is defined as per ABS Rule requirements and the *ABS Guide for Inspection, Maintenance and Application of Marine Coatings*:

- GOOD is a condition with only minor spot rusting. (Score is 0 to 2 inclusive)
- FAIR is a condition with local breakdown at edges of stiffeners and weld connections and/or light rusting over 20 percent or more of areas under consideration, but less than as defined for POOR condition. (Score is 3 to 4 inclusive); and
- POOR is a condition with general breakdown of coating over 20 percent or more of areas, or hard scale at 10 percent or more of areas under consideration. (Score is 5 to 6 inclusive)

Table 2. Coating Inspection Criteria Point Scoring

Coating Condition	Rating	Points	Condition Comment	Risk Level	Color Code
Good	Excellent	0	Freshly coated, negligible coating breakdown	Low	Green
	Good	1	Minor spot rusting	Low	
	Good – Fair	2	General breakdown of coating over 5%	Low – Medium	
Fair	Fair	3	Local breakdown at edges of stiffeners and weld connections (uncoated)	Medium	Yellow
	Fair – Poor	4	General breakdown of coating over 10%	Medium – High	Yellow
Poor	Poor	5	General breakdown of coating over 20%	High	Red
	Worst	6	General breakdown of coating over 30%	Very High	Red

Coating Assessment Scale – Surfaces

Assessment Scale for Breakdown

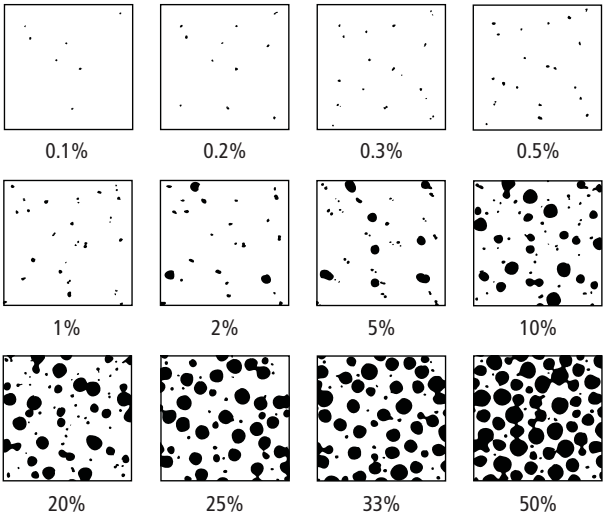
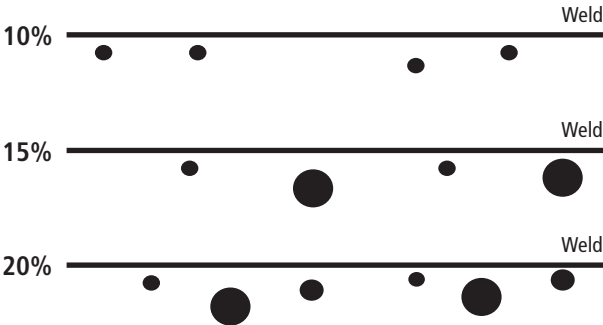


Diagram for Pitting Linear Extent



Coating

Coating Condition	Points	Condition Comment	Color Code
Good	0	Freshly coated, negligible coating breakdown	



Coating Condition	Points	Condition Comment	Color Code
Good	1	Minor spot rusting	



Coating Condition	Points	Condition Comment	Color Code
Good	2	General breakdown of coating over 5%	



Coating Condition	Points	Condition Comment	Color Code
Fair	3	Local breakdown at edges of stiffeners and weld connections (uncoated)	



Coating Condition	Points	Condition Comment	Color Code
Fair	4	General breakdown of coating over 10%	



Coating Condition	Points	Condition Comment	Color Code
Poor	5	General breakdown of coating over 20%	



Coating Condition	Points	Condition Comment	Color Code
Poor	6	General breakdown of coating over 30%	



General Corrosion

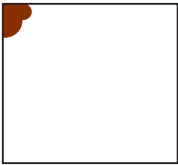
General or overall corrosion appears as non-protective rust which can uniformly occur on tank internal surfaces that are uncoated, or where coating has totally deteriorated. The rust scale continually breaks off, exposing fresh metal to corrosive attack. Material thickness loss cannot be judged visually until excessive loss has occurred.

Table 3. General Corrosion Inspection Criteria Point Scoring

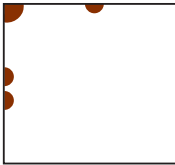
Corrosion as % of zone	Rating	Points	Condition Comment	Risk Level	Color Code
0%	Excellent	0	No rusting	Very Low	Green
≤ 5% Light rust	Good	1	Negligible rusting/corrosion	Low	
< 20% Light rust	Good – Fair	2	Minor spot rusting	Low – Medium	
≥ 20% Light rust ≥ 5% Hard scale	Fair	3	Local breakdown at edges of stiffeners and weld connections and/or light rusting over 20% or more of zone.	Medium	Yellow
≥ 10% Hard scale	Fair – Poor	4	Hard scale at 10% or more of zone.	Medium – High	Yellow
≥ 30% Hard scale	Poor	5	Serious/significant corrosion: More than 30% corrosion and active scale is present. Active scale is loose or has fallen off the structure.	High	Red
≥ 70% Hard scale	Worst	6	Extensive area of corrosion: corrosion of hard and/or loose scale, including pitting, over 70% or more of the plating surface in question accompanied by evidence of thinning.	Very High	Red

Corrosion Extent Diagrams – Edges and Welds

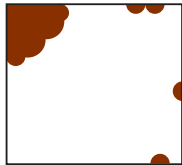
Localized Corrosion Extent Diagrams



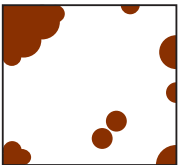
2% localized
breakdown



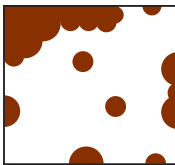
2% scattered
breakdown



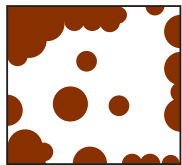
10% scattered
breakdown



15% scattered
breakdown

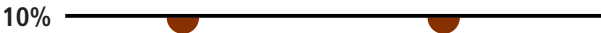


20% scattered
breakdown



30% scattered
breakdown

Linear Extent Diagrams



Corrosion

Corrosion as % of zone	Points	Condition Comment	Color Code
0%	0	No rusting	



Corrosion as % of zone	Points	Condition Comment	Color Code
≤ 5% Light rust	1	Negligible rusting/corrosion	



Corrosion as % of zone	Points	Condition Comment	Color Code
< 20% Light rust	2	Minor spot rusting	



Corrosion as % of zone	Points	Condition Comment	Color Code
$\geq 20\%$ Light rust $\geq 5\%$ Hard scale	3	Local breakdown at edges of stiffeners and weld connections and/or light rusting over 20% or more of zone	



Corrosion as % of zone	Points	Condition Comment	Color Code
≥ 10% Hard scale	4	Hard scale at 10% or more of zone	



Corrosion as % of zone	Points	Condition Comment	Color Code
$\geq 30\%$ Hard scale	5	Serious/significant corrosion: More than 30% corrosion and active scale is present. Active scale is loose or has fallen off the structure.	



Corrosion as % of zone	Points	Condition Comment	Color Code
≥ 70% Hard scale	6	Extensive area of corrosion: corrosion of hard and/or loose scale, including pitting, over 70% or more of the plating surface in question accompanied by evidence of thinning.	



Pitting & Grooving Corrosion

Localized corrosion can occur on bottom plating, other horizontal surfaces and at structural details that trap or follow the flow of water and other fluids, particularly in aft bays of tank bottoms and in the region of suction bell mouths. For coated surfaces, the attack produces deep and relatively small diameter pits that can lead to penetration of the steel member in isolated random places in the tank.

Pitting of uncoated tanks, as it progresses, forms shallow but very wide scabby patches (e.g. 300 mm diameter). The appearance resembles a condition of general corrosion. Pitting is usually seen on horizontal hull parts such as the inner bottom or stringers.

Grooving is a localized, linear corrosion which occurs at structural intersections in welds or heat affected zones. This corrosion is sometimes referred to as “in line pitting attack” and can also occur on vertical members and flush sides of bulkheads in way of flexing. Grooving or “necking” is usually seen on the butt/seam welds and weldments of stiffeners to plating. In particular pitting is found below the suction bell mouths in ballast tanks.

Table 4. Pitting & Grooving Inspection Criteria Point Scoring

Pitting/ Grooving Type	Rating	Points	Pitting & Grooving Depth	Intensity (% of Zone)	Risk Level	Color Code
No Pits/ Grooves	Excellent	0	—	—	Very Low	
Shallow Pits/ Grooves	Good	1	Less than 1/3 of original thickness	≤ 5 %	Low	
Shallow Pits/ Grooves	Good — Fair	2	Less than 1/3 of original thickness	≤ 15 %	Low — Medium	
Shallow Pits/ Grooves	Fair	3	Less than 1/3 of original thickness	> 15%	Medium	
Deep Pits/ Grooves	Fair — Poor	4	More than 1/3 of original thickness	≤ 15 %	Medium — High	
Deep Pits/ Grooves	Poor	5	More than 1/3 of original thickness	> 15 %	High	
Deep Pits/ Grooves	Worst	6	Less than 6 mm of original thickness remaining	—	Very High	

Pitting & Grooving

Pitting/ Grooving Type	Points	Pitting & Grooving Depth	Intensity (% of Zone)	Color Code
No Pits/ Grooves	0	—	—	



Pitting/ Grooving Type	Points	Pitting & Grooving Depth	Intensity (% of Zone)	Color Code
Shallow Pits/ Grooves	1	Less than 1/3 of original thickness	$\leq 5\%$	



Pitting/ Grooving Type	Points	Pitting & Grooving Depth	Intensity (% of Zone)	Color Code
Shallow Pits/ Grooves	2	Less than 1/3 of original thickness	$\leq 15\%$	



Pitting/ Grooving Type	Points	Pitting & Grooving Depth	Intensity (% of Zone)	Color Code
Shallow Pits/ Grooves	3	Less than 1/3 of original thickness	> 15%	



Pitting/ Grooving Type	Points	Pitting & Grooving Depth	Intensity (% of Zone)	Color Code
Deep Pits/ Grooves	4	More than 1/3 of original thickness	$\leq 15\%$	



Pitting/ Grooving Type	Points	Pitting & Grooving Depth	Intensity (% of Zone)	Color Code
Deep Pits/ Grooves	5	More than 1/3 of original thickness	> 15%	



Pitting/ Grooving Type	Points	Pitting & Grooving Depth	Intensity (% of Zone)	Color Code
Deep Pits/ Grooves	6	Less than 6 mm of original thickness remaining	—	



Deformation

Deformation is caused by impact loads, contact or overloading. Deformation may be local (deformation of panel or stiffener) or global (deformation of a beam, frame, girder or floor including associated plating). Permanent buckling is easily identified and may result from overloading, reduction of thickness due to corrosion or contact damage. Elastic buckling may be identified from coating damage, stress lines and/or shedding of scale.

The panel is defined as the area between adjacent transverse frames and adjacent longitudinal stiffeners. A bay is the area between adjacent transverse frames from longitudinal bulkhead to longitudinal bulkhead (or side shell).

Table 5. Deformation Inspection Criteria Point Scoring

Set-in Area	Set-in Depth	Rating	Points	Condition Comment	Risk Level	Color Code
No Deformation	—	Excellent	0	No deformation	Very Low	
Within Panel	≤ 75 mm (3 in)	Good	1	Gradual set-in	Low	
Within Panel	> 75 mm (3 in)	Good – Fair	2	Gradual set-in	Low – Medium	
Within Bay (multiple panels)	≤ 75 mm (3 in)	Fair	3	Set-in with associated internals tripped	Medium	
Brackets and Internals	Tripped	Fair – Poor	4	Tripped and buckled internals & brackets	Medium – High	
Within Bay	> 75 mm (3 in)	Poor	5	Buckled, indented, tripped internals	High	
Multiple Bays	—	Worst	6	Buckled, heavily indented, tripped internals	Very High	

Deformation

Set-in Area	Set-in Depth	Points	Condition Comment	Color Code
No Deformation	—	0	No deformation	



Set-in Area	Set-in Depth	Points	Condition Comment	Color Code
Within Panel	$\leq 75 \text{ mm}$ (3 in)	1	Gradual set-in	



Set-in Area	Set-in Depth	Points	Condition Comment	Color Code
Within Panel	> 75 mm (3 in)	2	Gradual set-in	



Set-in Area	Set-in Depth	Points	Condition Comment	Color Code
Within Bay (multiple panels)	$\leq 75 \text{ mm}$ (3 in)	3	Set-in with associated internals tripped	



Set-in Area	Set-in Depth	Points	Condition Comment	Color Code
Brackets & Internals	Tripped	4	Tripped and buckled internals & brackets	



Set-in Area	Set-in Depth	Points	Condition Comment	Color Code
Within Bay	> 75 mm (3 in)	5	Buckled, indented, tripped internals	



Set-in Area	Set-in Depth	Points	Condition Comment	Color Code
Multiple Bays	—	6	Buckled, heavily indented, tripped internals	



Fracture

Fractures are categorized by a different point system based on the location of the fracture and that local structure's contribution to overall hull integrity. A fracture of the toe welds of brackets and flanges of brackets, stiffeners or webs is given 3 points. The fractures to the web plating of frames, floors and stiffeners are given 4 points. Fractures to transverse bulkheads and longitudinal bulkheads are given 5 points. Any fracture to the external hull envelope is treated as the worst case and given 6 points.

Table 6. Fracture Inspection Criteria Point Scoring

Fracture Location	Points	Condition Comment	Risk Level	Color Code
No Fractures	0	No fractures	Very Low	
Welds	3	Weld fractures in support brackets, internals, detachments	Low – Medium	
Flanges	3	Flanges of brackets, internals, stiffeners	Medium	
Webs	4	Webs of frames, floors, brackets, stiffeners, internals	Medium – High	
Bulkheads	5	Transverse & longitudinal bulkheads, primary structure members	High	
Hull Envelope (Shell)	6	Sideshell, bottom & deck	Very High	

Fracture

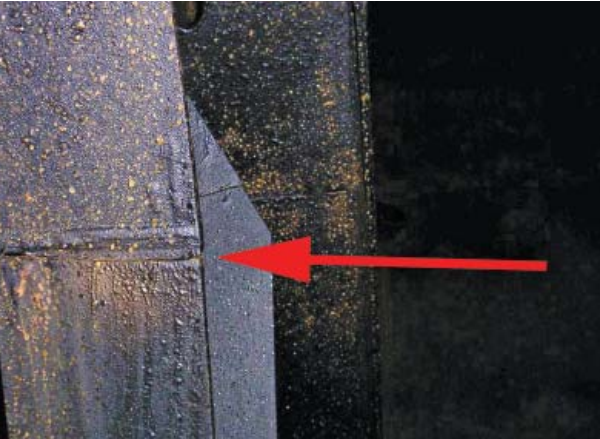
Fracture Location	Points	Condition Comment	Color Code
No Fractures	0	No fractures	



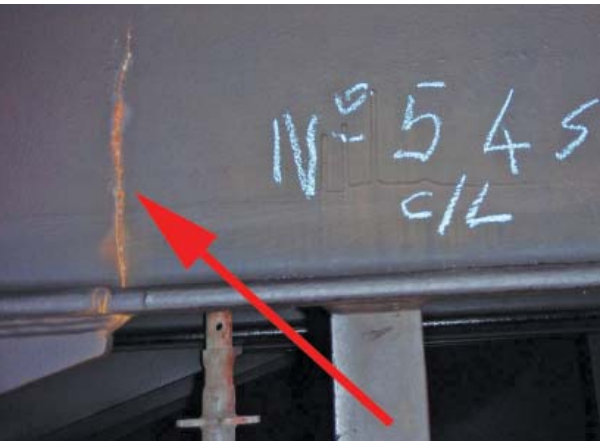
Fracture Location	Points	Condition Comment	Color Code
Welds	3	Weld fractures in support brackets, internals, detachments	



Fracture Location	Points	Condition Comment	Color Code
Flanges	3	Flanges of brackets, internals, stiffeners	



Fracture Location	Points	Condition Comment	Color Code
Webs	4	Webs of frames, floors, brackets, stiffeners, internals	



Fracture Location	Points	Condition Comment	Color Code
Bulkheads	5	Transverse & longitudinal bulkheads, primary structure members	



Fracture Location	Points	Condition Comment	Color Code
Hull Envelope (Shell)	6	Sideshell, bottom & deck	



Cleanliness & Housekeeping

This criteria is used to evaluate the general condition of the compartment for cleanliness and housekeeping. This should be judged based on the following:

- Amount of the sediments and dredge/sludge remaining in the tank
- Wastage of the anodes and their perceived effectiveness
- General cleanliness of the space
- Condition of the piping and its supports
- Condition of access hatches, manholes, entry spaces, ladders and other means of access
- Loose scale and plugged drainage openings in the structure (e.g., rat holes/scallops)

Table 7. Cleanliness & Housekeeping Inspection Criteria Point Scoring

Cleanliness & Housekeeping	Rating	Points	Condition Comment	Risk Level	Color Code
Clean and excellent condition	Excellent	0	Similar to newly built condition	Very Low	
Very light, negligible layer of residue and sediments	Good	1	Anodes in good condition more than 90% remaining	Low	
Light layer of residue, sediments inspections	Good – Fair	2	Anodes 75% remaining. Cleaning not required for close-up.	Low – Medium	
Spaces sufficiently clean and free from water, scale, dirt, container residues etc. to reveal corrosion, deformation, fractures, damages or other structural deterioration	Fair	3	Anodes 50% remaining. Meaningful examination is possible and may require some local cleaning.	Medium	
Spaces with surfaces containing loose accumulated corrosion scale	Fair – Poor	4	Anodes 30% remaining. Water, scale, dirt, container residues etc, which make examination difficult.	Medium – High	
Spaces with residue and sediments which do not give access to surfaces	Poor	5	Anodes not effective. Meaningful examination not possible without cleaning.	High	
In addition to above, spaces with means of access and entry not safe	Worst	6	Cathodic protection systems ineffective. Compartment needs to be made safe for entry.	Very High	

Cleanliness & Housekeeping

Cleanliness & Housekeeping	Points	Condition Comment	Color Code
Clean and excellent condition	0	Similar to newly built condition	



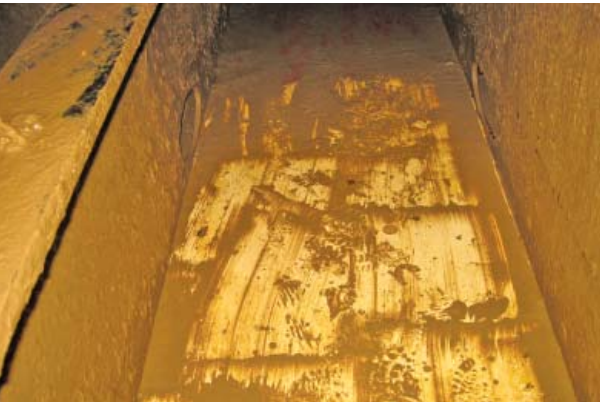
Cleanliness & Housekeeping	Points	Condition Comment	Color Code
Very light, negligible layer of residue and sediments	1	Anodes in good condition, more than 90% remaining	



Cleanliness & Housekeeping	Points	Condition Comment	Color Code
Light layer of residue, sediments	2	Anodes 75% remaining. Cleaning not required for close-up.	



Cleanliness & Housekeeping	Points	Condition Comment	Color Code
Spaces sufficiently clean and free from water, scale, dirt, container residues, etc. to reveal corrosion, deformation or other structural deterioration	3	Anodes 50% remaining. Meaningful examination is possible and may require some local cleaning.	



Cleanliness & Housekeeping	Points	Condition Comment	Color Code
Spaces with surfaces containing loose accumulated corrosion scale	4	Anodes 30% remaining. Water, scale dirt, container residues, etc. which make examination difficult.	



Cleanliness & Housekeeping	Points	Condition Comment	Color Code
Spaces with residue and sediments which do not give access to surfaces	5	Anodes not effective, Meaningful examination not possible with cleaning.	



Cleanliness & Housekeeping	Points	Condition Comment	Color Code
In addition to all other conditions, spaces with means of access and entry not safe	6	Cathodic protection systems ineffective. Compartment needs to be made safe for entry.	



Notifying Superintendent and Class Surveyor

All deformation or fractures discovered during inspection should be brought to the attention of the superintendent (owner's representative) and the attending class surveyor at the first opportunity. When a compartment transitions from good to fair condition, the class surveyor should be alerted at the next survey. When a compartment transitions to poor condition, class surveyor attendance should be requested at the next port of call.

Having a comparison of the normalized total scores enables the owner to rank like compartments in terms of the overall condition. Such a ranking may further enable a class surveyor to focus surveys in compartments where anomalies and higher scores have been identified.

Table 8. Suggested Notification Thresholds

Inspection Criteria	Notify Superintendent
Coating Condition	≥ 3 points
General Corrosion	≥ 3 points
Pitting & Grooving Corrosion	≥ 3 points
Deformation	> 0 points
Fracture	> 0 points
Cleanliness & Housekeeping	≥ 3 points

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