DAMAGE SURVEYS

A Damage survey is requested when damage is reported to have occurred to; a vessels Hull, Machinery, or Cargo. The Damage survey is used as a record for an involved party of the actual damage that has occurred, and provides evidence of that damage.

When a surveyor attends a damage survey, It is necessary to distinguish between damage and failure as the results of both incidents are usually described as “damage”.

Damage is physical harm done to something

Damage occurs by externally imposed forces in the form of; attack, influence, impact etc. in circumstances and/or conditions causing harm or loss to the object.

For damage by external forces, a vessel is usually insured and in identifying the external impacts protective means can be developed or provided.

The causes for damage, human error or unfavorable conditions or a combination of both influences may be traced. Damage can always be traced to external attack or impact of the surrounding media. Abnormal local influences may create adverse environmental circumstances leading directly to breakdown or accelerate it by deformation, fracturing, corrosion or other forms of material deterioration. The same may happen if maintenance is poor. Then similar signs of wastage and defect will appear and may result in damage. Grounding, impact to quay, collision, wrong maneuvers, overloading etc. may directly lead to hull damage with visible traces, fractures and indentations at the areas of contact.

Failure is that something does not achieve the result for which it was intended.

Failure occurs when structural systems, components or elements become defective before the end of their designed or required lifetime, when they cannot withstand the designed stresses or conditions.

A part, component, subsystem, or complete system may degrade and not necessarily reveal signs of failure. During a collapse, all signs of ***damage*** are visible despite of the fact that the collapse was the result of an internal fault ***failure***.

Failure may occur in connection with severe external conditions which can also conceal the actual cause of failure. It may then be difficult to locate correct reason for failure. During severe external condition events, it should be noted the time differential between the survey and the event as conditions and physical circumstances may have changed due to conditions.

If a failure can be identified as a failure, then corrective measures can be taken to prevent additional or progressing defects. Identification will enable the owner to initiate failure prevention on other similar structures or vessels.

When a failure has been identified, calculations, operations, production methods and/or materials can be reevaluated and structures or systems can be modified to correct the defect. If a damage survey, with investigative work is not undertaken, then failures and resultant damage is likely to reoccur.

DAMAGE SURVEYS

Failures are usually classified as weakness of design, material defect, incorrect calculation, manufacturing or assembly processes, chemical composition, incorrect inspection or testing methods.

Failures may also occur due to incorrect operational procedures in loading or discharging, ballasting, inerting, cargo handling, maneuvering and/or maintenance. In-service conditions may contribute to failure or premature defects.

Care is to be taken when considering premature defects as they may be found under other circumstances without an indication of incorrect operations.

Vibration responses may be induced by a damaged propeller, by imbalance of the main engine or improper operation of the vessel in bad weather.

If vibration is considered the likely cause, a vibration analysis may be suggested to identify the failure. Simultaneously induced vibration with detected or undetected response of local structures may lead to failures. External subject matter experts will be retained as this matter is complex and prone to dispute.

Only thorough investigations ***may*** lead to the roots of failure, especially when this was found after external circumstances which actually contributed to defects.

Loading and/or recalculation may be required, based on actual in-service measurements of hull deflection or excitation. Time should be taken to ensure all possible variables are collected as calculations can only be as good as the data presented.

Risk

The risk of damage is limited by the system of international safety regulations, IMO resolutions, guidelines and directives. That does not exclude damage by natural events, human error, negligence or similar reasons.

The Classification system was intended to reduce risk of failure by the system engineering design, manufacturing assurance and on-going monitoring. Classification societies are intended to be not for profit organizations, that have proven themselves to operate in a not for loss environment. Time, financial and cultural pressures have impacted the ability of classification surveyors to apply a suitable survey in order to reduce risk. Do NOT assume that a vessel that is free of deficiencies is in good condition.

The Surveyor

The surveyor's capabilities, dedication, experience and ability to cooperate with the shipboard management, repairers and others can only lead to the required success if he is technically educated, correctly trained and individually; objective, sincere and impartial.

The surveyor should also act with humility and honest self-control when required, and to request further and/or specialized assistance, should a problem become too complex or exceed their experience or knowledge.

DAMAGE SURVEYS

Causes of failure/damage
Some, but not all major causes of failure and damage of the hull structure are included below;

Material Defects

- Internal defects of materials due to production. Inclusions, voids, de-lamination, chemical composition.
- External defects due to processes. Incorrect material identification, storage conditions and exposure, incorrect manufacturing process or not following procedures, incomplete qualification of technical staff.

Design/Engineering

- Applied design criteria have not been successful in actual conditions, owing to interactions from propulsion systems, wave behavior, and inertia of the huge mass movements which are difficult to predict precisely.
- local structural components can be subjected to unexpected stress levels and excessive operational strains owing to inadequate detail construction, imposed loads, stress concentrations and loading cycles.
- failure may have been attributed to “weakness of design”. It might turn out that lack of proper operation of the vessel is the cause.

Manufacture

- Lack of adequate supervision and quality control by shipyards may lead to the following defects during new construction and repair tasks.
    - misalignment of internals,
    - displacement of seam crossings,
    - displacement of vertical or angled cross joints, or
    - excessive welding butt gaps,
    - excessive heat distortion of parts,
    - seam sagging,
    - Plate deformation.

In general the level of acceptable deviation found in structural manufacture is applied against the criteria of UR No. 47 shipbuilding and repair quality standard.

Vibration
Hull vibrations can usually be induced and/or excited by ;

- propeller;
- main engine and/or auxiliary machinery;
- Pumps or rotating system equipment
- Cargo handling gear (conveyors, hopper vibrators)
- forces induced by wave patterns (rolling, pitching, slamming, green water).

DAMAGE SURVEYS

Material Protection
Where structures and hull components are coated in order to reduce corrosion allowances, the coating must be maintained to ensure adequate material strength. Coatings are impaired by; poor quality materials or application, general wastage or mechanical abrasion.

Catholic protection only works as long as the anodes are submerged and have sufficient capacity.

Coatings in tanks or holds and at outer shell sides are firstly prone to deterioration along their welding seams and butts.

An area of wastage is normally found under decks, where mechanical stresses develop as a result of moving liquids and where coating layers are especially subjected to temperature differences between inside and outside surfaces.

The areas prone to erosion and corrosion of welding are forward and aft at outside underwater parts of a vessel:

- forward in way of bottom sections where slamming and anchor chain chafing is experienced.
- aft in way of stern section where cathode ion exchange is always imminent and the flow of water concentrated.
- in way of the rudder blade where welding and slot welding is abundant and wake action, corrosion and erosion are high.

Poor Maintenance
Maintenance is a process of keeping an object in good functional condition by regular checking and doing necessary repairs. The periods between checking and corrective means of repair can usually be established in considering the characteristics of the respective object.

If system is properly constructed, applied and functioning as initially expected but gradually deteriorating due to lack of maintenance, the efficiency, strength and suitability of the system become “damaged”.

Proper maintenance is a major contribution to general safety and it is a decisive factor in hull and structural systems where scantling thicknesses are reaching limits, or where weathertight integrity is impaired.

Maloperation
If a vessel is hit by a tug or when contacting other vessels or berthing facilities, touching ground etc., a major indentation may result. The “damage” will usually be visible and vary in intensity, extent or seriousness.

Although such casualties, malfunction or mishandling effects can never be excluded, the resulting damage is usually evident.

Maloperation of a vessel can, however, also be exercised without producing direct or corresponding visible signs of deficiency. It may take repeated actions of similar events before signs of damage announce latent or inherent danger of defect.

Such actions can be misjudgment or ship mismanagement with regard to:

- sea and wave forces,
- weight distribution in the ship,
- ballasting and/or
- tank cleaning, inerting,
- loading and discharging,
- anchoring or berthing.

Damage Checklist

1. GENERAL INFORMATION		
1	Principals / Assured	
2	Principals Ref. No. / Assured Ref. No.	
3	Vessel or other transport means	
4	Discharge Place / Port / Country	
5	Discharge Date	
6	Bill of Lading No.	
7	Goods (Type, No. of Packages)	
8	Quantity, Weight (Gross, Net)	
9	Reported value (CIF Landed)	
10	Claimant	
11	Survey Place / Town / Country	
12	Survey Date & Hour	
13	Aspect of Damage	
14	Quantity affected	
15	Depreciation or Loss (EUR, USD, kg, …)	

2. PARTIES INVOLVED		
16	Manufacturers	
	Shippers	
	Forwarding Agents	
	Carriers	
	Stevedores	
	Consignee	
	Final Receivers	
	Traders	
17	Comments (if any)	

3. GOODS OFFERED FOR SURVEY		
18	Bill of Lading No. or CMR No.	
19	Goods (Type, No. of Packages)	
20	Quantity, Weight (Gross, Net)	
21	Reported value (CIF Landed)	
22	Packing: Full, detailed description of the goods and their complete packing, plus the securing of packing	
23	Comments (if any)	

4. CIRCUMSTANCES		
24	Who bought which cargo from whom?	
	How was it transported?	
	Where and when was it loaded and discharged?	
	When was the first time any damage established?	
	When was a survey organised, where and by whom?	

25	Comments (if any)

5. DETAILS ABOUT THE SURVEY			
26	Claimant		
27	Survey Place / Town / Country		
28	Survey Date & Hour		
29	Parties invited for the survey		
30	Parties present during the survey		
	Name:	**Company:**	**Representing:**
34	Comments (if any)		

6. ASPECT OF THE DAMAGE			
35	Type:		
	Verification method:		
36	Comments (if any)		

7. NATURE OF THE DAMAGE	
37	

8. EXTENT OF THE DAMAGE	
38	

9. CAUSE OF THE DAMAGE	
39	

10. ACTIONS TAKEN TO DATE	
40	

11. ENCLOSURES	
41	

Damage Checklist

CARGO DAMAGE SURVEY REPORT [date]		**REPORT NUMBER: ###**
Survey carried out on behalf of: [client] Mobile: Tel: Fax: Email: Address 1: Address 2:	[company]	[reference]