European Maritime Safety Agency

BCSEA Project
Training on IMO Code and EU Directive on Accident Investigation

Evidence Collection

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Stephane Floch / Enrico Gironella
B.2.3 Marine Accident Investigation
Ship Safety

EMSA

Physical evidence collection

Content:

1. Physical evidence collection
2. Case Studies: Evidence gathering

General Principle

Initial stages of investigation, gathering evidence to determine

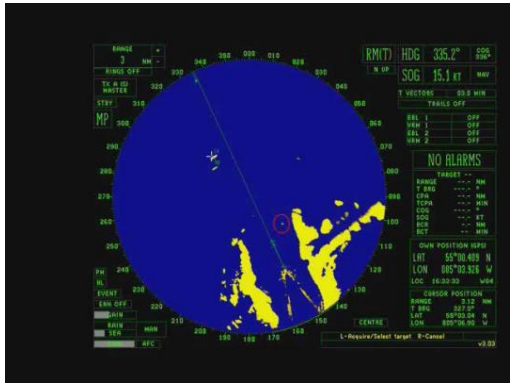
- Who (key persons)?
- What?
- When?
- How?
- and crucially Why?

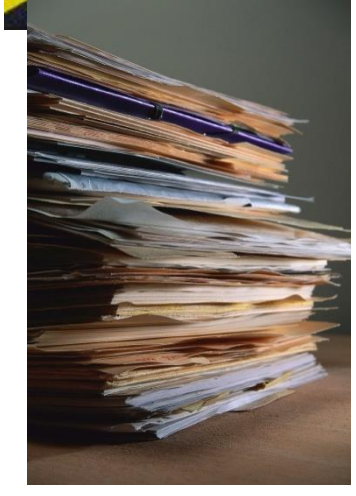
- Evidence crucial to support findings
- Beware of danger of reaching conclusions too early!
- Beware of **your own safety!**

Types of evidence?

- Human or testimonial evidence
- Physical evidence (equipment, parts, debris, hardware)

- Documentary evidence (reports, procedures, certificates)
- Electronic evidence (photos, videos, VDR, CCTV, VTS).





Case Study: Evidence gathering (30 min)

Look at summary of accident provided

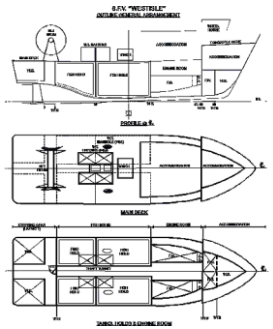
Plan your actions, concerning:

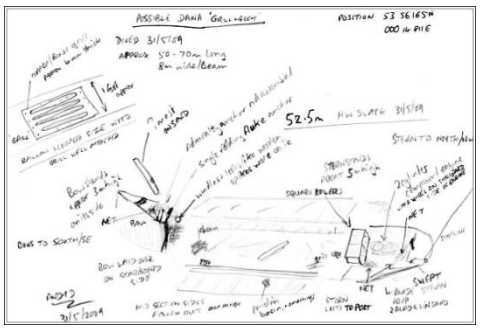
- What evidence needs to be collected to support your investigation?
- Sequence of your actions for evidence collection.
- What precautions and constraints there might be?

Discussion to follow afterwards

Witness evidence

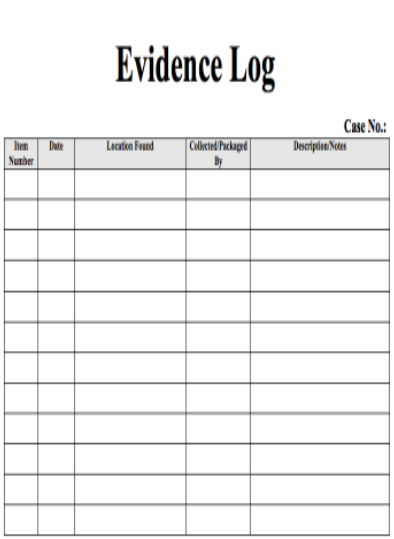
- Acquire the skills required (will be covered separately in the course)
- Try to request specific evidence from the right person
- Try to collect the same evidence from more than one witnesses if possible
- Try to link witness evidence with physical evidence
- Try to acquire any supporting evidence for witnesses' interviews (schemes or sketches, photos, audio-visual recordings, etc.)





Preserving and controlling evidence

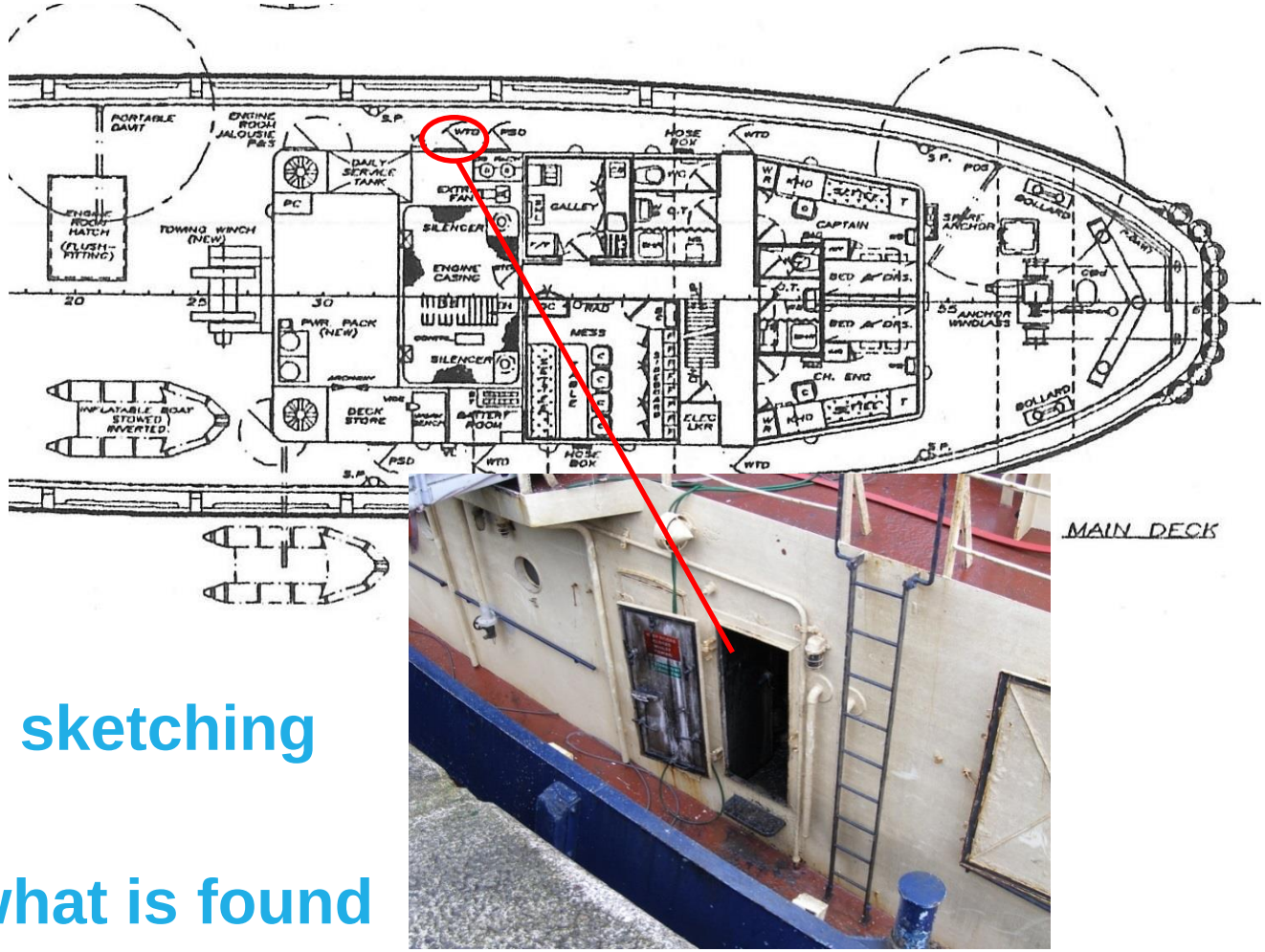
- Evidence photographed and documented in situ
- Label and log evidence collected
- Evidence log started and maintained, including:
  - date, time, location and who seized evidence
  - where item is stored
- Evidence controlled by signature transfer in log
- Secure storage for evidence provided
- Restricted access to store
- Take care especially with **electronic** evidence.


Evidence Log

Case No.:

Item Number	Date	Location Found	Collected/Packaged By	Description/Notes

Documenting and sketching



Plotting and sketching

Document what is found

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Inspecting physical evidence (1)

Following initial mapping, systematic inspection:

- **Plan** the inspection (usually you will be escorted)
- A **walkthrough** with key crew members may assist
- A **checklist** of complex equipment components to help ensure a thorough survey
- Make sure that critical areas are not **accessed** by people outside investigation.

Inspecting physical evidence (2)

Following initial mapping, systematic inspection:

- Note the **position or indication** of switches, valves, mechanisms, etc.
- Look for indication that component parts were **missing or out of place before** the accident
- Note the **absence or removal** of any parts **after** the accident
- **Identify** any equipment or parts prior to examination or testing
- Prepare **checklist** for complex equipment to be examined
  - Record such observations.

Removing physical evidence

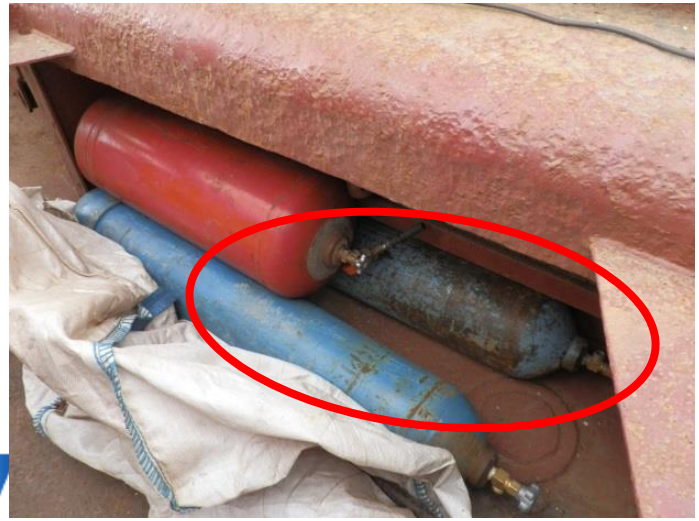
NOT until witnesses have been interviewed

NOT until position/status has been recorded

Locations of removed parts should be marked

Care during extraction/collection of items

Agreement with other interested parties BEFORE extraction takes place.



Physical evidence collection

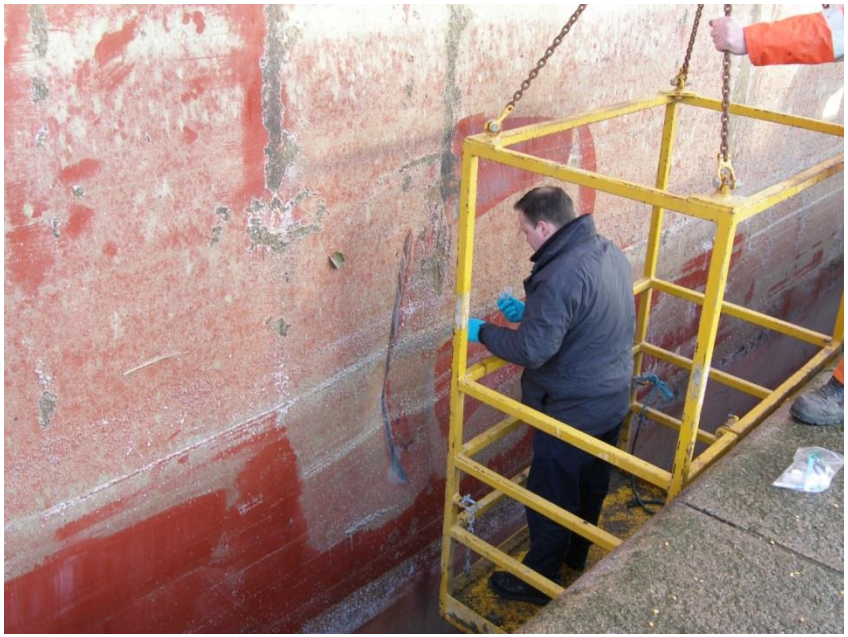
Examples:

- Equipment
- Tools
- Scatter debris
- Pattern, parts and properties of physical items

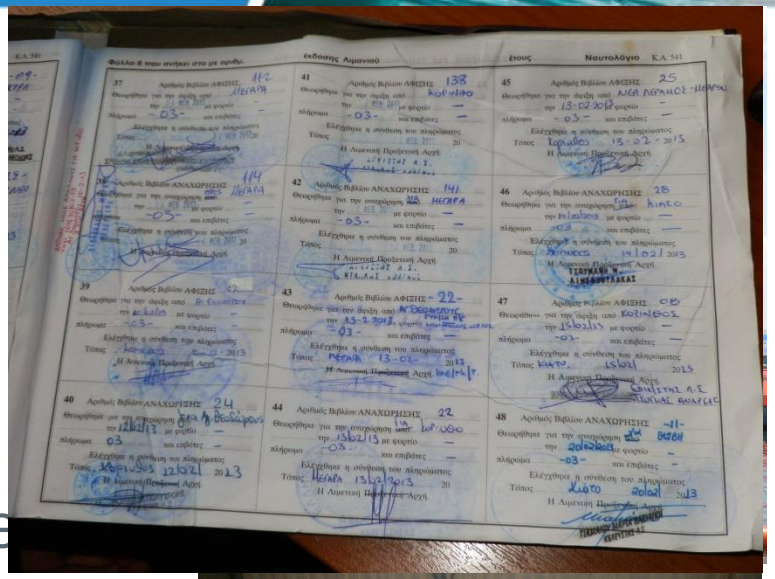
Less obvious example

- Liquid and gas **samples**

Examples



Photography



Vital tool in evidence collection

- assist with recall

Areas to photograph

- general layouts
- damaged areas, fractures (before re
- views from positions of key witnesses
- instrument and control settings
- **documents** if photocopying is unavailable

Some spots need careful access

Always take more photos than you think you need!

Equipment

Controls

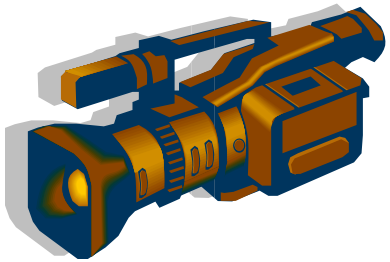
Failed components

Hull

Video recording

Can greatly assist with

- recording layout
- reconstructions

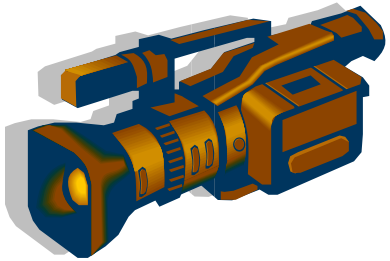


Ensure reference points are included

Commentary allows easier understanding later

Sample Video (general view from bridge)

Concerning visual evidence



In general:

- Better use digital cameras
- Add clarity when included in investigation report
- Digital photography enables high quality / ability to take numerous photos
- Often video and still photography now combined
- Practice to ensure familiarity with equipment
- Look for other possible visual data sources (facility cameras, witnesses mobile phones, etc.).

Examples of visual evidence

Collecting documentary evidence

Have a template list of all available documents-certificates to choose from

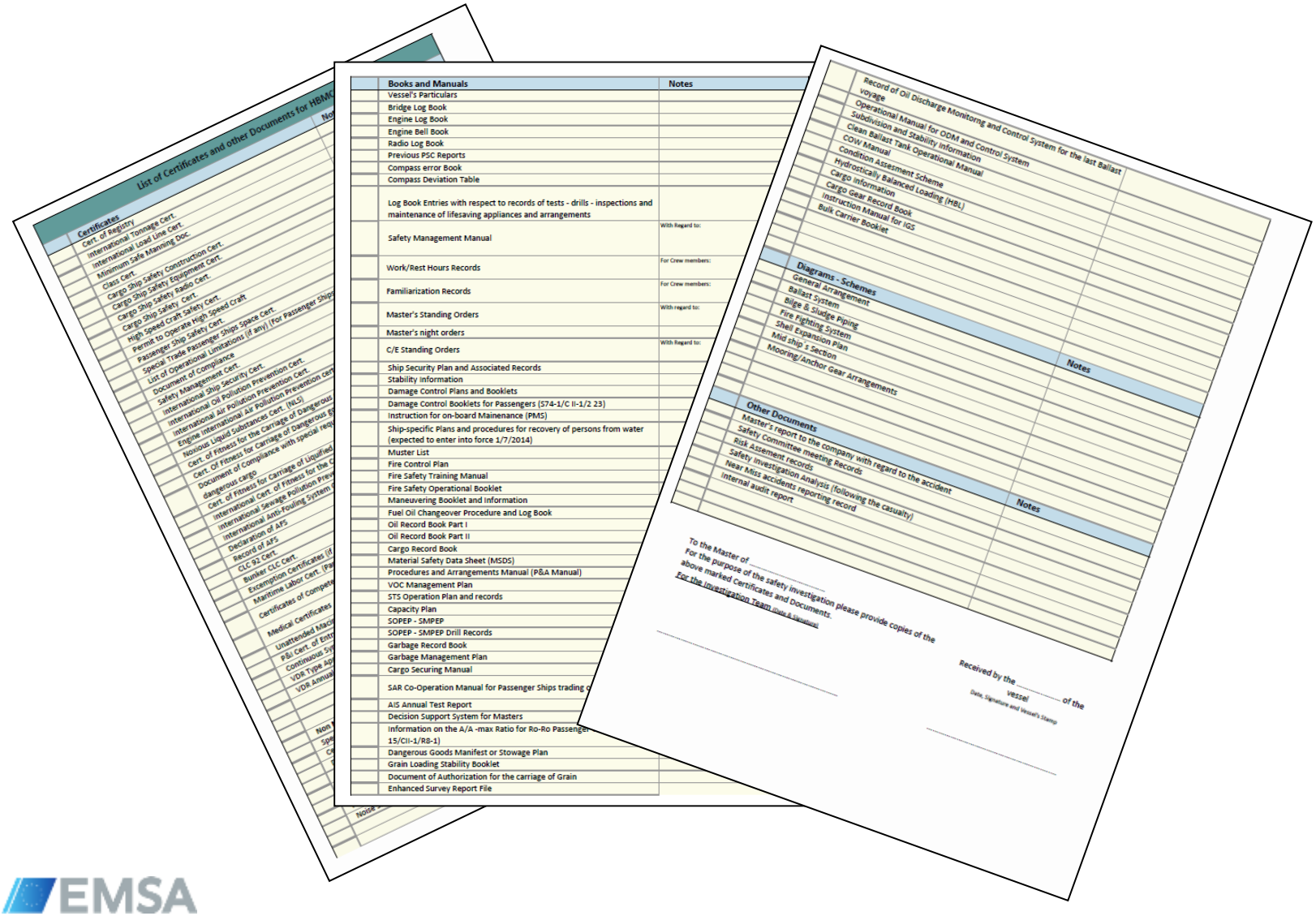
Examples of documentary evidence:

- Logbooks
- Equipment readouts
- Equipment manuals
- Licenses
- Certificates
- Photos
- Procedural documents
- Check lists

Sometimes available in electronic form

Ensure photocopies are truly representative.

Example of template document list



Documentary evidence types

- **Shipboard and Shore management control documents**
- **Records of work activities**
- **Reports of:**
  - Results of special studies
  - Analyses
  - Audits
  - Appraisals
  - Inspections (deficiencies)
  - Inquiries
- **Previous occurrences**
- **Investigations related to work activities**
- **Follow-on documentation that describes actions taken.**

Electronic evidence- Voyage Data Recorders

‘Black Box’ of the seas (VDR & Simplified-VDR)

Can provide:

- Date & time
- Position
- Speed
- Heading
- Bridge audio
- Comms audio
- Radar (or AIS)

Items below not required for S-VDR

- Echo sounder
- Wind speed and direction
- Accelerations & hull stresses
- WT and fire door status
- Engine order and response
- Hull openings
- Rudder order and response
- Main alarms

Data storage - minimum of 12 hrs of data

Voyage Data Recorder carriage

For ships on international voyages

- **VDR required on**
  - All passenger ships
  - Other ships>3,000GT constructed on/after 1/7/2002
- **S-VDR (simplified VDR) or VDR**
  - All Cargo ships >20,000GT
  - Cargo ships >3,000GT <20,000GT (by 1/7/2010)

From July 2010 all ships >3,000GT on international voyages must have a VDR or S-VDR!

Make sure VDR data has been saved!

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VDR equipment

VDR cabinet

SAVE button panel

Removable drive

VDR capsule

Electronic evidence - Other sources

Other data sources:

- Electronic Chart Display and Information Systems (ECDIS)
- Integrated Bridge Systems (IBS)

(generally will need to consult manuals/manufacturers)

- AIS data from coastal States
- VTS radar and VHF recordings
- CCTV footage/web cams
- Mobile phones

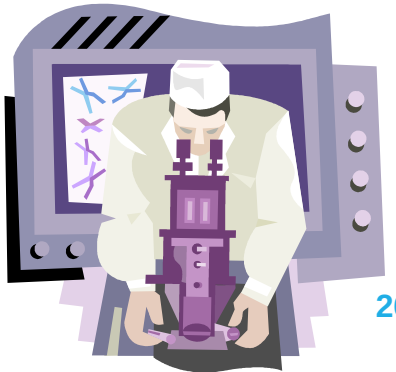
Specialist studies and testing

Investigators cannot be experts in everything!

Early assessment of the need for specialist services essential to:

- look for State specialists
- find appropriate contractors
- determine what preservation steps are needed
- List of specialist services (pre-planned action!)

Ideally having some specialist contacts and/or mechanism to enable contracts.



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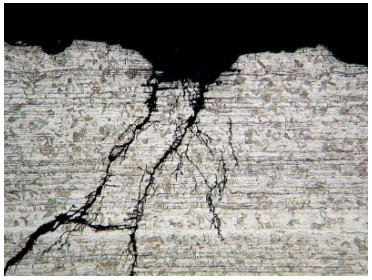
Material testing

Tensile testing

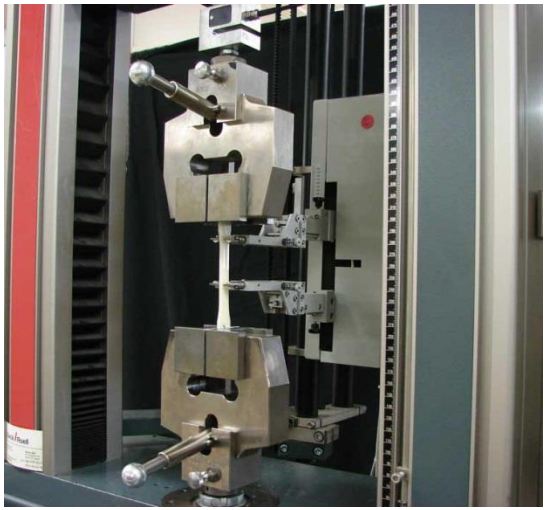
Shear testing



Microscopic examination

Failure mechanism,

Fatigue testing



Cable and rope testing

Determining failure mechanism

Load to failure prediction

Rope/cable condition

Rope properties

Rope certificates

Underwater Surveys- using divers

- Brief diver fully as to what is required
- Understand the limitations of the diver, e.g. dive time, visibility, current
- Give as much information on any known hazards
- Beware of client responsibilities
- Ideally head mounted camera feeding back to the surface, with communications to allow some direction of the diver
- Diver not to interfere with the wreck
- Interview diver

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