

Module number: C 04 b

Credits: ... points

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Introduction	
<p>Description of the subject</p> <p>After slight damage the hull of a ship has to be returned to shape and dents removed. That is what this skill is about.</p>	<p>Required knowledge/skills</p> <ul style="list-style-type: none"> - understand the safety implications
	<p>Infrastructure requirements</p> <ul style="list-style-type: none"> - Clean and clear working environment - Workshop with suitable equipment - Access to vessel repair

Objectives
<p>At the end of this module, the trainee can:</p> <ul style="list-style-type: none"> - Assess and mark out damaged areas - Assemble and install 'pulling jig'. - Operate Oxyacetylene equipment - Pull out damage as required - Burn off 'pulling gear - Repair minor marks left by welding 'pulling jig'.

Sources and additional learning material

<http://www.boat-building.org/learn-skills/index.php/en/metal/straightening-a-steel-plate/>

Required tools, machines and material



Iron



Stud bar, nuts and washers



Oxyacetylene



Plate hammer

More information?

KNOWLEDGE

Terms	Definition - Description - Explanation
Iron	To remove a dent from the hull of a ship a holder is made from a section of iron profile
Threaded bar, nuts & washers	Threaded rods are inserted through the holder and will be welded to the hull of the ship. The threaded rods are fitted with nuts and washers.
Oxyacetylene	Heat source
Plate Hammer	Large hammer with curved face to help force the metal into place without leaving marks

SKILLS

Step 1: Marking up damaged area

Content	Key points
The dent is first localised and marked	
Visual aids	
	

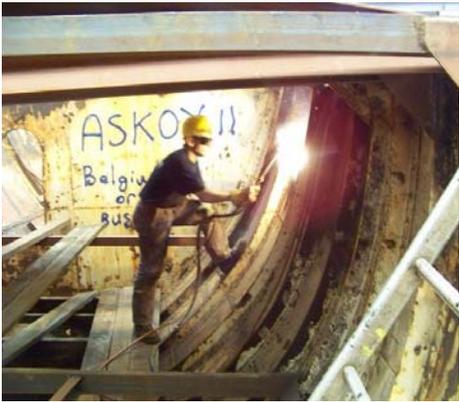
Step 2: Assembling 'pulling Jig'

Content	Key points	Visual aids
<p>The holder is assembled to match the size of the dent and the threaded rods are inserted through the slot</p>	<p>Ensure 'pulling jig is long enough to span repair and strong enough to withstand pulling out procedure</p>	

Step 3: Weld 'pulling Jig onto ship's side

Content	Key points	Visual aids
<p>The assembly is welded onto the ship's hull</p>	<p>Welding should be strong enough to safely hold 'pulling jig in place pulling load is taken by the jig itself.</p>	

Step 4: Apply heat onto damaged area

Content	Key points	Visual aids
<p>The hull is heated on the inside using the oxy-acetylene burner while the threaded rods are tightened.</p>	<p>This makes the metal "softer" for removing the dent and avoids abrupt reactions once the threaded rods are tightened. Large burner type nozzles are usually best.</p>	

Step 5: Tighten nuts on 'pulling-jig'

Content	Key points	Visual aids
<p>The nuts on the threaded rods are tightened so that the dent is pulled in the direction of the jig.</p>	<p>When tightening the threaded rods the dents can be continuously monitored and tightened more where necessary.</p>	

Step 6: Remove 'pulling jig'.

Content	Key points	Visual aids
<p>Once the hull is back into shape the holder and the threaded rods are removed using burning gear/angle grinder</p>	<p>When removing studs care must be taken not to burn/grind into the hull metal.</p>	