



## Statement of Requirements

The final selection of materials for sealing the caulked seams will be made after independent laboratory trials, with results analysed and evaluated with the NMRN Project Team. It is anticipated that these trials will investigate both the static performance (e.g. UV, Moisture/Water Ingress, Humidity and Temperature Cycling) as well as the dynamic performance (Adhesion and Cohesion) of the proposed material under cyclical stress, strain and shear cycles, and include longer term trials in a representative dockside model that is situated on the dockside adjacent to the ship.

**It is envisaged that trials will be conducted in four packages:**

### **PACKAGE 1 - Static Trials.**

This stage of the trial is for up to 6 types of caulking material, 2 types of paint, two types of wood and the selected types of fixings to be evaluated by static laboratory trials including accelerated cycles of wet/dry, hot/cold and UV. From analysis of results, the contractor is to recommend up to three types of caulking material, and two types of paint and fixings, for further testing on the preferred timber, which will be approved by NMRN. These trials are anticipated to last 1 month, with a 5 day report summary period on completion, and presentation to NMRN to recommend and select materials to be evaluated separately in Package 2.

Trials are also to be conducted on a range of possible materials, fixtures and fittings, to determine their long-term suitability for use. These materials include:

- a. Two types of paint scheme.
- b. Caulking Scheme:



- i. Traditional Pitch/Oakum
  - ii. Compounds such as 'Black Pudding' Mix ,Jeffery's Marine Glue, and 'Fosroc'
  - iii. Range of modern synthetic sealants, including bitumen
- c. Treenail:
- i. Wood
  - ii. Glass Reinforced Plastic (GRP)
- d. Screw fastenings and bolts:
- i. Coach Screws and Plugs – M20
  - ii. Stainless Steel (with and without polypropylene sheathing)
  - iii. Galvanised Mild Steel
  - iv. Phosphor Bronze
  - v. Silicon Bronze
  - vi. Titanium
  - vii. Aluminium Bronze

Within the range of testing, NMRN also wishes to investigate the performance of stainless steel in low-oxygen environments, therefore trials are to be conducted with, and without, polypropylene sheathing for comparison effects.

NMRN also wish to investigate the use of infilling material between ship frames to prevent water ingress. (E.g. marine butyl sealant), and the trials contractor/laboratory is to suggest materials (and provide costed trials options)



for possible sealant methods, with a justification for use in accordance with the stated CMP policies above alongside the other materials trials outlined within this package. **(COSTED OPTION 1)**

Materials, and methods used, must be proven to be reversible/removable as part of any future conservation maintenance work and intervention.

The materials will be used primarily in Oak<sup>1</sup>, with a fall-back option of Teak. (See Annex B for the Specification of Oak).

The trials package itself is to be determined jointly with the NMRN and the selected trials laboratory/organisation. Details here are for illustration and information only, and do not in themselves constitute a comprehensive requirement. Part of the response to tender is to include a specification of costed trials, and materials, that are considered necessary.

**Environment.** The ship is dry-docked in a coastal maritime environment, exposed to the prevailing weather. The typical annual temperature range in Portsmouth is from -10 Degrees Celsius to + 35 Degrees Celsius. This should be treated as a guide, and allowance and consideration made for any extremes and variation due to climate change. The effects of extended periods of high temperature interspersed with heavy periods of rain should be included.

**Package 2 - Dynamic Trials.** Package 2 is to include dynamic stress/strain/shear cycles of representative scale planking to test the adherence and coherence of caulking sealants over simulated cyclical movement and expansion/contraction of the ship. A planking plan of the ship is shown at Annex C. This plan, and structural model, is also available in (.dwg) format. The tests will, it is suggested, need to include painting the

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<sup>1</sup> See Annex B



caulking seam with the preferred paint. The output from the trials should be evaluated in a report with recommendations to NMRN. These trials are also anticipated to last 1 month, with a 5 day report summary period on completion, and presentation to NMRN.

**Package 3 - Dockside Monitoring and Lifecycle Testing**. It is intended that Selected materials (from Package 1 and 2) are installed on the existing ships side mock-up by NMRN staff, and the mock-up subject to periodic reevaluation and production of a working report and review with NMRN over an initial two year period, from completion of the replica. The aim is to look for long term degradation/indication of potential failure or need for conservation maintenance and intervention. It is intended that the trials be for a duration of 2 years with an option to extend for two further years. The response to tender is to include an outline plan and periodic inspection reports and associated costs.

**Package 4 - Costed Option (2)**. The NMRN wishes to explore non-invasive monitoring techniques for the long - term detection and monitoring of moisture content and decay within the hull, such as the use of Smart-RFID Tags/Sensors, Ground Probing Radar, / Heat/IR and Ultrasound, etc. The work required is to produce an initial feasibility report and a costed plan for a 3 year trial proposal to monitor the ships side and evaluate different technologies and how it may inform conservation maintenance and intervention.

Note:



For each Package, The Testing Laboratory/Facility will work with the NMRN Project Team to obtain and supply all materials and associated documentation for the materials to be tested.

The Testing Laboratory/Facility will work with the NMRN to produce an assessment matrix to record results and provide a framework for objective assessment of materials.

All trials specifications, documented procedures and copies of standards tested to/against are to be included in a final report for each Package.

Final decision on trials and materials for use will be taken by the NMRN, and the NMRN reserves the right to substitute in additional materials, or cancel the trials with an appropriate notice period to be agreed at any stage.

Should the trials at the end of each Package not produce results of sufficient confidence to establish clear materials choices to take forward to subsequent phases, the NMRN reserves the right to halt the programme.