SEMME3151 – HY1H 04
Identifying defects in marine composite components and assemblies

Overview

This standard describes the competences you need to identify and deal with defects in marine composite components and assemblies, such as bulkheads, hulls, superstructure, masts, spars, fairings, air intakes, hatches, steering equipment, rudders, skegs, tanks, casings and coverings, radar/navigational domes, davits and internal fitments such as berths, vanity units, consoles, seating, and shower units, in accordance with approved procedures. You will be required to use appropriate drawings, specifications and documentation to identify and deal with defects in composites mouldings.

You will be able to identify a range of defects in composite mouldings, such as dimensional errors, incomplete curing, ply orientation, surface finish, contamination, distortion, blisters, de-lamination, dents, disbonds, colour leaching, blisters and voids, using various methods and techniques. You will be expected to identify defects in a range of components and assemblies, with a variety of resin and fibre materials.

Your responsibilities will require you to comply with organisational policy and procedures for the activities undertaken, and to report any problems with these activities that you cannot personally resolve, or are outside your permitted authority, to the relevant people. You will be expected to work with a minimum of supervision, taking personal responsibility for your own actions and for the quality and accuracy of the work that you carry out.

Your underpinning knowledge will provide a good understanding of your work, and will provide an informed approach to identifying defects in marine composite components and assemblies, and to making decisions on what action needs to be taken. You will understand composite materials, and their application, and will know about defects in adequate depth to provide a sound basis for dealing with them in line with organisation practice and procedures.

You will understand the safety precautions required when working with the composite materials, and when using associated tools and equipment. You will be required to demonstrate safe working practices throughout, and will understand the responsibility you owe to yourself and others in the workplace, both ashore and afloat.

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Performance criteria

You must be able to:

- P1 work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines
- P2 identify defects with regard to the product or asset specification
- P3 assess the defects and determine action required to return the products and assets to specified condition
- P4 report recommendations for action to the appropriate people promptly and in accordance with organisational procedures
- P5 record details of defects in accordance with quality assurance and control systems and procedures

Knowledge and understanding

You need to know and understand:

K1 health and safety precautions to be taken, and procedures to be used when working with composite materials, consumables, tools and equipment in the specific work area

K2 how to recognise and deal with emergencies and the procedures to be followed (such as methods of safely evacuating and closing down of compartments in the case of fire or other major incident, first aid, fire fighting and resuscitation of personnel)

K3 the hazards associated with composite materials, consumables, tools and equipment, and how to minimise these in the work area

K4 the protective equipment (PPE) that is needed for personal protection and, where required, the protection of others

K5 the application of COSHH regulations in relation to the storage, use and disposal of composite materials and consumables

K6 how to use and extract information from drawings and related specifications (to include symbols and conventions to appropriate BS or ISO standards) in relation to work undertaken

K7 how to interpret first and third angle drawings, imperial and metric systems of measurement, workpiece reference points and system of tolerancing

K8 quality procedures used in the workplace to ensure production control (in relation to currency, issue, meeting specification), and the completion of such documents

K9 conventions and terminology used when identifying and rectifying defects (such as disbonds, de-lamination, resin injection, resin voids, core potting, repair patches)

K10 failure modes for various composite mouldings, and what can contribute to these

K11 different types of composite resin systems, fibres, reinforcements, and the types of defect that might be present

K12 different methods of production for composite mouldings, and the sorts of defect that might be caused

K13 different bonding agents, methods used, and the sorts of defect that might be present in the bond

K14 the various methods that can be used to help identify whether defects are present in the mouldings (to include visual inspection, touch, sound, measurement, mechanical and non-destructive tests)

K15 how to evaluate the extent of the defect, and which action to be taken (such as, can it be repaired or is it to be scrapped)

K16 correct methods of storage and handling of composite materials

K17 tools and equipment used for various activities associated with composite mouldings

K18 the extent of your own responsibility and whom you should report to if you have problems that you cannot resolve

Scope/range related to performance criteria

You must be able to:

1. Carry out **all** of the following during the inspection activities:
   - 1.1 use the correct issue of documentation (such as drawings, manuals, specifications, job cards)
   - 1.2 use relevant health and safety documentation (such as material data sheets, COSHH sheets, risk assessments)
   - 1.3 use the correct tools and equipment for the activity, and ensure that they are safe to use and suitably stored
   - 1.4 keep the work area in a safe and tidy condition

2. Identify defects in marine composite mouldings, using **four** of the following methods:
   - 2.1 touch
   - 2.2 visual
   - 2.3 mechanical tests
   - 2.4 non-destructive testing (NDT)
   - 2.5 sound
   - 2.6 measurement
   - 2.7 co-ordinate measuring (CMM)
   - 2.8 stage inspection

3. Identify defects in marine composite mouldings to include: Either **one** of the following:
   - 3.1 hull
   - 3.2 superstructure
   - 3.3 masts and spars
   - 3.4 cabins or wheel houses
   - 3.5 bulkhead

   Or **four** of the following:
   - 3.6 rudders
   - 3.7 berths
   - 3.8 radar/navigational domes
   - 3.9 air intakes/vents
   - 3.10 steering equipment (wheel, tiller)
   - 3.11 fairings
   - 3.12 consoles
   - 3.13 hatches
   - 3.14 casings and covers
   - 3.15 shower units
   - 3.16 vanity units

3.17 skegs
3.18 tanks
3.19 davits
3.20 seats
3.21 other specific marine components

4. Identify defects applicable to **two** of the following resin types:
   4.1 polyester
   4.2 vinyl ester
   4.3 acrylic resin
   4.4 bismaleimide
   4.5 epoxy resin
   4.6 cyanate ester
   4.7 phenolic resin

5. Identify defects applicable to **two** of the following fibre types:
   5.1 polyethylene
   5.2 glass
   5.3 aramid
   5.4 carbon
   5.5 hybrid

6. Identify **eight** of the following types of defect in composite mouldings:
   6.1 incomplete curing
   6.2 distortion
   6.3 splintering
   6.4 thin gel coat
   6.5 dimensional
   6.6 blisters
   6.7 voids
   6.8 excessive adhesive
   6.9 ply orientation
   6.10 bridging
   6.11 dents or `dings'
   6.12 damaged cores
   6.13 wrong join type
   6.14 de-lamination
   6.15 disbonds
   6.16 wrong inserts
   6.17 colour leaching
   6.18 wrinkles
   6.19 resin rich areas
   6.20 impact damage
   6.21 surface finish
   6.22 broken fibres
   6.23 incorrect material
   6.24 contamination

7. Ensure that the actions recommended to rectify the defects comply with **one** of the following standards:
   - 7.1 BS, ISO or BSEN standards and procedures
   - 7.2 customer standards and requirements
   - 7.3 company standards and procedures
   - 7.4 recognised compliance agency/body's standards

8. Complete the relevant paperwork, to include **one** from the following and pass it to the appropriate people:
   - 8.1 build records
   - 8.2 quality/acceptance documentation
   - 8.3 system log
   - 8.4 job cards
   - 8.5 work authorisation documents
   - 8.6 other specific reporting method

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