
Overview

This standard identifies the competences you need to produce a range of marine composite components such as hulls, superstructure, masts, spars, bulkheads, 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, using pre-preg laminating techniques, in accordance with approved procedures. You will be required to use appropriate drawings, specifications and documentation to produce various mouldings, using the correct pre-preg laminating production techniques.

You will be expected to prepare the tooling, apply release agents and prepare the composite materials. You will produce the composite mouldings, which will incorporate a range of features, using a range of application methods. Mouldings produced will include laminates and sandwich structures, using suitable resin, fibre and core materials.

Your responsibilities will require you to comply with organisational policy and procedures for the pre-preg laminating activities undertaken, and to report any problems with the production activities, equipment or materials 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 applying pre-preg laminating techniques and procedures to produce marine composite components. You will understand the production techniques used, and their application, in adequate depth to provide a sound basis for carrying out the activities, correcting faults, and ensuring that the work output is produced to the required specification.

You will understand the safety precautions required when carrying out the pre-preg laminating activities, and when using the 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.

Performance criteria

You must be able to:

1. work safely at all times, complying with health and safety and other relevant regulations, directives and guidelines 2. follow the correct component drawing or any other related specifications for the component to be produced 3. determine what has to be done and how this will be achieved 4. obtain and prepare the appropriate tools, equipment and materials 5. carry out the moulding or laying-up activities using the correct methods and techniques 6. produce components to the required specification 7. check that all the required operations have been completed to specification 8. deal promptly and effectively with problems within your control and report those that cannot be solved 9. complete relevant documentation in line with organisational procedures

Knowledge and understanding

You need to know and understand:

1. health and safety precautions to be taken, and procedures used, when working with composite materials, consumables, tools and equipment in the specific work area
2. the hazards associated with composite materials, consumables, tools and equipment, and how to minimise these in the work area
3. the protective equipment (PPE) that is needed for personal protection and, where required, the protection of others
4. the application of COSHH regulations in relation to the storage, use and disposal of composite materials and consumables
5. the specific workshop environmental conditions that must be observed when producing marine mouldings (such as temperature, humidity, styrene levels to threshold limits, fume/dust extraction systems and equipment)
6. 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)
7. how to interpret first and third angle drawings, imperial and metric systems of measurement, workpiece reference points and system of tolerancing
8. quality procedures used in the workplace to ensure production control (in relation to currency, issue, meeting specification), and the completion of the appropriate documents
9. conventions and terminology used for pre-preg laminating techniques (such as material orientation, material identification, material templates, ply lay-up, pressure plates, vacuum bagging, cure cycles, exotherm)
10. different types of resin systems, fibres, reinforcements, and their applications
11. building up laminates, including orientation and balance of plies to minimise spring and distortion in composite mouldings
12. different core, insert and filler materials, and their applications
13. the visual identification of both raw and finished composite materials
14. the identification of materials by product codes
15. different types of mould tools used for producing marine composite components, and their merits
16. the identification and rectification of defects in mould tooling
17. methods of preparation for patterns, moulds and tooling (including the correct selection and use of surface sealers and release agents)
18. the correct methods of storage, thawing and handling of pre-preg materials (including monitoring temperature, storage life and out-life)
19. methods used in the application of pre-preg materials to tooling surfaces (including methods of tailoring and cutting)

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20. the selection, use, storage and handling of ancillary and consumable materials (such as release films, breather fabrics, bagging films, tapes) to meet performance requirements (such as temperature and compatibility)
 21. tools and equipment used in the pre-preg laminating activities, and their care, preparation and control procedures
 22. problems that can occur during the lay-up process (including modifications to the ply lay-up, and defects such as contamination and distortion of marine components and fibre orientation)
 23. how modifications and defects can be overcome during the pre-preg laminating activity
 24. cure cycles, including temperature and pressure ramps, dwell times, post curing
 25. the need for monitoring the cure cycle using thermocouples, probes, chart recorders, thermometers and data logs
 26. procedures and methods used for removing mouldings from tooling
 27. the identification of defects in the composite moulding (such as delamination, voids, contaminants and distortion)
 28. the care and safe handling of production tooling and composite mouldings throughout the production cycle
 29. the production controls used in the work area, and actions to be taken for unaccounted items
 30. how the composite moulding relates to its own quality documents, and the production tooling used
 31. 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

1. Carry out all of the following activities during the pre-preg laminating activities:
 1. use the correct issue of production documentation (such as drawings, manuals, specifications, job cards)
 2. use relevant health and safety documentation (such as material data sheets, COSHH sheets, risk assessments)
 3. use the correct tools and equipment for the activity, and ensure that they are safe to use and suitably stored
 4. keep the work area in a safe and tidy condition
2. Carry out all of the following activities when preparing the marine tooling:
 1. check that tooling is correct and complete
 2. correctly apply sealers/release agents
 3. clean the tooling and remove resin build-ups
 4. clean and store tooling suitably after use
 5. check for surface defects
3. Carry out all of the following activities to prepare the materials for production:
 1. obtain the correct materials for the activity
 2. check the availability of ancillary materials required
 3. thaw material removed from freezer storage
 4. cut materials to the correct shape and orientation
 5. identifying defects in pre-preg materials
 6. check the materials when provided in kit form
 7. check materials are fit for purpose and 'in life'
 8. identify and protect materials in the work area
4. Produce marine composite mouldings using pre-preg laminating techniques, to include: Either one of the following:
 1. hull
 2. superstructure
 3. bulkhead
 4. masts and spars
 5. cabins or wheel houses

Or four of the following:

6. rudders
7. casings and covers
8. berths
9. vanity units

10. air intakes/vents
11. davits
12. shower units
13. steering equipment (wheel, tiller)
14. fairings
15. skegs
16. seats
17. radar/navigational domes
18. hatches
19. tanks
20. consoles
21. composite mould tools
22. other specific marine components

5. Produce marine components, using appropriate techniques for four of the following types of mould tools:

1. metal
2. glass pre-preg
3. carbon pre-preg
4. male tooling
5. matched tooling
6. wet lay-up
7. tooling block
8. female tooling
9. multi-part tools
10. closed tooling

6. Produce marine components incorporating two of the following in the lay-up:

1. butt joins
2. staggered joins
3. inverted plies
4. overlap joins
5. orientated plies
6. inserts

7. Produce marine components, incorporating five of the following shape features:

1. internal corners
2. concave surface
3. joggle details
4. external corners
5. convex surfaces
6. nett edges
7. double curvature

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8. return surfaces
 9. flanges
8. Produce marine components, using four of the following methods:
 1. production of ply templates
 2. pressure de-bulk
 3. joining boards
 4. nesting of ply templates
 5. intensifiers
 6. loose tooling
 7. vacuum de-bulk
 8. shaped locators
 9. others specific method
 9. Produce marine components, using appropriate techniques for one of the following types of resin:
 1. epoxy resin
 2. bismaleimide
 3. acrylic resin
 4. phenolic resin
 5. cyanate ester
 10. Produce marine components, using appropriate techniques for two of the following types of fibre:
 1. polyethylene
 2. aramid
 3. hybrid
 4. glass
 5. carbon
 11. Produce marine components, using appropriate techniques for two of the following types of reinforcement:
 1. continuous
 2. uni-directional
 3. braids
 4. woven
 5. multi-axis
 6. tapes
 12. Produce marine components, using appropriate techniques for two of the following types of core materials:
 1. solid timber
 2. expanding core
 3. nomex honeycomb
 4. aluminium honeycomb

5. syntactic core
6. foam
7. end grain balsa

13. When using core materials, use three of the following methods:

1. core templates
2. peel plies
3. core splicing
4. single stage curing
5. pre-shaping core
6. adhesive/resin films
7. edge filling
8. multi-stage curing
9. core chamfers
10. bonding paste

14. Use two of the following for applying temperature during the cure cycle:

1. oven
2. heated press
3. autoclave
4. heater mats
5. heater lamps
6. heated tools/moulds

15. Use one of the following for applying pressure during the cure cycle:

1. pressure bags
2. vacuum bags
3. thermal mould expansion
4. closed mould
5. fibre tensioning

16. Where vacuum bags are used, use four of the following processes/methods:

1. check vacuum integrity
2. envelope bagging
3. internal bagging
4. use of vacuum fittings
5. pleats and tucks
6. through-tube bagging
7. surface bagging
8. multi-part envelope bags
9. re-usable bagging

17. Produce a range of marine components which comply with one of

the following standards:

1. BS, ISO or BSEN standards and procedures
 2. customer (contractual) standards and requirements
 3. company standards and procedures
 4. recognised compliance agency/body's standards
18. Complete the relevant documentation in line with organisational procedures*, *to include one from the following and pass it to the appropriate people:
1. build records
 2. quality/acceptance documentation
 3. system log
 4. job cards
 5. work authorisation documents
 6. other specific reporting method

Behaviours

Behaviours:

You will be able to apply the appropriate behaviours required in the workplace to meet the job profile and overall company objectives, such as:

- strong work ethic
- positive attitude
- team player
- dependability
- responsibility
- honesty
- integrity
- motivation
- commitment

SEMME3144

Producing marine composite components using pre-preg laminating techniques



Developed by	Enginuity
Version Number	3
Date Approved	31 Mar 2019
Indicative Review Date	29 Apr 2021
Validity	Current
Status	Original
Originating Organisation	Semta
Original URN	SEMME3144
Relevant Occupations	Marine Engineering Trades
Suite	Marine Engineering Suite 3
Keywords	engineering; marine; produce; composite; components; pre-preg lamination; hulls; superstructures; masts; spars