edexcel

Pearson Edexcel Level 2 NVQ Diploma in Marine Engineering

Specification

Competence-based qualification

For first registration March 2011

Issue 2

Pearson

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This specification is Issue 2. Key changes are listed in the summary table on the next page. We will inform centres of any changes to this issue. The latest issue can be found on the Pearson website: qualifications.pearson.com

This qualification was previously known as:

Edexcel Level 2 NVQ Diploma in Marine Engineering (QCF)

The QN remains the same.

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ISBN 9781446949412

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Summary of Pearson Edexcel Level 2 NVQ Diploma in Marine Engineering specification Issue 2 changes

Summary of changes made between previous issue and this current issue	Page number
All references to QCF have been removed throughout the specification	
Definition of TQT added	1
Definition of sizes of qualifications aligned to TQT	2
TQT value added	6
Guided learning definition updated	23
QCF references removed from unit titles and unit levels in all units	26-1268

Earlier issue(s) show(s) previous changes.

If you need further information on these changes or what they mean, contact us via our website at: qualifications.pearson.com/en/support/contact-us.html.

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Introducing Pearson Edexcel NVQ qualifications

What are NVQ qualifications?

National Vocational Qualifications (NVQs) are work-based qualifications that give learners the opportunity to develop and demonstrate their competence in the area of work or job role to which the qualification relates.

NVQs are based on the National Occupational Standards (NOS) for the appropriate sector. NOS define what employees, or potential employees, must be able to do and know, and how well they should undertake work tasks and work roles. At Level 2 and above, these qualifications are recognised as the competence component of Apprenticeship Frameworks. Qualifications at Level 1 can be used in Traineeships, which are stepping-stones to Apprenticeship qualifications. NVQs qualifications can also be delivered as stand-alone for those who wish to take a work-based qualification.

NVQs qualifications are outcomes-based with no fixed learning programme – allowing flexible delivery that meets the individual learner's needs. They are suitable for those in employment or those who are studying at college and have a part-time job or access to a substantial work placement so that they are able to demonstrate the competencies that are required for work.

Most learners will work towards their qualification in the workplace or in settings that replicate the working environment as specified in the assessment requirements/strategy for the sector. Colleges, training centres and/or employers can offer these qualifications provided they have access to appropriate physical and human resources.

Sizes of NVQ/Competence-based qualifications

For all regulated qualifications, Pearson specify a total number of hours that is estimated learners will require to complete and show achievement for the qualification – this is the Total Qualification Time (TQT). The TQT value indicates the size of a qualification.
Within the TQT, Pearson identifies the number of Guided Learning Hours (GLH) that we estimate a centre delivering the qualification might provide. Guided learning means activities, such as lessons, tutorials, online instruction, supervised study and giving feedback on performance, that directly involve tutors and assessors in teaching, supervising and invigilating learners. Guided learning includes the time required for learners to complete external assessment under examination or supervised conditions.
In addition to guided learning, other required learning directed by tutors or assessors will include private study, preparation for assessment and undertaking assessment when not under supervision, such as preparatory reading, revision and independent research.
As well as TQT and GLH, qualifications can also have a credit value – equal to one tenth of TQT, rounded to the nearest whole number.
TQT and credit values are assigned after consultation with users of the qualifications.

NVQ/Competence-based qualifications are available in the following sizes:

- Award – a qualification with a TQT value of 120 or less (equivalent to a range of 1–12 credits)
- Certificate – a qualification with a TQT value in the range of 121–369 (equivalent to a range of 13–36 credits)
- Diploma – a qualification with a TQT value of 370 or more (equivalent to 37 credits and above).

Qualification title covered by this specification

This specification gives you the information you need to offer the Pearson Edexcel Level 2 NVQ Diploma in Marine Engineering:

Qualification title	Qualification Number (QN)	Accreditation start date
Pearson Edexcel Level 2 NVQ Diploma in Marine Engineering	600/0509/9	01/03/2011

Qualifications eligible and funded for post-16-year-olds can be found on the funding Hub. The Skills Funding Agency also publishes a funding catalogue that lists the qualifications available for 19+ funding.

You should use the Qualification Number (QN), when you wish to seek public funding for your learners. Each unit within a qualification will also have a unique reference number, which is listed in this specification.

The qualification title and unit reference numbers will appear on the learners' final certification document. Learners need to be made aware of this when they are recruited by the centre and registered with Pearson.

Key features of the Pearson Edexcel Level 2 NVQ Diploma in Marine Engineering

This qualification:

- is nationally recognised
- is based on the Semta National Occupational Standards (NOS). The NOS, Assessment Strategy and qualification structure are owned by Semta.

The Pearson Edexcel Level 2 NVQ Diploma in Marine Engineering has been approved as a component for the Semta Apprenticeship framework.

What is the purpose of this qualification?

This qualification is appropriate for employees in the engineering sector working across a broad range of areas. It is designed to assess occupational competence in the workplace where learners are required to demonstrate skills and knowledge to a level required in the engineering sector.

Who is this qualification for?

This qualification is for all learners aged 16 and above who are capable of reaching the required standards.

Pearson's policy is that the qualification should:

- be free from any barriers that restrict access and progression
- ensure equality of opportunity for all wishing to access the qualification.

What are the benefits of this qualification to the learner and employer?

This qualification allows learners to demonstrate competence against National Occupational Standards which are based on the needs of the engineering sector as defined by Semta, the Sector Skills Council. As such it contributes to the development of skilled labour in the sector. The qualification may contribute towards the competence element of an Apprenticeship.

What are the potential job roles for those working towards this qualification?

- Marine Craftsperson
- Marine Engineer
- Marine Engineering Technician.

What progression opportunities are available to learners who achieve this qualification?

This qualification allows learners to demonstrate competence in marine engineering at a level required by the engineering industry. Learners can progress across the level and size of the engineering competence and knowledge qualifications and into other occupational areas such as team leading and management.

What is the qualification structure for the Pearson Edexcel Level 2 NVQ Diploma in Marine Engineering ?

Individual units can be found in the *Units* section. The level and credit value are given on the first page of each unit.

The Total Qualification Time (TQT) for this qualification is 590.

The Guided Learning Hours for this qualification are 576.

To achieve the **Pearson Edexcel Level 2 NVQ Diploma in Marine Engineering** learners must complete a minimum of 59 credits.

Learners must complete all mandatory units in Group A (15 credits) and then choose one of the following pathways:

Pearson Edexcel Level 2 NVQ Diploma in Marine Engineering — Electrical Installation and Maintenance

Learners must complete a minimum of three units in Group B, for a minimum total of 61 credits.

Pearson Edexcel Level 2 NVQ Diploma in Marine Engineering — Pipework

Learners must complete a minimum of one unit in Group C1, a minimum of one unit in Group C2, a minimum of one unit in Group C3 and a minimum of one unit in Group C4, for a minimum total of 97 credits.

Pearson Edexcel Level 2 NVQ Diploma in Marine Engineering — Structural Steelwork

Learners must complete the unit in Group D1, a minimum of two units in Group D2 and a minimum of one unit in Group D3, for a minimum total of 61 credits.

Pearson Edexcel Level 2 NVQ Diploma in Marine Engineering — Mechanical Installation and Maintenance

Learners must complete a minimum of three units in Group E, for a minimum total of 77 credits.

Pearson Edexcel Level 2 NVQ Diploma in Marine Engineering — Woodwork/Outfitting

Learners must complete a minimum of three units in Group F, for a minimum total of 68 credits.

Pearson Edexcel Level 2 NVQ Diploma in Marine Engineering — Interior Finishing

Learners must complete a minimum of two units in Group G, for a minimum total of 50 credits.

Pearson Edexcel Level 2 NVQ Diploma in Marine Engineering — Composites

Learners must complete a minimum of two units in Group H, for a minimum total of 46 credits.

Pearson Edexcel Level 2 NVQ Diploma in Marine Engineering — Sheet-metalwork

Learners must complete a minimum of three units in Group I1 and a minimum of one unit in Group I2, for a minimum total of 81 credits.

Pearson Edexcel Level 2 NVQ Diploma in Marine Engineering — Manual Welding

Learners must complete a minimum of one unit in Group J, for a minimum total of 44 credits.

Pearson Edexcel Level 2 NVQ Diploma in Marine Engineering — Rigging

Learners must complete all the units in Group K1 and a minimum of two units in Group K2, for a minimum total of 58 credits.

Pearson Edexcel Level 2 NVQ Diploma in Marine Engineering — Paint Application

Learners must complete all the units in Group L1 and a minimum of two units in Group L2, for a minimum total of 90 credits.

Pearson Edexcel Level 2 NVQ Diploma in Marine Engineering — Yacht and Boat Equipment Installation

Learners must complete a minimum of three units in Group M, for a minimum total of 86 credits.

Pearson Edexcel Level 2 NVQ Diploma in Marine Engineering — Yacht and Boat Woodwork/Outfitting

Learners must complete a minimum of three units in Group N, for a minimum total of 75 credits.

Pearson Edexcel Level 2 NVQ Diploma in Marine Engineering — Yacht and Boat Painting/Finishing

Learners must complete all the units in Group O1 and a minimum of one unit in Group O2, for a minimum total of 80 credits.

Pearson Edexcel Level 2 NVQ Diploma in Marine Engineering — Yacht and Boat Building, Servicing, Maintenance and Repair

Learners must complete a minimum of four units in Group P, for a minimum total of 50 credits.

A — Mandatory units

Learners must complete all the units in Group A.

A/601/5013 — Complying with statutory regulations and organisational safety requirements

Y/601/5102 — Using and interpreting engineering data and documentation

Y/601/5052 — Working efficiently and effectively in engineering

B — Electrical Installation and Maintenance

Learners must complete a minimum of three units in Group B.

K/601/1796 — Carrying out the installation of cable runs and circuits in marine structures

T/601/1803 — Assisting in the installation of marine electrical equipment

T/601/1932 — Locating faults in marine electrical equipment and circuits

J/601/1935 — Carrying out modifications and rewiring of marine electrical circuits

Y/601/1938 — Carrying out tests on marine electrical equipment and circuits

R/601/1940 — Disconnecting and removing marine electrical equipment

A/601/1947 — Carrying out scheduled maintenance on marine electrical equipment

C — Pipework

Learners must complete a minimum of one unit in Group C1, a minimum of one unit in Group C2, a minimum of one unit in Group C3 and a minimum of one unit in Group C4.

C1 — Optional units

Learners must complete a minimum of one unit in Group C1.

L/601/1953 — Using hand methods to bend and form marine pipe

H/601/1957 — Using bending machines to form marine pipe

C2 — Optional units

Learners must complete a minimum of one unit in Group C2.

M/601/1962 — Joining ferrous marine pipework by mechanical means

L/601/1970 — Joining non-ferrous marine pipework

Y/601/1972 — Joining non-metallic marine pipework

C3 — Optional units

Learners must complete a minimum of one unit in Group C3.

H/601/1974 — Assisting in the installation of marine pipework and components

T/601/1977 — Assisting in the testing of marine pipework systems

C4 — Optional units

Learners must complete a minimum of one unit in Group C4.

F/601/1979 — Producing socket and flange fillet welded joints in low pressure marine pipework using a manual welding process

T/601/1980 — Carrying out manual torch brazing and soldering of marine pipework

D — Structural Steelwork

Learners must complete the unit in Group D1, a minimum of two units in Group D2 and a minimum of one unit in Group D3.

D1 — Mandatory unit

Learners must complete the unit in Group D1.

A/601/1981 — Marking off for the manufacture of marine steelwork components

D2 — Optional units

Learners must complete a minimum of two units in Group D2.

J/601/1983 — Cutting marine steelwork using handheld thermal cutting equipment

R/601/1985 — Cutting and shaping marine steelwork using gas cutting machines

Y/601/1986 — Cutting marine steelwork using saws and abrasive discs

H/601/1988 — Cutting marine steelwork using shearing machines

T/601/2000 — Drilling and finishing holes in marine steelwork

A/601/2001 — Operating CNC fabrication machines

D3 — Optional units

Learners must complete a minimum of one unit in Group D3.

Y/601/2040 — Shaping marine steelwork using a power press

M/601/2044 — Shaping marine steelwork using power rolling machines

T/601/2045 — Assisting in the assembly of marine steelwork components

J/601/2048 — Tack welding fillet joints in marine steelwork

E — Mechanical Installation and Maintenance

Learners must complete a minimum of three units in Group E.

J/601/2051 — Assisting in the installation of marine mechanical equipment

R/601/2053 — Locating faults in marine mechanical equipment

Y/601/2054 — Carrying out scheduled maintenance on marine mechanical equipment

M/601/2058 — Repairing marine mechanical components

T/601/2062 — Disconnecting and removing marine mechanical equipment

F/601/2064 — Carrying out maintenance on marine fuel systems and equipment

L/601/2066 — Carrying out maintenance on marine pneumatic systems and equipment

R/601/2067 — Carrying out maintenance on marine auxiliary power units for electrical power generation

T/601/2076 — Carrying out maintenance on marine mechanical control systems and equipment

A/601/2080 — Carrying out maintenance on marine steering gear, control systems and equipment

J/601/2082 — Carrying out maintenance on marine lifting equipment

L/601/2083 — Carrying out maintenance on marine ancillary plant and equipment

R/601/2084 — Carrying out maintenance on marine steam plant and equipment

T/601/2191 — Carrying out maintenance on marine liquid-ballast systems

L/601/2195 — Carrying out maintenance on marine fire main systems and equipment

D/601/2198 — Carrying out maintenance on marine pantry and galley equipment

F — Woodwork/Outfitting

Learners must complete a minimum of three units in Group F.

L/601/2200 — Marking out for manufacture and assembly of marine wooden components

R/601/2201 — Shaping marine wooden components using hand tools

Y/601/2202 — Shaping marine wooden components using machines

D/601/2203 — Producing assemblies of marine wooden components

K/601/2205 — Applying surface treatments to marine wooden assemblies

G — Interior Finishing

Learners must complete a minimum of two units in Group G.

M/601/2206 — Cutting and shaping marine soft furnishings

M/601/2285 — Fitting marine interior panels and soft furnishings

A/601/2287 — Fitting marine seating and furniture

H — Composites

Learners must complete a minimum of two units in Group H.

F/601/2288 — Using wet lay-up techniques to produce marine composite components

A/601/2290 — Using pre-preg laminating techniques to produce marine composite components

F/601/2291 — Forming marine components by acrylic moulding

L/601/2293 — Assembling marine composite components

R/601/2294 — Vacuum-forming marine composite materials

M/601/2299 — Carrying out trimming operations on marine composite mouldings

H/601/2302 — Fitting marine composite components to the vessel, craft or structure

J/601/2308 — Carrying out bonding operations on marine composite components

L/601/2312 — Carrying out repairs to marine composite mouldings

K/601/2317 — Checking marine composite components/mouldings for defects

I — Sheet-metalwork

Learners must complete a minimum of three units in Group I1 and a minimum of one unit in Group I2.

I1 — Optional units

Learners must complete a minimum of three units in Group I1.

K/601/2320 — Marking out marine sheet-metalwork

A/601/2323 — Cutting and shaping marine sheet-metal using hand and machine tools

D/601/2329 — Bending and forming marine sheet-metal using hand and machine tools

J/601/2356 — Cutting and shaping materials using CNC laser profiling machines

R/601/2358 — Cutting and shaping using NC/CNC plasma or gas cutting machines

L/601/2360 — Assembling marine sheet-metal components

H/601/2364 — Assisting in the installation of marine sheet-metal components/assemblies

I2 — Optional units

Learners must complete a minimum of one unit in Group I2.

K/601/2365 — Using mechanical fasteners to join marine sheet-metal components

T/601/2367 — Using resistance spot-welding to join marine sheet-metal materials

J/601/2373 — Joining marine materials and components using adhesives

H/601/2378 — Producing fillet welded joints using a manual welding process

J — Manual Welding

Learners must complete a minimum of one unit in Group J.

H/601/2378 — Producing fillet welded joints using a manual welding process

D/601/2380 — Joining marine materials/structures using the manual metal arc (MMA) welding process

K/601/2382 — Joining marine materials/structures using manual MIG/MAG and other continuous wire processes

A/601/2385 — Joining marine materials/structures using manual TIG and plasma-arc welding processes

L/601/2388 — Joining marine materials/structures using the manual gas welding process

K — Rigging

Learners must complete all the units in Group K1 and a minimum of two units in Group K2.

K1 — Mandatory units

Learners must complete all the units in Group K1.

A/601/2466 — Setting up and preparing loads for moving

J/601/2468 — Moving materials and components in a marine environment

K2 — Optional units

Learners must complete a minimum of two units in Group K2.

J/601/2471 — Carrying out preparations for rigging activities

R/601/2473 — Positioning and securing marine access structures

D/601/2489 — Removing marine access structures

D/601/2492 — Carrying out maintenance on rigging and lifting equipment

K/601/2494 — Checking rigging and lifting equipment

T/601/2496 — Assisting in the preparation of docks and slips for vessel operations

A/601/2497 — Assisting in mooring and berthing operations

J/601/2499 — Carrying out manual splicing of wire and fibre ropes

M/601/2500 — Carrying out the installation of rigging and lifting equipment

L — Paint Application

Learners must complete all the units in Group L1 and a minimum of two units in Group L2.

L1 — Mandatory units

Learners must complete all the units in Group L1.

T/601/2501 — Carrying out patch preparation of material surfaces using hand and mechanical tools

M/601/2559 — Preparing marine coatings for application

H/601/2574 — Carrying out the manual application of marine coatings

F/601/2582 — Carrying out the application of marine coatings using spray methods

L2 — Optional units

Learners must complete a minimum of two units in Group L2.

A/601/2502 — Carrying out the preparation of material surfaces by abrasive blasting

H/601/2509 — Preparing surfaces by ultra high pressure (UHP) water jetting

H/601/2588 — Carrying out the application of deck screeds and other deck coverings

H/601/2591 — Carrying out the application of signature reduction coverings

J/601/2602 — Applying fairing, filling and specialist protective coatings to marine components

M — Yacht and Boat Equipment Installation

Learners must complete a minimum of three units in Group M.

D/601/2606 — Carrying out the installation of cable runs and circuits in yachts and boats

H/601/2610 — Assisting in the installation of electrical/electronic equipment in yachts and boats

T/601/2613 — Assisting in the installation of engines/propulsion systems in yachts and boats

F/601/2615 — Assisting in the installation of ancillary equipment in yachts and boats

L/601/2617 — Assisting in the installation of domestic equipment in yachts and boats

N — Yacht and Boat Woodwork/Outfitting

Learners must complete a minimum of three units in Group N.

R/601/2618 — Cutting and shaping wooden components for yachts and boats using hand tools

Y/601/2619 — Cutting and shaping wooden components for yachts and boats using machines

L/601/2620 — Assisting in the assembly of wooden furniture/outfitting units for yachts and boats

R/601/2621 — Assisting in the installation of wooden furniture/outfitting units in yachts and boats

Y/601/2622 — Assisting in the assembly of wooden structural components to produce yachts and boats

D/601/2623 — Applying surface finishes to yacht and boat wooden assemblies

K/601/2625 — Fitting seating, interior panels, soft furnishing and trim in yachts and boats

M/601/2626 — Carrying out repairs to yacht and boat wooden components and assemblies

T/601/2627 — Carrying out repairs to yacht and boat composite components

O — Yacht and Boat Painting/Finishing

Learners must complete all the units in Group O1 and a minimum of one unit in Group O2.

O1 — Mandatory units

Learners must complete all the units in Group O1.

A/601/2628 — Preparing yacht and boat surfaces for painting/finishing

F/601/2629 — Preparing yacht and boat paints/coating materials for application

T/601/2630 — Applying yacht and boat paints/coating materials manually

F/601/2632 — Applying yacht and boat paints/coating materials using spray methods

O2 — Optional units

Learners must complete a minimum of one units in Group O2.

D/601/2623 — Applying surface finishes to yacht and boat wooden assemblies

D/601/2721 — Preparing yacht and boat material surfaces by abrasive blasting

K/601/2723 — Carrying out the application of fairing/filling compounds to yachts and boats

P — Yacht and Boat Building, Servicing, Maintenance and Repair

Learners must complete a minimum of four units in Group P.

D/601/2606 — Carrying out the installation of cable runs and circuits in yachts and boats

H/601/2610 — Assisting in the installation of electrical/electronic equipment in yachts and boats

T/601/2613 — Assisting in the installation of engines/propulsion systems in yachts and boats

F/601/2615 — Assisting in the installation of ancillary equipment in yachts and boats

L/601/2617 — Assisting in the installation of domestic equipment in yachts and boats

R/601/2618 — Cutting and shaping wooden components for yachts and boats using hand tools

Y/601/2619 — Cutting and shaping wooden components for yachts and boats using machines

L/601/2620 — Assisting in the assembly of wooden furniture/outfitting units for yachts and boats

R/601/2621 — Assisting in the installation of wooden furniture/outfitting units in yachts and boats

Y/601/2622 — Assisting in the assembly of wooden structural components to produce yachts and boats

D/601/2623 — Applying surface finishes to yacht and boat wooden assemblies

K/601/2625 — Fitting seating, interior panels, soft furnishing and trim in yachts and boats

M/601/2626 — Carrying out repairs to yacht and boat wooden components and assemblies

T/601/2627 — Carrying out repairs to yacht and boat composite components

A/601/2628 — Preparing yacht and boat surfaces for painting/finishing

F/601/2629 — Preparing yacht and boat paints/coating materials for application

T/601/2630 — Applying yacht and boat paints/coating materials manually

F/601/2632 — Applying yacht and boat paints/coating materials using spray methods

D/601/2721 — Preparing yacht and boat material surfaces by abrasive blasting

K/601/2723 — Carrying out the application of fairing/filling compounds to yachts and boats

M/601/2724 — Assisting in the disconnection and removal of yacht and boat electrical/electronic equipment

A/601/2726 — Assisting in the disconnection and removal of yacht and boat mechanical and ancillary equipment

J/601/2728 — Carrying out routine servicing of yacht and boat mechanical and ancillary equipment

F/601/2730 — Carrying out routine servicing of yacht and boat electrical/electronic equipment

R/601/2733 — Assisting in modifying and adding electrical circuits in yachts and boats

How is the qualification graded and assessed?

The overall grade for the qualification is a 'pass'. The learner must achieve all the required units within the specified qualification structure.

To pass a unit the learner must:

- achieve **all** the specified learning outcomes
- satisfy **all** the assessment criteria by providing sufficient and valid evidence for each criterion
- show that the evidence is their own.

The qualification is designed to be assessed:

- in the workplace or
- in conditions resembling the workplace, as specified in the assessment requirements/strategy for the sector, or
- as part of a training programme.

Assessment Strategy

The Assessment Strategy for this qualification has been included in *Annexe C*. It has been developed by Semta in partnership with employers, training providers, awarding organisations and the regulatory authorities. The Assessment Strategy includes details on:

- criteria for defining realistic working environments
- roles and occupational competence of assessors, expert witnesses, internal verifiers and standards verifiers
- quality control of assessment
- evidence requirements.

Evidence of competence may come from:

- **current practice** where evidence is generated from a current job role
- a **programme of development** where evidence comes from assessment opportunities built into a learning/training programme whether at or away from the workplace
- the **Recognition of Prior Learning (RPL)** where a learner can demonstrate that they can meet the assessment criteria within a unit through knowledge, understanding or skills they already possess without undertaking a course of learning. They must submit sufficient, reliable and valid evidence for internal and standards verification purposes. RPL is acceptable for accrediting a unit, several units or a whole qualification
- a **combination** of these.

It is important that the evidence is:

Valid	relevant to the standards for which competence is claimed
Authentic	produced by the learner
Current	sufficiently recent to create confidence that the same skill, understanding or knowledge persist at the time of the claim
Reliable	indicates that the learner can consistently perform at this level
Sufficient	fully meets the requirements of the standards.

Types of evidence (to be read in conjunction with the Assessment Strategy in Annexe C)

To successfully achieve a unit the learner must gather evidence which shows that they have met the required standard in the assessment criteria. Evidence can take a variety of different forms including the examples below. Centres should refer to the Assessment Strategy for information about which of the following are permissible.

- direct observation of the learner's performance by their assessor (O)
- outcomes from oral or written questioning (Q&A)
- products of the learner's work (P)
- personal statements and/or reflective accounts (RA)
- outcomes from simulation, where permitted by the Assessment Strategy (S)
- professional discussion (PD)
- assignment, project/case studies (A)
- authentic statements/witness testimony (WT)
- expert witness testimony (EPW)
- evidence of Recognition of Prior Learning (RPL).

The abbreviations may be used for cross-referencing purposes.

Learners can use one piece of evidence to prove their knowledge, skills and understanding across different assessment criteria and/or across different units. It is, therefore, not necessary for learners to have each assessment criterion assessed separately. Learners should be encouraged to reference the assessment criteria to which the evidence relates.

Evidence must be made available to the assessor, internal verifier and Pearson standards verifier. A range of recording documents is available on the Pearson website qualifications.pearson.com. Alternatively, centres may develop their own.

Additional requirements

The Joint Awarding Body and the SSC Working Practices Group have identified additional requirements that are needed to assess and quality assure qualifications that use NVQ within their title. These requirements are shown in *Annexe C: Additional Requirements for Qualifications that use the title NVQ within the QCF*.

Centre recognition and approval

Centre recognition

Centres that have not previously offered Pearson qualifications need to apply for and be granted centre recognition as part of the process for approval to offer individual qualifications. New centres must complete both a centre recognition approval application and a qualification approval application.

Existing centres will be given 'automatic approval' for a new qualification if they are already approved for a qualification that is being replaced by the new qualification and the conditions for automatic approval are met. Centres already holding Pearson approval are able to gain qualification approval for a different level or different sector via Edexcel online.

Approvals agreement

All centres are required to enter into an approvals agreement which is a formal commitment by the head or principal of a centre to meet all the requirements of the specification and any linked codes or regulations. Pearson will act to protect the integrity of the awarding of qualifications, if centres do not comply with the agreement. This could result in the suspension of certification or withdrawal of approval.

Quality assurance

Detailed information on Pearson's quality assurance processes is given in *Annexe A*.

What resources are required?

Each qualification is designed to support learners working in the engineering sector. Physical resources need to support the delivery of the qualifications and the assessment of the learning outcomes and must be of industry standard. Centres must meet any specific resource requirements outlined in *Annexe C: Assessment Strategy*. Staff assessing the learner must meet the requirements within the overarching assessment strategy for the sector.

Unit format

Each unit in this specification contains the following sections.

Unit title:

This is the formal title of the unit that will appear on the learner's certificate

Unit reference number:

This code is a unique reference number for the unit.

Level:

All units and qualifications have a level assigned to them. The level assigned is informed by the level descriptors by Ofqual, the qualifications regulator.

Credit value:

All units have a credit value. The minimum credit value is one, and credits can only be awarded in whole numbers. Learners will be awarded credits when they achieve the unit.

Guided learning hours:

A notional measure of the substance of a qualification. It includes an estimate of the time that might be allocated to direct teaching or instruction, together with other structured learning time, such as directed assignments, assessments on the job or supported individual study and practice. It excludes learner-initiated private study.

Unit summary:

This provides a summary of the purpose of the unit.

Assessment requirements/evidence requirements:

The assessment/evidence requirements are determined by the SSC. Learners must provide evidence for each of the requirements stated in this section.

Assessment methodology:

This provides a summary of the assessment methodology to be used for the unit.

Learning outcomes:	Assessment criteria:	Evidence type:	Portfolio reference:	Date:

The learner should use this box to indicate where the evidence can be obtained eg portfolio page number.

The learner should give the date when the evidence has been provided.

Learning outcomes state exactly what a learner should know, understand or be able to do as a result of completing a unit.

The assessment criteria of a unit specify the standard a learner is expected to meet to demonstrate that a learning outcome, or a set of learning outcomes, has been achieved.

Learners must reference the type of evidence they have and where it is available for quality assurance purposes. The learner can enter the relevant key and a reference. Alternatively, the learner and/or centre can devise their own referencing system.

Units

Unit 1: Complying with statutory regulations and organisational safety requirements

Unit reference number: A/601/5013

Level: 2

Credit value: 5

Guided learning hours: 35

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to deal with statutory regulations and organisational safety requirements. It does not deal with specific safety regulations or detailed requirements. It does, however, cover the more general health and safety requirements that apply to working in an industrial environment.

Learners will be expected to comply with all relevant regulations that apply to their area of work, as well as their general responsibilities as defined in the Health and Safety at Work Act. Learners will need to be able to identify the relevant qualified first aiders and know the location of the first aid facilities. They will have a knowledge and understanding of the procedures to be adopted in the case of accidents involving injury and in situations where there are dangerous occurrences or hazardous malfunctions of equipment, processes or machinery. Learners will also need to be fully conversant with their organisation's procedures for fire alerts and the evacuation of premises.

Learners will be required to identify the hazards and risks that are associated with their job. Typically, these will focus on their working environment, the tools and equipment that they use, the materials and substances that they use, any working practices that do not follow laid-down procedures, and manual lifting and carrying techniques.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Comply with statutory regulations and organisational safety requirements	1.1 comply with their duties and obligations as defined in the Health and Safety at Work Act 1.2 demonstrate their understanding of their duties and obligations to health and safety by: • applying in principle their duties and responsibilities as an individual under the Health and Safety at Work Act • identifying, within their organisation, appropriate sources of information and guidance on health and safety issues such as: – eye protection and personal protective equipment (PPE) – COSHH regulations – risk assessments • identifying the warning signs and labels of the main groups of hazardous or dangerous substances • complying with the appropriate statutory regulations at all times 1.3 present themselves in the workplace suitably prepared for the activities to be undertaken 1.4 follow organisational accident and emergency procedures			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.5 comply with emergency requirements, to include: • identifying the appropriate qualified first aiders and the location of first aid facilities • identifying the procedures to be followed in the event of injury to themselves or others • following organisational procedures in the event of fire and the evacuation of premises • identifying the procedures to be followed in the event of dangerous occurrences or hazardous malfunctions of equipment 1.6 recognise and control hazards in the workplace 1.7 identify the hazards and risks that are associated with the following: • their working environment • the equipment that they use • materials and substances (where appropriate) that they use • working practices that do not follow laid-down procedures 1.8 use correct manual lifting and carrying techniques			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.9 demonstrate one of the following methods of manual lifting and carrying: • lifting alone • with assistance of others • with mechanical assistance 1.10 apply safe working practices and procedures to include: • maintaining a tidy workplace, with exits and gangways free from obstruction • using equipment safely and only for the purpose intended • observing organisational safety rules, signs and hazard warnings • taking measures to protect others from any harm resulting from the work that they are carrying out			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
2 Know how to comply with statutory regulations and organisational safety requirements	2.1 describe the roles and responsibilities of themselves and others under the Health and Safety at Work Act, and other current legislation (such as The Management of Health and Safety at Work Regulations, Workplace Health and Safety and Welfare Regulations, Personal Protective Equipment at Work Regulations, Manual Handling Operations Regulations, Provision and Use of Work Equipment Regulations, Display Screen at Work Regulations, Reporting of Injuries, Diseases and Dangerous Occurrences Regulations) 2.2 describe the specific regulations and safe working practices and procedures that apply to their work activities 2.3 describe the warning signs for the seven main groups of hazardous substances defined by Classification, Packaging and Labelling of Dangerous Substances Regulations 2.4 explain how to locate relevant health and safety information for their tasks, and the sources of expert assistance when help is needed			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.5 explain what constitutes a hazard in the workplace (such as moving parts of machinery, electricity, slippery and uneven surfaces, poorly placed equipment, dust and fumes, handling and transporting, contaminants and irritants, material ejection, fire, working at height, environment, pressure/stored energy systems, volatile, flammable or toxic materials, unshielded processes, working in confined spaces) 2.6 describe their responsibilities for identifying and dealing with hazards and reducing risks in the workplace 2.7 describe the risks associated with their working environment (such as the tools, materials and equipment that they use, spillages of oil, chemicals and other substances, not reporting accidental breakages of tools or equipment and not following laid-down working practices and procedures) 2.8 describe the processes and procedures that are used to identify and rate the level of risk (such as safety inspections, the use of hazard checklists, carrying out risk assessments, COSHH assessments) 2.9 describe the first aid facilities that exist within their work area and within the organisation in general; the procedures to be followed in the case of accidents involving injury			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.10 explain what constitute dangerous occurrences and hazardous malfunctions, and why these must be reported even if no one is injured 2.11 describe the procedures for sounding the emergency alarms, evacuation procedures and escape routes to be used, and the need to report their presence at the appropriate assembly point 2.12 describe the organisational policy with regard to fire fighting procedures; the common causes of fire and what they can do to help prevent them 2.13 describe the protective clothing and equipment that is available for their areas of activity 2.14 explain how to safely lift and carry loads, and the manual and mechanical aids available 2.15 explain how to prepare and maintain safe working areas; the standards and procedures to ensure good housekeeping 2.16 describe the importance of safe storage of tools, equipment, materials and products 2.17 describe the extent of their own authority, and to whom they should report in the event of problems that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 2: Using and interpreting engineering data and documentation

Unit reference number: Y/601/5102

Level: 2

Credit value: 5

Guided learning hours: 25

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to make effective use of text, numeric and graphical information, by interpreting and using technical information extracted from documents such as engineering drawings, technical manuals, reference tables, specifications, technical sales/marketing documentation, charts or electronic displays, in accordance with approved procedures. Learners will be required to extract the necessary information from the various documents, in order to establish and carry out the work requirements, and to make valid decisions about the work activities based on the information extracted.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Use and interpret engineering data and documentation	1.1 use the approved source to obtain the required data and documentation 1.2 use the data and documentation and carry out all of the following: • check the currency and validity of the data and documentation used • exercise care and control over the documents at all times • correctly extract all necessary data in order to carry out the required tasks • seek out additional information where there are gaps or deficiencies in the information obtained • deal with or report any problems found with the data and documentation • make valid decisions based on the evaluation of the engineering information extracted from the documents • return all documents to the approved location on completion of the work • complete all necessary work-related documentation such as production documentation, installation documentation, maintenance documentation, planning documentation			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.3 correctly identify, interpret and extract the required information 1.4 extract information that includes three of the following: • materials or components required • dimensions • tolerances • build quality • installation requirements • customer requirements • timescales • financial information • operating parameters • surface texture requirements • location/orientation of parts • process or treatments required • dismantling/assembly sequence • inspection/testing requirements • number/volumes required • repair/service methods • method of manufacture			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• weld type and size • operations required • connections to be made • surface finish required • shape or profiles • fault finding procedures • safety/risk factors • environmental controls • specific data (such as component data, maintenance data, electrical data, fluid data) • resources (such as tools, equipment, personnel) • utility supply details (such as electricity, water, gas, air) • location of services, including standby and emergency backup systems • circuit characteristics (such as pressure, flow, current, voltage, speed) • protective arrangements and equipment (such as containment, environmental controls, warning and evacuation systems and equipment) • other specific related information			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.5 use the information obtained to ensure that work output meets the specification 1.6 use information extracted from documents to include one from the following: • drawings (such as component drawings, assembly drawings, modification drawings, repair drawings, welding/fabrication drawings, distribution and installation drawings) • diagrams (such as schematic, fluid power diagrams, piping, wiring/circuit diagrams) • manufacturers manuals/drawings • approved sketches • technical illustrations • photographic representations • visual display screen information • technical sales/marketing documentation • contractual documentation • other specific drawings/document			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.7 use information extracted from related documentation, to include two from the following: • instructions (such as job instructions, drawing instructions, manufacturers instructions) • specifications (such as material, finish, process, contractual, calibration) • reference materials (such as manuals, tables, charts, guides, notes) • schedules • operation sheets • service/test information • planning documentation • quality control documents • company-specific technical instructions • national, international and organisational standards • health and safety standards relating to the activity (such as COSHH) • other specific related documentation 1.8 deal promptly and effectively with any problems within their control and report those which cannot be solved 1.9 report any inaccuracies or discrepancies in documentation and specifications			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
2 Know how to use and interpret engineering data and documentation	2.1 explain what information sources are used for the data and documentation that they use in their work activities 2.2 explain how documents are obtained, and how to check that they are current and valid 2.3 explain the basic principles of confidentiality (including what information should be available and to whom) 2.4 describe the different ways/formats that data and documentation can be presented (such as drawings, job instructions, product data sheets, manufacturers' manuals, financial spreadsheets, production schedules, inspection and calibration requirements, customer information) 2.5 explain how to use other sources of information to support the data (such as electronic component pin configuration specifications, reference charts, standards, bend allowances required for material thickness, electrical conditions required for specific welding rods, mixing ratios for bonding and finishing materials, metal specifications and inspection requirements, health and safety documentation)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.6 describe the importance of differentiating fact from opinion when reviewing data and documentation 2.7 describe the importance of analysing all available data and documentation before decisions are made 2.8 describe the different ways of storing and organising data and documentation to ensure easy access 2.9 describe the procedures for reporting discrepancies in the data or documentation, and for reporting lost or damaged documents 2.10 describe the importance of keeping all data and documentation up to date during the work activity, and the implications of this not being done 2.11 explain the care and control procedures for the documents, and how damage or graffiti on documents can lead to scrapped work 2.12 explain the importance of returning documents to the designated location on completion of the work activities 2.13 explain what basic drawing conventions are used and why there needs to be different types of drawings (such as isometric and orthographic, first and third angle, assembly drawings, circuit and wiring diagrams, block and schematic diagrams)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.14 explain what types of documentation are used and how they interrelate (such as production drawings, assembly drawings, circuit and wiring diagrams, block and schematic diagrams) 2.15 explain the imperial and metric systems of measurement; tolerancing and fixed reference points 2.16 describe the meaning of the different symbols and abbreviations found on the documents that they use (such as surface finish, electronic components, weld symbols, linear and geometric tolerances, pressure and flow characteristics) 2.17 describe the extent of their own responsibility, when to act on their own initiative to find, clarify and evaluate information, and to whom they should report if they have problems that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 3: Working efficiently and effectively in engineering

Unit reference number: Y/601/5052

Level: 2

Credit value: 5

Guided learning hours: 25

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to work efficiently and effectively in the workplace, in accordance with approved procedures and practices. Prior to undertaking the engineering activity, learners will be required to carry out all necessary preparations within the scope of their responsibility. This may include preparing the work area and ensuring that it is in a safe condition to carry out the intended activities, ensuring that they have the appropriate job specifications and instructions, and ensuring that any tools, equipment, materials and other resources required are available and in a safe and usable condition.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Work efficiently and effectively in engineering	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 prepare the work area to carry out the engineering activity 1.3 prepare to carry out the engineering activity, taking into consideration all of the following, as applicable to the work to be undertaken: • the work area is free from hazards and suitably prepared for the activities to be undertaken • any required safety procedures are implemented • any necessary personal protection equipment is obtained and is in a usable condition • tools and equipment required are obtained and checked that they are in a safe and useable condition • all necessary drawings, specifications and associated documentation are obtained • job instructions are obtained and understood • the correct materials or components are obtained			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• storage arrangements for work are appropriate • appropriate authorisation to carry out the work is obtained 1.4 check that there are sufficient supplies of materials and/or consumables and that they meet work requirements 1.5 ensure completed products or resources are stored in the appropriate location on completion of the activities 1.6 complete work activities, to include all of the following: • returning tools and equipment • returning drawings and work instructions • completing all necessary documentation accurately and legibly • identifying, where appropriate, any unusable tools, equipment and components • arranging for the safe disposal of waste materials 1.7 tidy up the work area on completion of the engineering activity			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.8 deal promptly and effectively with problems within their control and report those that cannot be resolved 1.9 deal with problems affecting the engineering process, to include two of the following: • materials • tools and equipment • drawings • job specification • quality • people • timescales • safety • activities or procedures 1.10 contribute to organisational procedures for identifying opportunities for improvement to one of the following: • working practices • working methods • quality			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• safety • tools and equipment • supplier relationships • internal communication • customer service • training and development • teamwork • other 1.11 maintain effective working relationships with colleagues to include two of the following: • colleagues within their own working group • people outside their normal working group • line management • external contacts 1.12 review personal training and development as appropriate to the job role			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.13 review personal development objectives and targets to include one of the following: • dual or multi-skilling • training on new equipment/technology • increased responsibility • understanding of company working practices, procedures, plans and policies • other specific requirements			
2 Know how to work efficiently and effectively in engineering	2.1 describe the safe working practices and procedures to be followed while preparing and tidying up their work environment 2.2 describe the correct use of any equipment to protect the health and safety of themselves and their colleagues 2.3 describe the procedure for ensuring that all documentation relating to the work being carried out is available and current, prior to starting the activity 2.4 describe the action that should be taken if documentation received is incomplete and/or incorrect			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.5 describe the procedure for ensuring that all tools and equipment are available prior to undertaking the activity 2.6 describe the checks to be carried out to ensure that tools and equipment are in full working order, prior to undertaking the activity 2.7 describe the action that should be taken if tools and equipment are not in full working order 2.8 describe the checks to be carried out to ensure that all required materials are correct and complete, prior to undertaking the activity 2.9 describe the action that should be taken if materials do not meet the requirements of the activity 2.10 explain whom to inform when the work activity has been completed 2.11 describe the information and/or documentation that others will require to confirm that the activity has been completed 2.12 explain what materials, equipment and tools can be re-used 2.13 explain how any waste materials and/or products are transferred, stored and disposed of			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.14 explain where tools and equipment should be stored and located 2.15 describe the importance of maintaining effective working relationships within the workplace 2.16 describe the procedures for dealing with and reporting any problems that can affect working relationships 2.17 describe the importance of making a contribution to improving working practices 2.18 describe the procedure and format for making suggestions for improvements 2.19 describe the benefits for the work area if improvements can be identified 2.20 describe the difficulties that can occur in working relationships 2.21 describe the regulations that affect how they should be treated at work (such as Equal Opportunities Act, Race and Sex Discrimination, Working Time Directive) 2.22 describe the benefits of continuous personal development 2.23 describe the training opportunities that are available in the workplace			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.24 describe the importance of reviewing their training and development 2.25 explain with whom to discuss training and development issues 2.26 describe the extent of their own authority and to whom they should report if they have any problems that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____

(*if sampled*)

Unit 4: Carrying out the installation of cable runs and circuits in marine structures

Unit reference number: K/601/1796

Level: 2

Credit value: 32

Guided learning hours: 91

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to install and secure cable runs and circuits in marine structures, in accordance with approved procedures. Learners will be required to use appropriate installation drawings, specifications and documentation to install the various types of cabling/circuit. Learners will install the appropriate cable enclosures, which could include conduit systems, trunking and traywork systems, and they will be expected to position, align and secure these in the correct locations, using the specified/appropriate techniques, bulkhead/screen penetration and fastening devices. The circuitry could include vessel system cable assemblies, high voltage, medium voltage and low voltage power supply cables, internal and external lighting cables, components, and appropriate screening techniques. Learners will be expected to terminate cables to the appropriate circuit breaker panels, distribution panels and relay panels.

Learners' responsibilities will require them to comply with organisational policy and procedures for the cable/circuit installation activities undertaken, and to report any problems with these activities that they cannot personally resolve, or are outside their permitted authority, to the relevant people. Learners will be expected to work either with a high level of supervision or as a member of a team. They will take personal responsibility for their own actions and for the quality and accuracy of the work that they carry out. Where team working is involved, learners must demonstrate a significant personal contribution during the team activities, in order to satisfy the requirements of the standard, and competence in all the areas required by the standard must be demonstrated.

Learners' knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to applying electrical cable/circuit installation techniques and procedures. Learners will have an understanding of the circuits being installed, and their application, and will know about the installation methods, tools and techniques used in adequate depth to provide a sound basis for carrying out the activities to the required specification.

Learners will understand the safety precautions required when carrying out the installation of the cables. They will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Carry out the installation of cable runs and circuits in marine structures	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the electrical cable/circuit installation activities: • use the correct issue of structure/vessel/craft system installation drawings and technical documentation • use copies of relevant COSHH sheets, risk assessment and BS 7671/IEE wiring regulations, and organisational procedures • check the calibration dates of tools to be used • obtain clearance to work on the system, and observe the power isolation and safety procedures • return all tools and equipment to the correct location on completion of the activities • leave the system in a recognised and safe condition • leave the work area in a safe and tidy condition with incomplete terminations clearly identified 1.3 follow all relevant drawings and specifications for the installation being carried out			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.4 use the correct tools and equipment for the installation operations and check that they are in a safe and usable condition 1.5 install, position and secure the cabling and components in accordance with the specification 1.6 install two of the following types of wiring enclosures: • non-metallic conduit systems • metal conduit systems • non-metallic trunking systems • metal trunking systems • tray work systems • bulkhead/screen/deck penetration 1.7 apply all of the following installation methods and techniques: • marking out the location of the trunking, traywork or conduit • positioning and securing the trunking, traywork or conduit by using mechanical fixings • drilling and preparing holes for the trunking, traywork or conduit • levelling and alignment of the wiring enclosures and components			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.8 install cable runs in support of two of the following marine electrical systems/equipment: • three-phase power circuits • single-phase power circuits • direct current power circuits • communications systems • navigation systems • sensor systems (RADAR/SONAR) • weapons systems • computer control equipment • rotating electrical equipment • domestic electrical equipment • lighting and alarm systems • emergency/temporary power supplies 1.9 install two of the following types of cable runs: • multi-core cables • single-core cables • steel wire armoured (SWA) cables • wiring looms/harnesses • mineral insulated (MI) cables			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• screened cables • fibre optic cables 1.10 apply two of the following installation methods and techniques: • bending and forming conduit • bending and forming trunking • bending and forming trays • through bulkhead/screen/deck penetration Plus four more from the following: • allocating identification markings • cable banding • screening • heat shrinking • sealing and protecting cable connections 1.11 make four of the following types of electrical connections: • module blocks • terminal blocks • earth bonding points • soldered connections • multi-pin plugs and sockets			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• crimped connections • co-axial cable • free plugs and sockets • tray-mount sockets • overall screened • fibre-optic terminations • armoured cable terminations • mineral-insulated cable terminations 1.12 check that all necessary connections and terminations are complete 1.13 produce electrical installations, in accordance with one of the following standards: • BS or ISO standards and procedures • other accepted international standards • customer (contractual) standards and requirements • company standards and procedures • specific system requirements • BS 7671/IEE wiring regulations • recognised compliance agency/body's standards			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.14 deal promptly and effectively with problems within their control and report those that cannot be solved 1.15 check that the installation is complete and that all components are fit for purpose 1.16 complete the relevant paperwork, to include one from the following, and pass it to the appropriate people: • installation records • system log • job cards • vessel wiring documentation • system authorisation documentation			
2 Know how to carry out the installation of cable runs and circuits in marine structures	2.1 explain the specific safety practices and procedures that they need to observe when installing cable runs/circuits in marine structures (including any specific legislation, regulations/codes of practice for the activities, equipment or materials — particularly where the systems remain live whilst work is in hand) 2.2 explain the health and safety requirements of the work area where they are carrying out the activities, and the responsibility these requirements place on them			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.3 describe the hazards and risks associated with installing cable runs/circuits in marine structures, and with the tools and equipment used, and explain how they can be minimised 2.4 explain what protective equipment they need to use for both personal protection and protection of the vessel/equipment 2.5 explain how to obtain and interpret job instructions, drawings and specifications used during the installation process 2.6 explain the cable runs/circuits to be installed, and their function within the particular system 2.7 explain the different types of cabling (multi-core cables, single-core cables, SWA cables, MI cables, screened cables), their fittings and their application 2.8 explain the different types of electrical components (plugs, switches, lighting and fittings, junction boxes, consumer units) 2.9 describe the techniques used to position, align, adjust, carry, support, secure and distribute the cabling through the vessel 2.10 explain how to extract and insert cables in wiring enclosures (such as conduit, trunking, traywork and through-bulkhead penetration, without causing damage to cables or components			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.11 describe the methods and techniques to be used for soldering, de-soldering, crimping, and heat shrinking, and explain the importance of adhering to these 2.12 explain the importance of ensuring that the completed installation is free of damage, of ensuring that any exposed components are protected and that advisory notices are placed 2.13 describe the quality control procedures to be followed during the installation activities 2.14 explain the procedures for ensuring that they have the correct tools, equipment, components and fasteners for the activities 2.15 explain the methods of lifting, handling and supporting the cabling /equipment during the installation activities 2.16 explain the use of seals, sealant, adhesives and anti-electrolysis barriers, and the precautions to be taken 2.17 explain why electrical bonding is critical, and why it must be both mechanically and electrically secure 2.18 describe the procedure for the safe disposal of waste materials 2.19 describe the tools and equipment used in the installation activities, and explain their calibration/care and control procedures			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.20 explain why tool/equipment control is critical, and what to do if a tool or piece of equipment is unaccounted for on completion of the activities 2.21 describe the problems that can occur with the electrical wiring installation operations, and explain how these can be overcome 2.22 explain the recording documentation to be completed for the activities undertaken 2.23 describe the extent of their own responsibility, and explain whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____

(*if sampled*)

Unit 5: Assisting in the installation of marine electrical equipment

Unit reference number: T/601/1803

Level: 2

Credit value: 32

Guided learning hours: 91

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to assist in the installation of marine electrical equipment, in accordance with approved procedures. The installation activities will involve installing equipment at component or unit level, on a variety of marine electrical assemblies and sub-assemblies, such as single, three-phase and direct current power supply and control systems, motors and starters, switchgear and distribution panels, control systems, communication systems, weapon systems, navigation systems, sensor systems, computer control systems, lighting and alarm systems, electrical plant, luminaires and domestic electrically-powered equipment.

Learners' responsibilities will require them to comply with organisational policy and procedures for the installation of the marine electrical equipment, and to report any problems with the installation activities that they cannot personally resolve, or are outside their permitted authority, to the relevant people.

Learners will be expected to work either with a high level of supervision or as a member of a team. They will take personal responsibility for their own actions and for the quality and accuracy of the work that they carry out. Where team working is involved, they must demonstrate a significant personal contribution during the team activities in order to satisfy the requirements of the standard, and competence in all the areas required by the standard must be demonstrated.

Learners' knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to applying the appropriate electrical installation techniques and procedures. They will have an understanding of the basic knowledge behind the equipment being installed, and its application, and will know about the installation equipment and fastening devices in adequate depth to provide a sound basis for carrying out the activities to the required specification.

Learners will understand the safety precautions required when carrying out the installation of the marine electrical equipment, especially those for ensuring that any power supplies are correctly isolated and locked. They will be required to demonstrate safe working practices throughout, and will understand their responsibility for taking the necessary safeguards to protect themselves and others in the workplace, both ashore and afloat.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Assist in the installation of marine electrical equipment	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the installation of the marine electrical equipment: • use the correct issue of the structure/vessel/craft installation drawings and documentation • adhere to risk assessment, COSHH and other relevant safety standards • obtain clearance to work on the system, and observe the appropriate power isolation and safety procedures • maintain safe access and working arrangements for the installation area • carry out the installation activities, using appropriate techniques and procedures • leave the work area in the prescribed category of cleanliness on completion of the activities 1.3 follow all relevant drawings and specifications for the installation being carried out 1.4 use the correct tools and equipment for the installation operations and check that they are in a safe and usable condition			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.5 install, position and secure the equipment and components in accordance with the specification 1.6 take part in the installation of two of the following types of marine electrical equipment: • power generation and distribution equipment and systems • communication equipment and systems • navigational equipment and systems • sensor equipment and systems • computer equipment and systems • weapons equipment and systems • rotating electrical machines and domestic equipment • lighting, alarm, detection and monitoring systems 1.7 assist in carrying out eight of the following installation methods and techniques: • marking/setting out of locating and securing positions • preparing holes (such as drilling, cleaning out threads) • positioning equipment/components • levelling of equipment			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• aligning of equipment • securing by using mechanical fixings • connecting wires and cables • earth bonding • cable banding • equipment screening 1.8 assist in the installation and connection of five of the following types of electrical components: • wiring looms and cables • switches/contactors • connectors • overload protection devices • back-up battery system • electrical units/components • power supplies • motors and starters • distribution panels • luminaires • alarms • detection devices			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• monitoring devices • sensors and actuators • mechanical devices 1.9 make electrical connections on four of the following cables/terminations: • co-axial • tri-axial • multi-core cables • steel wired armoured • overall screened • module blocks • fibre optics • terminal blocks • multi-pin plugs/sockets • crimping • tray-mounted sockets • earth bonding points • soldering/brazing			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.10 make two of the following types of mechanical connections: • nuts and bolts • locking devices • screws • torque loaded bolts • quick release fasteners 1.11 check that all necessary connections to the equipment are complete 1.12 produce installations which comply with one of the following standards: • BS or ISO 9000 standards and procedures • other accepted international standards • customer (contractual) standards and requirements • company standards and procedures • specific system requirements • recognised compliance agency/body's standards 1.13 deal promptly and effectively with problems within their control and report those that cannot be solved 1.14 check that the installation is complete and that all components are free from damage			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.15 complete the relevant paperwork, to include one of the following, and pass it to the appropriate people: • installation record • job cards • timesheets • system log			
2 Know how to assist in the installation of marine electrical equipment	2.1 explain the procedures to be carried out before starting work on the installation (such as obtaining permits to work, obtaining and complying with risk assessments and other health and safety requirements) 2.2 explain the health and safety requirements of the work area where they are carrying out the installation activities, and the responsibility these requirements place on them 2.3 describe the hazards associated with the installation of marine electrical equipment and systems, and with the tools and equipment used, and explain how they can be minimised 2.4 explain what protective equipment they need to use for both personal protection and protection of the equipment or system being installed 2.5 explain how to obtain and interpret the job instructions, drawings and specifications used for the installation			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.6 describe the items, circuits and components to be installed, and explain their function within the particular marine equipment/system being installed 2.7 describe the various mechanical fasteners that will be used, and their method of installation (including threaded fasteners, special securing and locking devices) 2.8 explain the importance of using the specified electrical terminations/connections/fasteners for the particular installation process, and why they must not substitute others 2.9 explain why securing devices need to be locked and identified, and the different methods that are used 2.10 describe the quality control procedures to be followed during the installation operations 2.11 explain the procedures for ensuring that they have the correct tools, equipment, electrical components and fasteners for the activities 2.12 describe the techniques used to position, align, adjust and secure the equipment, components and circuitry to the vessel/compartment structure without damage 2.13 explain the methods of lifting, handling and supporting the components/equipment during the installation activities			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.14 explain the use of seals, sealant, adhesives and anti-electrolysis barriers, and the precautions to be taken 2.15 explain why unit electrical bonding/earth prevention and continuity is critical, and why it must be both mechanically and electrically secure 2.16 describe the procedure for the safe disposal of waste materials 2.17 explain the importance of ensuring that the completed installation is to the category of cleanliness prescribed, that any exposed components or pipe ends are correctly covered/protected, and that warning notices are fitted 2.18 explain why tool/equipment control is critical 2.19 describe the problems that can occur with the installation operations, and explain how these can be overcome 2.20 explain what recording documentation needs to be completed for the activities undertaken 2.21 describe the extent of their own responsibility, and explain whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____

(*if sampled*)

Unit 6: Locating faults in marine electrical equipment and circuits

Unit reference number: T/601/1932

Level: 2

Credit value: 28

Guided learning hours: 63

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to locate faults in marine electrical equipment and circuits, in accordance with approved procedures. Learners will be required to diagnose faults on a range of marine electrical equipment such as single, three-phase and direct current power supply and control systems, motors and starters, switchgear and distribution panels, lighting and alarm systems, electrical plant, luminaires and electrically-powered domestic equipment. Learners will be expected to use a variety of methods and procedures to assist in locating the fault, including gathering information from the person who reported the fault, using recognised fault finding techniques and diagnostic aids, and measuring, inspecting and operating the equipment.

Learners' responsibilities will require them to comply with organisational policy and procedures for the fault location activities undertaken, and to report any problems with these activities or the tools and equipment used that they cannot personally resolve, or are outside their permitted authority, to the relevant people. They will be expected to work either with a high level of supervision or as a member of a team. Learners will take personal responsibility for their own actions and for the quality and accuracy of the work that they carry out. Where team working is involved, they must demonstrate a significant personal contribution during the team activities in order to satisfy the requirements of the standard, and competence in all the areas required by the standard must be demonstrated.

Learners' knowledge will be sufficient to provide a sound understanding of their work, and will provide an informed approach to applying fault location procedures to marine electrical equipment and circuits. They will have an understanding of the basic fault location methods and techniques used, and their application. Learners will also know how to interpret information obtained from fault finding aids and equipment, in adequate depth to provide a sound basis for carrying out the activities and for identifying and locating the fault.

Learners will understand the safety precautions required when carrying out the fault location activities, especially those for isolating the equipment. They will be required to demonstrate safe working practices throughout, and will understand their responsibility for taking the necessary safeguards to protect themselves and others in the workplace, both ashore and afloat.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Locate faults in marine electrical equipment and circuits	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the fault locating activity: • plan the fault location methods and procedures in conjunction with others • use the correct issue of vessel/craft/structure system drawings and maintenance documentation • adhere to risk assessment, COSHH and other relevant safety standards • ensure the safe isolation of equipment (such as electricity, mechanical, gas, air or fluids) • ensure that safe access and working arrangements have been provided for the maintenance area • carry out the fault location activities, using approved procedures • identify the fault and consider the appropriate corrective action • in conjunction with others, take actions to resolve the problem			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• dispose of waste items in a safe and environmentally acceptable manner • leave the work area in a safe and tidy condition 1.3 carry out fault location on one the following types of marine electrical equipment: • lighting, alarm, detection and monitoring systems • domestic electrical equipment • rotating electrical machines • power generation and distribution equipment and systems 1.4 carry out fault location on one of the following types of supply: • single-phase power circuits • three-phase power circuits • direct current power circuits Plus four of the following types of electrical components: • wiring and cables • switches/contactors • connectors			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• overload protection devices • back-up battery system • control systems and components • motors and starters • distribution panels • luminaires • alarms • detection devices • monitoring devices • sensors and actuators • mechanical protection devices 1.5 review and use all relevant information on the symptoms and problems associated with the products or assets 1.6 select, use and apply four of the following diagnostic techniques, tools and aids to assist in locating the faults: • information gathered from the person who reported the fault • fault finding techniques (such as six point, half-split, input/output, unit substitution, emergent sequence)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• diagnostic aids (such as manuals, flow charts, troubleshooting guides, electronic aids, equipment records) • inspecting (such as checking for breakages, wear/deterioration, overheating, missing parts, loose fittings) • operating (such as manually switching 'off' and 'on', RCD test buttons, running equipment) 1.7 use two of the following types of instruments to assist in locating faults: • multimeter • watt meter • voltmeter • ammeter • earth-loop impedance tester • insulation resistance tester • portable appliance tester • light meter • other specific test equipment			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.8 locate faults that have resulted in one of the following breakdown categories: • intermittent fault • partial failure or reduced performance • sustained fault 1.9 investigate and establish the most likely causes of the faults 1.10 complete the fault diagnosis within the agreed time and inform the appropriate people when this cannot be achieved 1.11 determine the implications of the fault for other work and for safety considerations 1.12 use the evidence gained to draw valid conclusions about the nature and probable cause of the fault 1.13 record details on the extent and location of the faults in an appropriate format 1.14 complete one of the following maintenance records, and pass it to the appropriate person: • scheduled maintenance report • corrective maintenance report • other company-specific report			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
2 Know how to locate faults in marine electrical equipment and circuits	2.1 explain the health and safety requirements of the area in which the fault location is to take place, and the responsibility these requirements place on them 2.2 describe the isolation and lock-off procedure or permit-to-work procedure that applies in the work area 2.3 explain how to recognise and deal with victims of electric shock (to include methods of safely removing the victim from the power source, isolating the power source, and methods of first aid resuscitation) 2.4 explain the importance of wearing protective clothing and other appropriate safety equipment during fault location activities 2.5 describe the hazards associated with carrying out fault location activities on marine electrical equipment (such as live electrical components, stored energy, misuse of tools), and explain how they can be minimised 2.6 explain the procedure to be adopted to establish the background of the fault 2.7 explain how to use the various diagnostic aids to help identify the location of the fault			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.8 describe the various fault location techniques that can be used, and explain how they are applied (such as half-split, input-to-output, function testing, unit substitution, and equipment self-diagnostics) 2.9 explain how to evaluate sensory information (such as by sight, sound, smell, touch) 2.10 explain how to assess evidence and evaluate the possible causes of faults/problems 2.11 describe the care, handling and application of electrical test equipment (such as multimeter, portable appliance tester, earth loop impedance tester, insulation resistance tester) 2.12 explain how to check that electrical test equipment is in calibration and that it is free from damage and defects 2.13 explain how to use and extract information from drawings, circuit and physical layouts, charts, specifications, manufacturers' manuals, history/maintenance reports, graphical electrical symbols, IEE wiring regulations, and other documents needed in the fault location process 2.14 explain how to carry out currency/issue checks of the specifications they are working with			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.15 explain the basic principles of how the circuit functions, its operating sequence, the purpose of individual units/components and how they interact 2.16 describe the problems that can occur during the fault location activity, and explain how they can be minimised 2.17 explain the importance of completing the correct documentation following the maintenance activity 2.18 describe the extent of their own authority, and explain whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____

(*if sampled*)

Unit 7: Carrying out modifications and rewiring of marine electrical circuits

Unit reference number: J/601/1935

Level: 2

Credit value: 22

Guided learning hours: 70

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to carry out modifications to and/or rewiring of marine electrical circuits, in accordance with approved procedures. This will involve modifying or rewiring electrical circuits on equipment such as single, three-phase and direct current power supply and control systems, motors and starters, switchgear and distribution panels, control systems, communication systems, weapon systems, navigation systems, sensor systems, computer control systems, lighting and alarm systems, electrical plant, luminaires, portable appliances, electrically powered domestic equipment and other specific electrical equipment.

Learners will be expected to carry out a range of rewiring or modification processes, such as removing and replacing cables, adding new cables, changing or adding components to panels or sub-assemblies, changing breakout points and changing the routeing of cables. Learners will need to show ability in using various tools and equipment for cutting, stripping, crimping and soldering, bending and forming conduit, and in the installation of the various wires, cables and components that make up the marine electrical system and circuits being worked on.

Learners' responsibilities will require them to comply with organisational policy and procedures for the modification or rewiring activities undertaken, and to report any problems with the activities, components or equipment that they cannot personally resolve, or are outside their permitted authority, to the relevant people. They will be expected to work either with a high level of supervision or as a member of a team. Learners will take personal responsibility for their own actions and for the quality and accuracy of the work that they carry out. Where team working is involved, they must demonstrate a significant personal contribution during the team activities in order to satisfy the requirements of the standard, and competence in all the areas required by the standard must be demonstrated.

Learners must ensure that all tools, equipment, and materials used in the modification activities are removed from the work area on completion of the activities, and that all necessary job/task documentation is completed accurately and legibly.

Learners' knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to applying rewiring procedures to marine electrical equipment and circuits. They will have an understanding of the function and operating conditions of the circuits being rewired, in sufficient depth to ensure that the rewires/modifications carried out are safe and practical in operation.

Learners will understand the safety precautions required when carrying out the rewiring or modification activities. They will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Carry out modifications and rewiring of marine electrical circuits	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the modification or rewiring of the electrical circuits: • undertake the modification or rewiring activities to cause minimal disruption to normal working • use the correct issue of vessel/craft/structure system drawings and maintenance documentation • adhere to risk assessment, COSHH and other relevant safety standards • obtain clearance to work on the system, and observe the appropriate power isolation and safety procedures • provide safe access and working arrangements for the maintenance area • modify or rewire the electrical circuits, using approved techniques and procedures • re-connect and return the system to service on completion of the activities • dispose of waste items in a safe and environmentally acceptable manner			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• leave the work area in the prescribed category of cleanliness 1.3 obtain and follow the relevant modification specifications and job instructions 1.4 confirm and agree what modifications are to be carried out to meet the specification 1.5 prepare the electrical system for the required modification or rewire 1.6 carry out the system modification or rewiring using approved materials, methods and procedures 1.7 carry out modifications or rewiring to one of the following marine electrical supplies: • single-phase power circuits • three-phase power circuits • direct current power circuits Plus two of the following: • lighting, alarm, detection and monitoring systems • domestic electrical equipment • rotating electrical machines • switchgear and distribution panels • motors and starters			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.8 carry out six of the following types of modifications to the electrical circuits and equipment: • replacing cables of different size or length • changing the position or angle of breakout points • adding or removing components from circuits • changing the route of cables • adding looms or power supplies • changing or adding conduit runs • changing or adding components to panels or sub-assemblies • changing or adding trunking and trays • making changes to looms or mains circuits • changing the position of electrical units • fitting new electrical systems • removal of cables • addition of cables • removing and replacing cable end fittings			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.9 carry out four of the following types of electrical connections: • terminating mineral and armoured cables • sealing and protecting cable connections • making mechanical/screwed/clamped connections • soldering and de-soldering • terminating screened cables • terminating fibre-optic cables • terminating co-axial cable • terminating PVC cables • creating earth bonding points • heat shrinking (devices and boots) • crimping (tags and pins) • allocating identification markings 1.10 complete the modification or rewiring within the agreed timescales 1.11 ensure that the modified or rewired electrical system meets the specified operating conditions			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.12 produce modified or rewired marine electrical systems, in accordance with one of the following standards: • BS or ISO standards and procedures • other accepted international standards • customer (contractual) standards and requirements • company standards and procedures • specific equipment requirements/manufacturer's data • BS 7671/IEE wiring regulations • recognised compliance agency/body's standards 1.13 produce accurate and complete records of all modification or rewiring work carried out 1.14 complete the relevant paperwork, to include one of the following, and pass it to the appropriate people: • job cards • system log • maintenance logs or reports • vessel wiring documentation • work authorisation documents 1.15 deal promptly and effectively with problems within their control and report those that cannot be solved			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
2 Know how to carry out modifications and rewiring of marine electrical circuits	2.1 explain the specific safety precautions and procedures to be observed whilst carrying out the modifications or rewiring of the marine electrical systems (including any specific legislation, regulations or codes of practice relating to the activities, equipment or materials) 2.2 explain the health and safety requirements of the work area in which they are carrying out the modification or rewiring activities, and the responsibility they place on them 2.3 describe the hazards associated with carrying out modifications or rewiring of marine electrical systems, and explain how they can be minimised 2.4 explain how to recognise and deal with victims of electric shock (to include methods of safely removing the victim from the power source, isolating the power source, and methods of first aid resuscitation) 2.5 explain what personal protective equipment and clothing needs to be worn during the modification or rewiring activities 2.6 explain how to obtain and interpret information from job instructions, drawings and specifications used in the modification activities 2.7 explain the basic principles of how the circuit functions			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.8 explain the different types of cabling used in the modification or rewiring activities (such as multi-core cables, single-core cables, SWA cables, MI cables, screened cables), their fittings and their application 2.9 explain the different types of electrical components (such as plugs, switches, lighting and fittings, junction boxes, consumer units) 2.10 describe the preparations to be undertaken on the system, prior to carrying out the modification or rewiring 2.11 explain how to extract and insert new cables in wiring enclosures (such as conduit, trunking and traywork) without causing damage to other cables or components 2.12 describe the methods and techniques to be used for soldering, de-soldering, crimping, heat shrinking, and the importance of adhering to these procedures 2.13 explain the procedure for obtaining replacement parts, materials and other consumables necessary for the modification or rewiring activities 2.14 explain the importance of ensuring that the completed circuit is free from foreign objects, and that all terminations are sound and secure			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.15 explain how to conduct any necessary checks to ensure that the completed modification or rewiring complies with all required standards 2.16 describe the methods and equipment used to transport, lift and handle components/cabling into position, and explain how to check that the equipment is within its current certification dates 2.17 explain how to check that tools and equipment are free from damage or defect, are in a safe and usable condition, and are configured correctly for the intended purpose 2.18 describe the problems that can occur with the modification or rewiring operations, and explain how these can be overcome 2.19 explain what recording documentation needs to be completed for the activities undertaken 2.20 describe the extent of their own authority, and explain whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____

(*if sampled*)

Unit 8: Carrying out tests on marine electrical equipment and circuits

Unit reference number: Y/601/1938

Level: 2

Credit value: 22

Guided learning hours: 63

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to carry out inspections and tests on marine electrical equipment and circuits, in accordance with approved procedures. The marine electrical equipment to be tested could include such things as single-phase, three-phase and direct current power supply and control systems, motors and starters, switchgear and distribution panels, control systems, communication systems, weapon systems, navigation systems, sensor systems, computer control systems, lighting and alarm systems, electrical plant, luminaires and electrically powered domestic equipment. Learners will be required to carry out specified inspections and tests, including protective insulation and resistance values, load current, voltage levels and power ratings, on a range of electrical equipment, to establish that it is functioning at optimal level and to specification.

Learners' responsibilities will require them to comply with organisational policy and procedures for the testing activities undertaken, and to report any problems with these activities or with the tools and equipment used that they cannot personally resolve, or are outside their permitted authority, to the relevant people. Learners will be expected to work either with a high level of supervision or as a member of a team. They will take personal responsibility for their own actions and for the quality and accuracy of the work that they carry out. Where team working is involved, learners must demonstrate a significant personal contribution during the team activities in order to satisfy the requirements of the standard, and competence in all the areas required by the standard must be demonstrated.

Learners' knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to applying specified testing procedures to marine electrical equipment and circuits. Learners will have an understanding of the equipment being worked on, the test equipment to be used, and the various testing procedures in adequate depth to provide a sound basis for carrying out the activities to the required specification. In addition, they will be expected to record and report the results in the appropriate format.

Learners will understand the safety precautions required when carrying out the inspection and testing activities, especially those for isolating the equipment and for taking the necessary safeguards to protect themselves against direct and indirect electric shock. Learners will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Carry out tests on marine electrical equipment and circuits	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the testing activities: • plan the inspection and testing activities to cause minimal disruption to normal working • use the correct issue of vessel/craft/structure system drawings and maintenance documentation • adhere to risk assessment, COSHH and other relevant safety standards • obtain clearance to work on the system, and observe the appropriate power isolation and safety procedures • provide safe access and working arrangements for the maintenance area • carry out the inspection and testing activities, using appropriate techniques and procedures • re-connect and return the system to service on completion of the testing activities • functionally test and adjust equipment to specification			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• dispose of waste items in a safe and environmentally acceptable manner, and leave the work area in the prescribed category of cleanliness 1.3 follow the appropriate procedures for the use of tools and equipment to carry out the required tests 1.4 carry out all of the following checks, to ensure the accuracy and quality of the tests carried out: • the test equipment is correctly set up/calibrated • test equipment used is appropriate for the tests being carried out • test procedures used are as recommended in the appropriate electrical codes of practice/regulations • test equipment is operated within its specification range 1.5 carry out the tests using a range of tools and test equipment, to include three of the following: • oscilloscope • ohmmeter • ammeter • voltmeter • insulation resistance tester			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• loop impedance tester • residual current device (RCD) tester • multimeter • portable appliance tester (PAT) • specialist test equipment (such as for sound, speed, light, temperature) 1.6 set up and carry out the tests using the correct procedures and within agreed timescales 1.7 carry out inspections and tests on three of the following types of marine electrical equipment: • distribution switchgear • wiring systems • electric motors • contactors and relays • control panels • programmable logic control systems • auxiliary systems • domestic equipment • sensors • actuators • alarm systems • heating and lighting systems			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.8 use appropriate test equipment to carry out three of the following tests, as applicable to the equipment being worked on: • protective resistance values • insulation resistance values • load current • voltage levels • power rating • resistance • capacitance • frequency values • inductance • safety device trip speed • specialist tests (such as speed, sound, light, temperature) 1.9 record the results of the tests in the appropriate format 1.10 provide a record/report of the test outcome, using one of the following: • preventative maintenance log/report • company-specific reporting procedure • inspection schedule • specific test report			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.11 review the results and carry out further tests if necessary			
2 Know how to carry out tests on marine electrical equipment and circuits	2.1 explain the health and safety requirements of the work area where they are carrying out the testing activities, and the responsibility they place on them 2.2 explain the equipment isolation and lock-off procedure or permit-to-work procedure that applies to the testing activities (to include electrical isolation, locking off switch gear, removal of fuses, placing maintenance warning notices, proving that isolation has been achieved and secured) 2.3 explain the specific safety precautions to be taken when carrying out formal inspection, safety and testing of marine electrical equipment 2.4 explain how to recognise and deal with victims of electrical shock (to include methods of safely removing the victim from the power source, isolating the power source and methods of first aid resuscitation) 2.5 explain the importance of wearing protective clothing and other appropriate safety equipment during the electrical testing activities 2.6 describe the protection techniques for electrical systems (to prevent burn or fire risk) 2.7 explain how to obtain and interpret job instructions, drawings and specifications used in the testing process			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.8 describe the types of test equipment to be used, and explain their selection for particular types of tests 2.9 explain how to set up the test equipment to be used 2.10 explain how to connect the appropriate test equipment into the circuit/equipment (for the measurement of resistance, current, voltage, power, capacitance, inductance, power factor and protective device disconnection/trip times) 2.11 explain how to record and display the test results, and the documentation to be used 2.12 explain how to interpret the test readings obtained, and the significance of the readings gained 2.13 explain the importance of ensuring that test equipment is used only for its intended purpose and within its specified range and limits 2.14 describe the potential problems or errors that could occur and which may affect the test results, and explain how they can be avoided 2.15 explain the environmental control and company operating procedures relating to the testing activities 2.16 explain the documentation required and the procedures to be followed on completion of the testing			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.17 describe the extent of their own responsibility, and explain whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____

(*if sampled*)

Unit 9: Disconnecting and removing marine electrical equipment

Unit reference number: R/601/1940

Level: 2

Credit value: 20

Guided learning hours: 49

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to disconnect and remove marine electrical equipment, in preparation for overhaul or refit activities, in accordance with approved procedures. This will involve disconnecting and removing equipment at component or unit level, on a variety of electrical assemblies and sub-assemblies, such as power generation and distribution equipment, communication equipment, navigational equipment, sensor systems, computer systems, weapon systems, rotating electrical machines and domestic equipment, and lighting, alarm, detection and monitoring equipment.

Learners' responsibilities will require them to comply with organisational policy and procedures for the disconnection and removal of the marine electrical equipment, and to report any problems with these activities that they cannot personally resolve, or are outside their permitted authority, to the relevant people. Learners will be expected to work either with a high level of supervision or as a member of a team. They will take personal responsibility for their own actions and for the quality and accuracy of the work that they carry out.

Where team working is involved, learners must demonstrate a significant personal contribution during the team activities in order to satisfy the requirements of the standard, and competence in all the areas required by the standard must be demonstrated. Learners must ensure that all tools, equipment and materials used in the activities are removed from the work area on completion of the activities, and that all necessary job/task documentation is completed, accurately and legibly.

Learners' knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to applying disconnection and removal techniques on marine electrical equipment. Learners will have an understanding of the disconnection and removal methods and procedures used, and their application. They will know about the electrical equipment being removed in adequate depth to provide a sound basis for carrying out the disconnection and removal activities to the required specification.

Learners will understand the safety precautions required when carrying out the disconnection and removal activities, especially those for isolating the equipment. They will be required to demonstrate safe working practices throughout, and will understand their responsibility for taking the necessary safeguards to protect themselves and others in the workplace.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Disconnect and remove marine electrical equipment	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the disconnection and removal activities: • undertake the disconnection and removal activities to cause minimal disruption to normal working • use the correct issue of structure/vessel/craft system drawings and disconnection documentation • adhere to risk assessment, COSHH and other relevant safety standards • obtain clearance to work on the system, and observe the appropriate power isolation and safety procedures • provide safe access and working arrangements for the area • carry out the disconnection and removal activities, using appropriate techniques and procedures • dispose of waste items in a safe and environmentally acceptable manner, and leave the work area in the prescribed category of cleanliness			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.3 establish and where appropriate mark component for re-assembly 1.4 ensure that any stored energy or substances are released safely and correctly 1.5 make all isolations and disconnections to the equipment in line with approved procedures 1.6 carry out disconnection and removal of electrical equipment from two of the following: • single-phase power supplies • three-phase power supplies • direct current power supplies 1.7 carry out disconnection and removal of components from two of the following types of marine electrical systems: • communication equipment and systems • navigational equipment and systems • sensor equipment and systems • computer equipment and systems • weapons equipment and systems • rotating electrical machines and domestic equipment • lighting, alarm, detection and monitoring systems			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• power generation and distribution equipment and systems 1.8 carry out the disconnection and removals to the agreed level using correct tools and techniques 1.9 carry out all of the following dismantling and removal activities: • isolating and locking off equipment • disconnecting wires and cables • attaching suitable cable identification markers • removing wiring enclosures • removing electrical units/components • making safe all disconnected service supplies • supporting equipment to be removed • removing mechanical fastening devices • safely storing all peripheral units which are not part of the overhaul • protecting and preparing removed components for transportation for overhaul			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.10 dismantle and remove marine electrical equipment, in accordance with one of the following standards: • customer (contractual) standards and requirements • company standards and procedures • specific equipment requirements/manufacturer's data • recognised compliance agency/body's standards 1.11 store components for re-use in approved locations 1.12 dispose of unwanted components and substances in accordance with approved procedures 1.13 deal promptly and effectively with problems within their control and report those that cannot be solved 1.14 complete relevant paperwork and pass it to the appropriate people to include one from the following: • job cards • system log • maintenance logs or reports • work authorisation documents • vessel wiring documentation			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
2 Know how to disconnect and remove marine electrical equipment	2.1 explain the specific safety practices and procedures that they need to observe when disconnecting and removing marine electrical equipment and circuits (including any specific legislation, regulations/codes of practice for the activities, equipment or materials) 2.2 explain the health and safety requirements of the area in which the marine electrical disconnection and removal activity is to take place, and the responsibility these requirements place on them 2.3 explain the isolation and lock-off procedure or permit-to-work procedure that applies to the disconnection and removal activities (to include electrical isolation, locking off switch gear, removal of fuses, placing of maintenance warning notices, proving that isolation has been achieved and secured) 2.4 explain the importance of wearing protective clothing and other appropriate safety equipment during the electrical disconnection and removal activities 2.5 explain how to obtain and interpret job instructions, drawings and specifications used in the disconnection and removal process 2.6 describe the extent to which the equipment is to be dismantled for removal			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.7 describe the different types of cabling used in marine electrical installations, and explain their method of disconnection (such as multi-core cables, single-core cables, steel wire armoured (SWA), mineral insulated (MI), screened cables) 2.8 describe the different types of wiring enclosures that are used (to include conduit, trunking and traywork systems) and explain the methods of removing them 2.9 describe the techniques used to disconnect and remove electrical equipment (such as unplugging, de-soldering, removal of screwed, clamped and crimped connections) 2.10 explain the methods of removing and replacing cables and wires in wiring enclosures, without causing damage to existing cables 2.11 describe the methods of attaching identification marks/labels to removed components or cables, to assist with re-assembly 2.12 describe the methods used to support and lift the equipment being removed 2.13 explain the need to ensure that lifting and handling equipment is within its current test dates 2.14 describe the tools and equipment used in the disconnection activities (including the use of soldering irons and torches, gland disconnecting tools)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.15 explain the storage requirements of removed units and assemblies that are not part of the overhaul process 2.16 describe the methods used to protect and prepare the removed equipment during transportation to the place of overhaul 2.17 explain the generation of maintenance documentation and/or reports following the disconnection and removal activity 2.18 describe the problems that can occur during the electrical disconnection and removal activity, and explain how they can be overcome 2.19 describe the extent of their own authority, and explain whom they should report to if they have a problem that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____

(*if sampled*)

Unit 10: Carrying out scheduled maintenance on marine electrical equipment

Unit reference number: A/601/1947

Level: 2

Credit value: 19

Guided learning hours: 56

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to carry out scheduled maintenance tasks on marine electrical equipment, in accordance with approved procedures. Learners will be required to carry out scheduled maintenance tasks on marine electrical equipment such as single, three-phase and direct current power supply and control systems, motors and starters, switchgear and distribution panels, control systems, communication systems, weapon systems, navigation systems, sensor systems, computer control systems, lighting and alarm systems, electrical plant, luminaires, portable appliances, electrically powered domestic equipment and other specific electrical equipment, in order to minimise down time and ensure that the equipment performs at optimal levels and functions to specification.

Learners' responsibilities will require them to comply with organisational policy and procedures for the scheduled maintenance tasks undertaken, and to report any problems with these activities, or with the tools and equipment that are used that they cannot personally resolve, or are outside their permitted authority, to the relevant people. Learners must ensure that all tools, equipment, and materials used in the maintenance activities are removed from the work area on completion of the activities, and that all necessary job/task documentation is completed accurately and legibly. They will be expected to work either with a high level of supervision or as a member of a team. Learners will take personal responsibility for their own actions and for the quality and accuracy of the work that they carry out. When working in a team, they must demonstrate a significant personal contribution to the team activities in order to satisfy the requirements of the standard, and competence in all the areas required by the standard must be demonstrated.

Learners' knowledge will be sufficient to provide a sound basis for their work, and will enable them to adopt an informed approach to applying scheduled maintenance procedures to marine electrical equipment. They will have an understanding of the process of implementing scheduled maintenance tasks, the importance of carrying them out at specific times and in the specified sequence, and of recording the outcomes and actions taken. In addition, they will be expected to report where the outcome of the scheduled maintenance identifies a requirement for further investigation or remedial work.

Learners will understand the safety precautions required when carrying out the scheduled maintenance activities, especially those for isolating the equipment. They will also understand their responsibilities for safety, and the importance of taking the necessary safeguards to protect themselves and others in the workplace.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Carry out scheduled maintenance on marine electrical equipment	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the scheduled maintenance tasks: • undertake the maintenance activities in conjunction with others to cause minimal disruption to normal working • use the correct issue of maintenance documentation (such as drawings, manuals, maintenance records) • adhere to risk assessment, COSHH and other relevant safety standards • confirm with the authorised person that the equipment is ready for carrying out the scheduled maintenance • ensure the safe isolation of equipment (such as mechanical, electrical, gas, air or fluids) • ensure that safe access and working arrangements have been provided for the maintenance area • carry out the scheduled maintenance tasks, using appropriate techniques and procedures			

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Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• dispose of waste items in a safe and environmentally acceptable manner • leave the work area in a safe and tidy condition 1.3 follow the relevant maintenance schedules to carry out the required work 1.4 carry out the maintenance activities within the limits of their personal authority 1.5 carry out the maintenance activities in the specified sequence and in an agreed timescale 1.6 carry out scheduled maintenance on four of the following groups of electrical equipment: • motors and starters • switchgear and distribution panels • lighting and alarm systems • electrical plant • wiring enclosures (such as conduit, trunking or traywork) • electrically powered domestic equipment • portable appliances • other specific electrical equipment			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.7 carry out ten of the following scheduled maintenance activities: • removing excessive dirt and grime • making sensory checks (such as sight, sound, smell, touch) • replacing 'lifed' consumables (such as seals, batteries, brushes, lamps) • monitoring the condition/deterioration of components (such as cables, connectors, switches safety devices) • determining/measuring electrical characteristics (such as current drawn, resistance, continuity etc) • checking that any safety equipment or controls are operating correctly • checking the operation of instrumentation (such as gauges, sensors and indicators) • carrying out and/or checking equipment self-analysis data • making adjustments to components and/or connections • tightening fastenings to the required torque • checking the integrity and security of earth bonding			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• reviewing and checking equipment operation and performance Plus both of the following: • recording the results of the scheduled maintenance activity • reporting or taking action with regard to any defects that require immediate attention 1.8 maintain marine electrical equipment, in accordance with one of the following standards: • BS or ISO standards and procedures • other accepted international standards • customer (contractual) standards and requirements • company standards and procedures • specific equipment requirements/manufacturer's data • BS 7671/IEE wiring regulations • recognised compliance agency/body's standards 1.9 report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.10 complete relevant maintenance records accurately and pass them on to the appropriate person, to include one of the following: • job cards • system log • maintenance logs or reports • vessel wiring documentation • work authorisation documents 1.11 dispose of waste materials in accordance with safe working practices and approved procedures			
2 Know how to carry out scheduled maintenance on marine electrical equipment	2.1 explain the health and safety requirements of the area in which the scheduled maintenance tasks are to take place, and the responsibility these requirements place on them 2.2 describe the isolation procedures or permit-to-work procedure that applies to the marine electrical equipment being maintained 2.3 explain the specific health and safety precautions to be applied during the scheduled maintenance tasks, and their effects on others 2.4 explain how to recognise and deal with victims of electric shock (to include methods of safely removing the victim from the power source, isolating the power source, and methods of first aid resuscitation)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.5 explain the importance of wearing protective clothing and other appropriate safety equipment during the maintenance activities 2.6 describe the hazards associated with carrying out scheduled maintenance tasks on marine electrical equipment (such as live electrical components, stored energy, misuse of tools), and explain how they can be minimised 2.7 explain how to obtain and interpret information from job instructions, drawings and specifications used in the maintenance process 2.8 describe the various checks to be carried out during the scheduled maintenance procedure 2.9 explain the procedure for obtaining the consumables to be used during the scheduled maintenance activity 2.10 describe the methods of checking that components are fit for purpose, how to identify defects and wear characteristics, and explain the need to replace 'lifed' items (such as seals and gaskets) 2.11 explain how to check that any replacement components meet the required specification/operating conditions 2.12 explain how to make appropriate sensory checks (such as sight, sound, smell and touch)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.13 describe the appropriate testing methods to be adopted during the maintenance activity 2.14 explain how to make adjustments to components/assemblies to ensure that they function to specification 2.15 explain the basic principles of how the equipment functions, its operating sequence, the working purpose of individual units/components, and how they interact 2.16 explain how to complete scheduled maintenance records/logs/reports, in accordance with company policy and procedures 2.17 explain the equipment operating and control procedures, and how to apply them in order to carry out scheduled maintenance 2.18 describe the problems that can occur whilst carrying out the scheduled maintenance tasks, and explain how they can be avoided 2.19 describe the organisational procedure(s) to be adopted for the safe disposal of waste of all types of materials 2.20 describe the extent of their own authority, and explain whom they should report to if they have problems that they cannot resolve			

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Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____

(*if sampled*)

Unit 11: Using hand methods to bend and form marine pipe

Unit reference number: L/601/1953

Level: 2

Credit value: 28

Guided learning hours: 63

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to bend and form pipe for marine applications, using hand methods, in accordance with approved procedures. The type of pipe to be bent and formed will include ferrous, non-ferrous and non-metallic pipe. In producing pipe bends and forms, learners will be expected to use a range of hand tools, forming equipment and techniques, appropriate to the type of material and operations being performed.

Activities will include cutting the pipes to the required lengths using hand sawing, band sawing or pipe/cutting machines, bending pipes using hand bending machines, springs, fillers or heating techniques, and the use of templates or set wires to check the bend profiles. The pipework produced will have features that include angular bends, offsets, bridge sets and expansion loops.

Learners' responsibilities will require them to comply with organisational policy and procedures for the marine pipe-bending and forming activities undertaken, and to report any problems with the equipment, materials or pipe-bending activities that they cannot personally resolve, or are outside their permitted authority, to the relevant people. Learners will be expected to work either with a high level of supervision or as a member of a team. They will be expected to work to instructions, either alone or in conjunction with others, taking personal responsibility for their own actions and for the quality and accuracy of the work that they carry out.

Learners' knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to applying hand bending and forming procedures for marine pipe. Learners will have an understanding of the pipe-bending and forming activities used, and their application, and will know about the pipe-bending and forming equipment and techniques in adequate depth to provide a sound basis for carrying out the activities to the required specification.

Learners will understand the safety precautions required when carrying out the marine pipe-bending activities, and when using the associated tools and equipment. They will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace.

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Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe D.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Use hand methods to bend and form marine pipe	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the marine pipe hand forming and bending activities: • use the correct issue of drawings, specifications and quality documentation • check that bending and forming equipment is in a safe and usable condition • apply safe working practices at all times • return all tools and equipment to the correct location on completion of the activities • leave the work area in a safe condition 1.3 follow the correct component drawing and any other related specifications for the component to be produced 1.4 determine what has to be done and how this will be achieved 1.5 use the appropriate tools and equipment for the pressure-shaping operations and check that they are in a safe and usable condition			

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Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.6 cut and prepare pipework using three of the following: • hacksaws • power saw • pipe/tube cutter • de-burring reamers • abrasive discs 1.7 mark out the pipework using two of the following methods: • direct marking using tapes and markers • set-outs of pipework using templates • producing set wires • set-outs of pipework onto the floor 1.8 shape the materials to the required specification using appropriate methods and techniques 1.9 bend and form pipe using two of the following methods: • bending springs • pipe bender • pipe expander • heating methods			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• swaging kit • fillers 1.10 produce pipework forms that include three of the following: • angular bends • offsets • bridge sets • expansion loops • radii • external swaged ends • internal swaged ends 1.11 bend and form two of the following types of pipe: • carbon steel • stainless steel • copper • cupro-nickel • aluminium • plastic 1.12 check that all the required shaping operations have been completed to the required standard			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.13 produce pipe bends and forms, in accordance with one of the following standards: • BS or ISO standards and procedures • other accepted international standards • customer (contractual) standards and requirements • company standards and procedures • specific system requirements • recognised compliance agency/body's standards 1.14 deal promptly and effectively with problems within their control and report those that cannot be solved			
2 Know how to use hand methods to bend and form marine pipe	2.1 explain the specific safety precautions to be taken when working with marine pipe-bending and cutting equipment 2.2 explain what specific personal protective equipment needs to be worn when carrying out the marine pipe-bending activities 2.3 describe the hazards associated with the marine pipe-bending activities (such as handling long pipe lengths, using bending equipment, using heating equipment), and explain how they can be minimised			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.4 explain how to obtain and interpret information from job instructions, drawings and specifications, in relation to the work undertaken 2.5 explain the basic principles and methods of marking out pipework, and the type of equipment used (such as direct marking, use of templates, use of set wires) 2.6 explain how to prepare the pipes in readiness for the marking out activities (such as visually checking for defects, cleaning the materials, removing burrs and sharp edges) 2.7 describe the methods of holding and supporting pipework during the marking out activities, and equipment that can be used 2.8 explain the allowances to be made in the marking out, for bending or the assembly of the various fittings that will be used 2.9 explain the characteristics of the various materials that are to be used with regard to the bending operations, and why some materials may require the addition of heat/hot air to aid the bending process 2.10 describe the methods used to hand bend and form the pipe (including the use of bending springs, hand-bending machines, fillers, heating methods)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.11 explain how to produce the various bends required (such as angled bends, dog-leg sets, bridge sets and expansion loops) 2.12 describe the tools and equipment used in the bending and forming process 2.13 explain how to recognise contaminants and the problems they can create, and the effects and likely symptoms of contamination in the pipe system 2.14 describe the procedure for the safe disposal of waste materials 2.15 explain what recording documentation needs to be completed for the marine pipe-bending and forming activities undertaken and, where appropriate, the importance of marking and identifying specific pieces of work in relation to the documentation 2.16 describe the extent of their own responsibility, and explain whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____

(*if sampled*)

Unit 12: Using bending machines to form marine pipe

Unit reference number: H/601/1957

Level: 2

Credit value: 28

Guided learning hours: 63

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to bend and form pipe for marine applications, using bending machines, in accordance with approved procedures. The type of pipe to be bent and formed will include ferrous, non-ferrous and non-metallic pipe. In producing pipe bends and forms, learners will be expected to use a range of tools, forming equipment and techniques, appropriate to the type of material and operations being performed.

Activities include cutting the pipes to the required lengths using saws or pipe/cutting machines, bending pipes using hydraulic bending machines or power-operated equipment such as presses, the use of heating techniques to aid the bending process, and the use of templates or set wires to check bend profiles. The pipework produced will have features that include angular bends, offsets, bridge sets and expansion loops.

Learners' responsibilities will require them to comply with organisational policy and procedures for the marine pipe-bending and forming activities undertaken, and to report any problems with the equipment, materials or pipe-bending activities that they cannot personally resolve, or are outside their permitted authority, to the relevant people. Learners will be expected to work to instructions, either alone or in conjunction with others, taking personal responsibility for their own actions and for the quality and accuracy of the work that they carry out.

Learners' knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to applying marine pipe-bending and forming procedures using machines. They will have an understanding of the pipe-bending and forming activities used, and their application, and will know about the pipe-bending and forming equipment and techniques in adequate depth to provide a sound basis for carrying out the activities to the required specification.

Learners will understand the safety precautions required when carrying out the marine pipe-bending activities, and when using the associated tools and equipment. They will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace.

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Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe D.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Use bending machines to form marine pipe	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the pipe forming and bending activities: • use the correct issue of drawings, specifications, job instructions and quality documentation • check that the bending machine and equipment is in a safe and usable condition • obtain suitable formers for the type and size of pipe to be bent/formed • apply safe working practices at all times • return all tools and equipment to the correct location on completion of the activities • leave the work area in a safe condition 1.3 bend and form the pipe using two of the following methods: • hand-operated pipe bender • hydraulic pipe-bending equipment • heating methods • power-operated equipment (such as presses)			

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Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.4 check that the equipment is set up correctly and is ready for use 1.5 mark out the pipework using two of the following methods: • direct marking using tapes and markers • set-outs of pipework using templates • producing and using set wires • set-outs of pipework onto the floor 1.6 cut and prepare the pipework using two of the following: • pipe-cutting machine • power saw • abrasive discs • gas cutting equipment 1.7 manipulate the machine controls safely and correctly in line with operational procedures 1.8 produce pipework forms that include three of the following: • angular bends • offsets • bridge sets • expansion loops			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.9 bend and form two of the following types of pipe: • carbon steel • stainless steel • copper • cupro-nickel • aluminium • plastic 1.10 produce components to the required specification 1.11 produce pipe bends and forms, in accordance with one of the following standards: • BS or ISO standards and procedures • other accepted international standards • customer (contractual) standards and requirements • company standards and procedures • specific system requirements • recognised compliance agency/body's standards 1.12 carry out quality sampling checks at suitable intervals 1.13 deal promptly and effectively with problems within their control and report those that cannot be solved			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.14 shut down the equipment to a safe condition on conclusion of the machining activities			
2 Know how to use bending machines to form marine pipe	2.1 explain the specific safety precautions to be taken when working with marine pipe-bending and cutting equipment 2.2 explain what personal protective equipment needs to be worn when carrying out the marine pipe-bending activities 2.3 describe the hazards associated with carrying out the marine pipe-bending activities (such as handling long pipe lengths, using power-operated bending equipment, using heating equipment), and explain how they can be minimised 2.4 explain how to obtain and interpret information from job instructions, drawings and specifications, in relation to work undertaken 2.5 explain the basic principles and methods of marking out pipework, and the type of equipment used (such as direct marking, use of templates, use of set wires) 2.6 explain how to prepare the pipes in readiness for the marking-out activities (such as visually checking for defects, cleaning the materials, removing burrs and sharp edges) 2.7 describe the methods of holding and supporting pipework during the marking-out activities, and the equipment that can be used			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.8 explain the allowances to be made in the marking out, for bending or the assembly of the various fittings that will be used 2.9 explain the characteristics of the various materials that are to be used with regard to the bending operations, and why some materials may require the addition of heat or hot air to aid the bending process 2.10 describe the methods used to bend and form the pipe (including the use of hand bending machines, hydraulic bending equipment, power-operated equipment and heating methods) 2.11 explain how to produce the various bends required (such as angled bends, dog-leg sets, bridge sets and expansion loops) 2.12 describe the tools and equipment used in the cutting, bending and forming process 2.13 explain how to recognise contaminants and the problems they can create, and the effects and likely symptoms of contamination in the pipe system 2.14 describe the procedure for the safe disposal of waste materials			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.15 explain what recording documentation needs to be completed for the marine pipe-bending and forming activities undertaken and, where appropriate, marking and identifying specific pieces of work in relation to the documentation 2.16 describe the extent of their own responsibility, and explain whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____

(*if sampled*)

Unit 13: Joining ferrous marine pipework by mechanical means

Unit reference number: M/601/1962

Level: 2

Credit value: 22

Guided learning hours: 56

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to assemble and join ferrous marine pipework by mechanical means, in accordance with approved procedures. In producing the assemblies, learners will be expected to use a range of equipment, hand tools and techniques, appropriate to the operations being performed.

The assembly activities will include producing threads on the external ends of the pipe, using stocks and dies or threading machines, and joining the pipes using a range of fittings, which will include flanges and gaskets, straight couplings, elbows, tee pieces, reduction pieces and other fittings as appropriate to the application.

Learners' responsibilities will require them to comply with organisational policy and procedures for the ferrous pipe-assembly activities undertaken, and to report any problems with the equipment, materials or assembly activities that they cannot personally resolve, or are outside their permitted authority, to the relevant people. Learners will be expected to work to instructions, either alone or in conjunction with others, taking personal responsibility for their own actions and for the quality and accuracy of the work that they carry out.

Learners' knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to applying assembly and joining procedures to ferrous marine screwed pipework. They will have an understanding of the pipework assembly, and its application, and will know about the screwed pipework assembly process, components and materials used 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.

Learners will understand the safety precautions required when working on marine ferrous pipework assembly activities, and with the associated tools and equipment. They will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace, both ashore and afloat.

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Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Join ferrous marine pipework by mechanical means	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the ferrous pipe-assembly and joining activities: • use the correct pipe-assembly drawings, specifications or job instructions • ensure that appropriate COSHH regulations are adhered to • check that all tools and equipment are in a safe and usable condition • ensure that the components and pipes used are free from foreign objects, dirt or other contamination • ensure that appropriate techniques are used to assemble the pipework system • leave the work area in a safe condition on completion of the activities 1.3 follow the relevant instructions, assembly drawings and any other specifications 1.4 check that the specified components are available and that they are in a usable condition			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.5 assemble screwed pipework, using four of the following screwed fittings: • straight couplings • elbows • tee pieces • flanges • reduction pieces • valves • drain/bleeding devices • blanking caps 1.6 use the appropriate methods and techniques to assemble the components in their correct positions 1.7 prepare for the pipe-assembly activities, to include carrying out all of the following: • cutting pipes to length with appropriate allowance for threading • selecting and setting up dies in stocks or threading machines • cutting threads on pipe ends to the appropriate length • checking that completed threads have the required fit			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.8 produce assembled pipe work which contains two of the following features: • angular bends • offsets • bridge sets • expansion loops 1.9 assemble pipework using all the following methods and techniques: • securing and fitting pipework supports to ship structures • connecting pipe-to-pipe • connecting pipe to ship's equipment • using gaskets, seals or jointing compounds • alignment and levelling of pipework • torque loading of bolts • attaching identification markers of pipe contents (such as colour coding, labels)			

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Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.10 assemble pipe and components to form two of the following marine pipe systems: • auxiliary steam • steam drains • fuel systems • drain systems 1.11 secure the components using the specified connectors and securing devices 1.12 check the completed assembly to ensure that all operations have been completed and the finished assembly meets the required specification 1.13 produce pipework assemblies, in accordance with one of the following standards: • BS or ISO standards and procedures • other accepted international standards • customer (contractual) standards and requirements • company standards and procedures • specific system requirements • recognised compliance agency/body's standards 1.14 deal promptly and effectively with problems within their control and report those that cannot be solved			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
2 Know how to join ferrous marine pipework by mechanical means	2.1 explain the specific safety precautions to be taken when assembling and joining ferrous marine screwed pipework, and with the tools and equipment that are used both on land and onboard vessels 2.2 explain what personal protective equipment needs to be used when assembling marine screwed pipework 2.3 describe the hazards associated with the marine pipework assembly activities (such as handling long lengths of pipe, using pipe screwing machinery, handling sealing agents), and explain how they can be minimised 2.4 explain how to obtain and interpret information from job instructions, drawings and specifications, in relation to work undertaken 2.5 explain how to prepare the pipework and fittings for the assembly operation (such as checking for damage, removing foreign objects, dirt and swarf from bore of pipe, removing burrs) 2.6 describe the range of pipe fittings that can be used, and explain how to identify them (to include straight connectors, elbows, tee pieces, reduction pieces, flanged fittings, valves, blanking pieces/cap ends) 2.7 explain how to determine the overall length of the pipework required, taking into account allowances for pipe fittings and screwed connections			

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Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.8 explain how to produce screw threads on the pipe ends, and the tools and equipment that can be used (to include stocks and dies, pipe threading machines) 2.9 describe the methods used to seal screwed joints (such as tapes and sealing compounds) 2.10 explain the use of flanges to connect pipes; use of gaskets; and torque loading of flange bolts 2.11 explain how to identify the correct orientation of fittings with regard to flow 2.12 describe the methods used to handle pipework assemblies 2.13 describe the supporting methods that are used when assembling pipework, and the type of fittings that are used 2.14 describe the tools and equipment used when assembling pipework 2.15 explain the standards to be attained, and company quality procedures 2.16 describe the extent of their own responsibility, and explain whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____

(*if sampled*)

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Unit 14: Joining non-ferrous marine pipework

Unit reference number: L/601/1970

Level: 2

Credit value: 22

Guided learning hours: 56

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to assemble and join non-ferrous marine pipework, in accordance with approved procedures. In producing the assemblies, learners will be expected to use a range of equipment, hand tools and techniques, appropriate to the operations being performed.

The assembly and joining activities will include producing soft-soldered joints and compression joints. The pipe assemblies produced will use a range of fittings, including straight connectors, elbows, tee pieces, reduction pieces, tank connectors, tap connectors, valves and other fittings, as appropriate to the application.

Learners' responsibilities will require them to comply with organisational policy and procedures for the non-ferrous pipe-assembly activities undertaken, and to report any problems with the equipment, materials or assembly/joining activities that they cannot personally resolve, or are outside their permitted authority, to the relevant people. They will be expected to work to instructions, either alone or in conjunction with others, taking personal responsibility for their own actions and for the quality and accuracy of the work that they carry out.

Learners' knowledge will be sufficient to provide a good understanding of their work, and will provide an informed approach to applying assembly and joining procedures to non-ferrous marine pipework. They will have an understanding of the pipework assembly, and its application, and will know about the various methods of assembling and joining the pipework using soft soldering, compression joints, pipe components and materials in adequate depth to provide a sound basis for carrying out the activities to the required specification.

Learners will understand the safety precautions required when working on non-ferrous marine pipework assembly and joining activities, and with the associated tools and equipment. They will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace, both ashore and afloat.

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Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Join non-ferrous marine pipework	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the pipe-assembly activities: • use the correct pipe-assembly drawings, specifications or job instructions • ensure that appropriate COSHH regulations are adhered to • check that all tools and equipment are in a safe and usable condition • ensure that the components and pipes used are free from foreign objects, dirt or other contamination • ensure that appropriate techniques are used to assemble the pipework system • leave the work area in a safe condition on completion of the activities 1.3 follow the relevant instructions, assembly drawings and any other specifications 1.4 check that the specified components are available and that they are in a usable condition			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.5 produce pipework assemblies which contain four of the following types of fittings: • straight couplings • valves • elbows • blanking caps • tee pieces • pipe clips/supports • reduction pieces • drain/bleeding devices • screwed fittings (such as tank, tap, pump, gauges) 1.6 use the appropriate methods and techniques to assemble the components in their correct positions 1.7 cut pipes to length and assemble them, using all of the following methods: • compression fittings • snap-on/push fittings • soldered fittings			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.8 produce assembled pipework which contains two of the following features: • angled bends • offsets • bridge sets 1.9 assemble pipework using five of the following: • soft solder • flux • hand tools • pipe cutters • gas torches • sealing tapes, seals or compounds 1.10 assemble pipework using four of the following methods and techniques: • securing and fitting pipework supports to ship structures • connecting pipe-to-pipe • connecting pipe to ship's equipment • using gaskets, seals or jointing compounds • alignment and levelling of pipework			

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Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• torque loading of connections • attaching identification markers of pipe contents (such as colour coding, labels) 1.11 assemble pipe and pipe components to form two of the following marine pipework systems: • low pressure air • sea water • lubricating/oil • refrigeration gas • cold/chilled water • hot water 1.12 secure the components using the specified connectors and securing devices 1.13 check the completed assembly to ensure that all operations have been completed and the finished assembly meets the required specification 1.14 produce pipework assemblies, in accordance with one of the following standards: • BS or ISO standards and procedures • other accepted international standards • customer (contractual) standards and requirements			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• company standards and procedures • specific system requirements • recognised compliance agency/body's standards 1.15 deal promptly and effectively with problems within their control and report those that cannot be solved			
2 Know how to join non-ferrous marine pipework	2.1 explain the specific safety precautions to be taken when assembling and joining non-ferrous marine pipework, and with the tools and equipment that are used both on land and onboard vessels 2.2 explain what personal protective equipment needs to be used when assembling and joining the pipework 2.3 describe the hazards associated with the marine pipework assembly and joining activities (such as handling long lengths of pipe, using gas torches and brazing equipment, handling sealing agents and fluxes), and explain how they can be minimised 2.4 explain how to obtain and interpret information from job instructions, drawings and specifications, in relation to the work undertaken 2.5 explain how to prepare the pipework and fittings for the assembly operation (such as checking for damage, removing foreign objects, dirt and swarf from bore of pipe, removing burrs)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.6 describe the range of pipe fittings that can be used, and explain how to identify them (to include straight connectors, elbows, tee pieces, reduction pieces, screwed fittings, valves, blanking pieces/cap ends) 2.7 describe the different types of fittings available, such as soldered fittings, compression fittings and push fit fittings 2.8 explain how to determine the overall length of the pipework required, taking into account allowances for pipe fittings 2.9 explain how to identify the correct orientation of fittings with regard to flow, and the consequences of incorrectly orientating the fitting 2.10 explain how to prepare the pipe ends and fittings for soldering or brazing, and why it is necessary to ensure that these preparations are carried out 2.11 describe the various types of soldered connectors available (such as solder ring types and capillary fittings) 2.12 describe the methods used to solder the joints, and explain how to recognise when the fitting is correctly soldered on 2.13 describe the precautions to be taken when using gas torches to form the joint, and the effect of overheating the joint			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.14 explain the use of compression fittings; how the pipes are sealed; and the effects of over-tightening the fittings 2.15 explain the use of push-fit connectors, and their advantages and disadvantages 2.16 describe the methods of supporting the pipework, and the type of fittings that are used 2.17 describe the tools and equipment used when assembling non-ferrous pipework 2.18 explain the standards to be attained, and the company quality procedures 2.19 describe the extent of their own responsibility, and explain whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____

(*if sampled*)

Unit 15: Joining non-metallic marine pipework

Unit reference number: Y/601/1972

Level: 2

Credit value: 19

Guided learning hours: 49

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to assemble and join non-metallic marine pipework, in accordance with approved procedures. The pipework systems being assembled will include fresh water, chilled water, air-conditioning, waste water, deck drains and other salvage drainage systems. In producing the assemblies, learners will be expected to use a range of equipment, hand tools and techniques, appropriate to the operations being performed.

The assembly and joining activities include producing cemented/glued joints, compression joints and push-fit joints. The pipe assemblies produced will use a range of fittings, which will include straight connectors, elbows, tee pieces, reduction pieces, flanges, tank connectors, tap connectors, valves and other fittings, as appropriate to the application.

Learners' responsibilities will require them to comply with organisational policy and procedures for the marine pipework assembly activities undertaken, and to report any problems with the equipment, materials or pipe-assembly activities that they cannot personally resolve, or are outside their permitted authority, to the relevant people. They will be expected to work to instructions, either alone or in conjunction with others, taking personal responsibility for their own actions and for the quality and accuracy of the work that they carry out.

Learners' knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to applying marine non-metallic pipework assembly procedures. Learners will have an understanding of the pipework assembly, and its application, and will know about the assembly techniques, pipe components and materials used in adequate depth to provide a sound basis for carrying out the activities to the required specification.

Learners will understand the safety precautions required when working on the pipework-assembly activities, and with the associated tools and equipment. They learner will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace.

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Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Join non-metallic marine pipework	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the pipe-assembly activities: • use the correct pipe-assembly drawings, specifications or job instructions • ensure that appropriate COSHH regulations are adhered to • check that all tools and equipment are in a safe and usable condition • ensure that the components and pipes used are free from foreign objects, dirt or other contamination • leave the work area in a safe condition on completion of the activities 1.3 follow the relevant instructions, assembly drawings and any other specifications 1.4 check that the specified components are available and that they are in a usable condition			

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Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.5 produce pipework assemblies which contain four of the following types of fittings: • straight couplings • valves • elbows • blanking caps • tee pieces • reduction pieces • drain/bleeding devices • screwed fittings (such as tank, tap, pump, gauges) 1.6 use the appropriate methods and techniques to assemble the components in their correct positions 1.7 cut pipes to length, and assemble them using all of the following methods: • compression fittings • snap-on/push fittings • cemented/glued fittings 1.8 produce assembled pipework which contains two of the following features: • angled bends • offsets • bridge sets			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.9 assemble pipework, to include carrying out all of the following: • connecting pipe-to-pipe • connecting pipe to ship's equipment • using gaskets, seals or jointing compounds • aligning and levelling of pipework • securing and fitting pipework supports to ship structures • torque loading of connections • attaching identification markers of pipe contents (such as colour coding, labels) 1.10 assemble pipes and pipework components to form two of the following marine pipe systems: • fresh water • chilled water • air-conditioning • waste water • deck drains • other salvage drainage systems 1.11 secure the components using the specified connectors and securing devices			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.12 check the completed assembly to ensure that all operations have been completed and the finished assembly meets the required specification 1.13 produce pipework assemblies, in accordance with one of the following standards: • BS or ISO standards and procedures • other accepted international standards • customer (contractual) standards and requirements • company standards and procedures • specific system requirements • recognised compliance agency/body's standards 1.14 deal promptly and effectively with problems within their control and report those that cannot be solved			
2 Know how to join non-metallic marine pipework	2.1 explain the specific safety precautions to be taken when assembling non-metallic marine pipework, and with the tools and equipment that are used in the workplace and onboard vessels (including general workshop and site safety, accident procedure, statutory regulations, risk assessment procedures and COSHH regulations) 2.2 explain what personal protective equipment needs to be used when assembling non-metallic marine pipework			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.3 describe the hazards associated with the non-metallic marine pipework assembly activities (such as handling long lengths of pipe, using hot air/gas torches, handling adhesives and sealing agents), and explain how they can be minimised 2.4 explain how to obtain and interpret information from job instructions, drawings and specifications, in relation to the work undertaken 2.5 explain how to prepare the pipework and fittings for the assembly operation (such as checking for damage, removing foreign objects, dirt and swarf from bore of pipe, removing burrs) 2.6 describe the range of pipe fittings that can be used, and explain how to identify them (to include straight connectors, elbows, tee pieces, reduction pieces, tank fittings, valves, blanking pieces/cap ends) 2.7 describe the different types of fittings available (such as cemented/glued fittings, compression fittings and push-fit fittings) 2.8 explain how to determine the overall length of the pipework required, taking into account allowances for pipe fittings 2.9 explain how to identify the correct orientation of fittings with regard to flow, and the consequences of incorrectly orientating the fitting			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.10 describe the methods used to prepare pipe ends and fittings when using adhesives, and explain why it is necessary to ensure that these preparations are carried out 2.11 describe the tools and equipment used when assembling the pipework 2.12 describe the methods used to glue the joints, and explain how to recognise when the fitting is correctly secured 2.13 explain the various adhesives and sealing compounds that are used on non-metallic pipework 2.14 explain the precautions to be taken when using the adhesives and sealing compounds (such as adequate ventilation especially in confined spaces, away from naked flames, avoiding skin contact) 2.15 explain the precautions to be taken when using hot air/gas torches to form the joint, and the effect of overheating the joint 2.16 explain the principles of sealing, and use of compression fittings, and the effects of over-tightening the fittings 2.17 explain the use of push-fit connectors, and their advantages and disadvantages 2.18 describe the methods used to handle and support pipework during assembly			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.19 describe the types of fittings that are used for securing pipework assemblies to ship structures 2.20 explain the standards to be attained, and company quality procedures 2.21 describe the procedure for the safe disposal of waste materials 2.22 explain what recording documentation needs to be completed for the marine pipe-bending and forming activities undertaken and, where appropriate, the importance of marking and identifying specific pieces of work in relation to the documentation 2.23 describe the extent of their own responsibility, and explain whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____

(*if sampled*)

Unit 16: Assisting in the installation of marine pipework and components

Unit reference number: H/601/1974

Level: 2

Credit value: 28

Guided learning hours: 63

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to assist in the installation of marine pipework and associated components onboard vessels, in accordance with approved procedures. The marine pipework systems to be installed include fresh water, chilled water, air-conditioning, lubricating oil, waste water, steam drains, sea water and other salvage drainage systems. In installing the marine pipework, learners will be expected to use a range of equipment, hand tools and techniques, appropriate to the operations being performed.

The installation activities include producing cemented/glued joints, compression joints, threaded joints, flanged joints and push-fit joints. The marine pipe installations will use a range of fittings, which will include straight connectors, elbows, tee pieces, reduction pieces, flanges, tank connectors, tap connectors, valves and other fittings, as appropriate to the application.

Learners' responsibilities will require them to comply with organisational policy and procedures for the marine pipework installation activities undertaken, and to report any problems with the equipment, materials or installation activities that they cannot personally resolve, or are outside their permitted authority, to the relevant people. They will be expected to work either with a high level of supervision or as a member of a team. Learners will take personal responsibility for their own actions and for the quality and accuracy of the work that they carry out. When working in a team they must demonstrate a significant personal contribution to the team activities in order to satisfy the requirements of the standard, and competence in all the areas required by the standard must be demonstrated.

Learners' knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to the installation of marine pipework and associated components on board vessels. They will have an understanding of the marine pipework system being installed, and its application, and will know about the installation techniques, pipe components and materials used in adequate depth to provide a sound basis for carrying out the activities to the required specification.

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Learners will understand the safety precautions required when working on the installation of the marine pipework and with the associated tools and equipment. They will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others onboard the vessel.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Assist in the installation of marine pipework and components	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the marine pipework installation activities: • ensure that the site is kept accessible and free from obstructions or hazards • use the correct marine pipe installation drawings, specifications or job instructions • ensure that the components and pipes used are free from foreign objects, dirt or other contamination • check that all tools are in a safe and usable condition • ensure that tag-out systems are in place before removal of any blanks etc, prior to installation • ensure that appropriate COSHH regulations are adhered to • leave the work area in a safe condition and to the prescribed category of cleanliness 1.3 follow all relevant drawings and specifications for the installation being carried out 1.4 use the correct tools and equipment for the installation operations and check that they are in a safe and usable condition			

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Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.5 install, position and secure the equipment and components in accordance with the specification 1.6 assist in the installation of marine pipework which contains six of the following types of fittings: • straight couplings • valves • elbows • blanking caps • tee pieces • pipe clips/supports • reduction pieces • drain/bleeding devices • screwed fittings (such as tank, tap, pump, gauges) 1.7 use two of the following jointing methods during the installation activities: • nut and ferrule • bolted flanges • screwed fittings • snap-on/push fittings • compression fittings • cemented/glued joints			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.8 assist in the installation of the marine pipework, to include carrying out four of the following: • securing pipework supports to ship structures • connecting pipe-to-pipe • making bulkhead penetrations • connecting pipe to ship's equipment • using gaskets, seals or jointing compounds • aligning and levelling equipment • torque loading of bolts 1.9 assist in the installation of three of the following marine pipework systems: • fresh water • chilled water • waste water • fuel gas • air-conditioning • lubricating oil • steam drains • hydraulics • sea water • other salvage drainage systems • refrigeration gas			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.10 produce marine pipework installations, in accordance with one of the following standards: • BS or ISO standards and procedures • other accepted international standards • customer (contractual) standards and requirements • company standards and procedures • specific system requirements • recognised compliance agency/body's standards 1.11 check that all necessary connections to the equipment are complete 1.12 deal promptly and effectively with problems within their control and report those that cannot be solved 1.13 check that the installation is complete and that all components are free from damage			
2 Know how to assist in the installation of marine pipework and components	2.1 explain the specific safety precautions to be taken when installing marine pipework onboard vessels (including general workshop and site safety, accident procedure; statutory regulations, risk assessment procedures and COSHH regulations) 2.2 explain what personal protective equipment needs to be used when installing marine pipework			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.3 describe the hazards associated with carrying out marine pipework installation activities (including tag-out systems and how they operate, ship boundaries and handling long lengths of pipe in confined spaces), and explain how they can be minimised 2.4 explain the procedures to be carried out before starting work on the installation (such as obtaining permits to work, obtaining and complying with risk assessments and other health and safety requirements) 2.5 explain how to obtain and interpret information from job instructions, drawings and specifications, in relation to the work undertaken 2.6 explain how to prepare the pipework and fittings for the installation operation (including checking for damage, removing foreign objects, dirt and swarf from bore of pipe, removing burrs) 2.7 describe the range of marine pipe fittings that can be used, and explain how to identify them (including straight connectors, elbows, tee pieces, reduction pieces, tank fittings, valves, blanking pieces/cap ends) 2.8 describe the different methods of connecting pipework (such as bolted flanges, screwed couplings, nut and ferrules, compression fittings and push-fit fittings)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.9 explain how to identify the correct orientation of fittings with regard to flow, and the consequences of incorrectly orientating the fitting 2.10 describe the methods used to prepare pipe ends, and explain why it is necessary to ensure that these preparations are carried out 2.11 explain the use of compression fittings, how the pipes are sealed, and the effects of over-tightening the fittings 2.12 explain the use of flanged fittings, jointing materials, fasteners, and the effect of over-tightening fasteners 2.13 explain the use of push-fit connectors, and their advantages and disadvantages 2.14 explain the use of threaded connections, and their advantages and disadvantages 2.15 describe the methods of fastening pipe supports to the vessel structure, and explain the need to protect the integrity of the vessel at all times 2.16 describe the methods of supporting the pipework, and the type of fittings that are used 2.17 explain the importance of ensuring that the completed installation is free from dirt, swarf and foreign object damage, and of ensuring that any exposed components or pipe ends are correctly covered/protected			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.18 describe the procedure for the safe disposal of waste materials 2.19 describe the tools and equipment used when installing marine pipework 2.20 explain the standards to be attained, and company quality procedures 2.21 describe the extent of their own responsibility, and explain whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____

(*if sampled*)

Unit 17: Assisting in the testing of marine pipework systems

Unit reference number: T/601/1977

Level: 2

Credit value: 22

Guided learning hours: 56

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to assist in the testing of ferrous, non-ferrous and non-metallic marine pipework systems, in accordance with approved procedures. Pipework systems to be tested include low pressure air, hydraulics, lubricating oil, fresh water, distilled water, waste water, chilled water, main service, fuel and steam. In preparing and testing the pipework system, learners will be expected to use a range of hand tools, test equipment and techniques, as required by the test procedures. The testing activities will include such things as purging equipment and materials, using appropriate test equipment (such as hydraulic, compressed air, gas and water), and the use of pressure gauges and leak repair equipment and materials.

Learners' responsibilities will require them to comply with organisational policy and procedures for the preparation and testing of the marine pipework, and to report any problems with the testing equipment, testing activities or installations tested that they cannot personally resolve, or are outside their permitted authority, to the relevant people. They will be expected to work either with a high level of supervision or as a member of a team. Learners will take personal responsibility for their own actions and for the quality and accuracy of the work that they carry out. When working in a team they must demonstrate a significant personal contribution to the team activities in order to satisfy the requirements of the standard, and competence in all the areas required by the standard must be demonstrated.

Learners' knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to applying marine pipework preparation and testing activities. They will have an understanding of the pipework system being tested, and its application, and will know about the preparations required, equipment to be used and tests to be carried out in adequate depth to provide a sound basis for carrying out the activities to the required specification.

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Learners will understand the safety precautions required when testing the pipework installation, and when using the associated tools and equipment. They will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Assist in the testing of marine pipework systems	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the testing activities: • use the correct test procedures and specifications • check that all tools and test equipment are within calibration date • obtain clearance/authority/permit to pressure test the installation • ensure that isolation and tag-out procedures are followed • ensure that safe working distance procedures are set up • erect relevant warning notices or safety signs • ensure that appropriate safety measures are taken to protect test personnel (such as guards, distance, incremental pressure tests) 1.3 follow the appropriate procedures for use of tools and equipment to carry out the required tests			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.4 use one of the following types of equipment for the testing: • hydraulic test equipment • compressed air test equipment • gas test equipment • water test equipment 1.5 set up and carry out the tests using the correct procedures and within agreed timescales 1.6 assist in the preparation of the installation for testing by carrying out all of the following: • checking the security of all joints • purging or flushing the system (as appropriate) • fitting appropriate blanking plugs/plates to exposed ends of pipe or equipment • connecting an appropriate test source • fitting leak detection equipment and/or pressure gauges 1.7 assist in carrying out tests on two of the following types of pipework installations: • ferrous pipework • non-ferrous pipework • non-metallic pipework			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.8 assist in carrying out tests on three of the following pipe systems: • low pressure air • hydraulics • lubricating oil • hot/cold fresh water • distilled water • waste water • fuel • chilled water • main services • steam • salvage 1.9 assist in carrying out all of the following, during the testing activities: • filling the system with the appropriate test medium • venting air from the system (where appropriate) • applying test pressures in incremental stages • checking for leaks at each stage • depressurising the system • draining down the system (where appropriate)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.10 assist in dealing with two of the following types of complexity: • systems with no faults • systems with faults • systems with intermittent faults 1.11 assist in the use of two of the following fault finding techniques: • half-split technique • input/output technique • six point technique. • unit substitution 1.12 carry out the testing activities, in accordance with one of the following standards: • BS or ISO standards and procedures • other accepted international standards • customer (contractual) standards and requirements • company standards and procedures • specific system requirements • recognised compliance agency/body's standards			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.13 record the results of the tests in the appropriate format to include one from the following: • system/installation test documentation • vessel, craft, or structure log • job sheet • handover report • corrective action report 1.14 review the results and carry out further tests if necessary			
2 Know how to assist in the testing of marine pipework systems	2.1 explain the specific safety precautions to be taken when carrying out test procedures on pipework systems, used both on land and onboard vessels (including general workshop and site safety, accident procedure; statutory regulations, risk assessment procedures and COSHH regulations) 2.2 explain the importance of ship boundaries of testing, and the tag-out system 2.3 explain the reasons for a 'permit-to-pressure' test certificate, prior to testing onboard a vessel 2.4 explain what personal protective equipment needs to be worn whilst carrying out the testing activities 2.5 describe the hazards associated with the testing activities, and explain how they can be minimised			

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Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.6 explain how to obtain and interpret information from job instructions, drawings and specifications, in relation to work undertaken 2.7 explain the colour code standard used for identifying pipes, and why it is important to adhere to these standards 2.8 explain the use of the pipe system being tested 2.9 describe the various pressure test methods used on ferrous, small-bore non-ferrous and non-metallic pipelines 2.10 explain the importance of components being fitted in the correct relation to the direction of flow 2.11 explain the reasons for purging and venting pipework systems, and the consequences of not purging the system 2.12 explain how to identify the fluids that can be used for flushing pipework systems 2.13 explain the consequences of not flushing, or of using the incorrect flushing agent 2.14 describe the methods of testing the system, and explain the need to gradually increase pressure in the pipework system			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.15 describe the methods used to isolate parts of the pipework system for testing, and explain how this can be achieved 2.16 explain how the amount of test fluid for the pipework system is determined, and what problems would be caused if the incorrect amount were used 2.17 explain the factors that govern the choice of test equipment used in the pressure testing of pipework systems, and the importance of equipment being calibrated 2.18 explain how the test pressures are determined 2.19 explain the reasons for maintaining test pressures for specific times 2.20 explain how the results of the pressure test are analysed, and why this is important 2.21 explain how pipework systems are depressurised, and what environmental precautions must be taken (especially in confined spaces onboard vessels) 2.22 describe the procedures for recording and reporting test results to the relevant people 2.23 describe the extent of their own responsibility, and explain whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____

(*if sampled*)

Unit 18: Producing socket and flange fillet welded joints in low pressure marine pipework using a manual welding process

Unit reference number: F/601/1979

Level: 2

Credit value: 44

Guided learning hours: 169

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to produce socket and flange fillet welded joints in pipe, using a manual welding process, such as MMA, MIG, or gas welding equipment, in accordance with instructions and/or approved welding procedures. Learners will be required to check that all the workholding equipment and manipulating devices required are available and are in a usable condition. They will be expected to check the welding equipment to ensure that all the leads/cables, hoses and wire feed mechanisms are securely connected and free from damage.

In preparing to weld, learners will need to set and adjust the welding conditions, in line with the instructions or welding procedure specification. Learners must operate the equipment safely and correctly, and make any necessary adjustments to settings, in line with their permitted authority, in order to produce the welded joints to the required specification. They will be required to demonstrate their capability to produce the fillet welds to the required quality, and this could be through tests according to BS 4872 or EN 287.

Learners' responsibilities will require them to comply with organisational policy and procedures for the welding activities undertaken, and to report any problems with the welding equipment or welding activities that they cannot resolve, or are outside their permitted authority, to the relevant people. They will be expected to work to instructions, either alone or in conjunction with others, taking personal responsibility for their own actions and for the quality and accuracy of the work that they carry out.

Learners' knowledge will be sufficient to provide a sound basis for their work, and will provide an understanding of how the particular welding process works. They will know about the equipment, materials and consumables in adequate depth to provide a sound background for the welding operations to be performed, and for ensuring that the work output is produced to the required specification.

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Learners will understand the safety precautions required when working with the welding equipment. They will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace and onboard vessels.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Produce socket and flange fillet welded joints in low pressure marine pipework using a manual welding process	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 prepare for the pipe-welding process, including carrying out all of the following: • obtaining the appropriate equipment for the welding activities to be carried out • checking the condition of and correctly connecting welding leads, earthing arrangements and electrode holder (where appropriate) • connecting all required hoses, regulators and/or flow meters and safety devices (where appropriate) • setting and adjusting welding conditions/parameters in accordance with welding procedure specification • preparing the work area for the welding activities (such as siting welding screens, positioning fume-extraction equipment) • ensuring that the components are correctly set up with regard to specified joint preparation, and are secure • obtaining and wearing appropriate personal protective equipment			

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Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.3 follow the relevant joining procedure and job instructions 1.4 check that the joint preparation complies with the specification 1.5 check that joining and related equipment and consumables are as specified and fit for purpose 1.6 make the joints as specified using the appropriate thermal joining technique 1.7 use welding and related equipment for one of the following welding processes: • manual metal arc • gas welding • MIG/MAG 1.8 use consumables appropriate to the material and application, to include: either two types of electrode from: • rutile • basic • cellulosic • nickel alloy • aluminium			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	or • two types of filler wire from different material groups 1.9 produce socket and flange fillet welded joints in one of the following: • small-bore pipe (50mm outside diameter or less) • large bore pipe (above 50mm outside diameter) 1.10 weld joints according to BS EN 287, in good access situations, in two of the following positions: • flat (PA) rotating • horizontal vertical (PB) fixed • horizontal vertical (PB) rotating • vertical upwards (PF) fixed • vertical down (PG) fixed • horizontal overhead (PD) fixed 1.11 produce joints of the required quality and of specified dimensional accuracy			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.12 produce marine socket and flange fillet welded joints in pipe, which comply with all of the following: • achieve minimum weld quality requirements applicable to fillet welds equivalent to those given in the relevant European/International Standards (eg EN 25817/ISO 5187 and EN 30042/ISO 10042), as required by the application standard or specification • meet the required dimensional accuracy within specified tolerance 1.13 shut down the equipment to a safe condition on completion of joining activities 1.14 deal promptly with excess and waste materials and temporary attachments, in line with approved and agreed procedures 1.15 deal promptly and effectively with problems within their control and report those that cannot be solved			
2 Know how to produce socket and flange fillet welded joints in low pressure marine pipework using a manual welding process	2.1 explain the safe working practices and procedures to be observed when working with the selected welding equipment, both on land and onboard vessels (including general workshop and site safety, appropriate personal protective equipment, fire prevention, protecting other workers from arc eye, safety in enclosed/confined spaces, fume control, accident procedure, statutory regulations, risk assessment procedures and COSHH regulations)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.2 explain the correct handling and storage of gas cylinders (including manual handling and use of cylinder trolley, leak detection procedures, relevant BCGA codes of practice, cylinder identification, gas pressures, cylinder and equipment safety features, emergency shutdown procedures) 2.3 describe the hazards associated with the selected welding process (including live electrical components, poor earthing, arc radiation, fumes and gases, gas supply leaks, spatter, hot slag and metal, elevated working, enclosed spaces, slips, trips and falls, and explain how they can be minimised) 2.4 explain the manual welding process selected, and an awareness of the different types of welding equipment (including basic principles of fusion welding, AC and DC power sources, ancillary equipment, power ranges, care of equipment, terminology used in welding, flame setting) 2.5 explain how to extract the information required from the drawings and welding procedure specifications (including interpretation of welding symbols, scope, content and application of the welding procedure specification) 2.6 explain the importance of complying with job instructions and with the welding procedure specification			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.7 explain how to carry out currency/issue checks on the specifications they are working with 2.8 describe the consumables associated with the chosen welding process (including types of electrodes and/or filler metal and application, types of shielding gas and their application, gas supply and control, correct storage and drying of electrodes and filler wire) 2.9 describe the types and features of welded joints in pipe (including fillet and butt welds, single and multi-run welds, welding positions, weld quality) 2.10 explain the methods of setting up and restraining the joint to achieve correct location of components and control of distortion (including edge preparation, use of jigs and fixtures, manipulators and positioners, tack welding size and spacing in relationship to material thickness and component size, use of temporary attachments, pre-setting) 2.11 explain how to prepare the welding equipment, and the checks to be made to ensure that it is safe and ready to use (including electrical connections, earthing arrangements, equipment calibration, setting welding parameters)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.12 explain the techniques of operating the welding equipment to produce a range of joints in the various joint positions (including fine tuning parameters, correct manipulation of the welding gun or electrode, safe closing down of the welding equipment) 2.13 describe the problems that can occur with the welding activities, and explain how these can be overcome (including causes of distortion and methods of control, effects of welding on materials, sources of weld defects and methods of prevention) 2.14 describe the organisational quality systems used and weld standards to be achieved; weld inspection and test procedures used (including visual and non-destructive tests) 2.15 explain the personal approval tests, and their applicability to their work 2.16 explain the calibration/care and control procedures for the tools and equipment 2.17 describe the procedure for the safe disposal of waste materials 2.18 describe the extent of their own responsibility, and explain whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____

(*if sampled*)

Unit 19: Carrying out manual torch brazing and soldering of marine pipework

Unit reference number: T/601/1980

Level: 2

Credit value: 28

Guided learning hours: 63

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to set up and use manual torch brazing and soldering equipment, to produce socket and flange joints for low pressure marine pipework, in accordance with approved instructions or procedures. Learners will be required to check that all the hoses and equipment are correctly connected, free from leaks or damage, and are ready for use. They will be required to set and adjust the brazing and soldering conditions, in line with the specification. Learners will also need to select and use workholding and manipulating devices that are appropriate to the size and shape of materials and the joint configuration being produced. They must operate the equipment safely and correctly and make any adjustments to settings, in order to produce the joints to the required specification.

Learners' responsibilities will require them to comply with organisational policy and procedures for carrying out the brazing and soldering activities, and to report any problems with the equipment or activities that they cannot resolve, or are outside their permitted authority, to the relevant people. They will be expected to work to instructions, either alone or in conjunction with others, taking personal responsibility for their own actions and for the quality and accuracy of the work that they carry out.

Learners' knowledge will be sufficient to provide a sound basis for their work, and will provide understanding of how the torch brazing and soldering process works. They will know about the equipment, materials and consumables in adequate depth to provide a sound background for the brazing and soldering operations to be performed, and for ensuring that the work output is produced to the required specification.

Learners will understand the safety precautions required when working with the brazing and soldering equipment. They will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace and onboard vessels.

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Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Carry out manual torch brazing and soldering of marine pipework	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 prepare for the manual torch brazing and soldering activities, including carrying out all of the following: • obtaining the appropriate equipment for the brazing or soldering activities to be carried out • correctly handling and storing gas cylinders (where appropriate) • checking the condition of, and correctly connecting hoses and valves • connecting the brazing/soldering torch, and selecting and fitting the correct size nozzle • fitting a flashback arrestor (where applicable) • setting appropriate gas pressures • using the correct procedure for lighting, adjusting and extinguishing the flame • preparing the work area for the brazing or soldering activities (such as siting protective screens, positioning fume-extraction equipment and arranging fire sentries, as appropriate)			

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Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• ensuring that the workpiece is correctly set up with regard to specified joint preparation, and is secure • obtaining and wearing appropriate personal protective equipment 1.3 follow the relevant joining procedure and job instructions 1.4 check that the joint preparation complies with the specification 1.5 check that joining and related equipment and consumables are as specified and fit for purpose 1.6 make the joints as specified using the appropriate thermal joining technique 1.7 use one of the following processes and related equipment: • brazing • soldering 1.8 use specified consumables appropriate to the parent metals, to include both of the following: • two different filler metals • appropriate fluxes			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.9 produce brazed or soldered joints according to work procedures, and in good access situations, covering two of the following: • low pressure small-bore pipe (30mm outside diameter or less) • two different parent metal groups (such as copper/brass) 1.10 produce joints of the required quality and of specified dimensional accuracy 1.11 produce brazed or soldered pipes, which meet all of the following quality and accuracy requirements: • achieve the specified joint quality, as required by the application standard • meet the required dimensional accuracy within specified tolerance • are of good appearance, free from flux residues and excess filler metal 1.12 shut down the equipment to a safe condition on completion of joining activities 1.13 deal promptly with excess and waste materials and temporary attachments, in line with approved and agreed procedures 1.14 deal promptly and effectively with problems within their control and report those that cannot be solved			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
2 Know how to carry out manual torch brazing and soldering of marine pipework	2.1 explain the safe working practices and procedures to be observed when working with gas brazing and soldering equipment (general workshop and site safety, appropriate personal protective equipment, fire and explosion prevention, fume-extraction, protecting other workers, safety in enclosed/confined spaces, statutory regulations, risk assessment procedures and COSHH regulations) 2.2 describe the hazards associated with torch brazing and soldering (naked flames, explosive gas mixes, oxygen enrichment, fumes and gases, hot metal, enclosed/confined spaces, tag-out systems and how they operate), and explain how they can be minimised (especially onboard vessels) 2.3 explain the correct handling and storage of gas cylinders (manual handling and use of cylinder trolley, leak detection procedures, relevant British Compressed Gas Association (BCGA) codes of practice, cylinder identification, gas pressures, cylinder and equipment safety features, emergency shutdown procedures) 2.4 explain the torch brazing and soldering process (basic principles of the process, wetting and capillary flow, role of fluxes, equipment type and its care)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.5 describe types of filler metal and fluxes; forms of filler metal 2.6 describe the types of joints to be produced 2.7 explain how to set up and locate the joint (methods of cleaning joint faces; use of jigs and fixtures, restraining devices; self-locating joints; pre-placement of filler metal and flux) 2.8 explain how to prepare to braze or solder (including checks to confirm the correct set-up and cleanliness; use of gauges, setting up the equipment, checking connections for leaks, checking operating parameters) 2.9 explain the techniques of operating the equipment to produce a range of joints (selection of nozzle and flame adjustment, application of flux, correct manipulation of torch and filler wire, safe closing down of the equipment) 2.10 explain the importance of complying with job instructions and the joining procedure specification 2.11 describe the problems that can occur with the joining activities, and explain how these can be overcome (causes of distortion and methods of control; effects of heat on materials and sources of defects; methods of prevention)			

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Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.12 describe the methods of removing flux residues and for cleaning the finished joint 2.13 describe the organisational quality control systems and standards to be achieved; visual and non-destructive tests 2.14 explain the personal approval tests, and their applicability to their work 2.15 describe the extent of their own authority, and explain whom they should report to if they have problems that they cannot resolve 2.16 explain the reporting lines and procedures, line supervision and technical experts			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____

(*if sampled*)

Unit 20: Marking off for the manufacture of marine steelwork components

Unit reference number: A/601/1981

Level: 2

Credit value: 18

Guided learning hours: 42

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to mark off plate and rolled sections for the manufacture of marine steelwork components, in accordance with approved procedures. Learners will be required to select the required materials to use, and the appropriate marking out tools and equipment, based on the information presented to them and the accuracy to be achieved. Marking off will be the preparation required for cutting, shaping and forming of plate and sections, as appropriate to the application, and could include marking out workpiece datums, centre lines, angles and curved details, bending details — including bending allowances, hole centring and outlining details.

Learners' responsibilities will require them to comply with organisational policy and procedures for the marking-off activities undertaken, and to report any problems with the materials, equipment or marking-off activities that they cannot resolve themselves, or are outside their permitted authority, to the relevant people. They will be expected to work to instructions, with a minimum of supervision, taking personal responsibility for their own actions and the quality and accuracy of the work that they carry out.

Learners' knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to applying marking-off procedures in a marine fabrication environment. They will have an understanding of the marking-off process, and its application, and will know about the materials as well as the care and use of marking out tools in adequate depth to provide a sound basis for carrying out the activities to the required specification.

Learners will understand the safety procedures required when using marking mediums, and when carrying out the marking-off activities. They will be required to demonstrate safe working practices throughout, and will understand the responsibilities they owe to themselves and others in the workplace.

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Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Mark off for the manufacture of marine steelwork components	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 obtain and use the correct information for marking out 1.3 obtain the appropriate marking out equipment and check that it is in a usable condition 1.4 mark off plate or section using six of the following tools and instruments: • scriber • punch • rule and tape • straight edge • square • protractor • dividers or trammels • chalk line • templates • laser (where applicable) 1.5 prepare suitable datums and marking out surfaces			

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Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.6 mark out using appropriate methods 1.7 mark off marine parts on two appropriate materials from the following: • carbon steel plate • carbon steel sections • aluminium • stainless steel • non-metallic materials • other material (specify) 1.8 mark off plate or sections for three of the following components: • deck plates • shell plates • transverses/longitudinal girders • frames/longitudinals/stiffeners • bulkheads • intercostals/wash plates • beam knees/brackets • web supports			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.9 use marking out methods and techniques, including one of the following: • direct marking using instruments • use of templates • tracing/transfer methods 1.10 mark off material, to include five of the following features: • datum and centre lines • square/rectangular profiles • irregular shapes • circles • curved profiles • bend guide lines • angles • hole centring and outlining (linear) • hole centring and outlining (circular) 1.11 check that the marking out complies with the specification			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.12 produce marked-off components which meet all of the following standards: • company/client standards • dimensionally accurate (to drawing or specification) • clearly defined for required processes • use recognised marking out conventions 1.13 deal promptly and effectively with problems within their control and report those that cannot be resolved			
2 Know how to mark off for the manufacture of marine steelwork components	2.1 explain the specific safety precautions to be taken when carrying out marking-off activities in a marine fabrication environment, and when using plate or rolled section materials, both on land and onboard vessels (including general workshop and site safety, appropriate personal protective equipment, accident procedure; statutory regulations, risk assessment procedures and COSHH regulations) 2.2 explain what personal protective clothing and equipment needs to be worn when carrying out the marking-off activities 2.3 explain the correct methods of moving or lifting plate and rolled section materials			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.4 describe the hazards associated with marking off fabricated components (such as working in a marine fabrication environment, lifting and handling plate/fabricated components, slivers/burrs on plate materials, using marking-out mediums, using laser marking-out equipment), and explain how they can be minimised 2.5 explain how to obtain and interpret information from job instructions, engineering drawings and specifications, in relation to the work undertaken 2.6 explain what preparations need to be carried out on the material prior to marking out, to enhance clarity, accuracy and safety 2.7 explain the use of patterns and templates as aids to assist in the marking-out process 2.8 explain the principles of marking out, developing basic shapes (including flat, rectangular and cylindrical) from flat plate or rolled section materials 2.9 describe the various marking-out tools and equipment that can be used to mark off straight lines, angles, circles and profiles 2.10 explain the use of marking-out conventions, datum edges/lines and centre lines 2.11 explain the ways of laying out the shapes/patterns to maximise the use of plate or sheet material			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.12 describe the methods of marking out large or long shapes 2.13 explain how to mark out and transfer information from templates 2.14 explain the care and control procedures for marking-out tools and equipment 2.15 explain the need for clear and dimensional accuracy in marking out to specifications/drawings 2.16 describe the things that can go wrong in marking out the marine components, and explain how these can be avoided 2.17 describe the extent of their own responsibility, and explain whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____

(*if sampled*)

Unit 21: Cutting marine steelwork using handheld thermal cutting equipment

Unit reference number: J/601/1983

Level: 2

Credit value: 22

Guided learning hours: 56

Unit summary

This unit covers the skills and knowledge needed to prove the competences required for cutting and shaping marine steelwork, such as plate of 3mm thickness and above, rolled sections, pipe and tube for marine fabrications, using handheld thermal cutting equipment, in accordance with approved procedures. The equipment to be used will include handheld oxy-fuel gas cutting equipment or hand plasma cutting equipment. Learners will be required to assemble and set up the appropriate equipment to be used, for the material and thickness to be cut, the type of operation to be carried out and the accuracy required. Materials to be cut and shaped may include mild steel, stainless steel, special steels and other appropriate materials, and will include guided cuts, vertical cuts, overhead cuts, external curved contours, round and square holes and demolition work, as appropriate.

Learners' responsibilities will require them to comply with organisational policy and procedures for the cutting operations undertaken, and to report any problems with the equipment, materials, consumables or cutting activities that they cannot personally resolve, or are outside their personal responsibilities, to the relevant authority. They will be expected to work to instructions, with a minimum of supervision, taking personal responsibility for their own actions and for the quality and accuracy of the work that they carry out.

Learners' knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to applying thermal cutting procedures in a marine environment. They will understand the cutting processes, and will know about the equipment, its application, the materials and consumables in adequate depth to provide a sound basis for carrying out the activities to the required specification.

Learners will need to understand the safety precautions required when working with the thermal cutting equipment, especially those with regard to fire and potential explosion, and the necessary safeguards for undertaking the activities safely and correctly. They will be expected to demonstrate safe working practices throughout, and will understand the responsibilities they owe to themselves and others in the workplace.

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Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Cut marine steelwork using handheld thermal cutting equipment	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 use one of the following thermal cutting methods: • handheld oxy-fuel gas-cutting equipment • handheld plasma gas-cutting equipment 1.3 confirm that the machine is set up and ready for the cutting activities to be carried out by carrying out all of the following checks: • the equipment selected is suitable for the operations to be performed • regulators, hoses and valves are securely connected, and are free from leaks and damage • the correct gas nozzle is fitted to the cutting torch • a flashback arrestor is fitted to the gas equipment • appropriate gas pressures are set • the correct procedure is used for lighting, adjusting and extinguishing the cutting flame • hoses are safely routed and protected at all times • gas cylinders are handled and stored, safely and correctly			

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Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.4 manipulate the machine tool controls safely and correctly in line with operational procedures 1.5 perform thermal cutting operations, to produce four of the following features: • down-hand straight cuts — freehand • straight cuts — track guided • vertical cuts • overhead cuts • regular shapes • irregular shapes • angled cuts • radial cuts • rough cutting (demolition) • gouging/flushing • bevelled edge (weld preparations) 1.6 produce thermal cuts in two of the following forms of material: • plate • rolled sections • pipe/tube			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.7 produce cut profiles for one type of material from the following: • mild steel • high tensile steel • other appropriate metal 1.8 produce components to the required quality and within the specified dimensional accuracy 1.9 produce thermally cut components which meet all of the following standards: • dimensional accuracy is within the tolerances specified on the drawing/specification, or within +/- 1.5mm • angled/radial cuts are within specification requirements (perpendicular/angularity/elliptical/parabolic) • cuts are clean and smooth, with minimal drag lines 1.10 carry out quality sampling checks at suitable intervals 1.11 deal promptly and effectively with problems within their control and report those that cannot be solved 1.12 shut down the equipment to a safe condition on conclusion of the machining activities			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
2 Know how to cut marine steelwork using handheld thermal cutting equipment	2.1 explain the specific safety precautions to be taken when working with portable thermal cutting equipment in a marine fabrication environment, both on land and onboard vessels (including general workshop and site safety, appropriate personal protective equipment, fire and explosion prevention, protecting other workers, safety in enclosed/confined spaces; fume control; accident procedure; statutory regulations) 2.2 explain what personal protective clothing and equipment needs to be worn when working with marine steelwork and thermal cutting equipment (including leather aprons and gloves, eye protection and safety helmets) 2.3 explain the correct methods of moving or lifting plate materials and components 2.4 describe the hazards associated with thermal cutting (including naked flames, fumes and gases, explosive gas mixtures, oxygen enrichment, spatter, hot metal, elevated working, enclosed spaces), and explain how they can be minimised 2.5 explain the safe working practices and procedures for using thermal equipment in line with British Compressed Gas Association (BCGA) codes of practice (to include setting-up procedures, permit-to-work procedures and emergency shutdown procedures)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.6 explain how to obtain and interpret information from job instructions, drawings and thermal cutting specifications, in relation to the work undertaken 2.7 explain the basic principles of thermal cutting and related equipment; the various techniques and their limitation; care of the equipment to ensure that it is safe and ready to use 2.8 describe the accessories that can be used with handheld thermal cutting equipment to aid cutting operations (such as guides, trammels, templates); arrangements for attaching cutting aids to the equipment 2.9 explain the types of gases used in thermal cutting, gas identification and colour codes, their particular characteristics and safety procedures 2.10 explain how to set up the thermal cutting equipment (including connection of hoses, regulators and flashback arrestors); selection of cutting torch and nozzle size in relationship to material thickness and operations performed 2.11 describe the preparations that need to be carried out prior to cutting (including checking connections for leaks, setting gas pressures, setting up the material/workpiece and checking the cleanliness of materials used)			

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Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.12 explain the holding methods that are used to aid thermal cutting, and the equipment that can be used 2.13 explain how to set up the correct operating conditions (including flame control, and the effects of mixtures and pressures associated with thermal cutting) 2.14 explain the correct procedure for lighting and extinguishing the flame, and the importance of following the procedure 2.15 explain the procedures to be followed for cutting specific materials, and why these procedures must always be adhered to 2.16 explain the terminology used in thermal cutting, in relation to the operations being performed 2.17 describe the problems that can occur with thermal cutting, and how they can be avoided (including causes of distortion during thermal cutting and methods of controlling distortion) 2.18 explain the effects of oil, grease, scale or dirt on the cutting process 2.19 explain the causes of cutting defects, how to recognise them, and methods of correction and prevention 2.20 describe the procedure for the safe disposal of waste materials			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.21 describe the extent of their own responsibility, and explain whom they should report to if they have problems that they cannot resolve			

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Unit 22: Cutting and shaping marine steelwork using gas cutting machines

Unit reference number: R/601/1985

Level: 2

Credit value: 28

Guided learning hours: 56

Unit summary

This unit covers the skills and knowledge needed to prove the competences required for cutting and shaping marine steelwork, such as plate (3mm thickness and above), rolled sections, pipe and tube for fabrications, using fixed or portable gas cutting machines, in accordance with approved procedures. Learners will be required to assist in the assembling and setting up of the appropriate equipment to be used, for the material and thickness to be cut, the type of operation to be carried out, and the accuracy to be achieved.

Materials to be cut and shaped may include mild steel, stainless steel, special steels and other appropriate materials, and will include straight cuts, external curved contours, round and square holes and internal curved contours.

Learners' responsibilities will require them to comply with organisational policy and procedures for the thermal cutting operations undertaken, and to report any problems with the equipment, materials, consumables or cutting activities that they cannot personally resolve, or are outside their personal responsibilities, to the relevant authority. They will be expected to work to instructions, with a minimum of supervision, taking personal responsibility for their own actions and for the quality and accuracy of the work that they carry out.

Learners' knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to applying machine gas cutting procedures. They will have an understanding of the gas cutting process, and its application, and will know about the equipment, materials and consumables in adequate depth to provide a sound basis for carrying out the activities to the required specification.

Learners will understand the safety precautions required when working with the gas cutting equipment, especially those with regard to fire and potential explosion, and the necessary safeguards for undertaking the activities safely and correctly. The learner will be expected to demonstrate safe working practices throughout, and will understand the responsibilities they owe to themselves and others in the workplace.

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Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe D.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Cut and shape marine steelwork using gas cutting machines	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 use one of the following types of gas cutting machine: • fixed bench or gantry type machine • portable track-driven cutting machine 1.3 confirm that the machine is set up and ready for the cutting activities to be carried out by carrying out all of the following checks: • hoses and equipment are securely connected, and are free from leaks and damage • the correct gas nozzle is fitted to the cutting torch • appropriate gas pressures are set and maintained, as instructed • the correct procedure is used for lighting, adjusting and extinguishing the cutting flame • hoses are safely routed and protected at all times • where appropriate, gas cylinders are handled and stored, safely and correctly			

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Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.4 manipulate the machine tool controls safely and correctly in line with operational procedures 1.5 perform thermal cutting operations to produce four of the following features: • straight cuts • square/rectangular shapes • irregular shapes • angled cuts • external curved contours • round holes • square holes • internal curved contours • weld preparations 1.6 produce thermal cuts in two of the following forms of material: • plate • bar • rolled sections • pipe/tube			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.7 produce cut profiles for one type of material from the following: • mild steel • high tensile steel • stainless steel • special steels • other appropriate metal 1.8 produce components to the required quality and within the specified dimensional accuracy 1.9 produce cut components which meet all of the following quality and accuracy standards: • dimensional accuracy is within the tolerances specified on the drawing/specification, or within +/- 2 mm • angled/radial cuts are within specification requirements (perpendicular/angularity/elliptical/parabolic) • cuts are clean and smooth, with minimal drag lines 1.10 carry out quality sampling checks at suitable intervals			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.11 deal promptly and effectively with problems within their control and report those that cannot be solved 1.12 shut down the equipment to a safe condition on conclusion of the machining activities			
2 Know how to cut and shape marine steelwork using gas cutting machines	2.1 explain the specific safety precautions to be taken when working with gas cutting machines in a fabrication environment (to include general workshop and site safety, fire and explosion prevention, protecting other workers, safety in enclosed/confined spaces; fume control; accident procedures; statutory regulations) 2.2 explain what personal protective clothing and equipment needs to be worn when working with marine steelwork and gas-cutting equipment (such as leather aprons and gloves, eye protection, safety helmets etc) 2.3 explain the correct methods of moving or lifting plate materials and components 2.4 describe the hazards associated with using gas cutting machines (such as naked flames, fumes and gases, explosive gas mixtures, oxygen enrichment, spatter, hot metal), and explain how they can be minimised			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.5 explain the safe working practices and procedures for using gas cutting machines in line with British Compressed Gas Association (BCGA) Codes of Practice (to include setting-up procedures, permit-to-work procedures and emergency shutdown procedures) 2.6 explain how to obtain and interpret information from job instructions, drawings and thermal cutting specifications, in relation to the work undertaken 2.7 explain the basic principles of thermal cutting and related equipment; the various techniques and their limitation; care of the equipment to ensure that it is safe and ready to use 2.8 describe the preparations that need to be carried out prior to cutting (checking connections for leaks, setting gas pressures, setting up the material/workpiece, checking cleanliness of materials used) 2.9 explain the holding methods that are used to aid gas cutting, and the equipment that can be used 2.10 explain how to set up the correct operating conditions; flame control and the effects of mixtures and pressures associated with gas cutting machines			

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Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.11 explain the correct procedure for lighting and extinguishing the flame, and the importance of following the procedure 2.12 explain the procedures for cutting specific materials, and why these procedures must always be adhered to 2.13 explain the terminology used in gas cutting, in relation to the operations being performed 2.14 describe the problems that can occur with gas cutting, and explain how they can be avoided; causes of distortion during gas cutting, and methods of controlling distortion 2.15 explain the effects of oil, grease, scale or dirt on the cutting process 2.16 explain the causes of cutting defects, how to recognise them, and methods of prevention and correction 2.17 describe the extent of their own authority, and explain whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____

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Unit 23: Cutting marine steelwork using saws and abrasive discs

Unit reference number: Y/601/1986

Level: 2

Credit value: 13

Guided learning hours: 42

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to cut and shape marine steelwork using saws and abrasive discs, in accordance with approved procedures. Learners will be required to select the appropriate equipment for the operations to be carried out, and to check that it is in a safe and usable condition. In carrying out the cutting and shaping operations, they will be expected to use saws and abrasive discs to cut and shape the materials to the required accuracy and specification.

Learners' responsibilities will require them to comply with organisational policy and procedures for the cutting activities undertaken, and to report any problems with the equipment or with the cutting activities that they cannot personally resolve, or are outside their permitted authority, to the relevant people. They will be expected to work to instructions, with a minimum of supervision, taking personal responsibility for their own actions and for the quality and accuracy of the work that they carry out.

Learners' knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to applying cutting procedures to marine steelwork using saws and abrasive discs. They will have an understanding of the suitability of the cutting processes, and their applications, and will know about the characteristics of the materials, and the appropriate processes and techniques in adequate depth to provide a sound basis for carrying out the activities to the required specification.

Learners will understand the safety precautions required when carrying out the cutting and shaping activities. They will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

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Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1. Cut marine steelwork using saws and abrasive discs	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 use one of the following types of saw: • band saw • mechanical hacksaw • circular saw Plus one of the following abrasive cutting tools: • handheld portable abrasive disc • Radiac abrasive disc 1.3 confirm that the equipment is fit for purpose and used safely, by carrying out all of the following: • selecting the appropriate equipment/machine for the operation being performed • checking that machine guards and safety devices are in position and function correctly • checking that cutting discs/blades are in a serviceable condition (free from damage or chips, and are sharp) • isolating the equipment from its power supply whilst changing blades or discs • using the equipment safely and correctly, and only for its intended purpose			

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Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.4 confirm that the machine is set up and ready for the machining activities to be carried out 1.5 manipulate the machine tool controls safely and correctly in line with operational procedures 1.6 cut and shape components which contain all of the following features: • straight parallel cuts • square cuts • notches • curved contours • angled cuts • chamfers/mitred cuts 1.7 cut and shape three of the following forms of material: • flat plate • solid bar (square, round, hexagonal etc) • rolled sections (angle, channel, RSJ) • pipe/tube • rail section 1.8 produce components to the required quality and within the specified dimensional accuracy			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.9 produce components that comply with all of the following quality and accuracy requirements: • materials dimensional accuracy is within specification tolerances • cuts are square and clean, and are free from excessive burrs • angled cuts are within specification requirements 1.10 carry out quality sampling checks at suitable intervals 1.11 deal promptly and effectively with problems within their control and report those that cannot be solved 1.12 shut down the equipment to a safe condition on conclusion of the machining activities			
2 Know how to cut marine steelwork using saws and abrasive discs	2.1 explain the specific safety precautions to be taken when working in a marine fabrication environment, and when working with power-operated saws and abrasive disc cutting machines (to include risk assessment procedures, accident procedures, and relevant requirements of HASAWA, COSHH and Work Equipment Regulations) 2.2 explain what personal protective clothing and equipment needs to be worn when carrying out the cutting activities (leather gloves, eye protection, safety helmets etc)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.3 explain the safe working practices and procedures to be observed when working with the machines (including emergency shutdown procedures) 2.4 explain the correct methods of moving or lifting heavy plate or rolled sections 2.5 describe the hazards associated with cutting and shaping marine steelwork using saws and abrasive cutting equipment (such using dangerous or badly maintained tools and equipment; airborne particles; hot metal; burrs and sharp edges), and explain how they can be minimised 2.6 explain how to obtain and interpret information form job instructions, drawings and cutting specifications, in relation to the work undertaken 2.7 explain how to interpret marking-out conventions (cutting lines, centre lines etc) 2.8 describe the range of machine saws available (such as power hacksaws, circular saws and band saws) 2.9 describe the abrasive cutting equipment available (to include handheld portable machines and bench-type radiac cutting machines) 2.10 explain the selection and fitting of abrasive cutting discs; cutting disc identification markings, and how to identify the correct type of disc for the type of material being cut			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.11 explain the statutory regulations regarding the fitting and use of abrasive discs 2.12 explain the use and care of tools and equipment (such as checking that trailing leads, plugs and sockets are in a safe and usable condition) 2.13 explain the use of safety screens to protect other uses from flying sparks whilst using abrasive cutting discs 2.14 explain the importance of ensuring that the machine guards are correctly fitted and positioned before using the equipment 2.15 explain how to set and adjust power saws for the various operations being performed 2.16 explain the importance of using tools or equipment only for the purpose intended; the care that is required when using the tools or equipment; the proper way of preserving tools or equipment between operations 2.17 describe the things that can go wrong when cutting materials using saws or abrasive discs, and explain how these can be avoided 2.18 describe the inspection techniques that can be applied to check that shape and dimensional accuracy is to specification and within acceptable limits			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.19 describe the extent of their own authority, and explain whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____

(*if sampled*)

Unit 24: Cutting marine steelwork using shearing machines

Unit reference number: H/601/1988

Level: 2

Credit value: 21

Guided learning hours: 56

Unit summary

This unit covers the skills and knowledge needed to prove the competences required for cutting and shaping marine steelwork, such as metal plate and sections (3 mm thickness and above) for marine fabrications, using guillotines or section-cropping machines, in accordance with approved procedures. Learner will be required to select the appropriate equipment and machine settings to use, for the material, thickness and the accuracy to be achieved. Items to be cut and shaped may include ferrous and non-ferrous materials, and will include parallel cuts, square cuts, and cuts that are at an angle. These cuts will be achieved by working to marking out, and by setting the machine's backstop when multiple cutting is required.

Learners' responsibilities will require them to comply with organisational policy and procedures for the activities undertaken, and to report any problems with the equipment, materials or cutting activities that they cannot personally resolve, or are outside their permitted authority, to the relevant people. They will be expected to work to instructions, with a minimum of supervision, taking personal responsibility for their own actions and for the quality and accuracy of the work that they produce.

Learners' knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to applying metal shearing procedures. They will have an understanding of the shearing processes, the equipment and its application, and will know about the process in adequate depth to provide a sound basis for carrying out the activities to the required specification.

Learners will understand the safety precautions required when working with shearing machines, and with their associated tools and equipment. They will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

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Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Cut marine steelwork using shearing machines	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 confirm that the equipment is safe and fit for purpose, by carrying out all of the following checks: • the appropriate equipment/machine is selected for the operation being performed • the machine guards and safety devices are in position, and function correctly • cutting blades are in a usable condition • the machine is set for the material thickness to be cut (where applicable) 1.3 confirm that the machine is set up and ready for the machining activities to be carried out 1.4 cut metal plate or section using one of the following types of shearing machine: • guillotines • section-cropping machine 1.5 manipulate the machine tool controls safely and correctly in line with operational procedures			

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Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.6 cut materials using both of the following techniques: • to markings • using machine backstop for multiple cutting 1.7 perform operations that produce straight and accurate cuts, which include both of the following: • parallel cuts • square cuts 1.8 cut plate, sections or bars for one appropriate material from the following: • carbon steel • stainless steel • aluminium • other specific materials 1.9 produce components to the required quality and within the specified dimensional accuracy which meet all of the following: • dimensional accuracy is within the tolerances specified on the drawing/specification • cut components are free from excessive distortion • cut edges are neat and free from false tool cuts and shearing slivers			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.10 carry out quality sampling checks at suitable intervals 1.11 deal promptly and effectively with problems within their control and report those that cannot be solved 1.12 shut down the equipment to a safe condition on conclusion of the machining activities			
2 Know how to cut marine steelwork using shearing machines	2.1 explain the specific safety precautions to be taken when working in a marine steelwork environment, and when working with shearing machines (to include general workshop and site safety, accident procedure; risk assessment procedures and relevant requirements of HASAWA, COSHH and Work Equipment Regulations) 2.2 explain what personal protective clothing and equipment needs to be worn when carrying out the steelwork cutting activities (such as leather gloves, eye protection, safety helmets etc) 2.3 explain the safe working practices and procedures for operating shearing machines 2.4 explain the correct methods of moving or lifting heavy plate, and the equipment to be used 2.5 describe the hazards associated with marine steelwork and shearing operations (such as using dangerous or badly maintained tools and equipment; lifting and handling plate; operating machinery), and explain how they can be minimised			

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Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.6 explain how to obtain and interpret information from job instructions, drawings and cutting specifications in relation to the work undertaken 2.7 explain how to interpret marking-out conventions (cutting lines, centre lines etc) 2.8 describe the various shearing machine-cutting methods and techniques (such as cutting to marking out, and using the machine backstops for multiple pieces) 2.9 explain the material handling and preparation methods (such as degreasing, de-burring, straightening) 2.10 explain how to set and adjust guillotine blades for the material thickness 2.11 describe the tool and equipment care and control procedures, and how to recognise when the cutting blades require changing 2.12 explain the importance of using tools or equipment only for the purpose intended; the care that is required when using the tools or equipment; the proper way of preserving tools or equipment between operations 2.13 describe the safety mechanisms and devices that are on the machine, and explain why they must always be used (such as machine guards, interlocks, safety operating devices)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.14 describe the things that can go wrong when shearing materials, and explain how these can be avoided 2.15 describe the inspection techniques that can be applied to check that shape and dimensional accuracy are to specification and within acceptable limits 2.16 describe the extent of their own authority, and explain whom they should report to if they have problems that they cannot resolve			

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Unit 25: Drilling and finishing holes in marine steelwork

Unit reference number: T/601/2000

Level: 2

Credit value: 10

Guided learning hours: 49

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to drill and finish holes in marine steelwork, such as sheet, plate, rolled section or pipe, using drilling machines, in accordance with approved procedures. Learners will be required to select the appropriate drilling equipment to use, based on the operations to be performed and the size of the component to be worked on. They will be expected to use appropriate workholding methods and techniques to secure the workpiece for the drilling operations, and this will include the use of jigs, clamps, machine vice and other appropriate holding devices. In drilling and finishing the holes, learners will need to position the drill bits accurately, and to use appropriate speeds and feeds to drill and finish the holes to the required specification. Drilling and finishing operations will include through holes, blind holes, counterbored holes, countersunk holes, spot facing, reaming and tapping.

Learners' responsibilities will require them to comply with organisational policy and procedures for the drilling activities undertaken, and to report any problems with the equipment or drilling activities that they cannot personally resolve, or are outside their permitted authority, to the relevant people. They will be expected to work to instructions, with a minimum of supervision, taking personal responsibility for their own actions and for the quality and accuracy of the work that they carry out.

Learners' knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to applying the drilling and finishing procedures. They will have an understanding of the drilling equipment used and its application, together with the material characteristics and the appropriate tooling for carrying out the drilling and finishing process. Learners will know about the basic principles and requirements of securing the workpiece prior to carrying out the process, in adequate depth to provide a sound basis for carrying out the drilling activities safely and correctly, ensuring that the work output meets the required specification.

Learners will understand the safety precautions required when carrying out the drilling and finishing activities. They will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace.

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Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Drill and finish holes in marine steelwork	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 use two of the following drilling machines: • handheld drilling machine • pillar/bench drill • radial arm drill • other (specify) 1.3 use two of the following workholding devices: • jigs/fixtures • machine vice • clamps • other (specify) 1.4 ensure that the equipment is fit for purpose and used safely, by carrying out all of the following: • selecting the appropriate drilling equipment/machine for the operation being performed • checking that machine guards and safety devices are in position and function correctly • checking that drill bits and cutting tools are in a serviceable condition (such as being sharp, and free from damage or chips)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• isolating the equipment from its power supply whilst changing drill bits • securely clamping/restraining the components during the drilling operations • using the equipment safely and correctly, and only for its intended purpose 1.5 confirm that the machine is set up and ready for the machining activities to be carried out 1.6 manipulate the machine tool controls safely and correctly in line with operational procedures 1.7 carry out three of the following drilling and finishing operations: • drilling through holes • drilling holes to a depth • counterboring holes • countersinking holes • centre drilling • spot facing • trepanning holes • tapping holes • jig or template drilling • component alignment drilling			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.8 produce drilled holes in two of the following material types: • ferrous sheet/plate/sections • stainless steel sheet/plate/sections • non-ferrous sheet/plate/sections • non-metallic materials • composite materials 1.9 produce components to the required quality and within the specified dimensional accuracy which meet all of the following, as applicable to the process: • dimensional and positional accuracy is within specification tolerances • drilled holes are correctly formed and free from excessive tool marks • counterbores, countersinks and spot facings meet job requirements 1.10 carry out quality sampling checks at suitable intervals 1.11 deal promptly and effectively with problems within their control and report those that cannot be solved 1.12 shut down the equipment to a safe condition on conclusion of the machining activities			

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Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
2 Know how to drill and finish holes in marine steelwork	2.1 explain the specific safety precautions to be taken when working in a marine steelwork environment, and when carrying out drilling and finishing operations on materials used in marine fabrications (to include general workshop and site safety, accident procedures; risk assessment procedures and relevant requirements of HASAWA, COSHH and Work Equipment Regulations) 2.2 explain what personal protective clothing and equipment needs to be worn when carrying out the fabrication activities (such as leather gloves, eye protection, safety helmets etc) 2.3 explain the correct methods of moving or lifting materials 2.4 explain the safe working practices and procedures to be used when using portable power-operated tools and drilling machines (including emergency stop procedures for the machines) 2.5 describe the hazards associated with carrying out drilling work on marine steelwork (such as using dangerous or badly maintained tools and equipment; insecure or poorly clamped workpieces; airborne metal particles; sharp edges and splinters), and explain how they can be minimised			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.6 explain how to obtain and interpret information from job instructions, drawings and thermal cutting specifications in relation to the work undertaken 2.7 explain how to interpret marking-out conventions (cutting lines, centre lines etc) 2.8 explain the various types and application of drilling machines (including portable power tools, bench and pedestal machines and radial arm machines) 2.9 explain the range of drilling and hole-finishing tools available (including twist drills, reamers, counterbore tools, countersink tools, spot-facing tools) 2.10 explain the methods of holding and securing the drills and finishing tools into the machine spindle (including chucks, taper shank sleeves, collet chucks) 2.11 explain the methods of holding and securing workpieces for drilling (such as jigs and fixtures, machine vices, clamps and restraining devices) 2.12 explain the methods used to align the drill with the workpiece, and the use of centre drills and pilot drills 2.13 explain how to check that the drill hole is in the correct position before drilling to the full diameter			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.14 explain how to correct a drill that has been started off-centre 2.15 explain the selection of speeds and feeds for drilling, reaming and finishing operations 2.16 explain the selection of cutting fluids and compounds for drilling 2.17 describe the care and control of tools and equipment; checking that portable power tool leads, plugs and sockets are in a safe and usable condition 2.18 explain the importance of using tools or equipment only for the purpose intended; the care that is required when using the tools or equipment; the proper way of preserving tools or equipment between operations 2.19 describe the things that can go wrong with drilling operations, and explain how these can be avoided 2.20 describe the extent of their own authority and explain whom they should report to if they have problems that they cannot resolve			

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Unit 26: Operating CNC fabrication machines

Unit reference number: A/601/2001

Level: 2

Credit value: 35

Guided learning hours: 77

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to operate computer numerical controlled (CNC) fabrication machines, such as shearing machines, gas, laser or plasma cutting, punching, bending and forming machines, in accordance with approved procedures.

Learners will be expected to take charge of the prepared machine and check that it is ready for the machining operations to be performed. This will involve checking that all the required materials and consumables are present, and that the machine has been approved for production. In operating the machine, learners will be expected to follow the correct procedures for calling up the operating program, dealing with any error messages, and executing the program activities safely and correctly.

Learners will be required to continuously monitor the cutting or forming operations, making any necessary adjustments to machine parameters, in line with their permitted authority. Meeting production targets will be an important issue, and their production records must show consistent and satisfactory performance.

Learners' responsibilities will require them to comply with organisational policy and procedures for the CNC machining activities undertaken, and to report any problems with the equipment, tooling, program, materials or activities that they cannot personally resolve, or are outside their permitted authority, to the relevant people. They will be expected to work to instructions, with a minimum of supervision, taking personal responsibility for their own actions and for the quality and accuracy of the work that they produce.

Learners' knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to applying CNC fabrication machining procedures. They will have an understanding of the CNC fabrication machining process used, and its application, and will know about the machine, tooling, materials, machining activities and consumables in adequate depth to provide a sound background to machine operation and for carrying out the activities to the required specification.

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Learners will understand the safety precautions required when working with the machine, its associated tools and equipment. They will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Operate CNC fabrication machines	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 operate one of the following CNC fabrication machines: • shearing machine • punching machine • forming machine • bending machine • plasma cutting • laser cutting • gas cutting 1.3 confirm that the equipment is set up and ready for operation by carrying out all of the following: • checking that the correct operating program is loaded and is at the correct start point • ensuring that machine guards are in place and correctly adjusted • positioning and securing material/components without distortion • checking that cutting tools/tooling are in a suitable condition			

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Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• setting plate/section datums and positioning the machine • updating program tool data, as applicable • ensuring that the correct start-up procedures are observed • ensuring that machine settings are adjusted as required to maintain accuracy 1.4 position and secure the workpiece, using two of the following holding methods/devices: • jigs and fixtures • clamps and stops • pneumatic clamps • other workholding devices 1.5 follow the defined procedures for starting and running the operating system 1.6 produce components which combine several different operations, and which cover five of the following: • straight cuts • square/rectangular profiles • curved profiles • internal profiles			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• holes linearly pitched • holes radially pitched • louvres • swages • bends at 90° • bends of various angles • multi-bend platework • curved plates • other specific operations 1.7 produce components for four of the following: • deck plates • shell plates • transverses/longitudinal girders • frames/longitudinals/stiffeners • bulkheads • web/cantilevers • beam knees/brackets • intercostals/wash plates			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.8 produce components using one of the following types of material: • ferrous • non-ferrous • stainless • special alloys 1.9 deal promptly and effectively with error messages or equipment faults that are within their control and report those that cannot be solved 1.10 monitor the computer process and ensure that the production output is to the required specification 1.11 carry out the necessary checks during production, for accuracy of four of the following: • linear dimensions • position of features • accuracy of profiles • accuracy of louvres and swages • flatness/freedom from excessive distortion			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.12 produce components which meet all of the following quality and accuracy requirements: • dimensional accuracy is within the specification tolerances • the plate conforms to best practice and/or specification, without deformation or cracking • the component conforms to the required shape/geometry (to the template profile) • components to be free from deformity, burrs and sharp edges 1.13 shut down the equipment to a safe condition on conclusion of the activities			
2 Know how to operate CNC fabrication machines	2.1 explain the specific safety precautions to be taken when working with CNC fabrication machines and equipment 2.2 explain the safety mechanisms on the machine, and the procedures for checking that they are operating correctly 2.3 describe the hazards associated with working on CNC cutting and forming machines (such as moving machinery, automatic machine operation, handling cutting tools, lifting and handling workholding devices, handling sheet materials) 2.4 explain how to start and stop the machine, in both normal and emergency situations			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.5 explain the importance of wearing the appropriate protective clothing and equipment, and of keeping the work area clean and tidy 2.6 describe the application of the CNC machine, and the range of operations it can perform 2.7 explain how to obtain and interpret information from job instructions, drawings and machining specifications, in relation to the work undertaken 2.8 explain how to interpret first and third angle drawings, imperial and metric systems of measurement, workpiece reference points and system of tolerancing 2.9 explain how to interpret the visual display and understand the various messages displayed 2.10 explain the function of error messages, and what to do when an error message is displayed 2.11 explain how to find the correct restart point in the program when the machine has been stopped before completion of the program 2.12 describe the operation of the various hand and automatic modes of machine control (such as hand wheels, joysticks, program operating and control buttons)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.13 explain how to operate the machine using single block run, full program run and feed/speed override controls 2.14 explain how to make adjustments to the program operating parameters 2.15 explain how to set and secure the workpiece to the machine, the effects of clamping the workpiece, and how material removal can cause warping/distortion of the finished workpiece 2.16 describe the problems that can occur with the cutting and forming activities, and explain how these can be overcome 2.17 describe the quality control procedures used, inspection checks to be carried out, and the equipment that is used for this 2.18 describe the extent of their own responsibility, and explain whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____

(*if sampled*)

Unit 27: Shaping marine steelwork using a power press

Unit reference number: Y/601/2040

Level: 2

Credit value: 28

Guided learning hours: 56

Unit summary

This unit covers the skills and knowledge needed to prove the competences required for bending and forming marine steelwork (of 3mm and above) for marine fabrications, using power-operated equipment such as press brakes, bending machines and power presses, in accordance with approved procedures. Learners will be required to operate the appropriate bending and forming equipment, in accordance with the instructions for the operations being performed. They will need to check that all the required safety devices are operating correctly, and that the machine guards are in place and correctly adjusted.

Items to be bent and formed may include ferrous and non-ferrous materials, and tasks will include producing bends of various angles, setting plate ends for rolling operations, and producing curved sections.

Learners' responsibilities will require them to comply with organisational policy and procedures for the activities undertaken, and to report any problems with the equipment, materials, tooling or bending activities that they cannot personally resolve, or are outside their personal authority, to the relevant people. Learners will be expected to work to instructions, with a minimum of supervision, taking personal responsibility for their own actions and for the quality and accuracy of the work that they carry out.

Learners' knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to applying the power pressing procedures required. They will have an understanding of the bending processes, and will know about the equipment and its application in adequate depth to provide a sound basis for carrying out the activities, and for ensuring that the completed work is to the required specification.

Learners will understand the safety precautions required when working with power-operated presses, and the safeguards necessary for undertaking the activities safely and correctly. They will be required to demonstrate safe working practices and procedures throughout, and will understand the responsibilities they owe to themselves and others in the workplace.

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Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Shape marine steelwork using a power press	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 use one of the following types of power-operated bending equipment: • press brakes • powered bending machine • power press • variable power press 1.3 confirm that the equipment is safe to use and fit for purpose, by carrying out all of the following checks: • the press is appropriate for the material used and the operation being performed • the machine guards and safety devices are in position, and function correctly • the press is in a safe and serviceable condition • press settings are suitable for the material thickness and operation to be performed • equipment for supporting the plate at the start of the pressing operations is in place 1.4 confirm that the equipment is set up correctly and is ready for use			

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Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.5 manipulate the machine controls safely and correctly in line with operational procedures 1.6 perform operations that produce three of the following: • bends at 90° • bends of various angles, knuckles, cambers or strakes • set plate ends for rolling • box, square and rectangular sections, bulkheads • swaging bulkheads, walls or partitions • multi-bend platework, bulkheads or walls • curved plates, bollards, hawse pipes 1.7 bend and form marine steelwork of 3mm or greater thickness, for one of the following: • carbon steel • stainless steel • aluminium • special metals 1.8 produce components to the required specification			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.9 produce pressed components that conform to all of the following quality and accuracy requirements: • bend position and dimensional accuracy is within the specification tolerances • the pressed plate conforms to best practice and/or specification, without deformation or cracking • the component conforms to the required shape/geometry (to the template profile) 1.10 carry out quality sampling checks at suitable intervals 1.11 deal promptly and effectively with problems within their control and report those that cannot be solved 1.12 shut down the equipment to a safe condition on conclusion of the machining activities			

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Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
2 Know how to shape marine steelwork using a power press	2.1 explain the specific safety precautions to be taken when working with power-operated bending and forming equipment (such as press brakes and/or bending machines) in a marine fabrication environment, both on land and onboard vessels (including general workshop and site safety and accident procedures) 2.2 explain the statutory requirements, risk assessment procedures and relevant requirements of HASAWA, COSHH and Work Equipment Regulations that apply to the work carried out or equipment being used 2.3 explain what personal protective clothing, and handling precautions need to be taken, when working with heavy platework 2.4 explain the correct methods of moving or lifting sheet or plate materials 2.5 describe the hazards associated with power-operated bending and forming processes (such as handling heavy sheet plate materials and components; operating moving equipment; using faulty or badly maintained tools and equipment), and explain how they can be minimised 2.6 explain the safe working practices and procedures required for operating power presses and bending machines			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.7 explain how to obtain and interpret information from job instructions, drawings and bending specifications, in relation to the work undertaken 2.8 explain the marking-out conventions applicable to the bending process (including centre lines and bending lines) 2.9 describe the various types of power-operated bending machines that are used, and their typical applications 2.10 explain the methods and techniques that are used to obtain the required shape and size 2.11 explain the ways of limiting distortion, marking and creases in the finished workpiece 2.12 explain how the materials need to be prepared prior to bending them 2.13 explain the basic characteristics of the materials with regard to the bending operations undertaken 2.14 explain the need to take care of the bending tools and equipment, and how to recognise faulty or damaged forming tools 2.15 explain how bending and forming tools should be stored 2.16 describe the problems that can occur with the bending and forming activities, and explain how they can be avoided			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.17 describe the organisational quality control procedures that are used, and how to recognise defects in the bends that they produce 2.18 explain how to make dimensional and forming inspection checks, and describe the tools and equipment that can be used 2.19 explain the procedure for the safe disposal of waste materials 2.20 describe the extent of their own authority, and explain whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____

(*if sampled*)

Unit 28: Shaping marine steelwork using power rolling machines

Unit reference number: M/601/2044

Level: 2

Credit value: 28

Guided learning hours: 56

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to form marine steelwork for fabrications, in accordance with approved procedures, using power-operated pinch or pyramid rolls, which may be hand adjusted or console controlled. Learner will be required to operate the power rolling machine, based on the operations to be performed and the thickness and size of the material to be rolled. Setting the rolls will involve setting and adjusting the gap between feed and forming rolls to suit plate thickness, positioning side roller(s) and adjusting to suit the required radius, checking and setting parallelism of rollers, and applying suitable pressure to rollers throughout the forming operation.

Learners will be expected to carry out the rolling operation in a manner that ensures that the material is formed to the required profile, without flats or deformities. Learners will also need to check that all the required safety devices are operating correctly, and that the machine guards are in place and correctly adjusted. Items to be rolled will include carbon steel, stainless steel and aluminium, and will include operations such as producing shell plates, mast sections, crane pedestals, save-alls and guards, uptakes, vents, main exhaust units, bollards and funnel plates.

Learners' responsibilities will require them to comply with organisational policy and procedures for the activities undertaken, and to report any problems with the equipment, materials, or rolling activities that they cannot personally resolve, or are outside their personal authority, to the relevant people. They will be expected to work to instructions, with a minimum of supervision, taking personal responsibility for their own actions and for the quality and accuracy of the work that they carry out.

Learners' knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to applying the power rolling procedures. They will have an understanding of the rolling process, and its application, and will know about the equipment and materials in adequate depth to provide a sound basis for carrying out the activities to the required specification.

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Learners will understand the safety precautions required when working with power rolls, and the necessary safeguards for undertaking the activities safely and correctly. They will be required to demonstrate safe working practices and procedures throughout, and will understand the responsibilities they owe to themselves and others in the workplace.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Shape marine steelwork using power rolling machines	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 use one of the following types of power rolling machine: • small rolls (hand adjusted) • large rolls (console adjusted) • variable rolls 1.3 confirm that the equipment is safe to use and fit for purpose by carrying out all of the following checks: • the rolls are appropriate for the material used and the operations being performed • the machine guards and safety devices are in position and operating correctly • rolls are appropriate for the operation and are in a serviceable condition (suitable diameter; free from damage) • roll settings are suitable for the material thickness and operations to be performed • equipment for supporting the plate at the start of the rolling operations is in place			

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Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.4 confirm that the equipment is set up correctly and is ready for use 1.5 manipulate the machine controls safely and correctly in line with operational procedures 1.6 perform rolling operations that produce three of the following marine components: • shell plates (curvatures) • mast sections • crane pedestals • collars/save-alls • guards • main exhaust units • uptakes/vents • bollards • funnel plates • pipe sections • flattening or straightening plate 1.7 carry out rolling operations on one type of material (of 3mm thickness or more) from the following: • carbon steel • stainless steel • aluminium			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.8 produce components to the required specification 1.9 produce rolled marine components that conform to all of the following quality and accuracy requirements: • dimensional accuracy is within the specification tolerances • the rolled plate conforms to best practice and/or specification, without deformation or cracking • the component conforms to the required shape/geometry (to the template profile) 1.10 carry out quality sampling checks at suitable intervals 1.11 deal promptly and effectively with problems within their control and report those that cannot be solved 1.12 shut down the equipment to a safe condition on conclusion of the machining activities			
2 Know how to shape marine steelwork using power rolling machines	2.1 explain the specific safety precautions to be taken when working with rolling machines in a marine fabrication environment, both on land and onboard vessels (including general workshop and site safety, and accident procedures) 2.2 explain the statutory requirements, risk assessment procedures and relevant requirements of HASAWA, COSHH and Work Equipment Regulations that apply to the work or equipment used			

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Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.3 describe the checks to be carried out to ensure that the power rolls are safe and are in a fit condition to use 2.4 describe the hazards associated with marine fabrication work (such as handling sheet/fabricated components, using hot metal techniques, using dangerous or badly maintained tools and equipment, moving parts of power rolling machines), and explain how they can be minimised 2.5 explain what personal protective clothing and equipment needs to be worn when working with heavy platework (such as gloves, eye protection, safety helmets) 2.6 explain the handling precautions and correct methods of moving or lifting sheet or plate materials 2.7 explain how to obtain and interpret information form job instructions, drawings and forming specifications, in relation to the work undertaken 2.8 explain the marking out conventions used in marine platework, and how to recognise the bending, forming and cutting lines 2.9 explain the basic principle of operation of the power rolling machine used, and the type of work it can perform			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.10 explain how to set up the machine to produce the required form (such as mast sections, crane pedestals, bollards, straightening plates) 2.11 explain the techniques of rolling (including pre-setting plate edges, adjusting pressure throughout the rolling operations, checking components for parallelism or form throughout the operations) 2.12 explain how to release the rolls and remove the workpiece when rolling cylindrical and conical sections 2.13 explain the ways of limiting distortion, marking, creases and flats in curved sections 2.14 explain how the materials need to be prepared prior to rolling, and the effects of raw material scale or burrs on the finished article 2.15 explain the material characteristics with regard to forming using rolling machines 2.16 describe the care and maintenance procedures to be observed to ensure that machines are in a serviceable condition 2.17 describe the organisational quality control procedures, and explain how to recognise rolling defects 2.18 describe the inspection checks to be carried out, and the tools and equipment that are used			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.19 describe the extent of their own authority, and explain whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____

(*if sampled*)

Unit 29: Assisting in the assembly of marine steelwork components

Unit reference number: T/601/2045

Level: 2

Credit value: 32

Guided learning hours: 63

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to assist in producing marine steelwork plate (3mm and above) and rolled section assemblies, in accordance with instructions and approved procedures. Learners will be required to identify and select the correct components, lay out and follow the build strategy procedures, bring together, prepare for joining and assemble, in the right order, platework and rolled section components, in order to construct completed marine minor sub-assemblies. The steelwork assemblies produced could cover such things as deck components, shell/cover plates, girders/beams/transverses, seating/platforms, tanks, tube/pipe trusses, guards/uptakes, floor components, brackets and stiffener structures, posts/pillars/columns and cylindrical structures. Learners will be required to lay out and secure the various component parts of the structure, using mechanical fastenings, temporary tack welding or adhesive bonding techniques, in the correct order, ensuring that they are assembled in a manner that is fit for purpose.

Learners' responsibilities will require them to comply with organisational policy and procedures for the marine steelwork assembly activities to be undertaken, and to report any problems with the activities, tools, equipment or materials that they cannot personally resolve, or are outside their permitted authority, to the relevant people. They will be expected to work either with a high level of supervision or as a member of a team. Learners will take personal responsibility for their own actions and for the quality and accuracy of the work that they carry out. When working in a team, they must demonstrate a significant personal contribution to the team activities in order to satisfy the requirements of the standard, and competence in all the areas required by the standard must be demonstrated.

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Learners' knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to applying assembly techniques to marine steelwork. They will have an understanding of the assembly techniques used, the requirements of the manufacturing and assembling procedures, and their application. Learners will know about the methods of assembly and the role of the components in adequate depth to provide a sound basis for carrying out the activities, correcting/reporting faults and ensuring that the sub-assemblies are produced to the required specification.

Learners will understand the safety precautions required when lifting and handling marine steelwork components, and when using the associated tools and equipment. They will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Assist in the assembly of marine steelwork components	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the assembly of the marine steelwork: • correctly prepare and set up the components and faces to be joined • use the correct datum faces • correctly align the components and faces to be joined • assemble/fabricate the platework components, in the correct order or manner • produce an assembly which meets the required specification 1.3 follow the relevant instructions, assembly drawings and any other specifications 1.4 check that the specified components are available and that they are in a usable condition			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.5 use three of the following types of components in the steelwork assemblies produced: • rolled sections • tubes/pipes • stiffeners • brackets/beam knees • flat plates • pressed plates • rolled plates • pre-fabricated components 1.6 use the appropriate methods and techniques to assemble the components in their correct positions 1.7 assemble platework components, using two of the following methods: • temporary tack welding • pin-table jig • panel line fabrication • riveting (hot or cold) • mechanically fastened (nuts and bolts) • adhesive bonding • fairing aids			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.8 assist in producing three of the following steelwork assemblies: • deck assemblies • shell and cover plates • girders/beams/transverses • seating/platforms • tanks • tube/pipe trusses • guards/uptakes • floor/bracket/stiffener structures • posts/pillars/columns • cylindrical structures 1.9 secure the components using the specified connectors and securing devices 1.10 check the completed assembly to ensure that all operations have been completed and the finished assembly meets the required specification			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.11 produce marine sub-assemblies which meet all of the following quality and accuracy requirements: • all components are correctly assembled and aligned, in accordance with the specification • overall dimensions are within specification tolerances • assemblies meet appropriate geometric tolerances (square, straight, angles, free from twists) • where appropriate, the pitch of erection holes meets specification requirements • completed assemblies have secure and firm joints, and are clean and free from burrs or flash 1.12 deal promptly and effectively with problems within their control and report those that cannot be solved			
2 Know how to assist in the assembly of marine steelwork components	2.1 explain the specific safety precautions to be taken when working in a marine steelwork environment, and when producing marine steelwork assemblies (to include general workshop and site safety, accident procedures, risk assessment procedures and relevant requirements of HASAWA, COSHH and Work Equipment Regulations) 2.2 explain what personal protective clothing and equipment needs to be worn when carrying out the sub-assembly activities (including leather gloves, eye protection, safety helmets and ear protection)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.3 explain the safe working practices and procedures for producing marine steelwork assemblies 2.4 explain the correct methods of moving or lifting bulky and heavy components and fabrications 2.5 describe the hazards associated with marine steelwork assembly activities (such as using dangerous or badly maintained tools and equipment; lifting and handling long and heavy components; cuts, slips, trips and falls), and explain how they can be minimised 2.6 explain how to obtain and interpret information form job instructions, drawings and thermal cutting specifications, in relation to the work undertaken 2.7 explain how to interpret marking-out conventions (such as cutting lines, centre lines etc) 2.8 explain what preparations need to be carried out on the components, prior to assembling them 2.9 describe the various methods of securing the assembled components (including nuts and bolts; tack welding methods and techniques; hot and cold riveting; adhesive bonding of components) 2.10 explain how to set up and align the various components, and the tools and equipment to be used			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.11 explain how to hold the joints together to aid the assembly activities (such as jigs, clamps, rivet clamps, jacks and wedges) 2.12 explain the importance of using tools or equipment only for their intended purpose 2.13 explain the care that is required when using the tools or equipment, and the proper way of preserving tools or equipment between operations 2.14 describe the things that can go wrong when producing marine steelwork assemblies, and explain how these can be avoided 2.15 describe the inspection techniques that can be applied to check that shape (including straightness) and dimensional accuracy is to specification and within acceptable limits 2.16 describe the extent of their own authority, and explain whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____

(*if sampled*)

Unit 30: Tack welding fillet joints in marine steelwork

Unit reference number: J/601/2048

Level: 2

Credit value: 20

Guided learning hours: 56

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to produce tack fillet welds in plate, sheet, sections, pipe/tube, using a manual welding process such as manual metal arc, MIG, MAG, TIG, flux-cored wire, inert shield or gas welding equipment, in accordance with instructions and/or approved welding procedures. Learners will be required to check that the workholding equipment and manipulating devices required are available and are in a usable condition. They will also be expected to check the welding equipment to ensure that all the leads/cables, hoses and wire feed mechanisms are securely connected and free from damage.

In preparing to weld, learners will need to set and adjust the welding conditions, in line with the instructions or welding procedure specification. They must operate the equipment safely and correctly, and make any necessary adjustments to settings, in line with their permitted authority, in order to produce the tack welded joints to the required specification. The tack welds produced will satisfy the requirements of BS 4872 or BS EN 287.

Learners' responsibilities will require them to comply with organisational policy and procedures for the tack welding activities undertaken, and to report any problems with the welding equipment or tack welding activities that they cannot resolve, or are outside their permitted authority, to the relevant people. They will be expected to work to instructions, with a minimum of supervision, taking personal responsibility for their own actions and for the quality and accuracy of the work that they carry out.

Learners' knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to applying manual arc tack welding procedures and instructions. They will know about the equipment, materials and consumables in adequate depth to provide a sound background for the tack welding operations to be performed, and for ensuring that the work output is produced to the required specification.

Learners will understand the safety precautions required when working with the welding equipment. They will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace.

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Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Tack weld fillet joints in marine steelwork	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 prepare for the manual welding process, including carrying out all of the following: • obtain the appropriate equipment for the tack welding activities to be carried out (such as type, current capacity) • check the condition of, and correctly connect, welding leads, earthing arrangements and electrode holder (where applicable) • connect all required hoses, regulators and/or flow meters and safety devices (where applicable) • set and adjust welding conditions/parameters in accordance with welding procedure specification • prepare the work area for the welding activities (such as siting welding screens, positioning fume-extraction equipment) • ensure that the workpiece/component is correctly set up with regard to specified joint preparation, and is secure • obtain and wear appropriate personal protective equipment			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.3 follow the relevant joining procedure and job instructions 1.4 check that the joint preparation complies with the specification 1.5 check that joining and related equipment and consumables are as specified and fit for purpose 1.6 make the joints as specified using the appropriate thermal joining technique 1.7 use welding and related equipment for one of the following manual welding processes: • manual metal arc • MIG/MAG • TIG • plasma arc • cored wire 1.8 produce tack-welded joints according to approved welding procedures, in good access situations, in two of the following BS EN 287 positions: • Flat (PA) • Horizontal (PC) • Horizontal Vertical (PB)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• Vertical Upwards (PF) • Vertical Downwards (PG) • Overhead (PE or PD) 1.9 produce fillet tack-welded joints in two of the following forms of material: • plate • sections • pipe/tube • sheet • other (specify) 1.10 produce joints of the required quality and of specified dimensional accuracy which: • satisfy the requirements of BS EN 287 • meet the required dimensional accuracy within specified tolerance 1.11 shut down the equipment to a safe condition on completion of joining activities 1.12 deal promptly with excess and waste materials and temporary attachments, in line with approved and agreed procedures 1.13 deal promptly and effectively with problems within their control and report those that cannot be solved			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
2 Know how to tack weld fillet joints in marine steelwork	2.1 explain the safe working practices and procedures to be observed when working with the selected welding equipment (including general workshop and site safety, fire prevention, protecting other workers from 'arc eye', safety in enclosed/confined spaces; fume control; accident procedure; risk assessment procedures and relevant requirements of HASAWA, COSHH and Work Equipment Regulations) 2.2 explain the correct handling and storage of gas cylinders (including manual handling and use of cylinder trolley, leak detection procedures, relevant British Compressed Gas Association (BCGA) codes of practice, cylinder identification, gas pressures, cylinder and equipment safety features, emergency shutdown procedures) 2.3 describe the hazards associated with the selected welding process (such as live electrical components, poor earthing, arc radiation, fumes and gases, gas supply leaks, spatter, hot slag and metal, grinding and mechanical metal/slag removal; elevated working, enclosed spaces, slips, trips and falls), and explain how they can be minimised 2.4 explain the manual welding process selected, and the different types of welding equipment available			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.5 explain how to obtain and interpret information from job instructions, drawings and welding specifications, in relation to the work undertaken 2.6 explain what consumables are associated with the chosen welding process (such as types of electrodes and/or filler metal and their application; types of shielding gas and their application, gas supply and control; correct control, storage and drying of electrodes and filler wire) 2.7 explain how to set up and restrain the joint to achieve the correct location of components and control of distortion (including edge preparation, use of jigs and fixtures, manipulators and positioners, tack welding size and spacing in relationship to material thickness and component size, use of temporary attachments, pre-setting) 2.8 explain how to prepare the welding equipment, and the checks to be made to ensure that it is safe and ready to use (such as electrical connections, power return and earthing arrangements; equipment calibration before use, setting welding parameters, care and maintenance of the equipment) 2.9 describe the techniques of operating the welding equipment to produce tack welds in the various joint positions (including fine tuning parameters, correct manipulation of the welding gun or electrode, safe closing down of the welding equipment)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.10 explain the importance of complying with job instructions and the welding procedure specification 2.11 describe the problems that can occur with the tack-welding activities, and explain how these can be overcome 2.12 explain the personal approval tests, and their applicability to their work 2.13 describe the extent of their own authority, and explain whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____

(*if sampled*)

Unit 31: Assisting in the installation of marine mechanical equipment

Unit reference number: J/601/2051

Level: 2

Credit value: 32

Guided learning hours: 91

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to assist in the installation of marine mechanical equipment, in accordance with approved procedures. The installation activities will involve installing equipment at component or unit level, on a variety of marine mechanical assemblies and sub-assemblies such as gear boxes, stabilisers, pumps, propeller shafts (including controllable pitch propeller (CPP) systems), steering and rudder arrangements, aircraft lifts, ballast arrangements, engines, weapons equipment, sewage-treatment, reverse osmosis and low pressure steam plant, pantry and galley equipment and other specific marine mechanical equipment.

Learners' responsibilities will require them to comply with organisational policy and procedures for the installation of the marine mechanical equipment, and to report any problems with the installation activities that they cannot personally resolve, or are outside their permitted authority, to the relevant people. They will be expected to work either with a high level of supervision, or as a member of a team. Learners will take personal responsibility for their own actions and for the quality and accuracy of the work that they carry out. Where team working is involved, learners must demonstrate a significant personal contribution during the team activities in order to satisfy the requirements of the standard, and competence in all the areas required by the standard must be demonstrated.

Learners' knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to applying the appropriate mechanical installation techniques and procedures. They will have an understanding of the basic knowledge behind the equipment being installed, and its application, and will know about the installation equipment and fastening devices in adequate depth to provide a sound basis for carrying out the activities to the required specification.

Learners will understand the safety precautions required when carrying out the installation of the marine mechanical equipment, especially those for isolating and/or depressurising the equipment. They will be required to demonstrate safe working practices throughout, and will understand their responsibility for taking the necessary safeguards to protect themselves and others in the workplace, both ashore and afloat.

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Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Assist in the installation of marine mechanical equipment	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the installation of the marine mechanical equipment: • use the correct issue of the structure/vessel/craft installation drawings and documentation • adhere to risk assessment, COSHH and other relevant safety standards • obtain clearance to work on the system, and observe the appropriate power isolation and safety procedures • maintain safe access and working arrangements for the installation area • carry out the installation activities using appropriate techniques and procedures • leave the work area in the prescribed category of cleanliness on completion of the activities 1.3 follow all relevant drawings and specifications for the installation being carried out 1.4 use the correct tools and equipment for the installation operations and check that they are in a safe and usable condition			

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Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.5 install, position and secure the equipment and components in accordance with the specification 1.6 take part in the installation of three of the following types of marine mechanical equipment: • propulsion gear box (single reduction, double reduction, 'V' or 'Z' drive) • pump jet propulsion unit • stabiliser (fixed or retractable) • pump (salt water, fresh water, fuel oil or lubricating) • propeller shaft (fixed blade or controllable pitch propeller (CPP) systems) • steering gear and rudder arrangements (hydraulic or mechanical) • thrusters (bow or stern) • clutch and coupling (gas turbine, steam turbine, diesel or steam reciprocating engine) • processing plant (sewage-treatment, reverse osmosis, distillation or garbage compactor) • liquid-ballast arrangements (pump or isolating valve) • engine (propulsion or power generation) • compressor (high pressure or low pressure)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• pantry and galley equipment (boiling copper, oven, dishwasher or garbage disposal unit) • low pressure steam plant (auxiliary boiler, calorifier, fuel or oil heater) • weapons equipment (gun mounting, missile mounting or weapon-loading system) • lifting and handling equipment (replenishment rig, aircraft lift, cargo hatch, windlass or capstan) 1.7 assist in carrying out eight of the following installation methods and techniques: • marking/setting out of locating and securing positions • preparing holes (such as drilling, cleaning out threads) • positioning equipment/components • levelling equipment • aligning equipment • assembly/connection of components or sub-assemblies • setting timing • setting and adjusting equipment • torque setting of mechanical fasteners			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• earth bonding • lifting and handling • lubricating • making pipe connections • connecting wires and cables • securing using mechanical fixings • securing using adhesives • sealing • applying screw-fastening locking devices • ensuring system cleanliness (such as covering exposed pipe ends or components) 1.8 use six of the following types of fasteners and securing devices: • swing bolts • screws • dowels • quick release fasteners • studs with nuts • wing nuts • bolts • flexible bellows			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• locking devices (such as split, parallel, clevis or taper pin) • keys/keyways (such as slotted, semi-circular, woodruff, taper) 1.9 check that all necessary connections to the equipment are complete 1.10 produce installations, in accordance with one of the following standards: • BS or ISO 9000 standards and procedures • other accepted international standards • customer (contractual) standards and requirements • company standards and procedures • specific system requirements • recognised compliance agency/body's standards 1.11 deal promptly and effectively with problems within their control and report those that cannot be solved 1.12 check that the installation is complete and that all components are free from damage			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.13 complete the relevant paperwork, to include one of the following, and pass it to the appropriate people: • installation record • job cards • timesheets • system log			
2 Know how to assist in the installation of marine mechanical equipment	2.1 explain the specific safety practices and procedures that they need to observe when installing marine mechanical equipment (including any specific legislation, regulations/codes of practice for the activities, equipment or materials) 2.2 explain the procedures to be carried out before starting work on the installation (such as obtaining permits to work, obtaining and complying with risk assessments and other health and safety requirements) 2.3 explain the health and safety requirements of the work area where they are carrying out the activities, and the responsibility they place on them 2.4 describe the hazards associated with installing marine mechanical equipment, and with the tools and equipment used, and explain how these can be minimised 2.5 explain what protective equipment they need to use for both personal protection and protection of the equipment or system			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.6 explain how to obtain and interpret the job instructions, drawings, specifications and other documentation used for the installation activities 2.7 explain the basic operating principles of the marine mechanical equipment being installed 2.8 describe the components to be installed, and their function within the particular marine mechanical equipment 2.9 describe the various mechanical fasteners that will be used, and their method of installation (including threaded fasteners, special securing and locking devices) 2.10 explain the importance of using the specified fasteners and locking devices for the particular installation, and why they must not substitute others 2.11 explain why securing devices need to be locked and labelled, and the different methods that are used 2.12 explain what the torque-loading requirements are on the fasteners, and what to do if these loadings are exceeded or not achieved 2.13 describe the quality control procedures to be followed during the installation operations			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.14 explain the procedures for ensuring that they have the correct tools, equipment, components and fasteners for the activities 2.15 describe the techniques used to position, align, adjust and secure the components, without damage 2.16 explain the methods of lifting, handling and supporting the components/equipment during the installation activities 2.17 explain the use of seals, sealant and adhesives, and the precautions to be taken 2.18 explain why electrical bonding is critical, and why it must be both mechanically and electrically secure 2.19 describe the procedure for the safe disposal of waste materials 2.20 explain the importance of ensuring that the completed installation is free from foreign object debris, and that any exposed components or pipe ends are correctly covered/protected 2.21 describe the tools and equipment used in the installation activities, and their care and control procedures 2.22 explain why tool/equipment control is critical 2.23 describe the problems that can occur with the installation operations, and explain how these can be overcome			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.24 explain the recording documentation to be completed for the activities undertaken 2.25 describe the extent of their own responsibility, and explain whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____

(*if sampled*)

Unit 32: Locating faults in marine mechanical equipment

Unit reference number: R/601/2053

Level: 2

Credit value: 26

Guided learning hours: 49

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to locate faults in marine mechanical equipment, in accordance with approved procedures. Learners will be required to investigate faults on a range of marine mechanical equipment, such as gearboxes, stabilisers, pumps, propeller shafts (including controllable pitch propeller (CPP) systems), steering and rudder arrangements, aircraft lifts, ballast arrangements, engines, weapons equipment, sewage-treatment, reverse osmosis and low pressure steam plant, pantry and galley equipment, and other specific marine mechanical equipment. Learners will be expected to use a variety of fault location methods and procedures, such as gathering information from the person who reported the fault, using recognised fault location techniques, and utilising a number of diagnostic aids and devices.

Learners' responsibilities will require them to comply with organisational policy and procedures for the fault location activities undertaken, and to report any problems with these activities, or with the tools and equipment used, that they cannot personally resolve, or that are outside their permitted authority, to the relevant people. They will be expected to work either with a high level of supervision, or as a member of a team. The learner will take personal responsibility for their own actions and for the quality and accuracy of the work that they carry out. When working in a team, they must demonstrate a significant personal contribution to the team activities in order to satisfy the requirements of the standard, and competence in all the areas required by the standard must be demonstrated.

Learners' knowledge will be sufficient to provide a sound understanding of their work, and will demonstrate an informed approach to applying fault location procedures to marine mechanical equipment. They will have an understanding of the basic fault location methods and techniques used, and their application. Learners will also know how to interpret the information obtained from fault-finding aids and devices in sufficient depth to provide a sound basis for carrying out the activities.

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Learners will understand the safety precautions required when carrying out the fault location activities, especially those for isolating the equipment. They will also understand their responsibilities for safety, and the importance of taking the necessary safeguards to protect themselves and others, both ashore and afloat.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Locate faults in marine mechanical equipment	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the fault location activity: • plan the fault location methods and procedures, in conjunction with others, prior to commencement • use the correct issue of drawings and maintenance documentation • adhere to risk assessment, COSHH and other relevant safety standards • under supervision, ensure the safe isolation of equipment (such as mechanical, electricity, gas, air or fluids) • under supervision, provide safe access and working arrangements for the maintenance area • in conjunction with others, carry out the fault location activities, using approved procedures • identify and confirm the fault, and consider appropriate corrective action • in conjunction with others, take actions to resolve the problem • leave the work area in a safe condition and to the prescribed category of cleanliness			

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Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.3 review and use all relevant information on the symptoms and problems associated with the products or assets 1.4 carry out fault location on two of the following types of equipment: • propulsion gear box (single reduction, double reduction, 'V' or 'Z' drive) • pump jet propulsion unit • stabiliser (fixed or retractable) • pump (salt water, fresh water, fuel oil or lubricating) • propeller shaft (fixed blade or controllable pitch propeller (CPP) systems) • steering gear and rudder arrangements (hydraulic or mechanical) • thrusters (bow or stern) • clutch and coupling (gas turbine, steam turbine, diesel or steam reciprocating engine) • processing plant (sewage-treatment, reverse osmosis, distillation or garbage compactor) • liquid-ballast arrangements (pump or isolating valve) • engine (propulsion or power generation) • compressor (high pressure or low pressure)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• pantry and galley equipment (boiling copper, oven, dish washer or garbage disposal unit) • low pressure steam plant (auxiliary boiler, calorifier, fuel or oil heater) • weapons equipment (gun mounting, missile mounting or weapon loading system) • lifting and handling equipment (replenishment rig, aircraft lift, cargo hatch, windlass or capstan) 1.5 investigate and establish the most likely causes of the faults 1.6 select, use and apply diagnostic techniques, tools and aids to locate faults 1.7 collect evidence regarding the fault, from four of the following sources: • information gathered from the person who reported the fault • fault location techniques (such as six point, half-split, input/output, unit substitution, emergent sequence, performance monitoring) • diagnostic aids (such as manuals, descriptions/drawings, flow charts/algorithms, troubleshooting guides, maintenance records/historic data)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• visual examination (such as checking for breakages, wear/deterioration, overheating, missing parts, lose fittings) • function testing (such as manually switching 'off' and 'on', running equipment, condition of end product) • sensory input (such as sight, sound, smell, touch) • monitoring equipment (such as use of monitoring equipment/gauges, lights and alarms) 1.8 apply two of the following monitoring or testing procedures to help in the fault location: • alignment checks (such as shafts and bearings) • force/pressure checks (such as spring pressure, hydraulic or pneumatic pressures) • leakage checks (such as pipes, valves, glands) • sound/vibration (such as shafts and bearings) • thermal checks (such as bearings, friction surfaces) • movement checks (such as travel, clearance, levers and links)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.9 use two of the following types of test equipment to aid fault location: • measuring instruments/devices • dial test indicators • torque-measuring devices • thermal-imaging equipment • vibration-monitoring equipment • self-diagnostic equipment • sonic leak detectors • soap and water • other specific test equipment 1.10 locate faults that have resulted in two of the following breakdown categories: • intermittent problem • partial failure/out-of-specification output • complete breakdowns 1.11 complete the fault diagnosis within the agreed time and inform the appropriate people when this cannot be achieved 1.12 determine the implications of the fault for other work and for safety considerations			

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Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.13 use the evidence gained to draw valid conclusions about the nature and probable cause of the fault 1.14 record details on the extent and location of the faults in an appropriate format 1.15 provide a record of the outcomes of fault location, using one of the following: • outcome report • corrective action report • company-specific documentation			
2 Know how to locate faults in marine mechanical equipment	2.1 explain the health and safety requirements of the area in which they are carrying out the fault location activities, and the responsibility these requirements place on them 2.2 explain the particular safety precautions to be taken when carrying out fault location on a specific piece of equipment 2.3 explain the isolation and lock-off procedure, or permit-to-work procedure that applies to the equipment or work area 2.4 explain the importance of wearing protective clothing and other appropriate safety equipment during the fault location activities			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.5 describe the hazards associated with carrying out fault location activities on marine mechanical equipment (such as moving machinery, handling oils and greases, stored pressure/force, misuse of tools, using practices or processes that do not follow laid-down procedures), and explain how they can be minimised 2.6 explain how to obtain and interpret information from job instructions, drawings, specifications, manufacturers' manuals, history/maintenance reports and other documents needed in the fault finding process 2.7 explain the procedure to be adopted to establish the background of the fault 2.8 describe the various fault location techniques that can be used, and explain how they are applied (such as six point, half-split, function testing, unit substitution and equipment self-diagnostics) 2.9 explain how to use the various diagnostic aids to help identify the location of the fault 2.10 explain how to use a range of fault finding equipment to investigate the problem (such as measuring devices, torque and run-out devices) 2.11 explain how to use various items of test equipment, and how to check that they are free from damage and defects			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.12 explain how to assess sensory information (sight, sound, smell, touch) 2.13 explain the procedure(s) to be followed for investigating the faults, and how to deal with intermittent faults 2.14 explain how to assess evidence and evaluate the possible causes of faults/problems 2.15 explain how to relate previous reports/records of similar fault conditions 2.16 explain how to determine the likely risk of running the equipment with the displayed fault, and the effects the fault could have on health and safety, and on the overall process or system 2.17 explain how to complete documentation which satisfies the company policy on conclusion of the fault location activity 2.18 describe the things that can go wrong when carrying out fault location activities, and explain what to do if they occur 2.19 describe the extent of their own authority, and explain whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____

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Unit 33: Carrying out scheduled maintenance on marine mechanical equipment

Unit reference number: Y/601/2054

Level: 2

Credit value: 28

Guided learning hours: 63

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to assist in conducting scheduled maintenance activities on marine mechanical equipment, in accordance with approved procedures. This will involve carrying out routine checks and adjustments, in line with marine maintenance procedures, on a variety of marine mechanical equipment, such as gearboxes, stabilisers, pumps, propeller shafts (including controllable pitch propeller (CPP) systems), steering and rudder arrangements, aircraft lifts, ballast arrangements, engines, weapons equipment, sewage-treatment, reverse osmosis and low pressure steam plant, pantry and galley equipment, and other specific marine mechanical equipment, in order to minimise downtime and ensure that the equipment performs at optimum levels and functions to specification.

Learners' responsibilities will require them to comply with organisational policy and procedures for the scheduled maintenance activities undertaken, and to report any problems with these activities, or with the tools and equipment used that they cannot personally resolve or are outside their permitted authority, to the relevant people. Learners must ensure that all tools, equipment and materials used in the maintenance activities are removed from the work area on completion of the activities, and that all necessary job/task documentation is completed accurately and legibly. They will be expected to work either with a high level of supervision or as a member of a team. Learners will take personal responsibility for their own actions and for the quality and accuracy of the work that they carry out. When working in a team, they must demonstrate a significant personal contribution to the team activities in order to satisfy the requirements of the standard, and competence in all the areas required by the standard must be demonstrated.

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Learners' knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to applying scheduled maintenance procedures to marine mechanical equipment. They will have an understanding of the process of implementing scheduled maintenance tasks, the importance of carrying them out at specific times, and of recording their outcomes and actions taken. In addition, learners will be expected to report where the outcome of the scheduled maintenance identifies a requirement for further investigation or maintenance work.

Learners will understand the safety precautions required when carrying out the marine maintenance activities, especially those for isolating the equipment. They will also understand their responsibilities for safety, and the importance of taking the necessary safeguards to protect themselves and others in the workplace, both ashore and afloat.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Carry out scheduled maintenance on marine mechanical equipment	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the scheduled maintenance activity: • undertake the maintenance activities, in conjunction with others involved, to cause minimal disruption to normal working • use the correct issue of drawings, job instructions and procedures • adhere to risk assessment, COSHH and other relevant safety standards • check that the equipment is safely isolated (such as mechanical, electricity, gas, air or fluids) • maintain safe access and working arrangements for the maintenance area • in conjunction with others, conduct maintenance activities, using appropriate techniques and procedures • help to re-connect and return the system to service, on completion of the activities • leave the work area in a safe condition and to the prescribed category of cleanliness			

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Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.3 follow the relevant maintenance schedules to carry out the required work 1.4 carry out the maintenance activities within the limits of their personal authority 1.5 carry out the maintenance activities in the specified sequence and in an agreed time scale 1.6 carry out scheduled maintenance activities on three of the following types of marine mechanical equipment: • propulsion gear box (single reduction, double reduction, 'V' or 'Z' drive) • pump jet propulsion unit • stabiliser (fixed or retracting) • pump (salt water, fresh water, fuel oil or lubricating) • propeller shaft (fixed blade or Controllable Pitch Propeller (CPP) systems) • steering gear and rudder arrangements (hydraulic or mechanical) • thrusters (bow or stern) • clutch and coupling (gas turbine, steam turbine, diesel or steam reciprocating engine) • processing plant (sewage-treatment, reverse osmosis, distillation or garbage compactor)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• liquid-ballast arrangements (pump or isolating valve) • engine (propulsion or power generation) • compressor (high pressure or low pressure) • pantry and galley equipment (boiling copper, oven, dish washer or garbage disposal unit) • low pressure steam plant (auxiliary boiler, calorifier, fuel or oil heater) • weapons equipment (gun mounting, missile mounting or weapon loading system) • lifting and handling equipment (replenishment rig, aircraft lift, cargo hatch. windless or capstan) 1.7 carry out twelve of the following scheduled maintenance procedures: • removing excessive dirt and grime • checking pipes, unions and joints for leaks • replenishing oils and greases • making sensory checks (sight, sound, smell, touch) • checking components for serviceability • making adjustments to components and connections			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• checking that fastenings are secure and to the required torque • replacing 'lifed' consumables (such as fluids, gaskets, seals, hoses) • monitoring the condition/deterioration of components (such as bearings, chains, belts, gears, cams, couplings) • checking that any safety equipment or controls are operating correctly • checking the operation of instrumentation (such as gauges, sensors and indicators) • reviewing and checking equipment operation and performance • recording the results of the scheduled maintenance activity • reporting any defects that require immediate attention (such as excessive wear in components) 1.8 carry out planned maintenance activities on marine mechanical equipment, in accordance with one of the following standards: • BS or ISO standards and procedures • other accepted international standards • customer (contractual) standards and requirements			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• company standards and procedures • specific equipment requirements/manufacturer's data • recognised compliance agency/body's standards 1.9 report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule 1.10 complete relevant maintenance records accurately and pass them on to the appropriate person, to include one of the following: • job cards • permit to work/formal risk assessment • maintenance log or report 1.11 dispose of waste materials in accordance with safe working practices and approved procedures			
2 Know how to carry out scheduled maintenance on marine mechanical equipment	2.1 explain the health and safety requirements of the area in which the marine scheduled maintenance activity is to take place, and the responsibility these requirements place on them 2.2 explain the isolation and lock-off procedures, or permit-to-work procedure that applies to the equipment being maintained			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.3 explain the specific health and safety precautions to be applied during the marine scheduled maintenance procedures, and their effects on others 2.4 describe the hazards associated with carrying out scheduled maintenance activities on marine mechanical equipment (such as moving machinery, handling oils, greases, stored pressure/force, misuse of tools, using damaged or badly maintained tools and equipment, not following laid-down maintenance procedures), and explain how to minimise them 2.5 explain the importance of wearing protective clothing and other appropriate safety equipment during the maintenance process 2.6 explain how to obtain and interpret information from job instructions, drawings, specifications, manufacturers' manuals and other documents needed in the maintenance process 2.7 explain the basic principles of how the equipment functions, its operating sequence, the working purpose of individual units/components and how they interact 2.8 explain the equipment operating and control procedures to be applied during the maintenance activity			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.9 describe the various checks to be carried out during the scheduled maintenance procedure 2.10 explain the procedure for obtaining the consumables to be used during the scheduled maintenance 2.11 describe the methods of checking that components are fit for purpose, how to identify defects and wear characteristics, and the need to replace 'lifed' items (such as seals and gaskets) 2.12 explain how to make appropriate sensory checks (such as sight, sound, smell, touch) 2.13 explain the uses of measuring equipment, such as micrometers, verniers and other measuring devices 2.14 explain how to make adjustments to components/assemblies to ensure that they function correctly (such as setting working clearance, setting travel, setting and adjusting chains and belts) 2.15 explain how to check that tools and equipment are free from damage or defects, are in a safe and usable condition, and are configured correctly for the intended purpose 2.16 explain the importance of maintenance documentation and/or reports following the maintenance activity, and how to complete them			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.17 describe the things that can go wrong when carrying out scheduled routine maintenance, and explain what to do if they occur 2.18 describe the organisational procedure(s) to be adopted for the safe disposal of waste of all types of materials 2.19 describe the extent of their own authority, and explain whom they should report to if they have a problem that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____

(*if sampled*)

Unit 34: Repairing marine mechanical components

Unit reference number: M/601/2058

Level: 2

Credit value: 23

Guided learning hours: 77

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to restore marine mechanical components to usable condition by repair, in accordance with approved procedures. Learners will be required to restore a range of mechanical components and equipment to operational condition, by repairing assemblies/sub-assemblies and components, by reworking the surface, re-cutting threads or replacing worn parts. They will also be required to select the appropriate equipment to use, based on the nature of the repair, the operations that will need to be carried out and the accuracy to be achieved.

In repairing the components, learners will be expected to use a range of hand tools, machine tools, portable power tools, and shaping and fitting techniques, that are appropriate to the type of material and repair being performed. These activities will include such things as sawing (hand, band), drilling, reaming, grinding (hand or pedestal), filing, scraping or lapping, threading (internal or external), basic machining (turning, milling), and thermal processes.

The learners' responsibilities will require them to comply with organisational policy and procedures for the repairing activities undertaken, and to report any problems with these activities, or with the tools, equipment or materials used, that they cannot personally resolve or are outside their permitted authority, to the relevant people. They will be expected to work to instructions, either alone or in conjunction with others, taking personal responsibility for their own actions and for the quality and accuracy of the work that they carry out.

Learners' knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to applying marine component repair procedures. They will have an understanding of the various repair techniques that are used, in sufficient depth to enable them to carry out the required repairs, safely and correctly. Learners will also understand the organisational policy on repairing components, and its application.

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Learners will understand the safety precautions required when carrying out the repair activities, especially those for isolating the equipment. They will also understand their responsibilities for safety, and the importance of taking the necessary safeguards to protect themselves and others in the workplace, both ashore and afloat.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Repair marine mechanical components	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the repair activity: • undertake the repair activities, in conjunction with others involved, to cause minimal disruption to normal working • adhere to risk assessment, COSHH and other relevant safety standards • under supervision, ensure the safe isolation of equipment (such as mechanical, electricity, gas, air or fluids) • under supervision, provide safe access and working arrangements for the maintenance area • in conjunction with others, carry out the repair activities, using appropriate techniques and procedures • record the repair, using appropriate methods or documentation • dispose of waste items in a safe and environmentally acceptable manner • leave the work area in a safe condition and to the prescribed category of cleanliness			

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Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.3 follow the relevant specifications for the component to be repaired 1.4 prepare the component for repair 1.5 carry out the repairs within agreed timescale using approved materials and components and methods and procedures 1.6 use appropriate techniques to carry out four of the following types of repair: • reforming the component surface by adding metal • sleeving worn components • making stepped dowels or studs • cutting new keyways • making a temporary fix • bushing worn holes • plugging holes • replacing internal threads (thread inserts) • reworking a fit (shimming) • replacement/reworking of worn keys/keyways • replacing damaged or missing gear teeth • stopping cracks running and filling them • other specific repair procedure			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• reworking surface finish (using techniques such as filing, scraping, lapping, grinding) • reconditioning units by replacement of worn components 1.7 use a range of methods and techniques to repair components, to include four of the following: • sawing (hand or band) • drilling • reaming • rinding (hand or machine) • filing • scraping or lapping • threading (external) • threading (internal) • turning • milling • thermal processes 1.8 repair components made from different types of material, to include two from the following: • low carbon steel • high carbon steel • cast iron			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• aluminium • brass/bronze • stainless steel • plastic/synthetic • composite 1.9 check that the repaired component meets the specified operating conditions 1.10 carry out repairs to mechanical equipment in accordance with one of the following standards: • organisational guidelines and codes of practice • specific equipment requirements/manufacturer's data • BS and/or ISO standards • customer (contractual) standards and requirements • recognised compliance agency/body's standards 1.11 produce accurate and complete records of all repair work carried out			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
2 Know how to repair marine mechanical components	2.1 explain the health and safety requirements of the area in which the repair activity is to take place, and the responsibility these requirements place on them 2.2 explain the isolation procedure or permit-to-work procedure that applies to the equipment being repaired 2.3 explain the specific health and safety precautions to be applied during the repair procedure, and their effects on others 2.4 explain the importance of wearing protective clothing and other appropriate safety equipment during repair activities 2.5 describe the hazards associated with the repair/restoration operations being carried out (sawing (hand, band), drilling, reaming, grinding (hand or machine), filing, scraping or lapping, threading (internal or external), turning, milling and thermal processes), and explain how they can be minimised 2.6 explain where to obtain, and how to interpret job instructions, drawings, specifications, manufacturers' manuals, maintenance schedules and other relevant documents			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.7 explain the methods, techniques and procedures to be followed for repairing the marine mechanical equipment 2.8 describe the types of repairs that can be made to components in order to prolong their useful life (such as bushing/plugging worn holes, re-cutting threads, joining mating surfaces by thermal process) 2.9 explain how to use a range of hand tools (such as files, scrapers) 2.10 explain how to cut internal and external threads (using hand dies and taps) 2.11 explain how to select saw blades (for different materials and different operations) 2.12 describe the types and application of portable power tools that can be used for the fitting operations 2.13 explain how to identify that portable power tools and extension cables are in a safe usable condition 2.14 explain the operating requirements of the machine tools and accessories being used (guards, workholding devices, speeds and feeds, specific statutory regulations such as Abrasive Wheels Regulations)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.15 explain how to handle and store tools and equipment safely and correctly 2.16 explain the application of cutting fluids 2.17 describe the company recording procedures to be used following the repair activity, and explain how to apply them 2.18 describe the problems associated with the repair, and explain how to resolve them 2.19 describe the extent of their own authority, and explain whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____

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Unit 35: Disconnecting and removing marine mechanical equipment

Unit reference number: T/601/2062

Level: 2

Credit value: 30

Guided learning hours: 63

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to disconnect and remove marine mechanical equipment, in preparation for complete overhaul or refit activities, which may be carried out in a shipyard or may involve returning the equipment to the manufacturer for overhaul. The activities will involve disconnecting and removing equipment at component or unit level, on a variety of marine mechanical assemblies and sub-assemblies, such as gearboxes, stabilisers, pumps, propeller shafts (including controllable pitch propeller (CPP) systems), steering and rudder arrangements, aircraft lifts, ballast arrangements, engines, weapons equipment, sewage-treatment, reverse osmosis and low pressure steam plant, pantry and galley equipment, and other specific marine mechanical equipment.

Learners' responsibilities will require them to comply with organisational policy and procedures for the disconnection and removal of the marine mechanical equipment, and to report any problems with the removal activities that they cannot personally resolve, or are outside their permitted authority, to the relevant people. They will be expected to work either with a high level of supervision or as a member of a team. Learners will take personal responsibility for their own actions and for the quality and accuracy of the work that they carry out. When working in a team, they learner must demonstrate a significant personal contribution to the team activities in order to satisfy the requirements of the standard, and competence in all the areas required by the standard must be demonstrated.

Learners' knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to applying the appropriate disconnection and removal techniques and procedures. They will have an understanding of the basic knowledge behind the equipment being removed and its application, and will know about the removed equipment and its release devices in adequate depth to provide a sound basis for carrying out the activities to the required specification.

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Learners will understand the safety precautions required when carrying out the disconnection and removal of the marine mechanical equipment, especially those for isolating and/or depressurising the equipment. They will be required to demonstrate safe working practices throughout, and will understand their responsibility for taking the necessary safeguards to protect themselves and others in the workplace, both ashore and afloat.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Disconnect and remove marine mechanical equipment	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the disconnection and removal of the marine mechanical equipment: • use the correct issue of the structure/vessel/craft installation drawings and documentation • adhere to risk assessment, COSHH and other relevant safety standards • ensure that they have clearance to work on the system, and observe the appropriate power isolation and safety procedures • maintain safe access and working arrangements for the removal area • in conjunction with others, carry out the removal activities, using appropriate techniques and procedures • leave the work area in a safe condition and to the prescribed category of cleanliness 1.3 establish and where appropriate mark component for re-assembly			

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Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.4 ensure that any stored energy or substances are released safely and correctly 1.5 make all isolations and disconnections to the equipment in line with approved procedures 1.6 take part in the disconnection and removal of three of the following types of marine mechanical equipment: • propulsion gear box (single reduction, double reduction, 'V' or 'Z' drive) • pump jet propulsion unit • stabiliser (fixed or retractable) • pump (salt water, fresh water, fuel oil or lubricating) • propeller shaft (fixed blade or controllable pitch propeller (CPP) systems) • steering gear and rudder arrangements (hydraulic or mechanical) • thrusters (bow or stern) • clutch and coupling (gas turbine, steam turbine, diesel or steam reciprocating engine) • processing plant (sewage-treatment, reverse osmosis, distillation or garbage compactor) • liquid-ballast arrangements (pump or isolating valve)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• engine (propulsion or power generation) • compressor (high pressure or low pressure) • pantry and galley equipment (boiling copper, oven, dishwasher or garbage disposal unit) • low pressure steam plant (auxiliary boiler, calorifier, fuel or oil heater) • weapons equipment (gun mounting, missile mounting or weapon loading system) • lifting and handling equipment (replenishment rig, aircraft lift, cargo hatch, windlass or capstan) 1.7 release six of the following types of fasteners and securing devices: • studs with nuts • swing bolts • wing nuts • screws • bolts • dowels • flexible bellows • quick release fasteners			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• locking devices (such as split, parallel, clevis or taper pin) • keys/keyways (such as slotted, semi-circular, woodruff, taper) 1.8 carry out the dismantling to the agreed level using correct tools and techniques 1.9 assist in carrying out eight of the following disconnection and removal methods and techniques: • isolating and locking off equipment • bringing the system to atmospheric pressure • draining off fluids • disconnecting wires and cables • attaching suitable cables/parts identification markers • dismantling equipment to unit/sub-assembly level • making safe all disconnected service supplies • supporting equipment to be removed • removing mechanical fastening devices • proof marking/labelling of components for re-assembly • securing or safely storing all peripheral units which are not part of the overhaul process			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• protecting and preparing removed components for transportation for overhaul • fitting blanks to open systems to prevent entry of contaminating debris 1.10 disconnect and remove marine mechanical equipment, in accordance with one of the following standards or procedures: • BS or ISO 9000 standards and procedures • other accepted international standards • customer (contractual) standards and requirements • company standards and procedures • specific system requirements • recognised compliance agency/body's standards 1.11 store components for re-use in approved locations 1.12 dispose of unwanted components and substances in accordance with approved procedures 1.13 deal promptly and effectively with problems within their control and report those that cannot be solved 1.14 complete the relevant paperwork, to include one of the following, and pass it to the appropriate people: • installation record • job cards • timesheets • system log			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
2 Know how to disconnect and remove marine mechanical equipment	2.1 explain the specific safety practices and procedures that they need to observe when disconnecting and removing marine mechanical equipment (including any specific legislation, regulations/codes of practice for the activities, equipment or materials) 2.2 explain the procedures to be carried out before starting work on the disconnection and removal (such as obtaining permits to work, obtaining and complying with risk assessments and other health and safety requirements) 2.3 explain the health and safety requirements of the work area in which they are carrying out the activities, and the responsibility they place on them 2.4 describe the hazards associated with disconnecting and removing marine mechanical equipment, and with the tools and equipment used, and explain how these can be minimised 2.5 explain what protective equipment they need to use for both personal protection and protection of the equipment or system 2.6 explain how to obtain and interpret information from job instructions, drawings and specifications used for the removal process 2.7 explain the basic operating principles of the marine mechanical equipment being removed			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.8 describe the components/units to be removed, and their function within the particular marine mechanical equipment 2.9 describe the various mechanical fasteners that will be removed, and their method of release (including threaded fasteners, special securing and locking devices) 2.10 explain the importance of using the specified release devices for the particular items being removed, and why they must not substitute others 2.11 explain why securing devices need to be correctly unlocked and labelled, and the different unlocking methods that are used 2.12 explain the methods used to assist with difficult-to-release items of equipment or components 2.13 describe the quality control procedures to be followed during the removal operations 2.14 explain the procedures for ensuring that they have the correct tools and equipment for the activities 2.15 explain the techniques used to secure loose items without damage, once equipment has been removed 2.16 describe the methods of lifting, handling and supporting the components/equipment during the removal activities			

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Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.17 explain how to remove seals, sealant and adhesives, and the precautions that need to be taken 2.18 explain why electrical bonding is critical, and why it must be removed correctly 2.19 describe the procedure for the safe disposal of waste materials 2.20 explain the importance of ensuring that the removal site is free from foreign-object debris, and that any exposed components or pipe ends are correctly covered/protected 2.21 describe the tools and equipment used in the removal activities, and explain their care and control procedures 2.22 explain why tool/equipment control is critical 2.23 describe the problems that can occur with the removal operations, and explain how these can be overcome 2.24 explain the recording documentation to be completed for the activities undertaken 2.25 describe the extent of their own responsibility, and explain whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____

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Unit 36: Carrying out maintenance on marine fuel systems and equipment

Unit reference number: F/601/2064

Level: 2

Credit value: 42

Guided learning hours: 98

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to assist in conducting maintenance activities on marine fuel systems and equipment, such as for heavy fuel oil, diesel fuel oil, aviation fuel, lubricating oil and liquefied natural gas, without complete removal of the unit(s) for overhaul. Learners will be required to maintain a range of marine fuel system and equipment items, such as pipework, pumps, filters, strainers, separators, coalescors and isolating valves, in accordance with approved procedures. This will involve dismantling, removing and replacing faulty equipment, at unit or component level, on a variety of marine fuel systems and equipment assemblies.

Learners will be expected to apply a range of dismantling and assembling methods and techniques, such as proof marking to aid reassembly, dismantling components requiring pressure or expansion/contraction techniques, setting, aligning, adjusting and torque loading components, and making 'off-load' checks before starting up the maintained equipment.

Learners' responsibilities will require them to comply with organisational policy and procedures for the maintenance activities undertaken, and to report any problems with these activities, or with the tools and equipment used that they cannot personally resolve or are outside their permitted authority, to the relevant people. They must ensure that all tools, equipment and materials used in the maintenance activities are removed from the work area on completion of the activities, and that all necessary job/task documentation is completed accurately and legibly. Learners will be expected to work either with a high level of supervision or as a member of a team. They will take personal responsibility for their own actions and for the quality and accuracy of the work that they carry out. When working in a team, learners must demonstrate a significant personal contribution to the team activities in order to satisfy the requirements of the standard, and competence in all the areas required by the standard must be demonstrated.

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Learners' knowledge will be sufficient to provide a sound basis for their work, and will enable them to adopt an informed approach to applying mechanical maintenance procedures to marine fuel systems and equipment. They will have an understanding of dismantling and reassembly methods and procedures, and their application. Learners will know how the equipment functions, and the purpose of individual components in adequate depth to provide a sound basis for carrying out any repair or adjustment. In addition, learners will have sufficient knowledge of these components to ensure that they are fit for purpose and meet the specifications, thus providing a sound basis for carrying out reassembly.

Learners will understand the safety precautions required when carrying out the marine maintenance activities, especially those for isolating the equipment. They will also understand their responsibilities for safety, and the importance of taking the necessary safeguards to protect themselves and others in the workplace, both ashore and afloat.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Carry out maintenance on marine fuel systems and equipment	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the maintenance of the marine fuel system/equipment: • undertake the maintenance activities, in conjunction with others involved, to cause minimal disruption to normal working • use the correct issue of drawings, job instructions and procedures • adhere to risk assessment, COSHH and other relevant safety standards • check that the equipment has been safely isolated (such as mechanical, electricity, gas, air or fluids) • maintain safe access and working arrangements for the maintenance area • carry out the maintenance activities, using appropriate techniques and procedures • help to re-connect and return the system to service, on completion of activities • leave the work area in a safe condition and to the prescribed category of cleanliness			

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Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.3 follow the relevant maintenance schedules to carry out the required work 1.4 carry out the maintenance activities within the limits of their personal authority 1.5 carry out the maintenance activities in the specified sequence and in an agreed time scale 1.6 carry out maintenance activities on two of the following types of marine fuel systems: • heavy fuel oil embarkation, transfer and disembarkation • diesel oil embarkation, transfer and disembarkation • lubricating oil embarkation, transfer and disembarkation • aviation fuel embarkation, transfer and disembarkation • liquefied natural gas embarkation, transfer and disembarkation			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.7 carry out maintenance activities on two of the following fuel system components: • separator • coalescor • pump • isolating valve • filter/strainer • system pipework 1.8 carry out all of the following maintenance activities: • dismantling equipment to the appropriate level • proof marking/labelling of components • checking components for serviceability • replacing all 'lifed' items (such as seals, gaskets) • replacing damaged/defective components • setting, aligning and adjusting components • tightening fastenings to the required torque • making 'off-load' checks before starting up • replenishing oils and greases • functionally testing the completed system			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.9 maintain marine fuel systems and equipment, in accordance with one of the following standards: • BS or ISO 9000 standards and procedures • other accepted international standards • customer (contractual) standards and requirements • company standards and procedures • specific system requirements • recognised compliance agency/body's standards 1.10 report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule 1.11 complete the relevant maintenance records accurately, to include one of the following, and pass them on to the appropriate person: • job cards • permit to work/formal risk assessment • maintenance log or report 1.12 dispose of waste materials in accordance with safe working practices and approved procedures			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
2 Know how to carry out maintenance on marine fuel systems and equipment	2.1 explain the health and safety requirements of the area in which the marine maintenance activity is to take place, and the responsibility these requirements place on them 2.2 explain the isolation and lock-off procedure, or permit-to-work procedure that applies 2.3 explain the specific health and safety precautions to be applied during the marine maintenance procedure, and their effects on others 2.4 describe the hazards associated with carrying out maintenance activities on marine fuel systems and equipment (such as explosive fumes, rules on smoking, handling oils, greases, stored pressure/force, misuse of tools, using damaged or badly maintained tools and equipment, not following laid-down maintenance procedures)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.5 explain how to recognise and deal with emergencies (including methods of safely evacuating and closing down compartments in the case of fire or other major incident and methods of first aid fire fighting and resuscitation of personnel) 2.6 explain the importance of wearing protective clothing and other appropriate safety equipment during the maintenance process 2.7 explain how to obtain and interpret information from job instructions, drawings, specifications, manufacturers' manuals and other documents needed in the maintenance process 2.8 explain the procedure for obtaining replacement parts, materials and other consumables necessary for the maintenance 2.9 describe the methods and techniques used to dismantle/assemble mechanical equipment (such as release of pressures/force, proof marking, extraction, pressing, alignment) 2.10 describe the methods of checking that components are fit for purpose, how to identify defects and wear characteristics, and the need to replace 'lifed' items (such as seals and gaskets) 2.11 explain the basic principles of how the equipment functions, its operating sequence, the working purpose of individual units/components and how they interact			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.12 explain the uses of measuring equipment (such as micrometers, verniers and other measuring devices) 2.13 explain how to make adjustments to components/assemblies to ensure that they function correctly (such as setting working clearance, setting travel, setting backlash in gears, preloading bearings) 2.14 explain how to identify the different types of locking devices and describe their application 2.15 explain the importance of making 'off-load' checks before running the equipment under power 2.16 explain how to check that tools and equipment are free from damage or defects, are in a safe and usable condition, and are configured correctly for the intended purpose 2.17 explain the importance of completing the relevant documentation and/or reports following the maintenance activity 2.18 describe the equipment operating and control procedures to be applied during the maintenance activity 2.19 explain how to use lifting and handling equipment in the maintenance activity 2.20 describe the things that can go wrong when carrying out maintenance on marine fuel systems, and explain what to do if they occur			

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Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.21 describe the organisational procedure(s) to be adopted for the safe disposal of waste of all types of materials 2.22 describe the extent of their own authority, and explain whom they should report to if they have a problem that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____

(*if sampled*)

Unit 37: Carrying out maintenance on marine pneumatic systems and equipment

Unit reference number: L/601/2066

Level: 2

Credit value: 42

Guided learning hours: 98

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to assist in conducting maintenance activities on marine pneumatic systems and equipment, such as air-start systems, air-to-weapon systems, breathing apparatus panels, waveguide supplies, reducers, isolating valves, air-operated valves, pneumatic controls, compressors, strainers, filters, driers and tank instrumentation, without complete removal of the unit(s) for overhaul. Learners will be required to maintain a range of marine pneumatic system and equipment items, such as pipework, control valves, portable cylinders, fixed reservoirs, actuating mechanisms, mechanical and electrical controls, safety devices and other associated mechanical equipment, in accordance with approved procedures. This will involve dismantling, removing and replacing faulty equipment, at unit or component level, on a variety of marine pneumatic systems and equipment assemblies.

Learners will be expected to apply a range of dismantling and assembling methods and techniques, such as proof marking to aid reassembly, dismantling components requiring pressure or expansion/contraction techniques, setting, aligning and adjusting components, torque loading components, and making 'off-load' checks before starting up the maintained equipment.

Learners' responsibilities will require them to comply with organisational policy and procedures for the maintenance activities undertaken, and to report any problems with these activities, or with the tools and equipment used that they cannot personally resolve or are outside their permitted authority, to the relevant people. They must ensure that all tools, equipment and materials used in the maintenance activities are removed from the work area on completion of the activities, and that all necessary job/task documentation is completed accurately and legibly. Learners will be expected to work either with a high level of supervision, or as a member of a team. They will take personal responsibility for their own actions and for the quality and accuracy of the work that they carry out. When working in a team, learners must demonstrate a significant personal contribution to the team activities in order to satisfy the requirements of the standard, and competence in all the areas required by the standard must be demonstrated.

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Learners' knowledge will be sufficient to provide a sound basis for their work, and will enable them to adopt an informed approach to applying mechanical maintenance procedures to marine pneumatic systems and equipment. They will have an understanding of dismantling and reassembly methods and procedures, and their application. Learners will know how the equipment functions, and the purpose of individual components in adequate depth to provide a sound basis for carrying out any repair or adjustment. In addition, learners will have sufficient knowledge of these components to ensure that they are fit for purpose and meet the specifications, thus providing a sound basis for carrying out reassembly.

Learners will understand the safety precautions required when carrying out the marine pneumatic maintenance activities, especially those for isolating and/or depressurising the equipment. They will also understand their responsibilities for safety, and the importance of taking the necessary safeguards to protect themselves and others in the workplace, both ashore and afloat.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Carry out maintenance on marine pneumatic systems and equipment	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the maintenance of the marine pneumatic systems: • undertake the maintenance activities, in conjunction with others involved, to cause minimal disruption to normal working • use the correct issue of drawings, job instructions and procedures • adhere to risk assessment, COSHH and other relevant safety standards • check that equipment has been safely isolated (such as mechanical, electricity, gas, air or fluids) • maintain safe access and working arrangements for the maintenance area • carry out the maintenance activities, using appropriate techniques and procedures • help to re-connect and return the system to service, on completion of the activities • leave the work area in a safe condition and to the prescribed category of cleanliness			

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Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.3 follow the relevant maintenance schedules to carry out the required work 1.4 carry out the maintenance activities within the limits of their personal authority 1.5 carry out the maintenance activities in the specified sequence and in an agreed time scale 1.6 carry out maintenance activities on one of the following types of marine pneumatic systems: • high pressure air system • low pressure air system 1.7 carry out maintenance activities on two of the following pneumatic system components: • breathing apparatus panel • engine air-start system • air-to-weapon system • waveguide supply • air-operated valve • tank instrumentation • pneumatic controls • compressor • other			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.8 carry out all of the following maintenance activities: • chocking/supporting cylinders/components • de-pressurising the system • dismantling equipment to the appropriate level • proof marking/labelling of components • checking components for serviceability • replacing all 'lifed' items (such as seals, gaskets) • replacing damaged/defective components • setting, aligning and adjusting components • tightening fastenings to the required torque • making 'off-load' checks before starting up • replenishing oils and greases • re-pressurising the system • leak testing • functionally testing the completed system			

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Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.9 maintain marine pneumatic systems and equipment, in accordance with one of the following standards: • BS or ISO 9000 standards and procedures • other accepted international standards • customer (contractual) standards and requirements • company standards and procedures • specific system requirements • recognised compliance agency/body's standards			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.10 report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule 1.11 complete the relevant maintenance records accurately, to include one of the following, and pass them on to the appropriate person: • job cards • permit to work/formal risk assessment • maintenance log or report 1.12 dispose of waste materials in accordance with safe working practices and approved procedures			
2 Know how to carry out maintenance on marine pneumatic systems and equipment	2.1 explain the health and safety requirements of the area in which the marine maintenance activity is to take place, and the responsibility these requirements place on them 2.2 explain the isolation and lock-off procedure, or permit-to-work procedure that applies 2.3 explain the specific health and safety precautions to be applied during the marine maintenance procedure, and their effects on others			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.4 describe the hazards associated with carrying out maintenance activities on marine pneumatic systems and equipment (such as handling oils, greases, stored pressure/force, misuse of tools, using damaged or badly maintained tools and equipment, not following laid-down maintenance procedures) 2.5 explain the importance of wearing protective clothing and other appropriate safety equipment during the maintenance process 2.6 explain how to obtain and interpret information from job instructions, drawings, specifications, manufacturers' manuals and other documents needed in the maintenance process 2.7 explain the procedure for obtaining replacement parts, materials and other consumables necessary for the maintenance 2.8 describe the methods and techniques used to dismantle/assemble mechanical equipment (such as release of pressures/force, proof marking, extraction, pressing, alignment) 2.9 describe the methods of checking that components are fit for purpose, how to identify defects and wear characteristics, and the need to replace 'lifed' items (such as seals and gaskets)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.10 explain the basic principles of how the equipment functions, its operating sequence, the working purpose of individual units/components and how they interact 2.11 explain the uses of measuring equipment (such as micrometers, verniers and other measuring devices) 2.12 explain how to make adjustments to components/assemblies to ensure that they function correctly (such as setting working clearance, setting travel) 2.13 explain how to identify the different types of locking devices and describe their application 2.14 explain the importance of making 'off-load' checks before running the equipment under power 2.15 explain how to check that tools and equipment are free from damage or defects, are in a safe and usable condition, and are configured correctly for the intended purpose 2.16 explain the importance of completing the relevant documentation and/or reports following the maintenance activity 2.17 describe the equipment operating and control procedures to be applied during the maintenance activity 2.18 explain how to use lifting and handling equipment in the maintenance activity			

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Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.19 describe the things that can go wrong when carrying out maintenance on marine pneumatic systems, and explain what to do if they occur 2.20 describe the organisational procedure(s) to be adopted for the safe disposal of waste of all types of materials 2.21 describe the extent of their own authority, and explain whom they should report to if they have a problem that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____

(*if sampled*)

Unit 38: Carrying out maintenance on marine auxiliary power units for electrical power generation

Unit reference number: R/601/2067

Level: 2

Credit value: 42

Guided learning hours: 98

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to assist in conducting maintenance on marine auxiliary power units such as shaft driven, diesel, self-contained steam turbine, back-pressure steam turbine and gas turbine generators, without complete removal of the unit(s) for overhaul. Learners will be required to maintain a range of marine auxiliary power unit items, such as pipework, turbo blowers, gearboxes, air intakes, combustion system, engine control units, fuel injectors, fuel pipes, fire detection systems, exhaust units, sea water cooling pumps, feed water extraction pumps, turbine rotors, lubricating oil coolers and other associated equipment, in accordance with approved procedures. This will involve dismantling, removing and replacing faulty equipment, at unit or component level, on a variety of marine auxiliary power units and equipment assemblies.

Learners will be expected to apply a range of dismantling and assembling methods and techniques, such as proof marking to aid reassembly, dismantling components requiring pressure or expansion/contraction techniques, setting, aligning, adjusting and torque loading components, and making 'off-load' checks before starting up the maintained equipment.

Learners' responsibilities will require them to comply with organisational policy and procedures for the maintenance activities undertaken, and to report any problems with these activities, or with the tools and equipment used that they cannot personally resolve or are outside their permitted authority, to the relevant people. They must ensure that all tools, equipment and materials used in the maintenance activities are removed from the work area on completion of the activities, and that all necessary job/task documentation is completed accurately and legibly. Learners will be expected to work either with a high level of supervision or as a member of a team. They will take personal responsibility for their own actions and for the quality and accuracy of the work that they carry out. When working in a team, learners must demonstrate a significant personal contribution to the team activities in order to satisfy the requirements of the standard, and competence in all the areas required by the standard must be demonstrated.

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Learners' knowledge will be sufficient to provide a sound basis for their work, and will enable them to adopt an informed approach to applying mechanical maintenance procedures to marine auxiliary power units. They will have an understanding of dismantling and reassembly methods and procedures, and their application. Learners will know how the equipment functions, and the purpose of individual components in adequate depth to provide a sound basis for carrying out any repair or adjustment. In addition, learners will have sufficient knowledge of these components to ensure that they are fit for purpose and meet the specifications, thus providing a sound basis for carrying out reassembly.

Learners will understand the safety precautions required when carrying out the marine maintenance activities, especially those for isolating the equipment. They will also understand their responsibilities for safety, and the importance of taking the necessary safeguards to protect themselves and others in the workplace, both ashore and afloat.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Carry out maintenance on marine auxiliary power units for electrical power generation	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the maintenance of the marine auxiliary power units: • undertake the maintenance activities, in conjunction with others involved, to cause minimal disruption to normal working • use the correct issue of drawings, job instructions and procedures • adhere to risk assessment, COSHH and other relevant safety standards • check that equipment has been safely isolated (such as mechanical, electricity, gas, air or fluids) • maintain safe access and working arrangements for the maintenance area • carry out the maintenance activities, using appropriate techniques and procedures • help to re-connect and return the system to service, on completion of activities • leave the work area in a safe condition and to the prescribed category of cleanliness			

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Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.3 follow the relevant maintenance schedules to carry out the required work 1.4 carry out the maintenance activities within the limits of their personal authority 1.5 carry out the maintenance activities in the specified sequence and in an agreed time scale 1.6 carry out maintenance activities on one of the following types of marine auxiliary power units: • gas turbine generator • steam turbine generator • ICE 2-stroke mechanically/turbine/naturally aspirated generator • ICE 4-stroke mechanically/turbine/naturally aspirated generator 1.7 carry out maintenance activities on eight of the following auxiliary power unit components: • air intake • air charger (blower) • combustion system • gas turbine rotor • engine monitoring unit • fire extinguishing system • steam turbine rotor			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• gearbox • extraction pump • sea water pump • fuel system • air ejector • fuel pump • exhaust system • air-start system • governor gear • turbine nozzle box • lubricating oil cooler • feed controller • lubricating oil pump • gland vapour condenser • gland sealing • condenser • fresh water cooler			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.8 carry out all of the following maintenance activities: • dismantling equipment to the appropriate level • proof marking/labelling of components • checking components for serviceability • replacing all 'lifed' items (such as seals, gaskets) • replacing damaged/defective components • setting, aligning and adjusting components • tightening fastenings to the required torque • making 'off-load' checks before starting up • replenishing oils and greases • functionally testing the completed system 1.9 maintain marine auxiliary power units and equipment, in accordance with one of the following standards: • BS or ISO 9000 standards and procedures • other accepted international standards • customer (contractual) standards and requirements • company standards and procedures • specific system requirements • recognised compliance agency/body's standards			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.10 report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule 1.11 complete the relevant maintenance records accurately, to include one of the following, and pass them on to the appropriate person: • job cards • permit to work/formal risk assessment • maintenance log or report 1.12 dispose of waste materials in accordance with safe working practices and approved procedures			
2 Know how to carry out maintenance on marine auxiliary power units for electrical power generation	2.1 explain the health and safety requirements of the area in which the marine maintenance activity is to take place, and the responsibility these requirements place on them 2.2 explain the isolation and lock-off procedure, or permit-to-work procedure that applies 2.3 explain the specific health and safety precautions to be applied during the marine maintenance procedure, and their effects on others			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.4 describe the hazards associated with carrying out maintenance activities on marine auxiliary power units and equipment (such as explosive fumes, rules on smoking, handling oils, greases, stored pressure/force, misuse of tools, using damaged or badly maintained tools and equipment, not following laid-down maintenance procedures) 2.5 explain how to recognise and deal with emergencies (including methods of safely evacuating and closing down compartments in the case of fire or other major incident, and methods of first aid, fire fighting and resuscitation of personnel) 2.6 explain the importance of wearing protective clothing and other appropriate safety equipment during the maintenance process 2.7 explain how to obtain and interpret information from job instructions, drawings, specifications, manufacturers' manuals and other documents needed in the maintenance process 2.8 describe the methods and techniques used to dismantle/assemble mechanical equipment (such as release of pressures/force, proof marking, extraction, pressing, alignment) 2.9 describe the methods of checking that components are fit for purpose, how to identify defects and wear characteristics, and the need to replace 'lifed' items (such as seals and gaskets)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.10 explain the basic principles of how the equipment functions, its operating sequence, the working purpose of individual units/components and how they interact 2.11 explain the uses of measuring equipment (such as micrometers, verniers and other measuring devices) 2.12 explain how to make adjustments to components/assemblies to ensure that they function correctly (such as setting working clearance, setting travel, setting backlash in gears, preloading bearings) 2.13 explain how to identify the different types of locking devices and describe their application 2.14 explain the importance of making 'off-load' checks before running the equipment under power 2.15 explain how to check that tools and equipment are free from damage or defects, are in a safe and usable condition, and are configured correctly for the intended purpose 2.16 explain the importance of completing the relevant documentation and/or reports following the maintenance activity 2.17 describe the equipment operating and control procedures to be applied during the maintenance activity			

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Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.18 explain how to use lifting and handling equipment in the maintenance activity 2.19 describe the things that can go wrong when carrying out maintenance on marine auxiliary power units, and explain what to do if they occur 2.20 describe the organisational procedure(s) to be adopted for the safe disposal of waste of all types of materials 2.21 describe the extent of their own authority, and explain whom they should report to if they have a problem that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____

(*if sampled*)

Unit 39: Carrying out maintenance on marine mechanical control systems and equipment

Unit reference number: T/601/2076

Level: 2

Credit value: 42

Guided learning hours: 98

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to assist in conducting maintenance activities on marine mechanical control systems and equipment, such as those linked to the following systems: hydraulic, pneumatic, sewage-treatment, steam, ballast, fuel, fire-main, fresh water, salt water, oil, ventilation, drainage, power transmission and engine/propulsion machinery, without complete removal of the unit(s) for overhaul. Learners will be required to maintain a range of marine mechanical control systems and equipment, such as rod gearing, universal joints, gearing support bearings, gearing bevel boxes, pipe hangers, cables, pulleys and turnbuckles, levers and linkages, control rods, pivots and bell cranks, stops, servo actuators and tie rods, and other associated mechanical equipment, in accordance with approved procedures. This will involve dismantling, removing and replacing faulty equipment, at unit or component level, on a variety of marine mechanical control systems and equipment assemblies.

Learners will be expected to apply a range of dismantling and assembling methods and techniques, such as proof marking to aid reassembly, dismantling components requiring pressure or expansion/contraction techniques, setting, aligning, adjusting and torque loading components, and making 'off-load' checks before setting to work the maintained equipment.

Learners' responsibilities will require them to comply with organisational policy and procedures for the maintenance activities undertaken, and to report any problems with these activities, or with the tools and equipment used that they cannot personally resolve or are outside their permitted authority, to the relevant people. They must ensure that all tools, equipment and materials used in the maintenance activities are removed from the work area on completion of the activities, and that all necessary job/task documentation is completed accurately and legibly. Learners will be expected to work either with a high level of supervision or as a member of a team. They will take personal responsibility for their own actions and for the quality and accuracy of the work that they carry out. When working in a team, learners must demonstrate a significant personal contribution to the team activities in order to satisfy the requirements of the standard, and competence in all the areas required by the standard must be demonstrated.

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Learners' knowledge will be sufficient to provide a sound basis for their work, and will enable them to adopt an informed approach to applying maintenance procedures to marine mechanical control systems and equipment. They will have an understanding of dismantling and reassembly methods and procedures, and their application. Learners will know how the equipment functions, and the purpose of individual components in adequate depth to provide a sound basis for carrying out any repair or adjustment. In addition, learners will have sufficient knowledge of these components to ensure that they are fit for purpose and meet the specifications, thus providing a sound basis for carrying out reassembly.

Learners will understand the safety precautions required when carrying out the marine maintenance activities, especially those for isolating the equipment. They will also understand their responsibilities for safety, and the importance of taking the necessary safeguards to protect themselves and others in the workplace, both ashore and afloat.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Carry out maintenance on marine mechanical control systems and equipment	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the maintenance of the marine mechanical control equipment: • undertake the maintenance activities, in conjunction with others involved, to cause minimal disruption to normal working • use the correct issue of drawings, job instructions and procedures • adhere to risk assessment, COSHH and other relevant safety standards • check that equipment has been safely isolated (such as mechanical, electricity, gas, air or fluids) • maintain safe access and working arrangements for the maintenance area • carry out the maintenance activities, using appropriate techniques and procedures • help to re-connect and return the system to service, on completion of activities • leave the work area in a safe condition and to the prescribed category of cleanliness			

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Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.3 follow the relevant maintenance schedules to carry out the required work 1.4 carry out the maintenance activities within the limits of their personal authority 1.5 carry out the maintenance activities in the specified sequence and in an agreed time scale 1.6 carry out maintenance activities on marine mechanical control equipment connected to four of the following types of systems/equipment: • hydraulic systems • pneumatic systems • sewage-treatment • steam • ballast • lubricating oil • fuel systems • salt water • hot/cold fresh water • ventilation • drainage • pre-wet sprays • generator engine • propulsion engine			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• power transmission • fire main/main service 1.7 carry out the maintenance of marine mechanical control devices linked to four of the following components: • inlet valve • outlet valve • cross connection valve • start valve • stop valve • air flaps and dampers • fire-fighting and pre-wet sprays • steam drench valve • CO2 drench system 1.8 carry out maintenance on six of the following mechanical control mechanisms: • rod gearing • universal joints • gearing support bearings • gearing bevel boxes • pipe hangers • cables, pulleys and turnbuckles			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• levers and linkages • control rods • pivots and bell cranks • stops • servo actuators • tie rods 1.9 carry out all of the following maintenance activities: • dismantling equipment to the appropriate level • proof marking/labelling of components • checking components for serviceability • replacing all 'lifed' items (such as seals, gaskets) • replacing damaged/defective components • setting, aligning and adjusting components • tightening fastenings to the required torque • making 'off-load' checks before starting up • replenishing oils and greases • functionally testing the completed system 1.10 maintain marine mechanical control systems and equipment, in accordance with one of the following standards: • BS or ISO 9000 standards and procedures • other accepted international standards			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• customer (contractual) standards and requirements • company standards and procedures • specific system requirements • recognised compliance agency/body's standards 1.11 report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule 1.12 complete the relevant maintenance records accurately, to include one of the following, and pass them on to the appropriate person: • job cards • permit to work/formal risk assessment • maintenance log or report 1.13 dispose of waste materials in accordance with safe working practices and approved procedures			
2 Know how to carry out maintenance on marine mechanical control systems and equipment	2.1 explain the health and safety requirements of the area in which the maintenance activity is to take place, and the responsibility they place on them 2.2 explain the isolation and lock-off procedure, or permit-to-work procedure that applies			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.3 explain the specific health and safety precautions to be applied during the maintenance procedure, and their effects on others 2.4 describe the hazards associated with carrying out maintenance activities on marine mechanical control equipment and systems (such as handling oils, greases, stored pressure/force, misuse of tools, using damaged or badly maintained tools and equipment, not following laid-down maintenance procedures) 2.5 explain the importance of wearing protective clothing and other appropriate safety equipment during the maintenance 2.6 explain how to obtain and interpret information from job instructions, drawings, specifications, manufacturers' manuals and other documents needed in the maintenance process 2.7 explain the procedure for obtaining replacement parts, materials and other consumables necessary for the maintenance 2.8 describe the methods and techniques used to dismantle/assemble marine mechanical control equipment and systems (such as release of pressures/force, proof marking, extraction, pressing, alignment)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.9 describe the methods of checking that components are fit for purpose, how to identify defects and wear characteristics, and the need to replace 'lifed' items (such as seals and gaskets) 2.10 explain how to make adjustments to components/assemblies to ensure that they function correctly (such as setting working clearance, setting travel, setting tension in cables and pulleys) 2.11 explain the basic principles of how the equipment functions, its operating sequence, the working purpose of individual units/components and how they interact 2.12 describe the methods and techniques of fitting keys and splines 2.13 explain how to identify, remove and refit different types of gears 2.14 explain how to identify the different types of locking devices and describe their application 2.15 explain the uses of measuring equipment (such as micrometers, verniers, expansion indicators and other measuring devices) 2.16 explain the importance of making 'off-load' checks before running the equipment under power			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.17 explain how to check that tools and equipment are free from damage or defect, are in a safe and usable condition and are configured correctly for the intended purpose 2.18 explain the importance of completing the relevant documentation and/or reports following the maintenance activity 2.19 describe the equipment operating and control procedures to be applied during the maintenance activity 2.20 explain how to use lifting and handling equipment in the maintenance activity 2.21 describe the things that can go wrong when carrying out maintenance on marine mechanical control systems, and explain what to do if they occur 2.22 describe the organisational procedure to be adopted for the safe disposal of waste of all types of materials 2.23 describe the extent of their own authority, and explain whom they should report to if they have a problem that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____

(*if sampled*)

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Unit 40: Carrying out maintenance on marine steering gear, control systems and equipment

Unit reference number: A/601/2080

Level: 2

Credit value: 42

Guided learning hours: 98

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to assist in conducting maintenance activities on marine steering gear, control systems and equipment, such as mechanical, hydraulic and electro-hydraulic steering, without complete removal of the unit(s) for overhaul. Learners will be required to maintain a range of marine steering gear and control systems and equipment, such as mechanical helm, telemotor transmitters and receivers, fluid power system/pump, rudder posts, local steering mechanisms, mechanical steering gear, steering hand pumps, rudders, pintle, hydraulic relay units, emergency hydraulic steering gear and other associated equipment, in accordance with approved procedures. This will involve dismantling, removing and replacing faulty equipment, at unit or component level, on a variety of marine steering gear and control systems and equipment assemblies.

Learners will be expected to apply a range of dismantling and assembling methods and techniques, such as proof marking to aid reassembly, dismantling components requiring pressure or expansion/contraction techniques, setting, aligning, adjusting and torque loading components, and making 'off-load' checks before setting to work the maintained equipment.

Learners' responsibilities will require them to comply with organisational policy and procedures for the maintenance activities undertaken, and to report any problems with these activities, or with the tools and equipment used that they cannot personally resolve or are outside their permitted authority, to the relevant people. Learners must ensure that all tools, equipment and materials used in the maintenance activities are removed from the work area on completion of the activities, and that all necessary job/task documentation is completed accurately and legibly. They will be expected to work either with a high level of supervision or as a member of a team. Learners will take personal responsibility for their own actions and for the quality and accuracy of the work that they carry out. When working in a team, they must demonstrate a significant personal contribution to the team activities in order to satisfy the requirements of the standard, and competence in all the areas required by the standard must be demonstrated.

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Learners' knowledge will be sufficient to provide a sound basis for their work, and will enable them to adopt an informed approach to applying mechanical maintenance procedures to marine steering gear, control systems and equipment. Learners will have an understanding of dismantling and reassembly methods and procedures, and their application. They will know how the equipment functions, and the purpose of individual components in adequate depth to provide a sound basis for carrying out any repair or adjustment. In addition, learners will have sufficient knowledge of these components to ensure that they are fit for purpose and meet the specifications, thus providing a sound basis for carrying out reassembly.

Learners will understand the safety precautions required when carrying out the marine maintenance activities, especially those for isolating the equipment. They will also understand their responsibilities for safety, and the importance of taking the necessary safeguards to protect themselves and others in the workplace, both ashore and afloat.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Carry out maintenance on marine steering gear, control systems and equipment	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the maintenance of the marine steering gear/control equipment: • undertake the maintenance activities, in conjunction with others involved, to cause minimal disruption to normal working • use the correct issue of drawings, job instructions and procedures • adhere to risk assessment, COSHH and other relevant safety standards • check that equipment has been safely isolated (such as mechanical, electricity, gas, air or fluids) • maintain safe access and working arrangements for the maintenance area • carry out the maintenance activities, using appropriate techniques and procedures • help to re-connect and return the system to service, on completion of activities • leave the work area in a safe condition and to the prescribed category of cleanliness			

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Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.3 follow the relevant maintenance schedules to carry out the required work 1.4 carry out the maintenance activities within the limits of their personal authority 1.5 carry out the maintenance activities in the specified sequence and in an agreed time scale 1.6 carry out maintenance activities on two of the following types of marine steering gear/control equipment: • mechanical steering • hydraulic steering • electro-hydraulic steering 1.7 carry out maintenance activities on two of the following marine steering gear/control equipment components: • mechanical helm • telemotor transmitter • fluid power system/pump • rudder posts • local steering mechanism • mechanical steering gear • telemotor receiver • steering hand pump			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• rudders • hydraulic relay unit • emergency mechanical steering • emergency hydraulic steering gear • pintle 1.8 carry out all of the following maintenance activities: • dismantling equipment to the appropriate level • proof marking/labelling of components • checking components for serviceability • replacing all 'lifed' items (such as seals, gaskets) • replacing damaged/defective components • setting, aligning and adjusting components • tightening fastenings to the required torque • making 'off-load' checks before starting up • replenishing oils and greases • functionally testing the completed system 1.9 maintain marine steering gear/control equipment mechanisms, in accordance with one of the following standards: • BS or ISO 9000 standards and procedures • other accepted international standards			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• customer (contractual) standards and requirements • company standards and procedures • specific system requirements • recognised compliance agency/body's standards 1.10 report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule 1.11 complete the relevant maintenance records accurately, to include one of the following, and pass them on to the appropriate person: • job cards • permit to work/formal risk assessment • maintenance log or report 1.12 dispose of waste materials in accordance with safe working practices and approved procedures			
2 Know how to carry out maintenance on marine steering gear, control systems and equipment	2.1 explain the health and safety requirements of the area in which the maintenance activity is to take place, and the responsibility they place on them 2.2 explain the isolation and lock-off procedure, or permit-to-work procedure that applies 2.3 explain the specific health and safety precautions to be applied during the maintenance procedure, and their effects on others			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.4 describe the hazards associated with carrying out maintenance activities on marine steering gear, control systems and equipment (such as handling oils, greases, stored pressure/force, misuse of tools, using damaged or badly maintained tools and equipment, not following laid-down maintenance procedures) 2.5 explain the importance of wearing protective clothing and other appropriate safety equipment during maintenance 2.6 explain how to obtain and interpret job instructions, drawings, specifications, manufacturers' manuals and other documents needed in the maintenance process 2.7 explain the procedure for obtaining replacement parts, materials and other consumables necessary for the maintenance 2.8 describe the methods and techniques used to dismantle/assemble on marine steering gear, control systems and equipment (such as release of pressures/force, proof marking, extraction, pressing, alignment) 2.9 describe the methods of checking that components are fit for purpose, how to identify defects and wear characteristics, and the need to replace 'lifed' items (such as seals and gaskets)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.10 explain how to make adjustments to components/assemblies to ensure that they function correctly (such as setting working clearance, setting travel, setting tension in cables and pulleys, setting backlash in gears) 2.11 explain the basic principles of how the equipment functions, its operating sequence, the working purpose of individual units/components and how they interact 2.12 describe the methods and techniques of fitting keys and splines 2.13 explain how to identify, remove and refit different types of gears 2.14 explain how to identify the different types of locking devices and describe their application 2.15 explain the uses of measuring equipment (such as micrometers, verniers, expansion indicators and other measuring devices) 2.16 explain the importance of making 'off-load' checks before running the equipment under power 2.17 explain how to check that tools and equipment are free from damage or defect, are in a safe and usable condition, and are configured correctly for the intended purpose 2.18 explain the importance of completing the relevant documentation and/or reports following the maintenance activity			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.19 describe the equipment operating and control procedures to be applied during the maintenance activity 2.20 explain how to use lifting and handling equipment in the maintenance activity 2.21 describe the problems associated with the marine maintenance activity, and explain how they can be overcome 2.22 describe the organisational procedure to be adopted for the safe disposal of waste of all types of materials 2.23 describe the extent of their own authority, and explain whom they should report to if they have a problem that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____

(*if sampled*)

Unit 41: Carrying out maintenance on marine lifting equipment

Unit reference number: J/601/2082

Level: 2

Credit value: 42

Guided learning hours: 98

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to assist in conducting maintenance activities on marine lifting equipment, such as davits, weapon hoists, stores lifts, hatches, derricks, aircraft lifts, cranes, vehicle ramps, ramp locking systems, windlasses, capstans, gangways and platforms, in accordance with approved procedures, without complete removal of the unit(s) for overhaul. This will involve dismantling, removing and replacing faulty equipment, at unit or component level, on a variety of marine lifting equipment, systems and assemblies.

Learners will be expected to apply a range of dismantling and assembling methods and techniques, such as proof marking to aid reassembly, dismantling components requiring pressure or expansion/contraction techniques, setting, aligning, adjusting and torque loading components, and making 'off-load' checks before setting to work the maintained equipment.

Learners' responsibilities will require them to comply with organisational policy and procedures for the maintenance activities undertaken, and to report any problems with these activities, or with the tools and equipment used that they cannot personally resolve or are outside their permitted authority, to the relevant people. Learners must ensure that all tools, equipment and materials used in the maintenance activities are removed from the work area on completion of the activities, and that all necessary job/task documentation is completed accurately and legibly. The learner will be expected to work either with a high level of supervision or as a member of a team. Learners will take personal responsibility for their own actions and for the quality and accuracy of the work that they carry out. When working in a team, they must demonstrate a significant personal contribution to the team activities in order to satisfy the requirements of the standard, and competence in all the areas required by the standard must be demonstrated.

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Learners' knowledge will be sufficient to provide a sound basis for their work, and will enable them to adopt an informed approach to applying mechanical maintenance procedures to marine lifting equipment, systems and assemblies. They will have an understanding of dismantling and reassembly methods and procedures, and their application. Learners will know how the equipment functions, and the purpose of individual components in adequate depth to provide a sound basis for carrying out any repair or adjustment. In addition, they will have sufficient knowledge of these components to ensure that they are fit for purpose and meet the specifications, thus providing a sound basis for carrying out reassembly.

Learners will understand the safety precautions required when carrying out the marine maintenance activities, especially those for isolating the equipment. They will also understand their responsibilities for safety, and the importance of taking the necessary safeguards to protect themselves and others in the workplace, both ashore and afloat.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Carry out maintenance on marine lifting equipment	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the maintenance of the marine lifting equipment: • undertake the maintenance activities, in conjunction with others involved, to cause minimal disruption to normal working • use the correct issue of drawings, job instructions and procedures • adhere to risk assessment, COSHH and other relevant safety standards • check that equipment has been safely isolated (such as mechanical, electricity, gas, air or fluids) • maintain safe access and working arrangements for the maintenance area • carry out the maintenance activities, using appropriate techniques and procedures • help to re-connect and return the system to service, on completion of activities • leave the work area in a safe condition and to the prescribed category of cleanliness			

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Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.3 follow the relevant maintenance schedules to carry out the required work 1.4 carry out the maintenance activities within the limits of their personal authority 1.5 carry out the maintenance activities in the specified sequence and in an agreed time scale 1.6 carry out maintenance activities on one of the following types of marine lifting equipment: • electro-hydraulic (such as davit, crane, capstan, windlass, hoist, winch, hoist, hatch, derrick, vehicle ramp) • electro-mechanical (such as davit, crane, capstan, windlass, winch, hoist, hatch, derrick, vehicle ramp) • combined electro-mechanical/hydraulic (such as gangway hoist/platform, stores lift, personnel lift, derrick, gantry) 1.7 carry out maintenance activities on two of the following marine lifting equipment components: • davit • crane • capstan • windlass • gangway • aerial hoist			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• winch • weapon hoist • hatch hoist • aircraft lift • derrick • vehicle ramp • gantry • platform • other 1.8 carry out all of the following maintenance activities: • dismantling equipment to the appropriate level • proof marking/labelling of components • checking components for serviceability • replacing all 'lifed' items (such as seals, gaskets) • replacing damaged/defective components • setting, aligning and adjusting components • tightening fastenings to the required torque • making 'off-load' checks before starting up • replenishing oils and greases • functionally testing the completed system			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.9 maintain marine lifting equipment, in accordance with one of the following standards: • BS or ISO 9000 standards and procedures • other accepted international standards • customer (contractual) standards and requirements • company standards and procedures • specific system requirements • recognised compliance agency/body's standards 1.10 report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule 1.11 complete the relevant maintenance records accurately, to include one of the following, and pass them on to the appropriate person: • job cards • permit to work/formal risk assessment • maintenance log or report 1.12 dispose of waste materials in accordance with safe working practices and approved procedures			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
2 Know how to carry out maintenance on marine lifting equipment	2.1 explain the health and safety requirements of the area in which the maintenance activity is to take place, and the responsibility they place on them 2.2 explain the isolation and lock-off procedure, or permit-to-work procedure that applies 2.3 explain the specific health and safety precautions to be applied during the maintenance procedure, and their effects on others 2.4 describe the hazards associated with carrying out maintenance activities on marine lifting equipment and systems (such as handling oils, greases, stored pressure/force, misuse of tools, using damaged or badly maintained tools and equipment, not following laid-down maintenance procedures) 2.5 explain the importance of wearing protective clothing and other appropriate safety equipment during the maintenance process 2.6 explain how to obtain and interpret job instructions, drawings, specifications, manufacturers' manuals and other documents needed in the maintenance process 2.7 explain the procedure for obtaining replacement parts, materials and other consumables necessary for the maintenance			

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Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.8 describe the methods and techniques used to dismantle/assemble marine lifting equipment and systems (such as release of pressures/force, proof marking, extraction, pressing, alignment) 2.9 describe the methods of checking that components are fit for purpose, how to identify defects and wear characteristics, and the need to replace 'lifed' items (such as seals and gaskets) 2.10 explain how to make adjustments to components/assemblies to ensure they function correctly (such as setting working clearance, setting travel, setting tension in cables and pulleys, setting backlash in gears) 2.11 explain the basic principles of how the equipment functions, its operating sequence, the working purpose of individual units/components and how they interact 2.12 describe the methods and techniques of fitting keys and splines 2.13 explain how to identify, remove and refit different types of gears 2.14 explain how to identify the different types of locking devices and describe their application 2.15 explain the uses of measuring equipment (such as micrometers, verniers, expansion indicators and other measuring devices)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.16 explain the importance of making 'off-load' checks before running the equipment under power 2.17 explain how to check that tools and equipment are free from damage or defect, are in a safe and usable condition, and are configured correctly for the intended purpose 2.18 explain the importance of completing the necessary documentation and/or reports following the maintenance activity 2.19 describe the equipment operating and control procedures to be applied during the maintenance activity 2.20 explain how to use lifting and handling equipment used in the maintenance activity 2.21 describe the problems associated with the marine maintenance activity, and explain how they can be overcome 2.22 describe the organisational procedure to be adopted for the safe disposal of waste of all types of materials 2.23 describe the extent of their own authority, and explain whom they should report to if they have a problem that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____

(*if sampled*)

Unit 42: Carrying out maintenance on marine ancillary plant and equipment

Unit reference number: L/601/2083

Level: 2

Credit value: 42

Guided learning hours: 98

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to assist in conducting maintenance activities on marine ancillary plant and equipment, such as garbage disposal compactors, sewage-treatment plants, reverse osmosis plant, incinerators, laundry and medical equipment, and evaporators, without complete removal of the unit(s) for overhaul. Learners will be required to maintain a range of marine ancillary plant and equipment, such as compactor mechanisms, macerators, sea water pumps, compressors, washing machines, furnace, press, pre-heater, sterilising equipment, fresh water pumps and tumble driers, in accordance with approved procedures. This will involve dismantling, removing and replacing faulty equipment, at unit or component level, on a variety of marine ancillary plant and equipment, systems and assemblies.

Learners will be expected to apply a range of dismantling and assembling methods and techniques, such as proof marking to aid reassembly, dismantling components requiring pressure or expansion/contraction techniques, setting, aligning, adjusting and torque loading components, and making 'off-load' checks before setting to work the maintained equipment.

Learners' responsibilities will require them to comply with organisational policy and procedures for the maintenance activities undertaken, and to report any problems with these activities, or with the tools and equipment used, that they cannot personally resolve or are outside their permitted authority, to the relevant people. They must ensure that all tools, equipment and materials used in the maintenance activities are removed from the work area on completion of the activities, and that all necessary job/task documentation is completed accurately and legibly. Learners will be expected to work either with a high level of supervision or as a member of a team. They will take personal responsibility for their own actions and for the quality and accuracy of the work that they carry out. When working in a team, learners must demonstrate a significant personal contribution to the team activities in order to satisfy the requirements of the standard, and competence in all the areas required by the standard must be demonstrated.

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Learners' knowledge will be sufficient to provide a sound basis for their work, and will enable them to adopt an informed approach to applying mechanical maintenance procedures to marine ancillary plant, equipment, systems and assemblies. They will have an understanding of dismantling and reassembly methods and procedures, and their application. Learners will know how the equipment functions, and the purpose of individual components in adequate depth to provide a sound basis for carrying out any repair or adjustment. In addition learners will have sufficient knowledge of these components to ensure that they are fit for purpose and meet the specifications, thus providing a sound basis for carrying out reassembly.

Learners will understand the safety precautions required when carrying out the marine maintenance activities, especially those for isolating the equipment. They will also understand their responsibilities for safety, and the importance of taking the necessary safeguards to protect themselves and others in the workplace, both ashore and afloat.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Carry out maintenance on marine ancillary plant and equipment	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the maintenance of the marine ancillary plant and equipment: • undertake the maintenance activities, in conjunction with others involved, to cause minimal disruption to normal working • use the correct issue of drawings, job instructions and procedures • adhere to risk assessment, COSHH and other relevant safety standards • check that equipment has been safely isolated (such as mechanical, electricity, gas, air or fluids) • maintain safe access and working arrangements for the maintenance area • carry out the maintenance activities, using appropriate techniques and procedures • help to re-connect and return the system to service, on completion of activities • leave the work area in a safe condition and to the prescribed category of cleanliness			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.3 follow the relevant maintenance schedules to carry out the required work 1.4 carry out the maintenance activities within the limits of their personal authority 1.5 carry out the maintenance activities in the specified sequence and in an agreed time scale 1.6 carry out maintenance activities on two of the following types of marine ancillary plant and equipment: • garbage compactor • sewage-treatment plant • laundry • incinerator • dental equipment • medical equipment • reverse osmosis plant • evaporators 1.7 carry out maintenance activities on three of the following marine ancillary plant and equipment components: • compactor mechanism • macerator • sea water pump			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• compressor • washing machine • furnace • press • pre-heater • sterilising equipment • fresh water pump • tumble drier 1.8 carry out all of the following maintenance activities: • dismantling equipment to the appropriate level • proof marking/labelling of components • checking components for serviceability • replacing all 'lifed' items (such as seals, gaskets) • replacing damaged/defective components • setting, aligning and adjusting components • tightening fastenings to the required torque • making 'off-load' checks before starting up • replenishing oils and greases • functionally testing the completed system			

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Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.9 maintain marine ancillary plant and equipment, in accordance with one of the following standards: • BS or ISO 9000 standards and procedures • other accepted international standards • customer (contractual) standards and requirements • company standards and procedures • specific system requirements • recognised compliance agency/body's standards 1.10 report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule 1.11 complete the relevant maintenance records accurately, to include one of the following, and pass them on to the appropriate person: • job cards • permit to work/formal risk assessment • maintenance log or report 1.12 dispose of waste materials in accordance with safe working practices and approved procedures			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
2 Know how to carry out maintenance on marine ancillary plant and equipment	2.1 explain the health and safety requirements of the area in which the maintenance activity is to take place, and the responsibility they place on them 2.2 explain the isolation and lock-off procedure, or permit-to-work procedure that applies 2.3 explain the specific health and safety precautions to be applied during the maintenance procedure, and their effects on others 2.4 describe the hazards associated with carrying out maintenance activities on marine ancillary plant, equipment and systems (such as handling oils, greases, stored pressure/force, misuse of tools, using damaged or badly maintained tools and equipment, not following laid-down maintenance procedures) 2.5 explain the importance of wearing protective clothing and other appropriate safety equipment during the maintenance process 2.6 explain how to obtain and interpret job instructions, drawings, specifications, manufacturers' manuals and other documents needed in the maintenance process 2.7 explain the procedure for obtaining replacement parts, materials and other consumables necessary for the maintenance			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.8 describe the methods and techniques used to dismantle/assemble marine ancillary plant, equipment and systems (such as release of pressures/force, proof marking, extraction, pressing, alignment) 2.9 describe the methods of checking that components are fit for purpose, how to identify defects and wear characteristics, and the need to replace 'lifed' items (such as seals and gaskets) 2.10 explain how to make adjustments to components/assemblies to ensure that they function correctly (such as setting working clearance, setting travel, setting tension in cables and pulleys, setting backlash in gears) 2.11 explain the basic principles of how the equipment functions, its operating sequence, the working purpose of individual units/components and how they interact 2.12 describe the methods and techniques of fitting keys and splines 2.13 explain how to identify, remove and refit different types of gears 2.14 explain how to identify the different types of locking devices and describe their application 2.15 explain the uses of measuring equipment (such as micrometers, verniers, expansion indicators and other measuring devices)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.16 explain the importance of making 'off-load' checks before running the equipment under power 2.17 explain how to check that tools and equipment are free from damage or defect, are in a safe and usable condition, and are configured correctly for the intended purpose 2.18 explain the importance of completing the necessary documentation and/or reports following the maintenance activity 2.19 describe the equipment operating and control procedures to be applied during the maintenance activity 2.20 explain how to use lifting and handling equipment in the maintenance activity 2.21 describe the problems associated with the marine maintenance activity, and explain how they can be overcome 2.22 describe the organisational procedure to be adopted for the safe disposal of waste of all types of materials 2.23 describe the extent of their own authority, and explain whom they should report to if they have a problem that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____

(*if sampled*)

Unit 43: Carrying out maintenance on marine steam plant and equipment

Unit reference number: R/601/2084

Level: 2

Credit value: 42

Guided learning hours: 98

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to assist in conducting maintenance activities on marine steam plant and equipment, such as fire tube boilers, machinery and systems; water tube boilers, machinery and systems; controlled superheat boilers, machinery and systems and other associated equipment, in accordance with approved procedures, without complete removal of the unit(s) for overhaul. Learners will be required to maintain a range of steam plant and equipment, such as boilers, super-heaters, economisers, air pre-heaters, dampers, drain coolers, fuel pumps, feed pumps, soot blowers, boiler internal gear, turbine gearing, combustion equipment, boiler mountings, steam turbines, steam reciprocating engines, high pressure saturated steam systems, low pressure saturated steam systems, drain systems, forced draft blowers, brickwork, casings, gearing oil pumps, turbine governors, superheated steam system, mechanical controls and safety devices, and other associated mechanical equipment, at unit or component level.

Learners will be expected to apply a range of dismantling and assembling methods and techniques, such as proof marking to aid reassembly, dismantling components requiring pressure or expansion/contraction techniques, setting, aligning, adjusting and torque loading components, and making 'off-load' checks before setting to work the maintained equipment.

Learners' responsibilities will require them to comply with organisational policy and procedures for the maintenance activities undertaken, and to report any problems with these activities, or with the tools and equipment used, that they cannot personally resolve or are outside their permitted authority, to the relevant people. Learners must ensure that all tools, equipment and materials used in the maintenance activities are removed from the work area on completion of the activities, and that all necessary job/task documentation is completed accurately and legibly. They will be expected to work either with a high level of supervision or as a member of a team. Learners will take personal responsibility for their own actions and for the quality and accuracy of the work that they carry out. When working in a team, learners must demonstrate a significant personal contribution to the team activities in order to satisfy the requirements of the standard, and competence in all the areas required by the standard must be demonstrated.

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Learners' knowledge will be sufficient to provide a sound basis for their work, and will enable them to adopt an informed approach to applying mechanical maintenance procedures to marine steam plant, equipment, systems and assemblies. They will have an understanding of dismantling and reassembly methods and procedures, and their application. Learners will know how the equipment functions, and the purpose of individual components in adequate depth to provide a sound basis for carrying out any repair or adjustment. In addition, learners will have sufficient knowledge of these components to ensure that they are fit for purpose and meet the specifications, thus providing a sound basis for carrying out reassembly.

Learners will understand the safety precautions required when carrying out the marine maintenance activities, especially those for isolating the equipment. They will also understand their responsibilities for safety, and the importance of taking the necessary safeguards to protect themselves and others in the workplace, both ashore and afloat.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Carry out maintenance on marine steam plant and equipment	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the maintenance of the marine steam plant and equipment: • undertake the maintenance activities, in conjunction with others involved, to cause minimal disruption to normal working • use the correct issue of drawings, job instructions and procedures • adhere to risk assessment, COSHH and other relevant safety standards • check that equipment has been safely isolated (such as mechanical, electricity, gas, air or fluids) • maintain safe access and working arrangements for the maintenance area • carry out the maintenance activities, using appropriate techniques and procedures • help to re-connect and return the system to service, on completion of activities • leave the work area in a safe condition and to the prescribed category of cleanliness			

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Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.3 follow the relevant maintenance schedules to carry out the required work 1.4 carry out the maintenance activities within the limits of their personal authority 1.5 carry out the maintenance activities in the specified sequence and in an agreed time scale 1.6 carry out maintenance activities on one of the following types of marine steam plant and equipment: • fire tube boiler, machinery and system • water tube boiler, machinery and system • controlled superheat boiler, machinery and system 1.7 carry out maintenance activities on two of the following marine steam plant and equipment components: • boiler • super-heater • economisers • air pre-heater • dampers • drain cooler • fuel pump • feed pump			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• soot blowers • boiler internal gear • turbine gearing • combustion equipment • boiler mountings • vertical steam turbine • drain systems • forced draft blower • high pressure saturated steam system • low pressure saturated steam system • steam reciprocating engine • brickwork/casing • gearing oil pump • turbine governor • superheated steam system • horizontal steam turbine 1.8 carry out all of the following maintenance activities: • dismantling equipment to the appropriate level • proof marking/labelling of components • checking components for serviceability • replacing all 'lifed' items (such as seals, gaskets)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• replacing damaged/defective components • setting, aligning and adjusting components • tightening fastenings to the required torque • making 'off-load' checks before starting up • replenishing oils and greases • functionally testing the completed system 1.9 maintain marine steam plant and equipment, in accordance with one of the following standards: • BS or ISO 9000 standards and procedures • other accepted international standards • customer (contractual) standards and requirements • company standards and procedures • specific system requirements • recognised compliance agency/body's standards 1.10 report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.11 complete the relevant maintenance records accurately, to include one of the following, and pass them on to the appropriate person: • job cards • permit to work/formal risk assessment • maintenance log or report 1.12 dispose of waste materials in accordance with safe working practices and approved procedures			
2 Know how to carry out maintenance on marine steam plant and equipment	2.1 explain the health and safety requirements of the area in which the maintenance activity is to take place, and the responsibility they place on them 2.2 explain the isolation and lock-off procedure, or permit-to-work procedure that applies 2.3 explain the specific health and safety precautions to be applied during the maintenance procedure, and their effects on others 2.4 describe the hazards associated with carrying out maintenance activities on marine steam plant, equipment and systems (such as handling oils, greases, stored pressure/force, misuse of tools, using damaged or badly maintained tools and equipment, not following laid-down maintenance procedures) 2.5 explain the importance of wearing protective clothing and other appropriate safety equipment during the maintenance process			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.6 explain how to obtain and interpret job instructions, drawings, specifications, manufacturers' manuals and other documents needed in the maintenance process 2.7 explain the procedure for obtaining replacement parts, materials and other consumables necessary for the maintenance 2.8 describe the methods and techniques used to dismantle/assemble marine steam plant and equipment and systems (such as release of pressures/force, proof marking, extraction, pressing, alignment) 2.9 describe the methods of checking that components are fit for purpose, how to identify defects and wear characteristics, and the need to replace 'lifed' items (such as seals and gaskets) 2.10 explain how to make adjustments to components/assemblies to ensure that they function correctly (such as setting working clearance, setting travel, setting tension in cables and pulleys, setting backlash in gears) 2.11 explain the basic principles of how the equipment functions, its operating sequence, the working purpose of individual units/components and how they interact 2.12 describe the methods and techniques of fitting keys and splines			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.13 explain how to identify, remove and refit different types of gears 2.14 explain how to identify the different types of locking devices and describe their application 2.15 explain the uses of measuring equipment (such as micrometers, verniers, expansion indicators and other measuring devices) 2.16 explain the importance of making 'off-load' checks before running the equipment under power 2.17 explain how to check that tools and equipment are free from damage or defect, are in a safe and usable condition, and are configured correctly for the intended purpose 2.18 explain the importance of completing the relevant documentation and/or reports following the maintenance activity 2.19 describe the equipment operating and control procedures to be applied during the maintenance activity 2.20 explain how to use lifting and handling equipment in the maintenance activity 2.21 describe the problems associated with the marine maintenance activity, and explain how they can be overcome			

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Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.22 describe the organisational procedure to be adopted for the safe disposal of waste of all types of materials 2.23 describe the extent of their own authority, and explain whom they should report to if they have a problem that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____

(*if sampled*)

Unit 44: Carrying out maintenance on marine liquid-ballast systems

Unit reference number: T/601/2191

Level: 2

Credit value: 42

Guided learning hours: 98

Unit summary

This unit covers the skills and knowledge needed to prove the competences required in conducting maintenance activities on marine liquid-ballast systems, such as fuel-compensating ballast systems, docking ballast systems, and cargo-compensating ballast systems, in accordance with approved procedures, without complete removal of the unit(s) for overhaul. Learners will be required to maintain a range of marine liquid-ballast equipment, such as valves, ring main, pumps, manifolds, vents, instrumentation, mechanical controls and safety devices and other associated mechanical equipment. This will involve dismantling, removing and replacing faulty equipment, at unit or component level, on a variety of marine liquid-ballast systems.

Learners will be expected to apply a range of dismantling and assembling methods and techniques, such as proof marking to aid reassembly, dismantling components requiring pressure or expansion/contraction techniques, setting, aligning, adjusting and torque loading components, and making 'off-load' checks before setting to work the maintained equipment.

Learners' responsibilities will require them to comply with organisational policy and procedures for the maintenance activities undertaken, and to report any problems with these activities, or with the tools and equipment used that they cannot personally resolve or are outside their permitted authority, to the relevant people. Learners must ensure that all tools, equipment and materials used in the maintenance activities are removed from the work area on completion of the activities, and that all necessary job/task documentation is completed accurately and legibly. They will be expected to work either with a high level of supervision or as a member of a team. The learner will take personal responsibility for their own actions and for the quality and accuracy of the work that they carry out. When working in a team, they must demonstrate a significant personal contribution to the team activities in order to satisfy the requirements of the standard, and competence in all the areas required by the standard must be demonstrated.

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Learners' knowledge will be sufficient to provide a sound basis for their work, and will enable them to adopt an informed approach to applying mechanical maintenance procedures to marine liquid-ballast systems and assemblies. Learners will have an understanding of dismantling and reassembly methods and procedures, and their application. They will know how the equipment functions, and the purpose of individual components in adequate depth to provide a sound basis for carrying out any repair or adjustment. In addition, the learner will have sufficient knowledge of these components to ensure that they are fit for purpose and meet the specifications, thus providing a sound basis for carrying out reassembly.

Learners will understand the safety precautions required when carrying out the marine maintenance activities, especially those for isolating the equipment. They will also understand their responsibilities for safety, and the importance of taking the necessary safeguards to protect themselves and others in the workplace, both ashore and afloat.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Carry out maintenance on marine liquid-ballast systems	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the maintenance of the marine liquid-ballast systems: • undertake the maintenance activities, in conjunction with others involved, to cause minimal disruption to normal working • use the correct issue of drawings, job instructions and procedures • adhere to risk assessment, COSHH and other relevant safety standards • check that equipment has been safely isolated (such as mechanical, electricity, gas, air or fluids) • maintain safe access and working arrangements for the maintenance area • carry out the maintenance activities, using appropriate techniques and procedures • help to re-connect and return the system to service, on completion of activities • leave the work area in a safe condition and to the prescribed category of cleanliness			

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Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.3 follow the relevant maintenance schedules to carry out the required work 1.4 carry out the maintenance activities within the limits of their personal authority 1.5 carry out the maintenance activities in the specified sequence and in an agreed time scale 1.6 carry out maintenance activities on one of the following types of marine liquid-ballast systems: • fuel-compensating ballast system • docking ballast system • cargo-compensating ballast system 1.7 carry out maintenance activities on two of the following marine liquid-ballast system components: • valves • ring main • pumps • manifolds • instrumentation • vents 1.8 carry out all of the following maintenance activities: • dismantling equipment to the appropriate level • proof marking/labelling of components • checking components for serviceability			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• replacing all 'lifed' items (such as seals, gaskets) • replacing damaged/defective components • setting, aligning and adjusting components • tightening fastenings to the required torque • making 'off-load' checks before starting up • replenishing oils and greases • functionally testing the completed system 1.9 maintain marine liquid-ballast systems, in accordance with one of the following standards: • BS or ISO 9000 standards and procedures • other accepted international standards • customer (contractual) standards and requirements • company standards and procedures • specific system requirements • recognised compliance agency/body's standards 1.10 report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.11 complete the relevant maintenance records accurately, to include one of the following, and pass them on to the appropriate person: • job cards • permit to work/formal risk assessment • maintenance log or report 1.12 dispose of waste materials in accordance with safe working practices and approved procedures			
2 Know how to carry out maintenance on marine liquid-ballast systems	2.1 explain the health and safety requirements of the area in which the maintenance activity is to take place, and the responsibility they place on them 2.2 explain the isolation and lock-off procedure, or permit-to-work procedure that applies 2.3 explain the specific health and safety precautions to be applied during the maintenance procedure, and their effects on others 2.4 describe the hazards associated with carrying out maintenance activities on marine liquid-ballast systems (such as handling oils, greases, stored pressure/force, misuse of tools, using damaged or badly maintained tools and equipment, not following laid-down maintenance procedures) 2.5 explain the importance of wearing protective clothing and other appropriate safety equipment during the maintenance process			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.6 explain how to obtain and interpret job instructions, drawings, specifications, manufacturers' manuals and other documents needed in the maintenance process 2.7 explain the procedure for obtaining replacement parts, materials and other consumables necessary for the maintenance 2.8 describe the methods and techniques used to dismantle/assemble marine liquid-ballast systems (such as release of pressures/force, proof marking, extraction, pressing, alignment) 2.9 describe the methods of checking that components are fit for purpose, how to identify defects and wear characteristics, and the need to replace 'lifed' items (such as seals and gaskets) 2.10 explain how to make adjustments to components/assemblies to ensure that they function correctly (such as setting working clearance, setting travel, setting tension in cables and pulleys, setting backlash in gears) 2.11 explain the basic principles of how the equipment functions, its operating sequence, the working purpose of individual units/components and how they interact 2.12 describe the methods and techniques of fitting keys and splines			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.13 explain how to identify, remove and refit different types of gears 2.14 explain how to identify the different types of locking devices and describe their application 2.15 explain the uses of measuring equipment (such as micrometers, verniers, expansion indicators and other measuring devices) 2.16 explain the importance of making 'off-load' checks before running the equipment under power 2.17 explain how to check that tools and equipment are free from damage or defect, are in a safe and usable condition, and are configured correctly for the intended purpose 2.18 explain the importance of completing the relevant documentation and/or reports following the maintenance activity 2.19 describe the equipment operating and control procedures to be applied during the maintenance activity 2.20 explain how to use lifting and handling equipment in the maintenance activity 2.21 describe the problems associated with the marine maintenance activity, and explain how they can be overcome			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.22 describe the organisational procedure to be adopted for the safe disposal of waste of all types of materials 2.23 describe the extent of their own authority, and explain whom they should report to if they have a problem that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____

(*if sampled*)

Unit 45: Carrying out maintenance on marine fire main systems and equipment

Unit reference number: L/601/2195

Level: 2

Credit value: 42

Guided learning hours: 98

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to assist in conducting maintenance activities on marine fire main systems, such as hangar spray systems, magazine spray systems, machinery space spray and evacuation systems, main service ring main and other compartment spray systems (such as accommodation areas, theatres/cinemas), in accordance with approved procedures, without complete removal of the unit(s) for overhaul. Learners will be required to maintain a range of marine fire main equipment, such as valves, sprays, pumps, vents, manifolds and mud boxes. This will involve dismantling, removing and replacing faulty equipment, at unit or component level, on a variety of marine fire main systems and equipment.

Learners will be expected to apply a range of dismantling and assembling methods and techniques, such as proof marking to aid reassembly, dismantling components requiring pressure or expansion/contraction techniques, setting, aligning, adjusting and torque loading components, and making 'off-load' checks before setting to work the maintained equipment.

Learners' responsibilities will require them to comply with organisational policy and procedures for the maintenance activities undertaken, and to report any problems with these activities, or with the tools and equipment used that they cannot personally resolve or are outside their permitted authority, to the relevant people. Learners must ensure that all tools, equipment and materials used in the maintenance activities are removed from the work area on completion of the activities, and that all necessary job/task documentation is completed accurately and legibly. They will be expected to work either with a high level of supervision or as a member of a team. Learners will take personal responsibility for their own actions and for the quality and accuracy of the work that they carry out. When working in a team, they must demonstrate a significant personal contribution to the team activities in order to satisfy the requirements of the standard, and competence in all the areas required by the standard must be demonstrated.

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Learners' knowledge will be sufficient to provide a sound basis for their work, and will enable them to adopt an informed approach to applying mechanical maintenance procedures to marine fire main systems and equipment. They will have an understanding of dismantling and reassembly methods and procedures, and their application. Learners will know how the equipment functions, and the purpose of individual components in adequate depth to provide a sound basis for carrying out any repair or adjustment. In addition, they will have sufficient knowledge of these components to ensure that they are fit for purpose and meet the specifications, thus providing a sound basis for carrying out reassembly.

Learners will understand the safety precautions required when carrying out the marine maintenance activities, especially those for isolating the equipment. They will also understand their responsibilities for safety, and the importance of taking the necessary safeguards to protect themselves and others in the workplace, both ashore and afloat.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Carry out maintenance on marine fire main systems and equipment	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the maintenance of the marine fire main systems and equipment: • undertake the maintenance activities, in conjunction with others involved, to cause minimal disruption to normal working • use the correct issue of drawings, job instructions and procedures • adhere to risk assessment, COSHH and other relevant safety standards • check that equipment has been safely isolated (such as mechanical, electricity, gas, air or fluids) • maintain safe access and working arrangements for the maintenance area • carry out the maintenance activities, using appropriate techniques and procedures • help to re-connect and return the system to service, on completion of activities • leave the work area in a safe condition and to the prescribed category of cleanliness			

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Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.3 follow the relevant maintenance schedules to carry out the required work 1.4 carry out the maintenance activities within the limits of their personal authority 1.5 carry out the maintenance activities in the specified sequence and in an agreed time scale 1.6 carry out maintenance activities on one of the following types of marine fire main system: • hangar spray system • magazine spray system • machinery space spray and evacuation system • main service ring main • other compartment spray system (such as accommodation areas, theatres/cinemas) 1.7 carry out maintenance activities on two of the following marine fire main systems equipment: • valves • sprays • pumps • vents • manifolds • mud boxes			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.8 carry out all of the following maintenance activities: • dismantling equipment to the appropriate level • proof marking/labelling of components • checking components for serviceability • replacing all 'lifed' items (such as seals, gaskets) • replacing damaged/defective components • setting, aligning and adjusting components • tightening fastenings to the required torque • making 'off-load' checks before starting up • replenishing oils and greases • functionally testing the completed system 1.9 maintain marine fire main systems and equipment, in accordance with one of the following standards: • BS or ISO 9000 standards and procedures • other accepted international standards • customer (contractual) standards and requirements • company standards and procedures • specific system requirements • recognised compliance agency/body's standards			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.10 report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule 1.11 complete the relevant maintenance records accurately, to include one of the following, and pass them on to the appropriate person: • job cards • permit to work/formal risk assessment • maintenance log or report 1.12 dispose of waste materials in accordance with safe working practices and approved procedures			
2 Know how to carry out maintenance on marine fire main systems and equipment	2.1 explain the health and safety requirements of the area in which the maintenance activity is to take place, and the responsibility they place on them 2.2 explain the isolation and lock-off procedures, or permit-to-work procedure that applies 2.3 explain the specific health and safety precautions to be applied during the maintenance procedure, and their effects on others 2.4 describe the hazards associated with carrying out maintenance activities on marine fire main systems and equipment (such as handling oils, greases, stored pressure/force, misuse of tools, using damaged or badly maintained tools and equipment, not following laid-down maintenance procedures)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.5 explain the importance of wearing protective clothing and other appropriate safety equipment during the maintenance process 2.6 explain how to obtain and interpret job instructions, drawings, specifications, manufacturers' manuals and other documents needed in the maintenance process 2.7 explain the procedure for obtaining replacement parts, materials and other consumables necessary for the maintenance 2.8 describe the methods and techniques used to dismantle/assemble marine fire main systems and equipment (such as release of pressures/force, proof marking, extraction, pressing, alignment) 2.9 describe the methods of checking that components are fit for purpose, how to identify defects and wear characteristics, and the need to replace 'lifed' items (such as seals and gaskets) 2.10 explain how to make adjustments to components/assemblies to ensure that they function correctly (such as setting working clearance, setting travel, setting tension in cables and pulleys) 2.11 explain the basic principles of how the equipment functions, its operating sequence, the working purpose of individual units/components and how they interact			

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Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.12 describe the methods and techniques of fitting keys and splines 2.13 explain how to identify, remove and refit different types of gears 2.14 explain how to identify the different types of locking devices and describe their application 2.15 explain the uses of measuring equipment (such as micrometers, verniers, expansion indicators and other measuring devices) 2.16 explain the importance of making 'off-load' checks before running the equipment under power 2.17 explain how to check that tools and equipment are free from damage or defect, are in a safe and usable condition, and are configured correctly for the intended purpose 2.18 explain the importance of completing the necessary documentation and/or reports following the maintenance activity 2.19 describe the equipment operating and control procedures to be applied during the maintenance activity 2.20 explain how to use lifting and handling equipment in the maintenance activity 2.21 describe the problems associated with the marine maintenance activity, and explain how they can be overcome			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.22 describe the organisational procedure to be adopted for the safe disposal of waste of all types of materials 2.23 describe the extent of their own authority, and explain whom they should report to if they have a problem that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____

(*if sampled*)

Unit 46: Carrying out maintenance on marine pantry and galley equipment

Unit reference number: D/601/2198

Level: 2

Credit value: 42

Guided learning hours: 98

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to assist in conducting maintenance activities on marine pantry and galley equipment, such as dishwashers, potato peelers, roll and bun dividers, proving ovens, steam ovens, electric ovens, deep fat fryers, mixing machines, slicers, tenderisers, servery counters, salad bars, ready-use refrigeration, ice-cream makers, salt and fresh water supplies, and other associated equipment, in accordance with approved procedures, without complete removal of the unit(s) for overhaul. Learners will be required to maintain a range of marine pantry and galley equipment, such as pipework, valves, machine baseplates, guards, mechanical controls and safety devices, and other associated mechanical equipment. This will involve dismantling, removing and replacing faulty equipment, at unit or component level, on a variety of marine pantry and galley equipment, systems and assemblies.

Learners will be expected to apply a range of dismantling and assembling methods and techniques, such as proof marking to aid reassembly, dismantling components requiring pressure or expansion/contraction techniques, setting, aligning and adjusting components, torque loading components and making 'off-load' checks before setting to work the maintained equipment.

Learners' responsibilities will require them to comply with organisational policy and procedures for the maintenance activities undertaken, and to report any problems with these activities, or with the tools and equipment used that they cannot personally resolve or are outside their permitted authority, to the relevant people. Learners must ensure that all tools, equipment and materials used in the maintenance activities are removed from the work area on completion of the activities, and that all necessary job/task documentation is completed accurately and legibly. They will be expected to work with either a high level of supervision or as a member of a team. Learners will take personal responsibility for their own actions and for the quality and accuracy of the work that they carry out. When working in a team, they must demonstrate a significant personal contribution to the team activities in order to satisfy the requirements of the standard, and competence in all the areas required by the standard must be demonstrated.

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Learners' knowledge will be sufficient to provide a sound basis for their work, and will enable them to adopt an informed approach to applying mechanical maintenance procedures to marine pantry and galley equipment. Learners will have an understanding of dismantling and reassembly methods and procedures, and their application. They will know how the equipment functions, and the purpose of individual components, in adequate depth to provide a sound basis for carrying out any repair or adjustment. In addition, learners will have sufficient knowledge of these components to ensure that they are fit for purpose and meet the specifications, thus providing a sound basis for carrying out reassembly.

Learners will understand the safety precautions required when carrying out the marine maintenance activities, especially those for isolating the equipment. They will also understand their responsibilities for safety, and the importance of taking the necessary safeguards to protect themselves and others in the workplace, both ashore and afloat.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Carry out maintenance on marine pantry and galley equipment	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the maintenance of the marine pantry and galley equipment: • undertake the maintenance activities, in conjunction with others involved, to cause minimal disruption to normal working • use the correct issue of drawings, job instructions and procedures • adhere to risk assessment, COSHH and other relevant safety standards • check that equipment has been safely isolated (such as mechanical, electricity, gas, air or fluids) • maintain safe access and working arrangements for the maintenance area • carry out the maintenance activities, using appropriate techniques and procedures • help to re-connect and return the system to service, on completion of activities • leave the work area in a safe condition and to the prescribed category of cleanliness			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.3 follow the relevant maintenance schedules to carry out the required work 1.4 carry out the maintenance activities within the limits of their personal authority 1.5 carry out the maintenance activities in the specified sequence and in an agreed time scale 1.6 carry out maintenance activities on four of the following types of marine pantry and galley equipment: • dishwashers • potato peelers • roll and bun dividers • proving ovens • salt water supply • garbage disposal units • electric oven • steam ovens • deep fat fryers • mixing machines • slicers • tenderisers • plumbing • sinks			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• servery counters • salad bars • ready-use refrigeration • ice-cream makers • fresh water supplies • boiling coppers 1.7 carry out all of the following maintenance activities: • dismantling equipment to the appropriate level • proof marking/labelling of components • checking components for serviceability • replacing all 'lifed' items (such as seals, gaskets) • replacing damaged/defective components • setting, aligning and adjusting components • tightening fastenings to the required torque • making 'off-load' checks before starting up • replenishing oils and greases • functionally testing the completed system 1.8 maintain marine pantry and galley equipment, in accordance with one of the following standards: • BS or ISO 9000 standards and procedures • other accepted international standards • customer (contractual) standards and requirements • company standards and procedures			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• specific system requirements • recognised compliance agency/body's standards 1.9 report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule 1.10 complete the relevant maintenance records accurately, to include one of the following, and pass them on to the appropriate person: • job cards • permit to work/formal risk assessment • maintenance log or report 1.11 dispose of waste materials in accordance with safe working practices and approved procedures			
2 Know how to carry out maintenance on marine pantry and galley equipment	2.1 explain the health, safety and hygiene requirements of the area in which the maintenance activity is to take place, and the responsibility they place on them 2.2 explain the isolation and lock-off procedure, or permit-to-work procedure that applies 2.3 explain the specific health and safety precautions to be applied during the maintenance procedure, and their effects on others			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.4 describe the hazards associated with carrying out maintenance activities on marine pantry and galley equipment (such as handling oils, greases, stored pressure/force, misuse of tools, using damaged or badly maintained tools and equipment, not following laid-down maintenance procedures) 2.5 explain the importance of wearing protective clothing and other appropriate safety equipment during the maintenance process 2.6 explain how to obtain and interpret job instructions, drawings, specifications, manufacturers' manuals and other documents needed in the maintenance process 2.7 explain the procedure for obtaining replacement parts, materials and other consumables necessary for the maintenance 2.8 describe the methods and techniques used to dismantle/assemble marine pantry and galley equipment (such as release of pressures/force, proof marking, extraction, pressing, alignment) 2.9 describe the methods of checking that components are fit for purpose, how to identify defects and wear characteristics, and the need to replace 'lifed' items (such as seals and gaskets) 2.10 explain how to make adjustments to components/assemblies to ensure they function correctly (such as setting working clearance, setting travel, setting tension in cables and pulleys)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.11 explain the basic principles of how the equipment functions, operation sequence, the working purpose of individual units/components and how they interact 2.12 describe the methods and techniques of fitting keys and splines 2.13 explain how to correctly set the tension of belts 2.14 explain how to identify the different types of locking devices and describe their application 2.15 explain the uses of measuring equipment (such as micrometers, verniers, expansion indicators and other measuring devices) 2.16 explain the importance of making 'off-load' checks before running the equipment under power 2.17 explain how to check that tools and equipment are free from damage or defect, are in a safe and usable condition, and are configured correctly for the intended purpose 2.18 explain the importance of completing the relevant documentation and/or reports following the maintenance activity 2.19 explain the equipment operating and control procedures to be applied during the maintenance activity 2.20 explain how to use lifting and handling equipment in the maintenance activity			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.21 describe the problems associated with the marine maintenance activity, and explain how they can be overcome 2.22 describe the organisational procedure to be adopted for the safe disposal of waste of all types of materials 2.23 describe the extent of their own authority, and explain whom they should report to if they have a problem that they cannot resolve			

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Unit 47: Marking out for manufacture and assembly of marine wooden components

Unit reference number: L/601/2200

Level: 2

Credit value: 18

Guided learning hours: 42

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to mark out materials for the manufacture and assembly of marine wooden components, in accordance with approved procedures. Learners will need to interpret the information contained in the drawings, instructions and specifications, in order to mark out the materials and components accurately and correctly. They will be expected to select the required wood, to identify any defects in the wood that would make it unfit for use, and to use the appropriate marking out tools and equipment, based on the features to be marked out, the accuracy required and the information presented to them.

Learners will need to use these instruments to mark out datums, profiles, simple joints, hole positions, assembly positions and cutting lines which will be followed when producing the required components. Materials to be marked out will include softwoods, hardwoods and manufactured board, which may be in sheet form, stock sections, or part-manufactured components or sub-assemblies.

Learners' responsibilities will require them to comply with organisational policy and procedures for the marking-out activities undertaken, and to report any problems with the marking-out activities, equipment or materials used that they cannot personally resolve, or are outside their permitted authority, to the relevant people. They will be expected to ensure that all tools, equipment and materials used in the marking out are correctly accounted for on completion of the activities, and to complete all necessary job/task documentation accurately and legibly. Learners will be expected to work to instructions, with a minimum of supervision, taking personal responsibility for their own actions and for the quality and accuracy of the work that they carry out.

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Learners' knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to applying marking out procedures for marine wooden components. They will have an understanding of the marking-out procedures used, and their application, and will know about the marking-out techniques, tools and equipment used in adequate depth to provide a sound basis for carrying out the activities, and ensuring that the marked-out materials are to the required specification.

Learners will understand the safety precautions required when undertaking the marking out operations. They will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace, both ashore and afloat.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Mark out for manufacture and assembly of marine wooden components	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 obtain and use the correct information for marking out to include two of the following: • drawings • specifications • verbal instructions • sketches 1.3 obtain the appropriate marking-out equipment and check that it is in a usable condition 1.4 use a range of marking-out equipment, to include five of the following: • pencil • marking knife • rule or tape • straight edge • square • protractor • sliding bevel • dividers, compass or trammels			

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Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• marking gauge • templates 1.5 prepare suitable datums and marking-out surfaces 1.6 mark out using appropriate methods 1.7 select and mark out two types of wood (which conform to specification in respect of type and condition): • hard wood • soft wood • manufactured board 1.8 identify and isolate any materials that have defects, to include all of the following: • structural • cosmetic • dimensional • distortion 1.9 mark out material, to include five of the following features: • datum and centre lines • square/rectangular profiles • angles • circles			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• joints • curved profiles • hole centring and outlining • cutting detail • assembly positions 1.10 check that the marking out complies with the specification 1.11 produce marked out components which meet all of the following requirements: • dimensionally accurate (to drawing, specification or template) • has clearly formed lines and profiles • waste material is clearly identified • uses recognised marking-out conventions • datum faces/points are clearly marked and identified • meets company/customer standards and codes of practice 1.12 deal promptly and effectively with problems within their control and report those that cannot be resolved			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
2 Know how to mark out for manufacture and assembly of marine wooden components	2.1 explain the specific safety precautions to be taken when marking out wood and composite materials, and with the tools and equipment that are used (including any specific statutory requirements, risk assessment procedures and relevant requirements of HASAWA, COSHH and Work Equipment Regulations) 2.2 describe the hazards associated with the marking-out activities (such as marking-out equipment used, lifting and handling sheet material, long lengths of materials, splinters from wood), and explain how they can be minimised 2.3 explain the process to be adopted to obtain the required drawings and job instructions 2.4 explain how to interpret information from job instructions, engineering drawings and related specifications, in relation to work undertaken 2.5 explain how to identify and select the materials that are to be used (to include colour, grain structure, size) 2.6 describe the common defects that occur in the wood to be used 2.7 describe the types of defects that would render the materials unfit for use			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.8 explain the importance of colour matching and grain convention, when using wood and wood-based materials 2.9 explain the principles of marking out, and the type of equipment used 2.10 describe the range of operations that the various marking-out equipment is capable of performing 2.11 explain how to prepare the materials in readiness for the marking-out activities, in order to enhance clarity, accuracy and safety (such as visually checking for defects, preparing the materials, removing sharp corners and edges) 2.12 explain the use of marking-out conventions when marking out the workpiece (including datums, centre lines, cutting guidelines, square and rectangular profiles, joints, circular and curved profiles, angles, holes which are linearly positioned, boxed and on pitch circles) 2.13 explain how to select and establish suitable datums, the importance of ensuring that marking out is undertaken from the selected datums, and the possible effects of working from different datums 2.14 explain the ways of laying out the marking out shapes or patterns so as to maximise the use of materials			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.15 describe the methods of marking out large or long shapes 2.16 explain how to mark out and transfer information from templates 2.17 explain how to set and adjust the marking-out tools (such as squares, protractors, marking gauges) 2.18 explain the importance of using tools only for the purpose intended, the care that is required when using the equipment and tools, and the proper way of preserving and storing tools and equipment between operations 2.19 explain the need for clear lines and dimensional accuracy in marking out to specification and drawing requirements 2.20 describe the things that can go wrong in marking out marine components, and explain how these can be avoided 2.21 explain the standards to be attained and company/customer quality control procedures 2.22 explain the recording documentation to be completed for the marking-out activities undertaken and, where appropriate, the importance of marking and identifying specific pieces of work in relation to the documentation 2.23 describe the extent of their own responsibility, and explain whom they should report to if they have problems that they cannot resolve			

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Unit 48: Shaping marine wooden components using hand tools

Unit reference number: R/601/2201

Level: 2

Credit value: 50

Guided learning hours: 119

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to cut and shape marine wood and manufactured board components, using hand tools, in accordance with approved procedures. Learners will be required to interpret drawings and work instructions, and to select the appropriate tools to use, based on the type of operations to be performed, the size of the components, and the materials to be used. The size and complexity of the components produced will vary, and it is anticipated that the production of the components will involve roughing them out, using fixed or portable machine tools, and finishing them using hand tools. The components produced will be used to produce frames, cases, storage units, furniture and other structures.

Learners' responsibilities will require them to comply with organisational policy and procedures for the woodwork manufacturing activities undertaken, and to report any problems with these activities, or with the tools, equipment and materials used that they cannot personally resolve, or are outside their permitted authority, to the relevant people. Learners will be expected to ensure that all tools, equipment and materials used in the manufacturing are correctly maintained and accounted for. They will need to complete all necessary job/task documentation accurately and legibly. Learners will be expected to work to instructions, with a minimum of supervision, and take personal responsibility for their own actions and for the quality and accuracy of the work that they carry out.

Learners' knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to the production of marine wooden components using hand woodworking tools and procedures. They will have an understanding of the equipment being used, and its application, and will know about the cutting tools, their function and maintenance requirements in adequate depth to provide a sound basis for carrying out the activities to the required specification. Learners will be able to identify blunt and damaged cutting tools, and will know how to sharpen and adjust them in use, in order for them to work efficiently.

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Learners will understand the safety precautions required when carrying out the hand shaping activities. They will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Shape marine wooden components using hand tools	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the hand shaping activities: • obtain all the necessary information to carry out the hand shaping activities (such as job instructions, drawings, specifications) • check that the hand tools are fit for purpose, and are in a safe and usable condition • ensure that the work area is free from hazards • use safe and approved hand shaping techniques at all times • maintain the cutting tools in a serviceable condition 1.3 follow relevant specifications for the component to be produced 1.4 obtain the appropriate tools and equipment for the shaping operations and check they are in a safe and usable condition 1.5 use hand tools to cut and shape materials, to include six of the following: • rip saws • tenon saws			

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Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• fret/bow saws • jack or smoothing planes • rebating planes • spokeshaves • chisels/gouges • drills/braces • files/rasps • sanding blocks/paper • portable powered hand tools 1.6 shape the materials using appropriate methods and techniques 1.7 produce components which combine different features and cover six of the following profiles: • flat faces • parallel faces • square faces • angular/tapered faces • stepped features • curved profiles • concave profiles • convex profiles • circular/round profiles			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• chamfers and radii • drilled holes • mortice and tenon joints 1.8 produce components from two of the following materials: • soft woods • hard woods • plywood • blockboard • hardboard • fibreboard (such as MDF) 1.9 check that all the required shaping operations have been completed to the required specification 1.10 use appropriate measuring equipment and tools to check four of the following: • dimensions • flatness • squareness • angles • alignment • positio			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• profile • distortion/straightness 1.11 produce components which meet all of the following quality and accuracy requirements: • dimensionally accurate within specification tolerances • free from false tool cuts and material defects • interlocking components (joints) are secure • have an appropriate surface texture • meet the drawing requirements • meet company and customer requirements 1.12 deal promptly and effectively with problems within their control and report those that cannot be solved			
2 Know how to shape marine wooden components using hand tools	2.1 explain the specific safety precautions to be taken whilst carrying out the wood-shaping activities (including any specific legislation, regulations or codes of practice relating to the activities, equipment or materials) 2.2 explain the health and safety requirements of the work area in which they are carrying out the woodworking activities, and the responsibility they place on them 2.3 explain what personal protective equipment and clothing needs to be worn during the woodworking activities			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.4 describe the hazards associated with cutting and shaping wood and composite materials, and with the tools and equipment that is used, and explain how they can be minimised 2.5 explain what precautions need to be observed when handling and lifting the materials to be shaped 2.6 explain how to obtain the necessary job instructions, drawings and specifications that are used during the woodworking activities, and how to interpret their information 2.7 describe the various hand tools that are used to cut and shape the materials, and the range of operations they are capable of performing (such as rip saws, tenon saws, fret/bow saws, smoothing planes, jack planes, re-bating planes, chisels and gouges, spokeshaves) 2.8 explain how to check that the cutting tools are in a usable and safe condition, and the procedure for sharpening and adjusting these when required 2.9 describe the various methods used to hold the components that are being shaped, formed or dressed 2.10 explain why they need to consider grain direction and construction when cutting and shaping wood and composites			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.11 explain the approved methods of removing material in such a way as to avoid damaging or distorting the finished components 2.12 describe the methods used to cut square, angular and circular/curved profiles 2.13 explain how to conduct any necessary checks to ensure the accuracy and quality of the components produced, and the type of equipment that is used for this 2.14 explain how to recognise defects in the components (these may be material defects or those produced through the cutting and shaping activities) 2.15 explain why it is important to keep the tools and equipment clean and free from damage, to practice good housekeeping of tools and equipment, and to maintain a clean and unobstructed working area 2.16 describe the standards to be attained, and company/customer quality control procedures 2.17 explain the recording documentation to be completed for the component producing activities undertaken and, where appropriate, the importance of marking and identifying specific pieces of work in relation to the documentation 2.18 describe the extent of their own responsibility, and explain whom they should report to if they have problems that they cannot resolve			

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Unit 49: Shaping marine wooden components using machines

Unit reference number: Y/601/2202

Level: 2

Credit value: 28

Guided learning hours: 77

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to cut and shape marine wooden components using machine tools, in accordance with approved procedures. Learners will be required to interpret the drawings and work instructions, and to select the appropriate equipment to use, based on the type of operations to be performed, the size of the components, and the materials used. The production of the components will involve the use of both fixed and portable conventional machines, which are designed specifically for wood and composite materials.

The size and complexity of the components produced will vary, and this will require learners to set up the necessary machines and their associated tooling, and to make any necessary adjustments during machining, in order that the parts produced meet the required specification. The components produced will be used to produce frames, cases, storage units, furniture and other marine components.

Learners' responsibilities will require them to comply with organisational policy and procedures for the machining activities undertaken, and to report any problems with the machining activities, materials or equipment used that they cannot personally resolve, or are outside their permitted authority, to the relevant people. They will be expected to ensure that all tools and equipment used in the machining activities are maintained in a safe and usable condition. The learners will need to complete all necessary job/task documentation accurately and legibly. They will be expected to work to instructions, with a minimum of supervision, and to take personal responsibility for their own actions and for the quality and accuracy of the work that they carry out.

Learners' knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to applying woodwork machining procedures. Learners will understand the equipment being used, and its application, and will know about the tooling, machine setting arrangements, tool maintenance and safety devices in adequate depth to provide a sound basis for carrying out the activities, correcting or reporting faults, and ensuring that the work output is to the required specification.

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Learners will understand the safety precautions required when carrying out the machining activities, especially those for using machine guards, and for isolating the equipment when setting or changing cutting tools. They will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Shape marine wooden components using machines	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the wood machining activities: • obtain all the necessary information to carry out the machining activities (such as job instructions, drawings, specifications) • check that the machine and its cutting tools are fit for purpose, and are in a safe and usable condition • ensure that the work area is free from hazards • ensure that all machine guards and safety devices are correctly positioned • check that dust extraction equipment is functioning correctly • set and adjust the machine to produce the components to the required specification • use safe and approved machining techniques at all times 1.3 use fixed and portable machines, to include four of the following: • circular saw • band saw			

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Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• sander (such as face, belt, bobbin) • router • planer/thicknesser • morticer/tenoner • combing machine • lathe • spindle moulder (single or double) • bench or pedestal drill • other special-purpose machine 1.4 confirm that the machine is set up and ready for the machining activities to be carried out 1.5 manipulate the machine tool controls safely and correctly in line with operational procedures 1.6 produce components which combine different features and cover eight of the following profiles: • flat faces • parallel faces • square faces • angular/tapered faces • stepped features • plain diameters • stepped diameters			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• tapers • slots/grooves • tenons • mortices • half-lap joints • combed joints • rebates • curved profiles • concave profiles • convex profiles • drilled holes 1.7 produce components from two of the following materials: • soft woods • hard woods • blockboard • plywood • hardboard • fibreboard (MDF) 1.8 carry out quality sampling checks at suitable intervals			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.9 use appropriate measuring equipment and tools to check four of the following: • dimensions • flatness • squareness • angles/taper • alignment • position • profile • distortion/straightness 1.10 produce components to the required quality and within the specified dimensional accuracy 1.11 produce components which meet all of the following quality and accuracy requirements: • dimensionally accurate within specification tolerances • free from false tool cuts and material defects • interlocking components (joints) are secure • have an appropriate surface texture • meet the drawing or specification requirements • free from defects due to stress relief and excessive burrs • meet company and customer requirements			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.12 deal promptly and effectively with problems within their control and report those that cannot be solved 1.13 shut down the equipment to a safe condition on conclusion of the machining activities			
2 Know how to shape marine wooden components using machines	2.1 explain the safe working practices and procedures to be observed when conducting shaping and cutting operations in wood (including working with machinery; machine guards; operation of machine safety devices; stopping the machine in an emergency; closing the machine down on completion of activities; statutory requirements, risk assessment procedures and relevant requirements of HASAWA, COSHH, Work Equipment Regulations and Woodworking Regulations) 2.2 explain the health and safety requirements of the work area in which they are carrying out the wood machining activities, and the responsibility they place on them 2.3 explain the importance of checking that the machinery used is working correctly, and that the cutting tools are undamaged and are in a safe and sharp condition 2.4 explain how to set up and use dust extraction equipment, and the importance of ensuring that the equipment is operating correctly 2.5 explain what personal protective equipment and clothing needs to be worn during the machining activities			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.6 describe the hazards associated with machining wood and composite materials, and explain how they can be minimised 2.7 explain the importance of ensuring that all machine and portable tools are used correctly and within their permitted operating range 2.8 explain why they need to check that all plugs, sockets and cables on portable machines are in a safe and usable condition 2.9 explain how to obtain the necessary job instructions, drawings and specifications that are used during the machining activities, and how to interpret the information they contain 2.10 describe the various machines that are used in wood machining, and the range of operations they are capable of performing (such as sawing, planning, rebating, profiling) 2.11 explain how to check that cutting tools are in a usable and safe condition, and the procedure for changing, sharpening and adjusting these when required 2.12 explain how to set up the cutting tools and operate the equipment and machinery 2.13 describe the various methods used to hold the components that are being shaped, formed or dressed			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.14 describe the methods used to cut square, angular and circular/curved profiles 2.15 explain how to conduct any necessary checks to ensure the accuracy and quality of the components produced, and the type of equipment that is used to carry out these checks 2.16 explain how to recognise defects in the components (which may be material defects or those produced through machining) 2.17 explain why it is important to keep the tools and equipment clean and free from damage, to practice good housekeeping of tools and equipment, and to maintain a clean and unobstructed working area 2.18 describe the standards to be attained and company/customer quality control procedures 2.19 explain the recording documentation to be completed for the component producing activities undertaken and, where appropriate, the importance of marking and identifying specific pieces of work in relation to the documentation 2.20 describe the extent of their own responsibility, and explain whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____

(*if sampled*)

Unit 50: Producing assemblies of marine wooden components

Unit reference number: D/601/2203

Level: 2

Credit value: 25

Guided learning hours: 70

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to assemble wooden components for marine woodwork applications, using mechanical fixing devices and adhesives, in accordance with approved procedures. Assemblies produced will include such things as bunks, top boxes, furniture units, helm and navigational consoles. Learners will be required to select the appropriate tools and equipment to use, based on the operations to be performed and the type of components to be assembled, and to check that they are in a safe and serviceable condition. They will also be expected to align the components correctly, and to assemble them in the correct order, using the appropriate fixing devices and adhesives. Learners will need to identify and/or create any datums which will be required to locate the components during the assembly process.

The size, shape and complexity of the parts to be assembled, and the finished workpiece, will vary and it is anticipated that some components will be sub-assembled prior to the final assembly taking place. The assembly activities will also include making all necessary visual and dimensional checks, to ensure that the assembly meets the required specification, that fasteners are securely tightened, and that the completed assembly is free from damage and has an appropriate cosmetic appearance.

Learners' responsibilities will require them to comply with organisational policy and procedures for the marine woodwork assembly activities undertaken, and to report any problems with the assembly activities, tools, adhesives or equipment used that they cannot personally resolve, or are outside their permitted authority, to the relevant people. Learners will be expected to work to instructions, with a minimum of supervision, taking personal responsibility for their own actions and for the quality and accuracy of the work that they carry out.

Learners' knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to the assembly of marine woodwork components. They will understand the function of the items being assembled, and will know about the assembly techniques, components, equipment, relevant materials, adhesives and fastening devices in adequate depth to provide a sound basis for carrying out the activities, correcting or reporting faults, and ensuring that the finished assembly is to the required specification.

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Learners will understand the safety precautions required when carrying out the assembly operations, especially those involved in the use of adhesives. They will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Produce assemblies of marine wooden components	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the marine woodwork assembly activities: • obtain and use the correct issue of documents and specifications • comply with relevant COSHH sheets and risk assessment standards • check that all tools and equipment are in a safe and usable condition • obtain all the required components and securing devices for the assembly • use recognised and approved assembly techniques and procedures • produce assemblies which comply with the specification • leave the work area in a safe and tidy condition 1.3 follow the relevant instructions, assembly drawings and any other specifications 1.4 ensure that the specified components are available and that they are in a usable condition			

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Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.5 use the appropriate methods and techniques to assemble the components in their correct positions 1.6 produce marine woodwork assemblies, including two of the following: • bunks • top boxes • navigational and helm consoles • furniture units without drawers and doors • furniture units with drawers • furniture units with doors 1.7 apply all of the following assembly methods and techniques, as appropriate for the assemblies being produced: • ensuring that correct and undamaged components are used • ensuring that the correct 'hand' of component is used at the appropriate position (left or right handed) • ensuring the correct orientation, position and alignment of components • using cramps to hold the components during the assembly activities • securing components using mechanical fasteners (pins, screws, nails, special fasteners) • securing components using prepared joints			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• securing components using adhesives • fitting of accessories (hinges, locks, handles, catches) 1.8 secure the components using the specified connectors and securing devices 1.9 check the completed assembly to ensure that all operations have been completed and the finished assembly meets the required specification 1.10 carry out quality and accuracy checks, which include all of the following: • dimensions • flatness • squareness • alignment • position • profile • fit • orientation • material type and quality • distortion/straightness • finish • completeness			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.11 produce marine woodwork assemblies which meet all of the following quality and accuracy requirements: • dimensionally accurate and is within specification tolerances • freedom from material defects • interlocking components (joints) are secure • doors and drawers are correctly aligned and open freely (where applicable) • have an appropriate surface texture • meet the drawing or specification requirements • meet company and customer requirements 1.12 deal promptly and effectively with problems within their control and report those that cannot be solved			
2 Know how to produce assemblies of marine wooden components	2.1 explain the specific safety precautions to be taken whilst carrying out the marine woodwork assembly activities (including any specific legislation, regulations or codes of practice relating to the activities, equipment or materials) 2.2 explain the health and safety requirements of the work area in which they are carrying out the woodwork assembly activities, and the responsibility they place on them			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.3 explain what personal protective equipment and clothing needs to be worn during the woodwork assembly activities, and explain where it can be obtained 2.4 describe the hazards associated with producing wood and composite assemblies, and explain how they can be minimised 2.5 explain how to obtain the necessary job instructions, assembly drawings and specifications that are used during the assembly activities, and how to interpret the information they contain 2.6 explain how to identify the components to be used; component identification systems (such as codes and component orientation indicators, left and right handing) 2.7 describe the preparations to be undertaken on the components prior to fitting them into the assembly 2.8 describe the assembly methods and procedures to be used, and explain the importance of adhering to these procedures 2.9 explain the importance of assembling components in the correct order 2.10 explain how to mark out the necessary datum lines for the assembly operations 2.11 explain how the components are to be aligned, oriented and positioned, prior to securing them, and the tools and equipment that are used for this			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.12 explain why some types of assembly require the use of jigs and gauges to aid the assembly 2.13 describe the various mechanical fasteners that will be used to secure the components, and explain their method of installation (including pins, nails, screws and special securing devices) 2.14 explain the application of adhesives within the assembly activities, and the precautions that must be taken when working with them 2.15 explain how to conduct any necessary checks to ensure the accuracy and quality of the assembly produced 2.16 explain how to recognise defects, blemishes, poor alignment, ineffective fasteners and damaged components within the assembly 2.17 explain how defects and variations should be dealt with, and the factors that determine the actions to be taken (including the relative costs of reworking or discarding the defective item) 2.18 explain how to check that the assembly tools and equipment to be used are in a safe and serviceable condition 2.19 explain why it is important to keep the tools and equipment clean and free from damage, to practice good housekeeping of tools and equipment, and to maintain a clean and unobstructed working area			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.20 describe the standards to be attained, and the company/customer quality control procedures 2.21 explain the recording documentation to be completed for the assembly activities undertaken and, where appropriate, the importance of marking and identifying specific pieces of work in relation to the documentation 2.22 describe the extent of their own responsibility, and explain whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____

(*if sampled*)

Unit 51: Applying surface treatments to marine wooden assemblies

Unit reference number: K/601/2205

Level: 2

Credit value: 25

Guided learning hours: 63

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to apply surface finishes to marine woodworking assemblies or installations, by hand methods, in accordance with approved procedures. Learners will be required to select the appropriate equipment to use, based on the materials to be applied and the surface area to be covered. They will be expected to use the specified or appropriate techniques to seal, prime, colour, varnish, stain, wax or polish the various parts, using brushes, rollers, pads or cloths, as applicable to the task.

Learners' responsibilities will require them to comply with organisational policy and procedures for the surface treatment activities undertaken, and to report any problems with the finishing activities, components or equipment that they cannot personally resolve, or are outside their permitted authority, to the relevant people. Learners will be expected to work to instructions, with a minimum of supervision, taking personal responsibility for their own actions and for the quality and accuracy of the work that they carry out.

Learners' knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to applying hand finishing techniques and procedures to marine woodwork assemblies or installations. They will have an understanding of the finishing procedures used, and their application, and will know about the finishing techniques, paints or coatings, and equipment used in adequate depth to provide a sound basis for carrying out the activities, correcting or reporting faults, and ensuring that the work is carried out to the required quality.

Learners will understand the safety precautions required when carrying out the finishing operations. They will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

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Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Apply surface treatments to marine wooden assemblies	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the finishing of the wooden assemblies: • obtain and follow the relevant job instructions and finishing/treatment specifications • comply with relevant COSHH requirements and risk assessments • prepare the tools and materials in readiness for the finishing operations • wear suitable protective clothing and, where appropriate, breathing apparatus • clean all tools and equipment on completion of the finishing activities • leave the work area in a safe condition and to the prescribed category of cleanliness 1.3 ensure the material surfaces to be treated are suitably prepared for the finishing operations to be carried out 1.4 prepare to carry out the finishing operations, by carrying out six of the following activities: • cleaning • flattening down			

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Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• sealing • masking • pre surface treatments • stripping old finishes • mixing of colour • mixing primers • re-activating treatments 1.5 use three of the following consumables: • masking medium and tape • rubbing paper • abrasive pads • cleaning materials 1.6 check that the finishing equipment and treatment solutions are set up and maintained at satisfactory operating conditions and levels 1.7 apply four types of the following finishing materials, using appropriate hand tools and techniques: • sanding sealer • water-based paints • oil/alkyd-based paints • synthetic paints • polyurethane varnish			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• lacquer • stain • wax • French polish • temporary protective coatings • gilding • other special finishes (specify) 1.8 carry out the treatment process in accordance with operating procedures and the component specification requirements 1.9 apply finishes to two of the following: • bulkheads • bunks • furniture units • top boxes • helm consoles • navigational consoles • doors and doorframe mouldings • other marine items (specify) 1.10 apply finishes to a range of surfaces, to include four of the following: • flat			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• horizontal • vertical • overhead • curved or cylindrical 1.11 ensure that the treated workpiece achieves the required characteristics and meets the finishing specification 1.12 apply finishes which comply with all of the following quality and accuracy standards: • has the required surface coating, in line with specification or job requirements • achieves acceptable colour match and gloss levels • is free from runs, drips or other surface defects • meets customer/company requirements 1.13 deal promptly and effectively with problems within their control and report those that cannot be solved 1.14 dispose of waste and excess materials in line with agreed organisational procedures 1.15 shut down the finishing equipment to a safe condition on completion of the processing activities			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
2 Know how to apply surface treatments to marine wooden assemblies	2.1 explain the specific safety precautions to be taken whilst carrying out the application of paint and other surface finishes (including any specific legislation, regulations or codes of practice relating to the activities, equipment or materials) 2.2 explain the health and safety requirements of the work area in which they are carrying out the finishing activity, and the responsibility they place on them 2.3 describe the hazards associated with carrying out hand painting and finishing activities in a marine environment, and with the materials and equipment used, and explain how they can be minimised 2.4 explain what personal protective equipment and clothing needs to be worn during the finishing activity 2.5 explain how to obtain and interpret the information from job instructions and specifications used in the finishing process 2.6 describe the preparation methods and techniques to be undertaken, prior to finishing for filling, and flatting 2.7 describe the surface treatment methods and techniques to be undertaken, prior to finishing			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.8 describe the preparation methods and techniques for mixing paints, varnishes, lacquers, stains and polishes 2.9 explain the various methods of applying the required finishes (using brushes, rollers, paint pads and cloths) 2.10 explain the procedures for the transportation and storage of finishing materials 2.11 explain the equipment care and control procedures (eg fume-extraction systems) 2.12 describe the cleaning and maintenance procedures for brushes and rollers 2.13 describe the procedures for dealing with waste materials 2.14 explain how to recognise defects (such as bubbles, contamination, runs and other surface defects) 2.15 describe the problems that can occur with the finishing operations, and explain how these can be overcome 2.16 explain the standards to be attained, and company/customer quality control procedures 2.17 describe the extent of their own responsibility, and explain whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____

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Unit 52: Cutting and shaping marine soft furnishings

Unit reference number: M/601/2206

Level: 2

Credit value: 30

Guided learning hours: 91

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to cut and shape marine soft furnishing materials, in accordance with approved procedures. Learners will be required to select the appropriate tools and equipment to use, based on the operations to be performed and the materials to be cut and shaped. The materials to be cut and shaped may include leather, cotton fabric, silk and decorative fabrics. The cutting and shaping activities will include hand sewing, machine sewing, cutting by hand, cutting by machine and bonding, to produce shapes that have concave forms, convex forms and multiple bending planes. Learners will be required to make all necessary checks and adjustments, to ensure that the materials are correctly positioned and aligned prior to cutting and shaping, and that they function/conform to the specification.

Learners' responsibilities will require them to comply with organisational policy and procedures for the production of the marine soft furnishings, and to report any problems with the cutting and shaping activities, or with the equipment or materials used, that they cannot personally resolve, or are outside their permitted authority, to the relevant people. Learners will be expected to work to instructions, with a minimum of supervision, and to take personal responsibility for their own actions and for the quality and accuracy of the work that they carry out. They will also need to complete all necessary job/task documentation accurately and legibly.

Learners' knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to applying cutting and shaping techniques and procedures for the production of marine soft furnishings. Learners will have an understanding of the materials being cut and shaped, and their application, and will know about the relevant fastening and securing devices in adequate depth to provide a sound basis for carrying out the activities, correcting/reporting faults and ensuring that the finished soft furnishings are to the required specification.

Learners will understand the safety precautions required when carrying out the operations, especially those involved in the use of cutting and shaping machinery. They will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace.

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Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Cut and shape marine soft furnishings	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the production of the soft furnishings: • obtain and use the correct job instructions, drawings and other relevant documentation • use copies of relevant COSHH sheets and risk assessment procedures • use safe and approved cutting and shaping procedures at all times • return all tools and equipment to the correct location on completion of the activities • leave the work area in a safe and tidy condition 1.3 follow relevant specifications for the component to be produced 1.4 obtain the appropriate tools and equipment for the shaping operations and check they are in a safe and usable condition 1.5 use five of the following tools and equipment: • tape measure • shears • scalpel			

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Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• straight edge • tri-square • knife • patterns • templates 1.6 shape the materials using appropriate methods and techniques 1.7 use three of the following cutting and shaping methods and techniques: • hand sewing • machine sewing • cutting by hand • cutting by machine • adhesive bonding 1.8 produce soft furnishings that have two of the following features: • concave forms • convex forms • multiple bending planes 1.9 use two of the following materials: • leather • silk			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• cotton fabric • synthetic materials • decorative fabrics 1.10 check that all the required shaping operations have been completed to the required specification 1.11 carry out all of the following quality and accuracy checks during the activity: • cosmetic appearance • accuracy of furnishing lines • freedom from damage 1.12 produce soft furnishings in accordance with one of the following standards: • BS or ISO standards and procedures • customer (contractual) standards and requirements • company standards and procedures • specific system requirements • recognised compliance agency/body's standards 1.13 deal promptly and effectively with problems within their control and report those that cannot be solved			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.14 complete the relevant paperwork, to include one from the following, and pass it to the appropriate people: • job cards • quality/acceptance documentation • work authorisation documents			
2 Know how to cut and shape marine soft furnishings	2.1 explain the specific safety practices and procedures that they need to observe when working with marine soft-furnishing materials (including any specific legislation, regulations/codes of practice for the activities, equipment or materials) 2.2 explain the health and safety requirements of the work area in which they are carrying out the activities, and explain the responsibility these requirements place on them 2.3 describe the hazards associated with cutting and shaping marine soft-furnishing materials, and with the tools and equipment used, and explain how they can be minimised 2.4 explain what protective equipment they need to use for both personal protection and protection of the soft furnishings 2.5 explain how to interpret the drawings, standards, quality control procedures and specifications used for the cutting and shaping activities			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.6 explain how to carry out currency/issue checks of the specifications they are working with 2.7 describe the soft furnishings to be worked, and explain their purpose within the item to which they are attached/used 2.8 describe the quality control procedures to be followed during the cutting and shaping operations 2.9 explain the procedures for ensuring that they have the correct tools, equipment and materials for the activities 2.10 explain the use of adhesives, and the precautions to be taken 2.11 describe the procedure for the safe disposal of waste materials 2.12 explain how to conduct any necessary checks to ensure the functionality, accuracy and quality of the product 2.13 explain how to recognise defects (such as cosmetic appearance, misalignment, incorrect stitching, stains, damage or contamination) 2.14 describe the problems that can occur with the cutting and shaping operations, and explain how these can be overcome 2.15 explain what recording documentation needs to be completed for the activities undertaken			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.16 describe the extent of their own responsibility, and explain whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____

(*if sampled*)

Unit 53: Fitting marine interior panels and soft furnishings

Unit reference number: M/601/2285

Level: 2

Credit value: 25

Guided learning hours: 65

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to fit marine interior panels and soft furnishings, in accordance with approved procedures. Learners will be required to select the appropriate tools and equipment to use, based on the operations to be performed and the panels or soft furnishings to be installed. The panels and soft furnishings to be installed will include items such as deckhead panels, bulkhead panels, dado panels, power support units, trim, carpets, vinyl floors, blinds, curtains, decorative panels and seat covers. The installation activities will include making all necessary checks and adjustments to ensure that the panels and soft furnishings are correctly positioned, aligned and secured, and that they function as per the specification.

Learners' responsibilities will require them to comply with organisational policy and procedures for the fitting of the panels and soft furnishings, and to report any problems with the fitting activities, materials or equipment used that they cannot personally resolve, or are outside their permitted authority, to the relevant people. Learners must ensure that all tools, equipment and materials used in the activities are removed from the work area on completion of the activities, and that all necessary job/task documentation is completed accurately and legibly. They will be expected to work either with a high level of supervision or as a member of a team. Learners will take personal responsibility for their own actions and for the quality and accuracy of the work that they carry out. Where team working is involved, they must demonstrate a significant personal contribution during the team activities, in order to satisfy the requirements of the standard, and competence in all the areas required by the standard must be demonstrated.

Learners' knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to applying fitting techniques and procedures for marine interior panels and soft furnishings. Learners will understand the panel and soft furnishings being fitted, and their application, and will know about the relevant panel and trim fastening and securing devices, in adequate depth to provide a sound basis for carrying out the activities, correcting/reporting faults and ensuring that the completed installation is to the required specification.

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Learners will understand the safety precautions required when carrying out the fitting operations, particularly when using adhesives in confined spaces. They will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Fit marine interior panels and soft furnishings	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the fitting of the interior panels and soft furnishings: • obtain and use the correct job instructions and installation documentation • use copies of relevant COSHH sheets and risk assessment procedures • return all tools and equipment to the correct location on completion of the activities • leave the work area in a safe condition and to the prescribed category of cleanliness 1.3 follow all relevant drawings and specifications for the installation being carried out 1.4 use the correct tools and equipment for the installation operations and check that they are in a safe and usable condition 1.5 install, position and secure the equipment and components in accordance with the specification 1.6 install three items of panel system from the following: • deckhead panels • dado panels			

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Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• bulkhead panels • power support units • hard trim 1.7 install three items of trim system from the following: • carpets • vinyl floors • blinds • curtains • decorative panels • seat covers 1.8 apply all of the following installation methods and techniques: • positioning and aligning • functional checks • manual handling 1.9 use four of the following types of joining techniques: • nuts and bolts • Velcro • adhesive spray • adhesive brush			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• screws • heat gun • hand gluing • carpet iron • quick-release fasteners • adhesive tapes 1.10 check that all necessary connections to the equipment are complete 1.11 deal promptly and effectively with problems within their control and report those that cannot be solved 1.12 check that the installation is complete and that all components are free from damage 1.13 carry out all of the following quality and accuracy checks during the installation: • cosmetic appearance • accuracy of installation/furnishing lines • freedom from damage 1.14 produce installations in accordance with one of the following standards: • BS or ISO standards and procedures • customer (contractual) standards and requirements • company standards and procedures			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• specific system requirements • recognised compliance agency/body's standards 1.15 complete the relevant paperwork, to include one from the following, and pass it to the appropriate people: • fitting records • quality/acceptance documentation • system log • job cards • work authorisation documents			
2 Know how to fit marine interior panels and soft furnishings	2.1 explain the specific safety practices and procedures that they need to observe when working with marine panels and soft furnishings (including any specific legislation, regulations/codes of practice for the activities, equipment or materials) 2.2 explain the health and safety requirements of the work area in which they are carrying out the activities, and the responsibility these requirements place on them 2.3 describe the hazards associated with fitting marine panels and soft furnishings, and with the tools and equipment used, and explain how they can be minimised			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.4 explain what protective equipment they need to use for both personal protection and protection of the vessel, structure or craft 2.5 explain how to interpret the drawings, standards, quality control procedures and specifications used for the fitting activities 2.6 explain how to carry out currency/issue checks of the specifications they are working with 2.7 describe the panels, trim and soft furnishings to be fitted, and explain their function within the particular system 2.8 describe the various fasteners that will be used, and their method of installation 2.9 explain the importance of using the specified fasteners for the particular fitting activity, and why they must not substitute others 2.10 describe the different methods and techniques that are used for the joining of soft furnishings 2.11 describe the quality control procedures to be followed during the fitting operations 2.12 explain the procedures for ensuring that they have the correct tools, equipment, components and fasteners for the activities 2.13 describe the techniques used to position, align, adjust and secure the panels, trim and soft furnishings to the vessel without damage			

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Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.14 describe the methods of lifting, handling and supporting the panels and trim during the fitting activities 2.15 explain the use of seals, sealant, adhesives, and the precautions to be taken 2.16 describe the procedure for the safe disposal of waste materials 2.17 explain how to conduct any necessary checks to ensure the accuracy and quality of the fitted components 2.18 explain how to recognise fitting defects (such as cosmetic appearance, poor fitting, misalignment, ineffective fastening, damage or contamination) 2.19 explain the importance of ensuring that the completed installation is free from dirt, swarf and damage 2.20 describe the tools and equipment used in the fitting activities, and explain their care and control procedures 2.21 describe the problems that can occur with the fitting operations, and explain how these can be overcome			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.22 explain what recording documentation needs to be completed for the activities undertaken 2.23 describe the extent of their own responsibility, and explain whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

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Unit 54: Fitting marine seating and furniture

Unit reference number: A/601/2287

Level: 2

Credit value: 25

Guided learning hours: 65

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to fit marine seating and furniture, in accordance with approved procedures. Learners will be required to select the appropriate tools and equipment to use, based on the operations to be performed and components to be fitted. The seating and furniture to be fitted will include items such as workstation furniture, cabin furniture, bunks or beds, standard furniture, public area furniture, passenger seats and VIP furniture.

The fitting activities will include making all necessary checks and adjustments to ensure that components are correctly positioned and aligned, have appropriate working clearances, their cosmetic appearance is acceptable, and that they function as per the specification.

Learners' responsibilities will require them to comply with organisational policy and procedures for the fitting of the marine seating and furniture, and to report any problems with the installation activities, materials or equipment used that they cannot personally resolve, or are outside their permitted authority, to the relevant people. Learners must ensure that all tools, equipment and materials used in the activities are removed from the work area on completion of the activities, and that all necessary job/task documentation is completed accurately and legibly. They will be expected to work either with a high level of supervision or as a member of a team. Learners will take personal responsibility for their own actions and for the quality and accuracy of the work that they carry out. Where team working is involved, they must demonstrate a significant personal contribution during the team activities in order to satisfy the requirements of the standard, and competence in all the areas required by the standard must be demonstrated.

Learners' knowledge will provide a sound basis for their work, and will provide an informed approach to applying fitting techniques and procedures for marine seating and furniture. They will have an understanding of the equipment being fitted, and its application, and will know about the relevant components, fastening and securing devices in adequate depth to provide a sound basis for carrying out the activities, correcting/reporting faults, and ensuring that the equipment fitted is to the required specification.

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Learners will understand the safety precautions required when carrying out the fitting operations. They will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Fit marine seating and furniture	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the fitting of the marine seating and furniture: • obtain and use the correct job instructions, installation drawings and other relevant documentation • use copies of relevant COSHH sheets and risk assessment procedures • return all tools and equipment to the correct location on completion of the activities • leave the work area in a safe condition and to the prescribed category of cleanliness 1.3 follow all relevant drawings and specifications for the installation being carried out 1.4 use the correct tools and equipment for the installation operations and check that they are in a safe and usable condition 1.5 install, position and secure the equipment and components in accordance with the specification 1.6 install two of the following items of equipment: • workstation/office furniture • cabin furniture			

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Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• communal/public area furniture • standard furniture • passenger seats • bunks/beds • VIP furniture • other specific furniture 1.7 apply all of the following installation methods and techniques: • positioning and aligning • manual handling • setting working clearances • functional checks 1.8 make three of the following types of connection: • nuts and bolts • electrical • locking devices • screws • torque load bolts • quick-release fasteners 1.9 check that all necessary connections to the equipment are complete			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.10 deal promptly and effectively with problems within their control and report those that cannot be solved 1.11 check that the installation is complete and that all components are free from damage 1.12 carry out all of the following quality and accuracy checks during the installation: • cosmetic appearance • accuracy of installation/furnishing lines • freedom from damage 1.13 produce installations in accordance with one of the following standards: • BS or ISO standards and procedures • other accepted international standards • customer (contractual) standards and requirements • company standards and procedures • specific system requirements • recognised compliance agency/body's standards 1.14 complete the relevant paperwork, to include one from the following, and pass it to the appropriate people: • installation records • quality/acceptance documentation			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• system log • job cards • work authorisation documents			
2 Know how to fit marine seating and furniture	2.1 explain the specific safety practices and procedures that they need to observe when fitting marine seating and furniture (including any specific legislation, regulations/codes of practice for the activities, equipment or materials) 2.2 explain the health and safety requirements of the work area in which they are carrying out the activities, and the responsibility these requirements place on them 2.3 describe the hazards associated with fitting marine seating and furniture, and with the tools and equipment used, and explain how they can be minimised 2.4 explain what protective equipment they need to use for both personal protection and protection of the structure, vessel or craft 2.5 explain how to interpret the drawings, standards, quality control procedures and specifications used for the fitting activities 2.6 explain how to carry out currency/issue checks of the specifications they are working with			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.7 describe the components to be fitted, and explain their function within the particular marine seating or furniture system 2.8 describe the various fasteners that will be used, and explain their method of installation (including threaded fasteners and special securing devices) 2.9 explain the importance of using the specified fasteners for the particular components, and why they must not substitute others 2.10 describe the quality control procedures to be followed during the fitting operations 2.11 explain the procedures for ensuring that they have the correct tools, equipment, components and fasteners for the activities 2.12 describe the techniques used to position, align, adjust and secure the components to the vessel without damage 2.13 describe the methods of lifting, handling and supporting the seats or furniture during the fitting activities 2.14 explain why electrical bonding is critical, and why it must be both mechanically and electrically secure 2.15 explain how to conduct any necessary checks to ensure the system integrity, functionality, accuracy and quality of the installation			

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Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.16 explain how to recognise fitting defects (such as cosmetic appearance, misalignment, ineffective fasteners, damage or contamination) 2.17 explain the importance of ensuring that the completed installation is free from dirt, swarf and damage 2.18 describe the tools and equipment used in the fitting activities, and explain their calibration/care and control procedures 2.19 describe the problems that can occur with the fitting operations, and explain how these can be overcome 2.20 explain what recording documentation needs to be completed for the activities undertaken 2.21 describe the extent of their own responsibility, and explain whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____

(*if sampled*)

Unit 55: Using wet lay-up techniques to produce marine composite components

Unit reference number: F/601/2288

Level: 2

Credit value: 42

Guided learning hours: 151

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to produce a range of marine composite mouldings by using wet lay-up techniques, in accordance with approved procedures. Learners will be required to use appropriate drawings, specifications and documentation to produce various mouldings, using the correct wet lay-up production techniques. The marine composite mouldings produced will include items 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.

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

Learners' responsibilities will require them to comply with organisational policy and procedures for the composite moulding activities undertaken, and to report any problems with the moulding activities, equipment or materials that they cannot personally resolve, or are outside their permitted authority, to the relevant people. Learners will be expected to work either with a high level of supervision or as a member of a team. They will take personal responsibility for their own actions and for the quality and accuracy of the work that they carry out. Where team working is involved, learners must demonstrate a significant personal contribution during the team activities in order to satisfy the requirements of the standard, and competence in all the areas required by the standard must be demonstrated.

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Learners' knowledge will be sufficient to provide a good understanding of their work, and will provide an informed approach to applying wet lay-up moulding techniques and procedures to produce marine composite components. Learners will have an understanding of the wet lay-up production techniques used, and their application in adequate depth to provide a sound basis for carrying out the activities, recognising and correcting/reporting faults, and ensuring that the work output is to the required specification.

Learners will understand the safety precautions required when carrying out the wet lay-up moulding activities and when using the associated tools and equipment. They will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Use wet lay-up techniques to produce marine composite components	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the moulding activities: • use the correct issue of production documentation (such as drawings, manuals, specifications, job cards) • use relevant health and safety documentation (such as material data sheets, COSHH sheets, risk assessments) • use the correct tools and equipment for the activity, and ensure that they are safe to use • use the correct materials, as specified in the production documentation • keep the work area in a safe and tidy condition 1.3 follow the correct component drawing or any other related specifications for the component to be produced 1.4 determine what has to be done and how this will be achieved 1.5 obtain and prepare the appropriate tools, equipment and materials			

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Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.6 prepare the moulds and materials for the production activities, to include all of the following: • clean tooling and remove resin build-ups • check tooling for surface defects • correctly apply sealers/release agents • obtain correct materials for the activity • identify and protect materials in the work area 1.7 carry out the moulding or laying-up activities using the correct methods and techniques 1.8 produce a range of marine components, using two of the following application techniques: • spray application of fibre/resin • application of a gel coat • brush application of fibre/resin • roller application of fibre/resin • removal of voids and air pockets 1.9 produce marine composite mouldings using wet lay up techniques, to include: • Either one of the following: • hull • cabins • wheel houses			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• superstructure • bulkheads • other major marine components • mast • spars OR three of the following types of marine components: • rudders • air intakes/vents • fairings • hatches • consoles • radar/navigational domes • casings and covers • davits • skegs • tanks • berths • vanity units • shower units • seats			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• steering equipment (wheel, tiller) • housings • composite mould tools • other specific components 1.10 produce a range of marine components, incorporating one of the following in the lay-up: • feathered joins • overlap joins • orientated plies • inserts • fixtures • butt joins 1.11 produce a range of marine mouldings, incorporating two of the following shape features: • internal corner • external corner • double curvature • concave surface • convex surface • vertical surface			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.12 produce a range of marine mouldings, using all of the following: • resin (such as polyester, epoxy, phenolic, vinyl ester) • fibre (such as glass, carbon, polyethylene, aramid) • reinforcement (such as braids, roving, tapes, chopped strand, continuous filament, woven) • core material (such as wood, coremat, structural foam, honeycomb) 1.13 produce components to the required specification in accordance with one of the following: • ISO 9000 quality assurance procedures • customer standards and requirements • company standards and procedures • recognised compliance agency/body's standards 1.14 check that all the required operations have been completed to specification 1.15 deal promptly and effectively with problems within their control and report those that cannot be solved			
2 Know how to use wet lay-up techniques to produce marine composite components	2.1 explain the health and safety precautions to be taken, and procedures used in the specific work area, when working with composite materials, consumables, tools and equipment			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.2 describe the hazards associated with carrying out wet lay-up laminating and moulding activities, and with the composite materials, consumables, tools and equipment, and explain how to minimise these in the work area 2.3 explain what protective equipment is needed for personal protection and, where required, the protection of others 2.4 explain the application of COSHH regulations in relation to the storage, use and disposal of composite materials and consumables 2.5 describe 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) 2.6 explain how to use and extract information from engineering drawings and related specifications (to include symbols and conventions to appropriate BS or ISO standards) in relation to work undertaken 2.7 explain how to interpret and use imperial and metric systems of measurement 2.8 describe the quality procedures used in the workplace to ensure production control (in relation to currency, issue, meeting specification etc) and the procedures for completion of such documents			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.9 explain the conventions and terminology used for wet lay-up techniques (including resin and fibre weights/volumes, material orientation, material identification, material tailoring, mixing ratios, gel times, exotherm, consolidation etc) 2.10 explain the types of resin, fibres and reinforcement used, and their applications 2.11 explain how to visually identify both raw and finished composite materials 2.12 describe the methods of preparation for patterns, moulds and tooling (including the correct use of surface sealers and release agents) 2.13 explain the mixing ratios for gel coats, resins, additives and catalysts, and the associated working times 2.14 describe the methods used in the application of the resin/fibre during the lay-up activity 2.15 describe tools and equipment used in the lay-up activities, and explain their care, preparation and control procedures 2.16 explain how to recognise faults that can occur during the lay-up process 2.17 explain how to identify defects in the composite moulding (such as de-lamination, voids, contaminants)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.18 explain how defects can be overcome during the lay-up activity 2.19 describe the procedures and methods used for removing mouldings from production tooling 2.20 describe the methods and techniques used to trim mouldings prior to release 2.21 describe the care and safe handling of production tooling and composite mouldings throughout the production cycle 2.22 explain how the composite moulding relates to its own quality documents and the production tooling used 2.23 describe the extent of their own responsibility, and explain whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date: _____

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(*if sampled*)

Unit 56: Using pre-preg laminating techniques to produce marine composite components

Unit reference number: A/601/2290

Level: 2

Credit value: 42

Guided learning hours: 151

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to produce a range of marine composite mouldings using pre-preg laminating techniques, in accordance with approved procedures. Learners will be required to use appropriate drawings, specifications and documentation to produce various mouldings, using the correct pre-preg laminating production techniques. The marine composite mouldings produced will include items 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.

Learners will be expected to prepare the tooling, apply release agents, and prepare the required composite materials. They will produce a range of composite mouldings, incorporating a variety of features and using a range of techniques and processes. Mouldings produced will include laminates and sandwich structures, using a range of resin, fibre and core materials.

Learners' responsibilities will require them 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 they cannot personally resolve, or are outside their permitted authority, to the relevant people. Learners will be expected to work either with a high level of supervision or as a member of a team. They will take personal responsibility for their own actions and for the quality and accuracy of the work that they carry out. Where team working is involved, learners must demonstrate a significant personal contribution during the team activities in order to satisfy the requirements of the standard, and competence in all the areas required by the standard must be demonstrated.

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Learners' knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to applying pre-preg laminating techniques and procedures to produce marine composite mouldings. They will have an understanding of the production techniques used, and their application in adequate depth to provide a sound basis for carrying out the activities, recognising and correcting/reporting faults and ensuring that the work output is to the required specification.

Learners will understand the safety precautions required when carrying out the pre-preg laminating activities, and when using the associated tools and equipment. They will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Use pre-preg laminating techniques to produce marine composite components	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the pre-preg laminating activities: • use the correct issue of production documentation (such as job instructions, drawings, specifications) • use relevant health and safety documentation (such as material data sheets, COSHH sheets, risk assessments) • use the correct tools and equipment for the activity, and ensure that they are safe to use • use the correct materials, as specified in the production documentation • keep the work area in a safe and tidy condition 1.3 follow the correct component drawing or any other related specifications for the component to be produced 1.4 determine what has to be done and how this will be achieved			

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Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.5 obtain and prepare the appropriate tools, equipment and materials 1.6 prepare moulds and materials for production activities, to include carrying out all of the following: • cleaning of tooling and removal of resin build-ups • checking of tooling for surface defects • correctly applying sealants/release agents • obtain correct materials for the activity • identify and protect materials in the work area 1.7 carry out the moulding or laying-up activities using the correct methods and techniques 1.8 produce marine composite mouldings, using techniques for two of the following types of production tools: • metal • wet lay-up • glass pre-preg • tooling block • closed tooling • female tooling • male tooling			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• multi-part tools • matched tooling • carbon pre-preg 1.9 produce marine composite mouldings using pre-preg laminating techniques, to include: Either one of the following: • hull • cabins • wheel houses • superstructure • bulkheads • other major marine components • masts • spars OR three of the following types of marine components: • rudders • air intakes/vents • fairings • hatches • consoles • radar/navigational domes			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• casings and covers • davits • skegs • tanks • berths • vanity units • shower units • seats • steering equipment (wheel, tiller) • housings • composite mould tools • other specific components 1.10 produce marine composite mouldings, incorporating one of the following in the lay-up: • butt joins • overlap joins • staggered joins • orientated plies • inverted plies • inserts			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.11 produce marine composite mouldings incorporating three of the following features: • internal corners • external corners • double curvature • concave surface • convex surfaces • return surfaces • joggle details • nett edges • flanges 1.12 use all of the following in the lay-up activities: • resin (such as epoxy, phenolic, bismaleimide, cyanate ester, acrylic) • fibre (such as glass, polyethylene, aramid, carbon, hybrid) • reinforcement (such as continuous, unidirectional, braids, woven, multi-axis, tapes) • core materials (such as wood, syntactic core, expanding core, foam, honeycomb, end grain balsa)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.13 use one of the following for applying temperature during the cure cycle: • oven • heated tools/moulds • autoclave • heated press 1.14 use one of the following for applying pressure during the cure cycle: • pressure bags • vacuum bags • thermal mould expansion • fibre tensioning 1.15 produce components to the required specification in accordance with one of the following: • ISO 9000 quality assurance procedures • customer standards and requirements • company standards and procedures • recognised compliance agency/body's standards 1.16 check that all the required operations have been completed to specification 1.17 deal promptly and effectively with problems within their control and report those that cannot be solved			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
2 Know how to use pre-preg laminating techniques to produce marine composite components	2.1 explain the health and safety precautions to be taken, and procedures used in the specific work area, when working with composite materials, consumables, tools and equipment 2.2 describe the hazards associated with working with composite materials, consumables, tools and equipment, and explain how to minimise these in the work area 2.3 explain what protective equipment is needed for personal protection and, where required, the protection of others 2.4 explain the application of COSHH regulations in relation to the storage, use and disposal of composite materials and consumables 2.5 describe 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) 2.6 describe the quality procedures used in the workplace to ensure production control (in relation to currency, issue, meeting specification), and explain the procedures for the completion of such documents			

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Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.7 explain the conventions and terminology used for pre-preg laminating techniques (to include material orientation, material identification, material templates, ply lay-up, pressure plates, vacuum bagging, cure cycles, exotherm) 2.8 explain the different types of resin systems, fibres, reinforcements, and their applications 2.9 explain how to build up the laminates (including orientation and balance of plies to minimise spring and distortion in composite mouldings) 2.10 describe the different core, insert and filler materials, and their applications 2.11 explain how to visually identify both raw and finished composite materials, and the identification of materials by product codes 2.12 describe how to prepare the patterns, moulds and tooling (including the correct selection and use of surface sealers and release agents) 2.13 explain the correct methods of storage, thawing and handling of pre-preg materials (including monitoring temperature, storage life and out-life) 2.14 describe the methods used in the application of pre-preg materials to tooling surfaces (including methods of tailoring and cutting) 2.15 describe the correct methods of storage and handling of ancillary and consumable materials			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.16 describe the tools and equipment used in the pre-preg laminating activities, and explain their care, preparation and control procedures 2.17 explain how to recognise faults that can occur during the moulding process 2.18 explain the importance of adhering to the cure cycle 2.19 describe the procedures and methods used for removing mouldings from production tooling 2.20 describe the care and safe handling of production tooling and composite mouldings throughout the production cycle 2.21 describe the production controls used in the work area, and actions to be taken for unaccounted items 2.22 describe the extent of their own authority, and explain whom they should report to if they have problems that they cannot resolve			

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Unit 57: Forming marine components by acrylic moulding

Unit reference number: F/601/2291

Level: 2

Credit value: 32

Guided learning hours: 130

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to produce components by acrylic moulding, in accordance with approved procedures. Learners will be required to follow the appropriate instructions, drawings, specifications and documentation to produce the various types of component. They will be expected to produce the acrylic components, using the specified moulding process and techniques. This will involve using equipment such as air circulating ovens, presses, trimming and automated cutting equipment. The products produced will include deep drawn, double curvature, convex and concave shapes.

Learners' responsibilities will require them to comply with organisational policy and procedures for the acrylic moulding activities undertaken, and to report any problems with the activities, equipment or materials that they cannot personally resolve, or are outside their permitted authority, to the relevant people. They will be expected to work to instructions, with a minimum of supervision, taking personal responsibility for their own actions and for the quality and accuracy of the work that they carry out.

Learners' knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to applying acrylic moulding techniques and procedures. Learners will have an understanding of the production techniques used, and their application in adequate depth to provide a sound basis for carrying out the activities, recognising and correcting/reporting faults, and ensuring that the work output is to the required specification.

Learners will understand the safety precautions required when carrying out the acrylic moulding activities, and when using the associated tools and equipment. They will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

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Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Form marine components by acrylic moulding	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the moulding activities: • use the correct issue of production documentation (such as job instructions, drawings, specifications) • use relevant health and safety documentation (such as material data sheets, COSHH sheets, risk assessments) • use the correct tools and equipment for the activity, and ensure that they are safe to use • use the correct materials and consumables, as specified in the production documentation • apply safe and appropriate acrylic moulding practices and procedures at all times • keep the work area in a safe and tidy condition 1.3 follow the correct component drawing or any other related specifications for the component to be produced 1.4 determine what has to be done and how this will be achieved 1.5 obtain and prepare the appropriate tools, equipment and materials			

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Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.6 carry out the moulding or laying-up activities using the correct methods and techniques 1.7 carry out one of the following acrylic moulding methods and techniques: • vacuum moulding • deep drawing • shape clamping • positive pressure shaping • stress relieving 1.8 carry out four of the following operations during the moulding process: • tool/equipment preparation • sheet preparation • trimming • setting and controlling temperatures • stress relieving • sheet forming • de-moulding 1.9 produce a range of components with two of the following features: • box sections • cylindrical section			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• convex shapes • concave shapes • single curvatures • double curvatures 1.10 produce components to the required specification in accordance with one of the following: • ISO 9000 quality assurance procedures • customer standards and requirements • company standards and procedures • recognised compliance agency/body's standards 1.11 check that all the required operations have been completed to specification 1.12 deal promptly and effectively with problems within their control and report those that cannot be solved			
2 Know how to form marine components by acrylic moulding	2.1 explain the specific safety practices and procedures that they need to observe when working with acrylics (including any specific legislation, regulations/codes of practice for the activities, equipment or materials used) 2.2 explain the health and safety requirements of the work area where they are carrying out the activities, and the responsibility these requirements place on them			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.3 explain what protective equipment they need to use for both personal protection and, where appropriate, protection of others 2.4 describe the hazards associated with moulding acrylic materials, and with the tools and equipment used, and explain how they can be minimised 2.5 explain how to interpret the drawings, standards, quality control procedures and specifications used for the moulding activity, and how to carry out currency/issue checks of the documents they are working with 2.6 explain the principles of deep drawing, concave/convex moulding, positive pressure moulding and stress relieving 2.7 explain the different methods of heating materials, and the temperature control methods 2.8 explain the sheet profiling procedures, and material trimming methods/procedures 2.9 explain how acrylic sheet is supplied (such as colour, thickness, sheet size, surface texture, material protection) 2.10 explain the use of forming aids 2.11 describe the methods of sheet trimming and sheet cleaning prior to moulding 2.12 describe the preparation methods and procedures applied to the moulding surface			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.13 describe the material cleaning methods and procedures to be applied 2.14 describe the quality control procedures to be followed during the moulding operations 2.15 describe the methods and techniques for lifting, handling and supporting the components, equipment and materials during the moulding activities 2.16 explain how to recognise moulding defects (such as misalignment, distortion, damage, contamination and surface defects) 2.17 describe the tools and equipment used in the moulding activities, and explain their calibration, care, preparation and control procedures 2.18 describe the problems that can occur with the moulding operations, and how these can be overcome 2.19 explain the recording documentation that needs to be completed for the moulding activities undertaken 2.20 describe the extent of their own authority, and explain whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____

(*if sampled*)

Unit 58: Assembling marine composite components

Unit reference number: L/601/2293

Level: 2

Credit value: 42

Guided learning hours: 151

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to produce marine composite assemblies from composite components and non-composite components, in accordance with approved procedures. Learners will be required to work to instructions, specifications and documentation to produce the composite assemblies, using the correct techniques. The marine composite assemblies produced will include items such as bulkheads, hulls, superstructure, masts, spars, fairings, air intakes, steering equipment, rudders, skegs, tanks, casings and coverings, davits and internal fitments such as berths, vanity units, consoles, seating, and shower units.

Learners' responsibilities will require them to comply with organisational policy and procedures for the composite assembly activities undertaken, and to report any problems with the assembly activities, equipment or materials that they cannot personally resolve, or are outside their permitted authority, to the relevant people. They will be expected to either work with a high level of supervision or as a member of a team. Learners will take personal responsibility for their own actions and for the quality and accuracy of the work that they carry out. Where team working is involved, they must demonstrate a significant personal contribution during the team activities in order to satisfy the requirements of the standard, and competence in all the areas required by the standard must be demonstrated.

Learners' knowledge will be sufficient to provide a good understanding of their work, and will provide an informed approach to applying assembly techniques and procedures to marine composite components. The learner will have an understanding of the composite assembly techniques used, and their application in adequate depth to provide a sound basis for carrying out the activities, recognising faults, and ensuring that the finished assembly is to the required specification.

Learners will understand the safety precautions required when carrying out the assembly activities, and when using the associated tools and equipment. They will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace.

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Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Assemble marine composite components	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the marine composite assembly activities: • use the correct issue of production documentation (such as job instructions, drawings, specifications) • use relevant health and safety documentation (such as material data sheets, COSHH sheets, risk assessments) • use the correct tools and equipment for the activity, and ensure that they are safe to use • ensure that components to be used are of the correct type, and that all mouldings are free from defects • apply safe and appropriate assembly techniques at all times • keep the work area in a safe and tidy condition 1.3 follow the relevant instructions, assembly drawings and any other specifications 1.4 check that the specified components are available and that they are in a usable condition			

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Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.5 use the appropriate methods and techniques to assemble the components in their correct positions 1.6 produce one of the following types of marine composite assembly: • one-off assemblies • batch assemblies • assembly line 1.7 produce marine composite assemblies that incorporate two of the following features: • loose fit tolerances • close fit tolerances • non-permanent fixing • shape location • staggered joins • permanent fixing • return joins • overlap joins 1.8 produce marine composite assemblies that require two of the following methods to be used: • fettling • pinning • clamping			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• trial fitting • aligning • assembly jigs 1.9 assemble marine composite components, which include two of the following: • hull • rudder • wheel houses • superstructure • bulkheads • masts • spars • skegs • cabins • tanks • berths • air intakes/vents • shower units • casings/coverings • radar/navigational domes • fairings			

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Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• hatches • consoles • davits • seating • vanity units • steering equipment • other marine assemblies 1.10 produce marine composite assemblies which include one of the following non-composite components: • brackets • fixtures • fittings • trim • tapes • memory foam • films 1.11 secure the components using the specified connectors and securing devices to include one of the following: • thread inserts • quick-release fasteners			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• rivets • laminating • mechanical fasteners • anchor nuts • adhesive bonding • pins 1.12 check the completed assembly to ensure that all operations have been completed and the finished assembly meets the required specification in accordance with one of the following: • ISO 9000 quality assurance procedures • customer standards and requirements • company standards and procedures • recognised compliance agency/body's standards 1.13 deal promptly and effectively with problems within their control and report those that cannot be solved			
2 Know how to assemble marine composite components	2.1 explain the health and safety precautions to be taken and procedures used in the specific work area, when working with composite materials, consumables, tools and equipment 2.2 describe the hazards associated with assembling composite materials, and with the consumables, tools and equipment used, and explain how to minimise these in the work area			

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Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.3 explain what protective equipment is needed for personal protection and, where required, the protection of others 2.4 explain the application of COSHH regulations in relation to the storage, use and disposal of composite materials and consumables 2.5 describe 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) 2.6 explain how to use and extract information from engineering drawings and related specifications (to include symbols and conventions to appropriate BS or ISO standards) in relation to work undertaken 2.7 explain how to use imperial and metric systems of measurement, workpiece reference points and system of tolerancing 2.8 explain what preparations need to be undertaken on the composite components prior to assembly 2.9 describe the assembly/joining methods, techniques and procedures to be used, and the importance of adhering to these procedures 2.10 explain how the components are to be aligned, adjusted, positioned and clamped prior to assembly, and the tools and equipment that are used for this			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.11 explain the importance of using the specified basic components and joining devices for the assembly, and why they must not use substitutes 2.12 explain where appropriate, the application of sealants and adhesives within the assembly activities, and the precautions that must be taken when working with them 2.13 describe the quality control procedures to be followed during the assembly operations 2.14 explain the methods for handling composite assemblies throughout the assembly activities 2.15 describe the tools and equipment used in assembly activities, and explain their care, preparation and control procedures 2.16 describe the things that can go wrong with the assembly activities, and explain how they can be avoided 2.17 describe the extent of their own authority, and explain whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____

(*if sampled*)

Unit 59: Vacuum-forming marine composite materials

Unit reference number: R/601/2294

Level: 2

Credit value: 32

Guided learning hours: 130

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to vacuum form components, in accordance with approved procedures. Learners will be required to follow the appropriate instructions, drawings and specifications, to produce the various types of component from thermoplastic sheet, fibre-reinforced thermoplastic sheet and structural foam. This will require learner to use a range of air circulating ovens, vacuum-forming machines, trimming equipment and various types of tooling. The components produced will have a range of features, including male shapes, female shapes, double curvatures and stiffened mouldings.

Learners' responsibilities will require them to comply with organisational policy and procedures for the vacuum-forming activities undertaken, and to report any problems with the activities, equipment, materials or consumables that they cannot personally resolve, or are outside their permitted authority, to the relevant people. They will be expected to work to instructions, with a minimum of supervision, taking personal responsibility for their own actions and for the quality and accuracy of the work that they carry out.

Learners' knowledge will be sufficient to provide an understanding of their work, and will provide an informed approach to applying vacuum-forming procedures. They will have an understanding of the vacuum-forming procedures used, and their application, and will know about the vacuum-forming techniques, materials, tooling and consumables used, in adequate depth to provide a sound basis for carrying out the activities, recognising faults and ensuring that the work output is to the required specification.

Learners will understand the safety precautions required when carrying out the vacuum-forming operations and when using the associated tools and equipment. They will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace.

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Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Vacuum form marine composite materials	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the vacuum-forming activities: • use the correct issue of production documentation (such as job instructions, drawings, specifications) • use relevant health and safety documentation (such as material data sheets, COSHH sheets, risk assessments) • use the correct materials and consumables, as specified in the production documentation (such as colour, size, composition) • use the correct tools and equipment for the activity, and check that they are fit for purpose • apply safe and appropriate vacuum-forming techniques and working practices at all times • leave the work area in a safe and tidy condition 1.3 use two of the following types of equipment: • air circulating ovens • vacuum-forming machines • Tufnol tooling • metal tooling			

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Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• wood tooling • trimming equipment • composite tooling 1.4 confirm that the equipment is set up correctly and is ready for use 1.5 manipulate the machine controls safely and correctly in line with operational procedures 1.6 carry out three of the following operations: • bubble blowing to minimize webbing • positioning of robbers • cleaning of tooling • temperature control • trimming techniques • drying of sheet • use of intensifiers • sheet cleaning 1.7 produce a range of components with two of the following features: • double curvatures • male shapes • female shapes • stiffened mouldings			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.8 produce a range of components, using one the following materials: • thermoplastic sheet (such as polycarbonate, polysulphone, acrylic, polyvinyl chloride (PVC), ABS) • fibre-reinforced thermoplastic sheet • structural foams (such as polyvinyl chloride (PVC), polymethate (Rohacell)) 1.9 produce components to the required specification in accordance with one of the following: • ISO 9000 series and procedures • customer standards and requirements • company standards and procedures • recognised compliance agency/body's standards 1.10 carry out quality sampling checks at suitable intervals 1.11 deal promptly and effectively with problems within their control and report those that cannot be solved 1.12 shut down the equipment to a safe condition on conclusion of the machining activities			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
2 Know how to vacuum form marine composite materials	2.1 explain the specific safety practices and procedures that they need to observe when working with vacuum-forming equipment (including any specific legislation, regulations/codes of practice for the activities, equipment or materials) 2.2 explain the health and safety requirements of the work area where they are carrying out the activities, and the responsibility these requirements place on them 2.3 explain what protective equipment they need to use for both personal protection and, where appropriate, protection of others 2.4 describe the hazards associated with carrying out vacuum-forming activities, and with the tools and equipment used, and explain how they can be minimised 2.5 explain the application of COSHH regulations in relation to the storage, use and disposal of materials and consumables used in the vacuum-forming process 2.6 explain how to extract information from engineering drawings and related specifications (to include symbols and conventions to appropriate BS or ISO standards) in relation to the work undertaken 2.7 explain how to interpret imperial and metric systems of measurement			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.8 describe the methods of sheet trimming and sheet cleaning, prior to forming 2.9 describe the preparation methods and procedures applied to the moulding surface 2.10 explain how to identify the correct male/female mould tooling 2.11 describe the methods and techniques of loading and aligning materials into the mould tooling 2.12 describe the methods and techniques for carrying out the de-moulding procedures 2.13 explain how to recognise vacuum-forming defects (such as misalignment, distortion, damage, contamination and surface defects) 2.14 explain the importance of adhering to the vacuum-forming cycle 2.15 describe the quality control procedures to be followed during the vacuum-forming operations 2.16 describe the tools and equipment used in the vacuum-forming activities, and explain their care, preparation and control procedures 2.17 describe the problems that can occur with the vacuum-forming operations, and explain how these can be overcome 2.18 explain what production documentation needs to be completed for the vacuum-forming activities undertaken			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.19 describe the extent of their own authority, and explain whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____

(*if sampled*)

Unit 60: Carrying out trimming operations on marine composite mouldings

Unit reference number: M/601/2299

Level: 2

Credit value: 32

Guided learning hours: 130

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to trim marine composite mouldings using hand tools, in accordance with approved procedures. Learners will be required to follow the appropriate instructions, drawings, specifications and documentation to trim various composite mouldings, using the correct trimming techniques.

Learners will be expected to select and use the correct tools and equipment for the trimming activity. They will trim a range of composite mouldings, incorporating a variety of features, by using cutting, sanding, drilling and polishing techniques and processes. Marine mouldings to be trimmed will include a range of resin and fibre materials.

Learners' responsibilities will require them to comply with organisational policy and procedures for the trimming activities undertaken, and to report any problems with the activities, equipment or materials that they cannot personally resolve, or are outside their permitted authority, to the relevant people. They will be expected to work to instructions, with a minimum of supervision, taking personal responsibility for their own actions and for the quality and accuracy of the work that they carry out.

Learners' knowledge will be sufficient to provide a good understanding of their work, and will provide an informed approach to applying trimming techniques and procedures to marine composite mouldings. They will have an understanding of the trimming techniques used, and their application in adequate depth to provide a sound basis for carrying out the activities, recognising faults and ensuring that the trimmed mouldings are to the required specification.

The learners will understand the safety precautions required when carrying out the trimming activities, and when using the associated tools and equipment. They will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace.

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Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Carry out trimming operations on marine composite mouldings	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the trimming activities: • use the correct issue of production documentation (such as job instructions, drawings, specifications) • use relevant health and safety documentation (such as material data sheets, COSHH sheets, risk assessments) • use the correct tools and equipment for the activity • apply safe and appropriate trimming techniques and working practices at all times • keep the work area in a safe and tidy condition 1.3 follow relevant specifications for the component to be produced 1.4 obtain the appropriate tools and equipment for the shaping operations and check they are in a safe and usable condition 1.5 shape the materials using appropriate methods and techniques			

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Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.6 carry out all of the following when preparing for the trimming activity: • check that the moulding is correct and complete • check for any defects in the moulding • identify and protect the moulding in the work area 1.7 mark out the mouldings using four of the following methods: • scriber • height gauge • trimming templates • moulded scribe lines • centre punch 1.8 trim mouldings using one the following methods: • cutting wheels/discs • saws • routers • trim jigs 1.9 sand the mouldings, using two of the following methods: • rubbing blocks • diamond files			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• belt sanders • pencil grinders • disc sanders 1.10 use a hand drill or pedestal drill to drill and finish mouldings, using two of the following: • drill jigs • hole saws • drill bits • counterbore tools • countersink tools • threading devices 1.11 polish mouldings using three of the following methods: • wet sanding • cutting compound • orbital sander • polishing compound • rubbing block • polisher			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.12 trim mouldings using appropriate techniques for both of the following: • resins (such as polyester, vinyl ester, epoxy, phenolic, bismaleimide, cyanate ester) • fibres (such as polyethylene, glass, aramid, carbon, hybrid) 1.13 trim mouldings that require, or incorporate, five of the following features: • straight edges • curved edges • flat surfaces • polished surfaces • shaped surfaces • radius corners • returns • nett edges • joggle details • removal of join lines • holes • multiple hole sizes • countersinks • counterbores			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• further lay-up stages • inserts to be drilled • inserts to be tapped • solid cores • honeycomb cores • edge filling 1.14 check that all the required shaping operations have been completed to the required specification and in accordance with one of the following: • ISO 9000 quality assurance procedures • customer standards and requirements • company standards and procedures • recognised compliance agency/body's standards 1.15 deal promptly and effectively with problems within their control and report those that cannot be solved			
2 Know how to carry out trimming operations on marine composite mouldings	2.1 explain the health and safety precautions to be taken and procedures used when working with composite materials, consumables, tools and equipment in the specific work area 2.2 describe the hazards associated with trimming composite materials, consumables, tools and equipment, and explain how to minimise these in the work area			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.3 explain what protective equipment is needed for personal protection and, where required, the protection of others 2.4 explain the application of COSHH regulations in relation to the storage, use and disposal of composite materials and consumables 2.5 describe the specific workshop environmental conditions that must be observed when trimming marine mouldings (such as temperature, humidity, styrene levels to threshold limits, fume/dust extraction systems and equipment) 2.6 explain how to use and extract information from engineering drawings and related specifications (to include symbols and conventions to appropriate BS or ISO standards) in relation to work undertaken 2.7 explain how to interpret drawings, imperial and metric systems of measurement, workpiece reference points and system of tolerancing 2.8 explain how to prepare for the trimming activities, and how to mark out the mouldings for the material to be removed 2.9 explain how to carry out drilling, hole sawing and finishing operations (such as countersinking), and the various tools that are used 2.10 explain how to carry out polishing activities on the mouldings, and the equipment and compounds that are used			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.11 describe the quality procedures used in the workplace to ensure production control (in relation to currency, issue, meeting specification etc) 2.12 explain the conventions and terminology used for trimming activities (such as scribe lines, sanding grades, types of cutting tools, speeds) 2.13 describe the different types of manual and power tools used in composite trimming operations 2.14 describe the different types of cutting tools and abrasives used in trimming composite materials, and their application 2.15 explain how to visually identify the cured composite materials 2.16 explain how to identify defects in composite mouldings 2.17 describe the methods used in the trimming of the composite mouldings 2.18 describe the care and safe handling of the composite mouldings throughout the trimming cycle 2.19 describe the extent of their own authority, and explain whom they should report to if they have problems that they cannot resolve			

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Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____

(*if sampled*)

Unit 61: Fitting marine composite components to the vessel, craft or structure

Unit reference number: H/601/2302

Level: 2

Credit value: 30

Guided learning hours: 126

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to fit/install marine composite components and assemblies to a vessel, craft or other marine structure, in accordance with approved procedures. Learners will be required to select the appropriate tools and equipment to use, based on the operations to be performed and the components or assemblies to be installed. The marine components to be fitted/installed will include items such as bulkheads, 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. The size, shape and complexity of the components and assemblies to be installed will vary, and it is anticipated that some parts will be trial assembled prior to installation taking place.

Learners' responsibilities will require them to comply with organisational policy and procedures for the marine composite installation/fitting activities undertaken, and to report any problems with the fitting/installation activities, components or equipment that they cannot personally resolve, or are outside their permitted authority, to the relevant people. They will be expected to either work either a high level of supervision or as a member of a team. Learners will take personal responsibility for their own actions and for the quality and accuracy of the work that they carry out. Where team working is involved, they must demonstrate a significant personal contribution during the team activities in order to satisfy the requirements of the standard, and competence in all the areas required by the standard must be demonstrated.

Learners' knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to applying fitting/installation techniques and procedures to marine composite components. They will have an understanding of the marine composite components and assemblies being installed, and will know about the relevant fastening and securing devices in adequate depth to provide a sound basis for carrying out the activities, recognising and correcting/reporting faults, and ensuring that the final installation is to the required specification.

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Learners will understand the safety precautions required when carrying out the installation operations, especially when working in confined spaces and when using adhesives and sealing materials. They will be required to demonstrate safe working practices throughout and will understand the responsibility they owe to themselves and others in the workplace, both ashore and afloat.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Fit marine composite components to the vessel, craft or structure	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the fitting/installation of the marine composite components and assemblies: • obtain and use appropriate installation drawings, instructions, sketches or specifications • adhere to relevant COSHH requirements, risk assessments and other relevant safety standards • check that all tools and equipment used during the installation are in a safe and usable condition • ensure that the work area is free from hazards, and that there is sufficient room to complete the installation • use safe and approved installation techniques and procedures at all times • return all tools and equipment to the correct location on completion of the activities • leave the work area in a safe condition and to the prescribed category of cleanliness 1.3 follow all relevant drawings and specifications for the installation being carried out			

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Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.4 use the correct tools and equipment for the installation operations and check that they are in a safe and usable condition 1.5 use a range of tools and equipment during the fitting/installation, to include four of the following: • hand tools • power tools • measuring equipment • levelling and alignment equipment • clamps/cramps • lifting and handling equipment • temporary fixing/supporting equipment 1.6 install, position and secure the equipment and components in accordance with the specification 1.7 fit/install three of the following types of composite components and assemblies to the vessel, craft or structure: • bulkhead • superstructure • wheelhouse • cabins • masts • spars			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• davits • rudders • berths • consoles • air intakes/vents • fairings • hatches • casings and covers • shower units • vanity units • steering equipment (such as wheel, tiller) • skegs • tanks • radar/navigational domes • seats • trim • housings • other specific marine components			

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Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.8 apply fitting/installation methods and techniques, to include five of the following: • positioning and aligning • levelling • applying sealants • applying adhesives • drilling and securing • laminating • filleting and fairing 1.9 use three of the following types of securing methods: • screws • adhesives • cavity fixing devices • nuts and bolts • rivets • special purpose or quick-release fasteners			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.10 fit/install marine composite components/assemblies, in accordance with one of the following standards: • ISO 9000 quality assurance procedures • customer standards and requirements • company standards and procedures • recognised compliance agency/body's standards 1.11 ensure that all necessary connections to the equipment are complete 1.12 deal promptly and effectively with problems within their control and report those that cannot be solved 1.13 check that the installation is complete and that all components are free from damage			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
2 Know how to fit marine composite components to the vessel, craft or structure	2.1 explain the specific safety practices and procedures that they need to observe when installing/fitting marine composite components and assemblies (including any specific legislation, regulations/codes of practice for the activities, equipment or materials) 2.2 explain the health and safety requirements of the work area where they are carrying out the installation/fitting activities, and the responsibility they place on them 2.3 describe the hazards associated with installing/fitting marine composite components and assemblies, and with the tools and equipment used, and explain how they can be minimised 2.4 explain what protective equipment they need to use for both personal protection and protection of other people in the near vicinity 2.5 explain the requirements for working in confined spaces — including an understanding of the importance of emergency procedures and safe systems of work (including permits to work, required air quantities (RAQs) and local exhaust ventilation (LEV) to maintain safe conditions, the provision of adequate and safe lighting and avoidance of sources of ignition)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.6 explain how to obtain the necessary job instructions, installation drawings or installation specifications required for the work being carried out 2.7 explain the terminology used for the various sub-assemblies, how to recognise the sub-assemblies and components, and how to interpret the labelling 2.8 describe the tools and equipment used in the installation activities, and explain how to check that they are in a safe and usable condition 2.9 explain the need to check that all plugs, sockets and cables on extension leads are in a safe and undamaged condition 2.10 explain how to prepare the vessel structure, sub-assemblies, and the levelling, setting out and marking techniques used 2.11 describe the techniques used to position, align, adjust and secure the components to the required surfaces, without causing damage to the vessel structure or surrounding areas 2.12 explain the importance of positional accuracy of the various sub-assemblies 2.13 describe the various types of fixing devices that are used to secure the structures to the required surfaces (including screws, cavity fixing devices, adhesives, nuts and bolts and rivets)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.14 explain the importance of using the correct fasteners for the particular installation 2.15 describe the procedures for obtaining the correct tools, equipment, components and fasteners for the activities 2.16 describe the methods of lifting, handling and supporting the components/equipment during the installation activities 2.17 explain the use of sealant and adhesives, and the precautions to be taken when using them 2.18 explain how to conduct any necessary checks to ensure the integrity, functionality, accuracy and quality of the installation 2.19 describe the extent of their own responsibility, and explain whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____

(*if sampled*)

Unit 62: Carrying out bonding operations on marine composite components

Unit reference number: J/601/2308

Level: 2

Credit value: 23

Guided learning hours: 95

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to carry out bonding activities on marine composite components and assemblies, in accordance with approved procedures. Learners will be required to follow the appropriate instructions, drawings, specifications and documentation to bond composite materials, using the correct production techniques. The marine components and assemblies to be bonded will include items such as the hull, bulkheads, superstructure, wheel houses, cabins, masts, spars, fairings, air intakes, steering equipment, rudders, skegs, tanks, casings and coverings, davits and internal fitments such as berths, vanity units, consoles, seating and shower units. Bonded mouldings produced will include the use of a range of resins, fibre and adhesive materials.

Learners' responsibilities will require them to comply with organisational policy and procedures for the composite bonding activities undertaken, and to report any problems with the activities, equipment or materials that they cannot personally resolve, or are outside their permitted authority, to the relevant people. They will be expected to work either with a high level of supervision or as a member of a team. Learners will take personal responsibility for their own actions and for the quality and accuracy of the work that they carry out. Where team working is involved, they must demonstrate a significant personal contribution during the team activities in order to satisfy the requirements of the standard, and competence in all the areas required by the standard must be demonstrated.

Learners' knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to applying composite bonding techniques and procedures. They will have an understanding of the bonding techniques used, and their application in adequate depth to provide a sound basis for carrying out the activities, recognising and correcting/reporting faults, and ensuring that the work output is to the required specification.

Learners will understand the safety precautions required when carrying out the bonding activities, and when using the associated tools and equipment. They will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace.

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Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Carry out bonding operations on marine composite components	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the bonding activities: • use the correct issue of production documentation (such as job instructions, drawings, specifications) • use relevant health and safety documentation (such as material data sheets, COSHH sheets, risk assessments) • use the correct tools and equipment for the activity, and ensure that they are safe to use and suitably stored • apply safe and appropriate bonding techniques at all times • keep the work area in a safe condition 1.3 carry out all of the following when preparing for the bonding activity: • check that mouldings are correct and complete • check for any defects in the mouldings			

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Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• identify and protect the moulding and bonding materials in the work area • check that bonding materials are correct and complete 1.4 follow the relevant bonding procedure specification and job instructions 1.5 check that the materials to be bonded and bonding agents comply with the specification 1.6 correctly prepare the parent materials and bonding agents in line with the bonding specification 1.7 prepare bonding surfaces, using three of the following methods: • peel plies • templates • gel planer • abrading • bead/grit blasting • water cleaning • solvent cleaning • dry fitting • acid etching • priming • surface masks			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.8 carry out the bonding operations using the specified processes and techniques to position and bond the materials in their correct locations 1.9 bond composite mouldings, using techniques for one of the following: • one-part pastes • two-part pastes • film adhesives • syntactic films 1.10 use two of the following methods when bonding the composite mouldings: • dry fitting • laminating • shimming materials • mixing adhesives • wetting-out by brush • applicator gun • hand tool applicator • laying film adhesives • oven curing • curing by ambient temperature • heated press • heated lamps/mats			

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Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.11 bond composite mouldings, using techniques for one of the following: • sandwich panels • feathered • butt joins • overlap joins • staggered joins • return joins 1.12 bond composite mouldings using techniques for two of the following: • flat surfaces • shaped surfaces • internal surfaces • external surfaces 1.13 bond composite components in two of the following positions: • horizontal • vertical • overhead 1.14 use appropriate techniques for bonding two of the following materials to the composite moulding: • other composites • metals			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• ceramics • plastics • wood-based materials 1.15 bond composite mouldings, using adhesives suitable for both of the following: • resins (such as polyester, epoxy, phenolic, bismaleimide, cyanate ester, vinyl ester) • fibres (such as polyethylene, glass, aramid, carbon, other specific fibres or hybrid types) 1.16 ensure that any equipment used to maintain surface contact during the bonding activities is set up and used correctly 1.17 use one of the following to retain the bond during the curing process: • weighting down • bonding jigs • pinning joins • mechanical fasteners • clamping • press • vacuum bagging			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.18 achieve bonds of the required quality and within the specified dimensional accuracy and in accordance with one of the following: • ISO 9000 quality assurance procedures • customer standards and requirements • company standards and procedures • recognised compliance agency/body's standards 1.19 deal promptly and effectively with problems within their control and report those that cannot be solved			
2 Know how to carry out bonding operations on marine composite components	2.1 explain the health and safety precautions to be taken and procedures used when working with composite materials, consumables, tools and equipment in the specific work area 2.2 describe the hazards associated with bonding composite materials, consumables, tools and equipment, and explain how to minimise these in the work area 2.3 explain what protective equipment is needed for personal protection and, where required, the protection of others 2.4 explain the application of COSHH regulations in relation to the storage, use and disposal of composite materials and consumables			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.5 describe the specific workshop environmental conditions that must be observed when bonding marine composite mouldings (such as temperature, humidity, styrene levels to threshold limits, fume/dust extraction systems and equipment) 2.6 explain the requirements for working in confined spaces — including an understanding of the importance of emergency procedures and safe systems of work (including permits to work, required air quantities (RAQs) and local exhaust ventilation (LEV) to maintain safe conditions, the provision of adequate and safe lighting and avoidance of sources of ignition) 2.7 explain how the usage of particular materials (such as adhesives) can result in a compartment (such as an accommodation space or tented enclosure) becoming a confined space 2.8 explain how to interpret information from engineering drawings and related specifications, in relation to work undertaken 2.9 explain how to use imperial and metric systems of measurement, workpiece reference points and system of tolerancing 2.10 describe the quality procedures used in the workplace to ensure production control (in relation to currency, issue, meeting specification etc)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.11 explain the conventions and terminology used for bonding (such as gel points, cure times, bond thickness, bond strength, peel strength) 2.12 explain the correct methods of storage and handling of bonding agents 2.13 describe the methods of preparation for bonding different materials 2.14 describe the methods of application for different bonding agents 2.15 describe the methods of retaining the bond during the curing process 2.16 describe the tools and equipment used in bonding activities, and explain their care, preparation and control procedures 2.17 explain how to identify bonding defects 2.18 describe the problems that can occur during the bonding process 2.19 describe the extent of their own authority, and explain whom they should report to if they have problems that they cannot resolve			

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Unit 63: Carrying out repairs to marine composite mouldings

Unit reference number: L/601/2312

Level: 2

Credit value: 42

Guided learning hours: 151

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to carry out repairs to composite mouldings, in accordance with approved procedures. Learners will be required to use appropriate specifications, documentation and materials to carry out the repairs to the composite components, using the correct techniques. The marine components and assemblies to be repaired will include items such as the hull, bulkheads, superstructure, wheel houses, cabins, masts, spars, fairings, air intakes, steering equipment, rudders, skegs, tanks, casings and coverings, davits and internal fitments such as berths, vanity units, consoles, seating and shower units.

Learners will be required to obtain all relevant and current documentation relating to the repair, to obtain the tools and equipment for the repair operations, and to check that they are in a safe and usable condition. In carrying out the repair, learners will be required to follow company procedures and specified repair techniques. They will repair a range of composite mouldings with various defects, using a range of methods. Mouldings repaired will include a range of resin and fibre materials.

Learners' responsibilities will require them to comply with organisational policy and procedures for the repair activities undertaken, and to report any problems with the activities, equipment or materials that they cannot personally resolve, or are outside their permitted authority, to the relevant people. They will be expected to work to instructions, with a minimum of supervision, taking personal responsibility for their own actions and for the quality and accuracy of the work that they carry out.

Learners' knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to applying composite moulding repair procedures to marine components. They will have an understanding of the repair techniques used, and their application in adequate depth to provide a sound basis for carrying out the activities to the required specification.

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Learners will understand the safety precautions required when carrying out the repair activities, and when using the associated tools and equipment. They will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Carry out repairs to marine composite mouldings	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the repair activities: • use the correct issue of production documentation (such as job instructions, drawings, specifications) • use relevant health and safety documentation (such as material data sheets, COSHH sheets, risk assessments) • obtain the correct tools and equipment for the activity, and check that they are in a safe and usable condition • check what needs to be repaired and the method of repair to be used • apply appropriate and safe repair techniques at all times • keep the work area in a safe and tidy condition 1.3 follow the relevant specifications for the component to be repaired 1.4 prepare the component for repair 1.5 carry out the repairs within agreed timescale using approved materials and components and methods and procedures			

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Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.6 carry out repairs to three of the following types of marine composite mouldings: • bulkhead • hull • superstructure • masts • spars • cabins • wheel houses • rudders • air intakes/vents • fairings • hatches • casings and covers • consoles • closing panels • steering equipment (wheel, tiller) • skegs • tanks • radar/navigational domes • vanity units			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• housings • berths • shower units • seats • trim • composite mould tools • other specific components 1.7 repair composite mouldings using three of the following methods: • localised curing • fettling • surface filling • colour matching • relieving distortion • separation of bonds • bonding • polishing • resin injection • wet-lay patching • pre-preg patching • osmosis			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• core patching • insert/core potting • repair patches/kits • laminating 1.8 repair composite mouldings using techniques and materials applicable to both of the following: • resins (such as polyester, vinyl ester, epoxy, phenolic, bismaleimide, cyanate ester, acrylic) • fibres (such as polyethylene, glass, aramid, carbon, hybrid materials) 1.9 repair five of the following types of defect/damage in marine composite mouldings: • incomplete curing • dimensional • surface finish • distortion • cosmetic (can be filled) • blisters • bridging • de-lamination • broken fibres • fractures			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• voids • disbonds • dents or 'dings' • excessive adhesive • gouges • damaged cores • wrong inserts • incorrect insert positions • impact damage • abrasion/erosion • hole damage (access from both sides) • hole damage (external access only) 1.10 check that the repaired component meets the specified operating conditions 1.11 carry out repairs to composite mouldings, in accordance with one of the following standards: • ISO 9000 quality assurance procedures • customer standards and requirements • company standards and procedures • recognised compliance agency/body's standards 1.12 produce accurate and complete records of all repair work carried out			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
2 Know how to carry out repairs to marine composite mouldings	2.1 explain the health and safety precautions to be taken and procedures used when working with composite materials, consumables, tools and equipment in the specific work area 2.2 describe the hazards associated with carrying out repairs to composite materials, consumables, tools and equipment, and explain how to minimise these in the work area 2.3 explain what protective equipment is needed for personal protection and, where required, the protection of others 2.4 explain the application of COSHH regulations in relation to the storage, use and disposal of composite materials and consumables 2.5 describe 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) 2.6 explain the requirements for working in confined spaces — including an understanding of the importance of emergency procedures and safe systems of work (including permits to work, required air quantities (RAQs) and local exhaust ventilation (LEV) to maintain safe conditions, the provision of adequate and safe lighting and avoidance of sources of ignition)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.7 explain how to use and extract information from repair drawings and related specifications 2.8 describe the quality procedures used in the workplace to ensure that repairs are carried out satisfactorily 2.9 explain the conventions and terminology used when repairing composite mouldings (such as disbonds, de-lamination, resin injection, resin voids, core potting, repair patches) 2.10 explain the different types of composite resin systems, fibres and reinforcements, and the repair techniques that can be used 2.11 describe the methods of cleaning and preparing the components in readiness for the repair 2.12 describe the various bonding agents and methods used 2.13 explain the correct methods for storage and handling of composite materials 2.14 describe the tools and equipment used for the various activities associated with repairing composite mouldings 2.15 describe the extent of their own authority, and explain whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date: _____

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(*if sampled*)

Unit 64: Checking marine composite components/mouldings for defects

Unit reference number: K/601/2317

Level: 2

Credit value: 23

Guided learning hours: 95

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to check marine composite components/mouldings for defects, and to identify and deal with any defects found, in accordance with approved procedures. Learners will be required to follow appropriate drawings, specifications and documentation to carry out the checks of the components/mouldings, which will include visual and sensory checks as well as the use of measuring instruments and non-destructive testing methods. The marine composite components/mouldings will include items such as hulls, bulkheads, 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. Learners should be able to identify a range of defects in a variety of resin and fibre materials, and to take the appropriate action to deal with them.

Learners' responsibilities will require them to comply with organisational policy and procedures for the checking activities undertaken, and to report any problems with the activities that they cannot personally resolve, or are outside their permitted authority, to the relevant people. They will be expected to work to instructions, with a minimum of supervision, taking personal responsibility for their own actions and for the quality and accuracy of the work that they carry out.

Learners' knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to identifying defects in marine composite components/mouldings. They will have an understanding of composite materials, and their application, and will know about the associated defects in adequate depth to provide a sound basis for identifying the defects in line with organisation practice and procedures.

Learners will understand the safety precautions required when working with the composite components/mouldings, and when using associated tools and equipment. They will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace.

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Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Check marine composite components/mouldings for defects	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the checking activities: • use the correct issue of production documentation (such as job instructions, drawings, specifications) • use relevant health and safety documentation (such as material data sheets, COSHH sheets, risk assessments) • use the correct tools and equipment for the activity, and check that they are in a safe and usable condition • keep the work area in a safe and tidy condition 1.3 check for defects in composite components/mouldings, using four of the following methods: • touch • sound • visual • measurement • mechanical tests • stage inspection			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• non-destructive testing (NDT) • co-ordinate measuring machines (CMM) 1.4 identify defects with regard to the product or asset specification 1.5 identify defects in marine composite components/mouldings, to include: • Either one of the following: • hull • cabins • wheel houses • superstructure • bulkheads • other major marine components • masts • spars OR three of the following types of components/mouldings: • rudders • air intakes/vents • fairings • hatches • casings and covers • consoles			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• steering equipment (wheel, tiller) • skegs • tanks • radar/navigational domes • vanity units • housings • berths • shower units • seats • trim • composite mould tools • other specific components 1.6 identify defects applicable to two of the following resin types: • polyester • acrylic • vinyl ester • epoxy • phenolic • bismaleimide • cyanate ester			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.7 identify defects applicable to two of the following fibre types: • polyethylene • glass • aramid • carbon • hybrid 1.8 identify six of the following types of defect in marine composite components/mouldings: • incomplete curing • dimensional • ply orientation • wrong join type • colour leaching • surface finish • distortion • blisters • bridging • de-lamination • wrinkles • broken fibres • splintering			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• voids • dents or 'dings' • disbonds • resin rich areas • incorrect material • thin gel coat • excessive adhesive • damaged cores • wrong inserts • impact damage • contamination 1.9 check marine components/mouldings against one of the following standards: • ISO 9000 quality assurance procedures • customer standards and requirements • company standards and procedures • recognised compliance agency/body's standards 1.10 assess the defects and determine action required to return the products and assets to specified condition			

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Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.11 report recommendations for action to the appropriate people promptly and in accordance with organisational procedures 1.12 record details of defects in accordance with quality assurance and control systems and procedures			
2 Know how to check marine composite components/mouldings for defects	2.1 explain the 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 2.2 describe the hazards associated with working with composite materials, consumables, tools and equipment, and explain how to minimise these in the work area 2.3 explain what protective equipment is needed for personal protection and, where required, the protection of others 2.4 explain the application of COSHH regulations in relation to the storage, use and disposal of composite materials and consumables 2.5 explain how to use and extract information from engineering drawings and related specifications (to include symbols and conventions to appropriate BS or ISO standards) in relation to work undertaken 2.6 explain how to use imperial and metric systems of measurement, workpiece reference points and system of tolerancing			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.7 describe the quality procedures used in the workplace to ensure production control (in relation to currency, issue, meeting specification etc), and the procedures for completion of appropriate documents 2.8 explain the conventions and terminology used when identifying and rectifying defects (such as disbonds, de-lamination, resin injection, resin voids, core potting, repair patches) 2.9 describe the failure modes for various composite mouldings, and what can contribute to these 2.10 explain the correct methods of storage and handling of composite materials 2.11 describe the various methods that can be used to help identify if defects are present in the mouldings (to include visual inspection, touch, sound, measurement, mechanical and NDT tests) 2.12 describe the tools and equipment used for checking the various composite mouldings 2.13 describe the extent of their own authority, and explain whom they should report to if they have problems that they cannot resolve			

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Unit 65: Marking out marine sheet-metalwork

Unit reference number: K/601/2320

Level: 2

Credit value: 18

Guided learning hours: 42

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to mark out sheet materials (including simple templates), and sections used in marine sheet-metalwork activities, using templates and basic tools, in accordance with approved procedures. Learners will be required to select the required materials to use, and the appropriate marking-out tools and equipment, based on the information presented to them and the accuracy to be achieved. Marking out will be the preparation required for cutting, shaping and forming sheet materials and sections, as appropriate to the application. This will include marking out workpiece datums, centre lines and cutting details, including hole centring and outlining details.

Materials to be marked out may include ferrous and non-ferrous. Certain materials will require them to take the grain flow into account to avoid later production process problems.

Learners' responsibilities will require them to comply with organisational policy and procedures for the marking-out activities undertaken, and to report any problems with the materials, equipment or marking-out activities that they cannot resolve themselves, or are outside their permitted authority, to the relevant people. They will be expected to work to instructions, with a minimum of supervision, taking personal responsibility for their own actions and for the quality and accuracy of the work that they carry out.

Learners' knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to applying marking-out procedures for marine sheet-metalwork activities. They will have an understanding of the marking out process, and its application, and will know about the materials as well as the care and use of tools in adequate depth to provide a sound basis for carrying out the activities to the required specification.

Learners will understand the safety procedures required when using marking mediums, and when carrying out the marking-out activities. They will be required to demonstrate safe working practices throughout, and will understand the responsibilities they owe to themselves and others in the workplace.

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Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Mark out marine sheet-metalwork	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 obtain and use the correct information for marking out 1.3 obtain the appropriate marking-out equipment and check that it is in a usable condition 1.4 mark out directly from drawings, using six of the following tools and instruments: • scriber • punch • rule and tape • straight edge • square • protractor • dividers or trammels • chalk, bluing or paint • templates 1.5 prepare suitable datums and marking-out surfaces 1.6 mark out using appropriate methods			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.7 mark out on one of the following materials: • cold-rolled mild steel (bright) • coated mild steel (tinned or galvanised) • stainless steel • aluminium • brass • copper • lead • titanium • non-metallic materials 1.8 mark out for three of the following forms/shapes of component: • flat covers and plates • square and radial bends • square/rectangular/box sections • cylindrical sections (such as trunking, pipes, tanks) • fish plates • gussets • brackets			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.9 mark out material, to include four of the following features: • datum and centre lines • square/rectangular profiles • angles • circles • curved profiles • cutting and bending detail (including allowances) • hole centring and outlining (circular or linear) 1.10 check that the marking out complies with the specification 1.11 produce marked out components which meet all of the following: • company/customer standards and codes of practice • dimensionally accurate (to drawing or specification) • clearly defined for required processes • use recognised marking-out conventions 1.12 deal promptly and effectively with problems within their control and report those that cannot be resolved			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
2 Know how to mark out marine sheet-metalwork	2.1 explain the specific safety precautions to be taken when marking out for the manufacture of marine sheet-metal components and assemblies, and with the tools and equipment that are used (including any specific statutory requirements, risk assessment procedures and relevant requirements of HASAWA, COSHH and Work Equipment Regulations) 2.2 explain what personal protective clothing and equipment needs to be worn when carrying out the marking-out activities (such as leather gloves, eye protection, safety helmets) 2.3 explain the correct methods of moving or lifting sheet and section materials 2.4 describe the hazards associated with marking out sheet-metal components (such as working in a marine fabrication environment, lifting and handling sheet/fabricated components, slivers/burrs on sheet materials, using marking-out mediums, using laser marking-out equipment), and explain how they can be minimised 2.5 explain the procedures to obtain the necessary job instructions, drawings and specifications 2.6 explain how to interpret information from engineering drawings and related specifications, in relation to work undertaken			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.7 explain how to use imperial and metric systems of measurement, workpiece reference points and system of tolerancing 2.8 explain what preparations need to be carried out on the material prior to marking out, to enhance clarity, accuracy and safety 2.9 explain the principles of marking out, developing basic shapes (flat, rectangular and cylindrical) from flat sheet, plate or rolled section materials 2.10 describe the effective use and care of tools/instruments 2.11 explain the use of marking-out conventions, datum edges/lines and centre lines 2.12 explain the ways of laying out the shapes/patterns to maximise the use of plate or sheet material 2.13 explain how to set and adjust tools, such as squares and protractors 2.14 describe the methods of marking out large or long shapes (using chalk lines and laser equipment) 2.15 explain how to mark out and transfer information from templates 2.16 explain the importance of using tools only for the purpose intended, and the care that is required when using the equipment and tools 2.17 explain the need for clear marks and dimensional accuracy in marking out to specifications/drawings			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.18 describe the things that can go wrong in marking out sheet-metal components, and explain how these can be avoided 2.19 describe the extent of their own authority, and explain whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

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Internal verifier signature: _____ Date: _____

(*if sampled*)

Unit 66: Cutting and shaping marine sheet-metal using hand and machine tools

Unit reference number: A/601/2323

Level: 2

Credit value: 28

Guided learning hours: 70

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to cut and shape sheet-metal (up to and including 3mm) in order to produce clips, brackets, covers, trunking and similar components for marine sheet-metalwork applications, in accordance with approved procedures. Learners will be required to select the appropriate equipment to use, based on the type of material, its thickness and the accuracy to be achieved. This will require them to use hand tools, hand power tools and machinery, as applicable. The cutting and shaping will involve producing straight cuts, external curved contours, cut-ins, notches, round and square holes.

Learners' responsibilities will require them to comply with organisational policy and procedures for the sheet-metal cutting and shaping activities undertaken, and to report any problems with the equipment, materials or activities that they cannot personally resolve, or are outside their permitted authority, to the relevant person. They will be expected to work to instructions, with a minimum of supervision, taking personal responsibility for their own actions and for the quality and accuracy of the work that they carry out.

Learners' knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to applying cutting and shaping procedures to marine sheet-metal components. They will have an understanding of the cutting and shaping processes, the equipment and its application, and will know about the materials in adequate depth to provide a sound basis for carrying out the activities to the required specification.

Learners will understand the safety precautions required when working with the fabrication tools and machinery. They will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace.

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Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Cut and shape marine sheet-metal using hand and machine tools	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 follow relevant specifications for the component to be produced 1.3 obtain the appropriate tools and equipment for the shaping operations and check they are in a safe and usable condition 1.4 shape the materials using appropriate methods and techniques 1.5 cut and finish material to the marked-out shape, using three of the following hand tools: • tin snips • bench shears • hacksaw • hand power tools (drill, nibbling, saw) • files • trepanning • pneumatic tools			

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Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.6 cut and finish material to the marked-out shape, using three of the following machine tools: • guillotine • pillar drill • bench saw • punch/cropping machine • nibbling machine • trepanning machine • band saw 1.7 perform operations to produce four of the following shapes: • straight cuts • cut-ins (straight and curved) • notches • external curved contours • internal curved contours • round holes • square holes 1.8 use sheet-metal (up to and including 3mm) to include one of the following materials: • black mild steel • bright mild steel			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• coated mild steel (such as tinned or galvanised) • stainless steel • aluminium • brass • copper • lead • titanium 1.9 check that all the required shaping operations have been completed to the required specification 1.10 produce cut and shaped components which meet all of the following: • company/customer standards requirements • dimensionally accurate (to drawing or specifications) • free from distortion • free from sharp edges, slivers or burrs 1.11 deal promptly and effectively with problems within their control and report those that cannot be solved			

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Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
2 Know how to cut and shape marine sheet-metal using hand and machine tools	2.1 explain the specific safety precautions to be taken when working with sheet-metal equipment and materials in a marine fabrication environment (including general workshop and site safety, appropriate personal protective equipment, accident procedure, statutory regulations, risk assessment procedures and COSHH regulations, safe disposal of waste materials) 2.2 explain what personal protective clothing and equipment needs to be worn when carrying out the marine fabrication activities (such as leather gloves, eye protection, safety helmets) 2.3 explain the correct methods of moving or lifting sheet-metal 2.4 explain the safe working practices and procedures to be observed when using manual and power-operated tools 2.5 describe the hazards associated with cutting and shaping marine sheet-metalwork (such as using dangerous or badly maintained tools and equipment, operating guillotines and when using hand and bench shears), and explain how they can be minimised 2.6 explain the procedures for obtaining the necessary job instructions, drawings and specifications			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.7 explain how to interpret information from engineering drawings and related specifications, in relation to the work undertaken 2.8 explain how to interpret the marking out conventions on the materials to be cut and shaped (such as cutting lines, centre lines, hole positions) 2.9 describe the tools and techniques available for cutting and shaping sheet-metal (such as tin snips, bench shears, guillotines, portable power tools, bench drills, saws) 2.10 explain what preparations they may have to carry out on the material prior to cutting it 2.11 explain the use and care of tools and equipment — including checks to be made to ensure that the tools are fit for purpose (such as sharp, undamaged, plugs and cables secure and free from damage, machine guards or safety devices operating correctly) 2.12 explain how to set and adjust the tools and equipment (including the use of backstops on guillotines) 2.13 explain the importance of using tools or equipment only for the purpose intended			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.14 describe the things that can go wrong with cutting and shaping sheet-metal, and explain how these can be avoided 2.15 explain the importance of using the machine guards and safety protection equipment at all times 2.16 describe the inspection techniques that can be applied to check that shape and dimensional accuracy are to specification and within acceptable limits 2.17 describe the extent of their own responsibility, and explain whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____

(*if sampled*)

Unit 67: Bending and forming marine sheet-metal using hand and machine tools

Unit reference number: D/601/2329

Level: 2

Credit value: 28

Guided learning hours: 77

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to bend and form marine sheet-metal components (up to and including 3mm) using hand tools and machine tools, in accordance with approved procedures. Learners will be required to select the appropriate equipment to use, based on the operations required, material to be formed, and accuracy to be achieved, and this will include the use of such things as hammers and stakes, formers, bending machines, rolling machines, and wiring and swaging machines. The components/shapes to be produced will include bends/upstands, folds, box sections, wired edges, cylinders, curved sections and trunking, and stretching and shrinking of materials to form cowlings, rounded covers and curved panels.

Learners' responsibilities will require them to comply with organisational policy and procedures for the marine sheet-metal forming activities undertaken, and to report any problems with the tools, equipment, materials or activities that they cannot personally resolve, or are outside their permitted authority, to the relevant people. They will be expected to work to instructions, with a minimum of supervision, taking personal responsibility for their own actions and for the quality and accuracy of the work that they carry out.

Learners' knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to applying bending and forming procedures to marine sheet-metalwork. They will have an understanding of the bending and forming processes, the equipment used and its application, and will know about the materials and forming techniques in adequate depth to provide a sound basis for carrying out the activities, recognising and correcting/reporting faults and producing the components to the required specification.

Learners will understand the safety precautions required when working with the bending and forming machines, and with the associated tools and equipment. They will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace.

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Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Bend and form marine sheet-metal using hand and machine tools	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 follow the correct component drawing and any other related specifications for the component to be produced 1.3 determine what has to be done and how this will be achieved 1.4 use the appropriate tools and equipment for the pressure shaping operations and check that they are in a safe and usable condition by carrying out all of the following checks: • hand tools are in a safe and usable condition (such as hammer shafts are secure; stakes, formers and striking faces are free from defects and damage) • the machine guards and safety devices are in position and function correctly • forming tools are appropriate and are in a serviceable condition (such as secure, correct shape, free from damage) • machine settings are suitable for the material thickness and operations to be performed			

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Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.5 shape the materials to the required specification using appropriate methods and techniques 1.6 use three of the following types of forming equipment/forming techniques: • hammers/panel beating equipment • stakes and formers • bending machine (hand or powered) • rolling machine (hand or powered) • wheeling machine • jenny/wiring machine • swaging machine • spot heating techniques 1.7 carry out forming operations which produce four of the following shapes: • bends/upstands • folds • box sections • wired edges • swages • curved panels • cylindrical sections • ribbed components			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• square to round trunking • other forming operations (specify) 1.8 form sheet-metal components for marine applications, to include two of the following • stowage racks • galley equipment • toilet/shower cubicles • tanks/reservoirs • stores • trunking and ducting • kit lockers • covers • pyrotechnic lockers • bunk spaces • cladding • other components (specify) 1.9 produce components made from one of the following materials: • bright mild steel • tinned steel • galvanised plate • stainless steel			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• titanium/special steels • aluminium • brass • copper 1.10 check that all the required shaping operations have been completed to the required standard 1.11 produce components which meet all of the following: • dimensional accuracy is within specification tolerances • finished components meet the required shape/geometry (to the template profile) • completed components are free from excessive tooling marks, deformation or cracking 1.12 deal promptly and effectively with problems within their control and report those that cannot be solved			
2 Know how to bend and form marine sheet-metal using hand and machine tools	2.1 explain the specific safety precautions to be taken when working with sheet-metal equipment and materials in a marine fabrication environment (including general workshop and site safety, appropriate personal protective equipment, accident procedure, statutory regulations, risk assessment procedures and COSHH regulations, safe disposal of waste materials)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.2 explain what personal protective clothing and equipment needs to be worn when carrying out the fabrication activities (such as leather apron and gloves, eye protection, safety helmets) 2.3 explain the correct methods of moving or lifting sheet or plate materials 2.4 describe the hazards associated with bending and forming marine sheet-metalwork (such as handling sheet/fabricated components, using machinery, using dangerous or badly maintained tools and equipment), and explain how they can be minimised 2.5 explain how to obtain the necessary job instructions, drawings and specifications 2.6 explain how to interpret information from engineering drawings and related specifications, in relation to work undertaken 2.7 explain the marking-out conventions used in sheet-metalwork, and how to recognise cutting detail and bending or folding lines 2.8 explain how hand tools are used in the sheet-metal forming activities, and typical operations that they are used for (such as range of hammers, stakes, formers, sand bags)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.9 describe the various machine tool forming equipment that can be used to produce a range of shapes (such as bends, box sections, cylinders and curved sections, wired edges and swages) 2.10 describe the methods of stretching and shrinking materials, and the tools, equipment and techniques used for this 2.11 explain how to set up the various machines to produce the required forms (such as setting up of rolls; setting fingers on bending machines; setting forming tools for swaging) 2.12 explain how the materials are to be prepared for the forming operations, and why some materials may require a heating process prior to forming 2.13 describe the tool and equipment care and maintenance procedures 2.14 describe the organisational quality control procedures, and explain how to recognise pressure-forming defects 2.15 describe the dimensional and forming inspection checks to be carried out, and the tools and equipment to be used for this 2.16 describe the extent of their own responsibility, and explain whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____

(*if sampled*)

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Unit 68: Cutting and shaping materials using CNC laser profiling machines

Unit reference number: J/601/2356

Level: 2

Credit value: 37

Guided learning hours: 130

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to carry out cutting and profiling operations using computer numerical control (CNC) laser profiling machines, in accordance with approved procedures.

Learners will take charge of the prepared machine and check that it is ready for the machining operations to be performed. This will involve checking that all the required materials and consumables are present, and that the machine has been approved for production. In operating the machine, learners will be expected to follow the correct procedures for calling up the machine-operating program, dealing with any error messages, and executing the program activities safely and correctly.

The components produced will have a number of different features, including square and rectangular profiles, angular profiles, curved profiles, circles, slots, holes linearly positioned and holes radially positioned. Learners will be required to continuously monitor the cutting operations, making any necessary adjustments to machine parameters, in line with their permitted authority. Meeting production targets will be an important issue, and their production records must show consistent and satisfactory performance.

Learners' responsibilities will require them to comply with organisational policy and procedures for the activities undertaken, and to report any problems with the equipment, program or materials that they cannot personally resolve, or are outside their permitted authority, to the relevant people. They will be expected to work to instructions, with a minimum of supervision, taking personal responsibility for their own actions and for the quality and accuracy of the work that they produce.

Learners' knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to applying CNC laser cutting and profiling procedures. They will have an understanding of the CNC cutting/profiling process, and its application, and will know about the equipment, materials and consumables in adequate depth to provide a sound basis for carrying out the activities to the required specification.

Learners will understand the safety precautions required when working with the laser cutting/profiling machine, and with its associated equipment. They will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Cut and shape materials using CNC laser profiling machines	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 confirm that the equipment is set up and ready for operation by checking all of the following: • the machine has been approved for production • all safety equipment and guards are in place and are functioning correctly • materials are correctly positioned and held securely without distortion • the laser lens is clean and in a suitable condition • the operating program is at the correct start point • safe working practices and start-up procedures are observed • machine settings are adjusted, as required, to maintain accuracy 1.3 follow the defined procedures for starting and running the operating system 1.4 deal promptly and effectively with error messages or equipment faults that are within their control and report those that cannot be solved			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.5 monitor the computer process and ensure that the production output is to the required specification 1.6 produce cut and shaped components, which cover five of the following features: • square/rectangular profiles • angular profiles • curved profiles • circles • ellipses • holes linearly positioned • holes radially positioned • slots and apertures • other features 1.7 carry out laser cutting activities on one of the following types of material: • ferrous • non-ferrous • stainless steel • alloy steel • other appropriate material			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.8 produce components within all of the following quality and accuracy standards: • dimensional accuracy is within the tolerance specified on the drawing/specification or within +/- 1.5mm • angled cuts are within specification requirements (perpendicularity/angularity) • cuts are clean and smooth • components are free from distortion 1.9 shut down the equipment to a safe condition on conclusion of the activities			
2 Know how to cut and shape materials using CNC laser profiling machines	2.1 explain the safe working practices and procedures to be observed when operating CNC laser cutting and profiling machines (to include care when working with high-power laser beams; machine guards; ventilation and fume-extraction; machine safety devices) 2.2 explain how to start and stop the machine in normal and emergency situations, and how to close the machine down on completion of activities 2.3 explain the importance of ensuring that the machine is isolated from the power supply before working with machinery; and the care needed, particularly when working with laser beams			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.4 explain the importance of wearing appropriate protective clothing and equipment, and of keeping the work area clean and tidy 2.5 describe the hazards associated with using laser cutting and profiling machines (such as dangers from the laser beam; live electrical components; moving parts of machinery), and explain how they can be minimised 2.6 describe the principles and operation of lasers and laser machines and explain the terminology used 2.7 explain how to interpret information from engineering drawings and related specifications, in relation to work undertaken 2.8 explain how to use imperial and metric systems of measurement, workpiece reference points and system of tolerancing 2.9 explain how to interpret the machine's visual display, and how to understand the various messages displayed 2.10 explain the function of error messages, and what to do when an error message is displayed 2.11 explain how to find the correct restart point in the program when the machine has been stopped before completion of the program			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.12 explain the operation of the various hand and automatic modes of machine control (such as hand wheels, joysticks, program-operating and control buttons) 2.13 explain how to operate the machine (using single block run, full program run and speed override controls) 2.14 explain how to make adjustments to machine-operating programs to take account of out-of-specification components 2.15 explain how to take care of equipment and operating programs (including safe storage of material away from electromagnetic forces) 2.16 explain how to monitor the machine during the cutting process; recognition of problems and action to be taken 2.17 describe the problems that can occur during the laser cutting activities, and explain how to prevent them 2.18 describe the organisational quality systems (such as standards to be achieved; production records to be kept) 2.19 describe the extent of their own authority, and explain whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 69: Cutting and shaping using NC/CNC plasma or gas cutting machines

Unit reference number: R/601/2358

Level: 2

Credit value: 37

Guided learning hours: 130

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to carry out cutting and shaping operations using numerical control (NC) or computer numerical control (CNC) plasma or gas cutting and profiling machines, in accordance with approved procedures.

Learners will take charge of the prepared machine and check that it is ready for the cutting operations to be performed. This will involve checking that all the required materials and consumables are present, and that the machine has been approved for production. In operating the machine, learners will be expected to follow the correct procedures for calling up the machine-operating program, dealing with any error messages, and executing the program activities safely and correctly.

The components produced will have a number of different features, including square and rectangular profiles, angular profiles, curved profiles, circles, slots, holes linearly positioned and holes radially positioned. Learners will be required to continuously monitor the cutting and shaping operations, making any necessary adjustments to machine parameters, in line with their permitted authority.

Learners' responsibilities will require them to comply with organisational policy and procedures for the activities undertaken, and to report any problems with the equipment, program or materials that they cannot personally resolve, or are outside their permitted authority, to the relevant people. They will be expected to work to instructions, with a minimum of supervision, taking personal responsibility for their own actions and for the quality and accuracy of the work that they produce.

Learners' knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to applying NC/CNC plasma or gas cutting/profiling procedures. They will have an understanding of the NC/CNC cutting process, and its application, and will know about the equipment, materials and consumables in adequate depth to provide a sound basis for carrying out the activities to the required specification.

Learners will understand the safety precautions required when working with the plasma/gas cutting machine, and with its associated equipment. They will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Cut and shape using NC/CNC plasma or gas cutting machines	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 use one of the following thermal cutting methods: • oxy-fuel gas cutting • plasma gas cutting 1.3 confirm that the equipment is set up and ready for operation to include checking all of the following: • the machine has been approved for production • all safety equipment and guards are in place and are functioning correctly • materials are correctly positioned and held securely without distortion • the cutting nozzles are clean and in a suitable condition • the operating program is at the correct start point • the workpiece is clear of the machine spindle • safe working practices and start-up procedures are observed • machine settings are adjusted, as required, to maintain accuracy 1.4 follow the defined procedures for starting and running the operating system			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.5 deal promptly and effectively with error messages or equipment faults that are within their control and report those that cannot be solved 1.6 monitor the computer process and ensure that the production output is to the required specification 1.7 produce components which are cut and shaped, and which cover six of the following features: • square/rectangular profiles • angular profiles • curved profiles • circles • ellipses • round holes • slots and apertures • angled cuts • bevelled edge – weld preparations • other features 1.8 carry out plasma or gas cutting on one of the following types of material: • mild steel • carbon steel • stainless steel			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• other alloy steels • other appropriate material 1.9 produce components within all of the following quality and accuracy standards: • dimensional accuracy is within the tolerance specified on the drawing/specification or within +/- 1.5mm • angled cuts are within specification requirements (perpendicularity/angularity) • cuts are clean and smooth with minimal drag lines • components are free from distortion 1.10 shut down the equipment to a safe condition on conclusion of the activities			
2 Know how to cut and shape using NC/CNC plasma or gas cutting machines	2.1 explain the safe working practices and procedures to be observed when operating NC/CNC plasma and gas cutting/profiling machines (to include general workshop and site safety, appropriate personal protective equipment, fire and explosion prevention, protecting other workers; fume control, machine safety devices) 2.2 explain the statutory requirements, risk assessment procedures, accident procedure and relevant requirements of HASAWA, COSHH and Work Equipment Regulations			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.3 describe the hazards associated with using NC/CNC plasma or gas cutting equipment (such as naked flames, fumes and gases, explosive gas mixtures, oxygen enrichment, spatter, hot metal, moving parts of machinery), and explain how they can be minimised 2.4 explain how to start and stop the machine in normal and emergency situations, and how to close the machine down on completion of activities 2.5 explain the importance of ensuring that the machine is isolated from the power supply before working with machinery; and the care needed when working with compressed gases 2.6 explain what protective clothing or equipment needs to be worn when working with fabrications and thermal cutting equipment (such as leather aprons and gloves, eye protection, safety helmets etc) 2.7 explain the correct methods of moving or lifting plate materials and components 2.8 explain the principles and operation of the plasma or gas cutting equipment, and the terminology used in thermal cutting, in relation to the operations being performed 2.9 explain how to interpret information from engineering drawings and related specifications, in relation to work undertaken			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.10 explain how to use imperial and metric systems of measurement, workpiece reference points and system of tolerancing 2.11 explain how to interpret the machine's visual display, and how to understand the various messages displayed 2.12 explain the function of error messages, and what to do when an error message is displayed 2.13 explain how to find the correct restart point in the program when the machine has been stopped before completion of the program 2.14 explain the operation of the various hand and automatic modes of machine control (such as hand wheels, joysticks, program operating and control buttons) 2.15 explain how to operate the machine (using single block run, full program run and speed override controls) 2.16 explain how to make adjustments to machine-operating programs to take account of out-of-specification components 2.17 explain how to set up the correct operating conditions; flame control and the effects of mixtures and pressures associated with thermal cutting			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.18 explain the effects of oil, grease, scale or dirt on the cutting process 2.19 explain how to take care of equipment and operating programs (including safe storage of material away from electromagnetic forces) 2.20 explain how to monitor the machine during the cutting process; recognition of problems and action to be taken 2.21 describe the actions to be taken prior to cutting (such as setting up the material/workpiece, checking cleanliness of materials used) 2.22 describe the holding methods that are used to aid thermal cutting, and equipment that can be used for this 2.23 describe the problems that can occur with thermal cutting, and explain how they can be avoided; causes of distortion during thermal cutting and methods of controlling distortion 2.24 describe the organisational quality systems (such as standards to be achieved; production records to be kept) 2.25 describe the extent of their authority, and explain whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 70: Assembling marine sheet-metal components

Unit reference number: L/601/2360

Level: 2

Credit value: 35

Guided learning hours: 84

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to assemble marine sheet-metal components (up to and including 3mm), in accordance with approved procedures. Learners will be required to interpret job instructions and drawings correctly, in order to assemble and join sheet-metal components and/or light sections, to construct completed marine assemblies or sub-assemblies such as ducting, tanks, cylindrical sections, conical sections, reduction pieces, etc. Learners will be required to lay out and secure the various component parts of the structure, using mechanical fastenings, resistance welding or self-securing methods, in the correct order, and to ensure that they are assembled in a manner that is fit for purpose.

Learners' responsibilities will require them to comply with organisational policy and procedures for the marine sheet-metal assembly activities undertaken, and to report any problems with the activities, tools, equipment or materials that they cannot personally resolve, or are outside their permitted authority, to the relevant people. They will be expected to work either with a high level of supervision or as a member of a team. Learners will take personal responsibility for their own actions and for the quality and accuracy of the work that they carry out. Where team working is involved, they must demonstrate a significant personal contribution during the team activities in order to satisfy the requirements of the standard, and competence in all the areas required by the standard must be demonstrated.

Learners' knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to applying marine sheet-metal assembly techniques, and their fixing procedures. They will have an understanding of the assembly techniques used, and their application. Learners will know about the methods of assembling components that are of the required strength and fit for purpose in adequate depth to provide a sound basis for carrying out the activities, recognising and correcting/reporting faults, and ensuring that the work output is produced to the required specification.

Learners will understand the safety precautions required when working with sheet-metal components, and with their associated tools and equipment. They will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Assemble marine sheet-metal components	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the marine sheet-metal assembly operations: • correctly prepare and set up the components and faces to be joined • use the correct datum faces • use the specified or appropriate fixing method • correctly align the components and faces to be joined • assemble/fabricate the sheet-metal components, in the correct order or manner • produce an assembly which meets the required specification 1.3 follow the relevant instructions, assembly drawings and any other specifications 1.4 check that the specified components are available and that they are in a usable condition			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.5 use three of the following types of components in the assemblies produced: • sheet-metal covers • pre-fabricated square/rectangular components • pre-fabricated cylindrical/conical components • brackets • flanges • light rolled section (angle, channel or tee section) • stiffeners and frame components 1.6 use the appropriate methods and techniques to assemble the components in their correct positions 1.7 assemble sheet-metal components, using two of the following methods: • temporary tack welding • soldering or brazing • resistance spot-welding • riveting (hollow or solid) • adhesive bonding • flanged and mechanically fastened (bolts, screws) • self-securing joints (such as knocked up, paned down, swaged, joggled)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.8 secure the components using the specified connectors and securing devices 1.9 produce three of the following marine sheet-metal assemblies: • frames • tanks/reservoirs • vent ducting/trunking • guards • hoods • stowage racks • panels • sectional trunking • toilet cubicles • shower cubicles • galley equipment • stores • kit lockers • bunk spaces • pyrotechnic lockers • protective covers/cladding			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.10 check the completed assembly to ensure that all operations have been completed and the finished assembly meets the required specification, to include all of the following: • all components are correctly assembled and aligned, in accordance with the specification • overall dimensions are within specification tolerances • assemblies meet appropriate geometric tolerances (square, straight, angles free from twists) • where appropriate, the pitch of erection holes meet specification requirements • completed assemblies have secure and firm joints, are clean and free from burrs or flash 1.11 deal promptly and effectively with problems within their control and report those that cannot be solved			
2 Know how to assemble marine sheet-metal components	2.1 explain the specific safety precautions to be taken when working in a marine fabrication environment, and when producing sheet-metal assemblies (including general workshop and site safety, appropriate personal protective equipment, accident procedure, statutory regulations, risk assessment procedures and COSHH regulations, safe disposal of waste materials)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.2 explain what personal protective clothing and equipment needs to be worn when carrying out the sheet-metal assembly activities (such as leather gloves, eye protection, safety helmets, ear protection) 2.3 explain the safe working practices and procedures for producing marine sheet-metal assemblies 2.4 explain the correct methods of moving or lifting bulky sheet-metal fabrications 2.5 describe the hazards associated with carrying out marine sheet-metal assembly work (such as using dangerous or badly maintained tools and equipment, lifting and handling long and heavy components, cuts, slips, trips and falls), and explain how they can be minimised 2.6 explain how to obtain the necessary job instructions, drawings and joining specifications 2.7 explain how to interpret information from engineering drawings and related specifications, in relation to work undertaken 2.8 explain how to use imperial and metric systems of measurement, workpiece reference points and system of tolerancing 2.9 explain how to interpret marking out conventions (such as cutting lines, centre lines, hole positions) 2.10 explain what preparations need to be carried out on the components, prior to assembling them			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.11 describe the various methods of securing the assembled components (such as nuts and bolts, screws, special fasteners, resistance and tack welding methods and techniques, adhesive bonding of components, and self secured joints — such as knocked up, paned down, swaged and joggled) 2.12 explain how to set up and align the various components, and the tools and equipment that is used for this 2.13 describe the methods of temporarily holding the joints together to aid the assembly activities (such as clamps, rivet clamps) 2.14 explain the importance of using tools or equipment only for the purpose intended; the care that is required when using the tools or equipment; the proper way of preserving tools or equipment between operations 2.15 describe the things that can go wrong when producing sheet-metal assemblies, and explain how these can be avoided 2.16 describe the inspection techniques that can be applied to check that shape (including straightness) and dimensional accuracy are to specification and within acceptable limits 2.17 describe the extent of their own responsibility, and explain whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 71: Assisting in the installation of marine sheet-metal components/assemblies

Unit reference number: H/601/2364

Level: 2

Credit value: 30

Guided learning hours: 77

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to assist in the installation of marine sheet-metal components or assemblies to a vessel, craft, or marine structure, in accordance with approved procedures. Learners will be required to select the appropriate tools and equipment to use, based on the operations to be performed and components to be installed. The marine sheet-metal components/assemblies to be installed will include items such as stowage racks, galley assemblies, toilet (head)/shower cubicles, kit lockers, pyrotechnic lockers, galley storage boxes, bunk spaces, venting and ducting units, and panels and cladding units. The installation activities will include making all necessary checks and adjustments to ensure that the assemblies and components are installed to the required specification.

Learners' responsibilities will require them to comply with organisational policy and procedures for the marine sheet-metal installation activities undertaken, and to report any problems with these activities that they cannot personally resolve, or are outside their permitted authority, to the relevant people. They will be expected to work either with a high level of supervision or as a member of a team. Learners will take personal responsibility for their own actions and for the quality and accuracy of the work that they carry out. Where team working is involved, the learner must demonstrate a significant personal contribution during the team activities in order to satisfy the requirements of the standard, and competence in all the areas required by the standard must be demonstrated. The learner will be expected to ensure that all tools, equipment and materials used in the installation activities are correctly accounted for on completion of the activities, and they will need to complete all necessary job/task documentation accurately and legibly.

Learners' knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to applying marine sheet-metalwork installation techniques and procedures. They will have an understanding of the equipment being installed, and its application, and will know about the relevant components, fastening and securing devices in adequate depth to provide a sound basis for carrying out the activities, correcting/reporting faults and ensuring that the completed installation is to the required specification.

Learners will understand the safety precautions required when carrying out the installation operations. They will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Assist in the installation of marine sheet-metal components/assemblies	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the marine sheet-metalwork installation: • use the correct issue of installation drawings and specifications • adhere to relevant COSHH sheets and risk assessment documentation • obtain clearance to work on the vessel, craft or marine structure, and observe the access and safety procedures • return all tools and equipment to the correct location on completion of the activities • leave the work area in a safe condition and to the prescribed category of cleanliness 1.3 follow all relevant drawings and specifications for the installation being carried out 1.4 use the correct tools and equipment for the installation operations and check that they are in a safe and usable condition			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.5 install, position and secure the equipment and components in accordance with the specification 1.6 assist in the installation of marine sheet-metalwork equipment, which includes four of the following: • frames • tanks/reservoirs • vent ducting/trunking • guards • hoods • stowage racks • kit lockers • bunk spaces • pyrotechnic lockers • panels • sectional trunking • toilet (head) cubicles • shower cubicles • galley equipment • stores • protective covers/cladding • work surfaces			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.7 install marine sheet-metalwork equipment in two of the following areas: • machinery spaces • engine room • bridge/control room • manoeuvring room • galley/pantry • weapon stowage compartments • accommodation/recreation facilities • passageways • toilets/showers • stores • refrigeration • medical/first aid facilities • ward room/senior and junior ratings messes 1.8 apply five the following installation methods and techniques: • positioning and aligning • functional checks • setting working clearance • applying sealant/adhesives • torque loading			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• manual handling • mounting/hanging techniques (hard/resilient, where applicable) 1.9 make three of the following types of mechanical securing connection: • nuts and bolts • locking and securing devices • screws • torque load bolts • quick-release fasteners 1.10 check that all necessary connections to the equipment are complete 1.11 produce installations in accordance with one of the following standards: • BS or ISO 9000 standards and procedures • other accepted international standards • customer (contractual) standards and requirements • company standards and procedures • specific system requirements • recognised compliance agency/body's standards 1.12 deal promptly and effectively with problems within their control and report those that cannot be solved			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.13 check that the installation is complete and that all components are free from damage 1.14 complete the relevant paperwork, to include one from the following, and pass it to the appropriate people: • build records • log cards • job cards • quality documentation			
2 now how to assist in the installation of marine sheet-metal components/ assemblies	2.1 explain the specific safety practices and procedures that they need to observe when installing marine sheet-metalwork equipment (including any specific legislation, regulations/codes of practice for the activities, equipment or materials) 2.2 explain the health and safety requirements of the work area in which they are carrying out the installation activities, and the responsibility these requirements place on them 2.3 describe the hazards associated with installing marine sheet-metal components/assemblies, and with the tools and equipment used, and explain how they can be minimised 2.4 explain what protective equipment they need to use for both personal protection and protection of the craft, vessel or structure			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.5 explain how to interpret the drawings, standards, quality control procedures and specifications used for the installation 2.6 explain how to use imperial and metric systems of measurement, workpiece reference points and system of tolerancing 2.7 describe the sheet-metal components to be installed, and explain their function within the particular system 2.8 describe the various mechanical fasteners that will be used and their methods of installation (including threaded fasteners and special securing devices) 2.9 explain the importance of using the specified fasteners for the particular installation, and why they must not substitute others 2.10 explain the torque loading requirements on the fasteners, and what to do if these loadings are exceeded or not achieved 2.11 describe the quality control procedures to be followed during the installation operations 2.12 explain the procedures for ensuring that they have the correct tools, equipment, components and fasteners for the activities 2.13 describe the techniques used to position, align, adjust and secure the components/assemblies to the vessel, craft or structure so as to avoid damage to the components/ assemblies and structures			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.14 explain the methods of lifting, handling and supporting the components/assemblies during the installation activities 2.15 explain the use of seals, sealant, adhesives and anti-electrolysis barriers, and the precautions to be taken 2.16 describe the procedure for the safe disposal of waste materials 2.17 explain how to recognise installation defects (such as cosmetic appearance, misalignment, ineffective fasteners, foreign object damage or contamination) 2.18 explain the importance of ensuring that the completed installation is free from dirt, swarf and damage 2.19 describe the tools and equipment used in the installation activities, and explain their calibration/care and control procedures 2.20 describe the problems that can occur with the installation operations, and explain how these can be overcome 2.21 explain what recording documentation needs to be completed for the activities undertaken 2.22 describe the extent of their own responsibility, and explain whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 72: Using mechanical fasteners to join marine sheet-metal components

Unit reference number: K/601/2365

Level: 2

Credit value: 18

Guided learning hours: 42

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to undertake the preparation and making of joints between fabricated marine sheet-metal components, using mechanical means, in accordance with approved procedures. Learners will be required to produce suitable joints, using appropriate methods for the materials to be joined, that meet the specified conditions demanded of the joint. Particular attention will be needed in the preparation and finishing of the materials, so that the finished component is fit for purpose and meets the level of accuracy required. The mechanical fastenings used will include rivets, self-tapping screws, bolts and screwed fittings, anchor nuts and proprietary fasteners, as appropriate to the application and/or specification. The joint will be of two or more materials, and may include non-metallic materials and joints of dissimilar metals.

Learners' responsibilities will require them to comply with organisational policy and procedures for the sheet-metal joining activities undertaken, and to report any problems with these activities, or with the equipment used that they cannot personally resolve, or are outside their permitted authority, to the relevant person. They will be expected to work to instructions, with a minimum of supervision, taking personal responsibility for their own actions and for the quality and accuracy of the work that they carry out.

Learners' knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to the joining activities carried out. They will understand the basic characteristics of the materials to be joined, the various processes used and the appropriate procedures that go with them, in adequate depth to provide a sound basis for carrying out the joining activities.

Learners will understand the safety precautions required when working with the joining tools and equipment, and the safeguards necessary for undertaking the joining processes. They will be required to demonstrate safe working practices throughout, and will understand the responsibilities they owe to themselves and others in the workplace.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Use mechanical fasteners to join marine sheet-metal components	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 follow the relevant instructions, assembly drawings and any other specifications 1.3 check that the specified components are available and that they are in a usable condition 1.4 carry out all of the following during the joining of the sheet-metal components: • prepare the faces of the materials to be joined • select the appropriate/specified fixings • correctly align the materials and faces to be joined • assemble the components in the correct order or manner • produce a joint that meets the requirements of the specification 1.5 use the appropriate methods and techniques to assemble the components in their correct positions 1.6 use three of the following assembly methods and techniques: • riveting using cold or/and hot rivets • riveting using pop/blind rivets • self-tapping screws • crimping			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• use of proprietary fasteners • crimping • assembling using bolt fittings • using screw fittings to tapped components • nuts and (spot welded) screw studs • locking methods and devices • clinching 1.7 produce assemblies which include four of the following: • flanged joints on flat or curved surfaces • pre-fabricated square/rectangular components • pre-fabricated cylindrical/conical components • access flanges and cover plates • tanks and tank covers • brackets • joints with gasket or sealant • pipes • structural components • light rolled section (angle, channel or tee section) • stiffeners and frame components • permanent and temporary assemblies			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.8 join the components in three of the following joining positions, access and environmental conditions: • horizontal • vertical • overhead • in workshop conditions • internal and confined spaces 1.9 secure the components using the specified connectors and securing devices 1.10 check the completed assembly to ensure that all operations have been completed and the finished assembly meets the required specification 1.11 produce joints which meet all of the following requirements, as appropriate to the application: • joints are accurately assembled and aligned, in accordance with the specifications • joints are secure and firm • bolted and screwed joints are tightened to the correct torque • riveted joints are free from excessive material deformation and hammer marks • pitches of holes meet the specification • completed joints are clean and free from burrs			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.12 deal promptly and effectively with problems within their control and report those that cannot be solved			
2 now how to use mechanical fasteners to join marine sheet-metal components	2.1 explain the specific safety precautions to be followed when working in a fabrication environment, and when carrying out joining activities using marine fabricated components (including general workshop and site safety, appropriate personal protective equipment, accident procedure, statutory regulations, risk assessment procedures and COSHH regulations) 2.2 explain what personal protective clothing and equipment needs to be worn when carrying out the joining activities (such as leather gloves, eye protection, safety helmets) 2.3 describe the hazards associated with carrying out the joining operations (such as handling sheet/fabricated components, using hot-metal riveting techniques, handling and using sealants and cleaning agents, using dangerous or badly maintained tools and equipment), and explain how they can be minimised 2.4 explain how to obtain the necessary job instructions, drawings and joining procedure specifications 2.5 explain how to interpret information from engineering drawings and related specifications, in relation to work undertaken			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.6 explain the use of manufacturers' specifications for the types of fasteners used 2.7 describe the various joining processes that are used, and the tools and equipment that is required 2.8 describe the preparations to be carried out on the materials/components prior to joining them (such as materials to be degreased, dry and clean, with holes and flanges de-burred) 2.9 explain how to set up and align the joints prior to fixing, and the tools and methods that can be used (such as clamps, rivet gripping tools, temporary fixings, jacking and supporting devices) 2.10 explain how to produce a secure joint using blind rivets, and the type of riveting tools that are available 2.11 explain how to produce a good hot or cold riveted joint, and the use of the various riveting tools 2.12 explain how to determine the length of the rivets required to give a properly formed rivet head 2.13 describe the range of bolts and screwed fasteners that are to be used; why it is important to use the correct type of washer; the sequence of tightening bolts on flanged joints, and the tools and equipment used to ensure that they are tightened to the required torque			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.14 describe the various types of proprietary fasteners that are used on fabricated assemblies (such as anchor nuts, clinch nuts, welded studs) 2.15 describe the checks to be carried out on the tools and equipment prior to use, to ensure that they are in a safe and usable condition (such as condition of plugs and leads on power tools, condition of striking faces on hammers, condition of riveting tools and rivet snaps) 2.16 explain the importance of using the tools only for the purpose intended, and the care that is required when using the equipment and tools 2.17 describe the things that can go wrong with the joining operations, and explain how these can be avoided 2.18 describe the extent of their own responsibility, and explain whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 73: Using resistance spot-welding to join marine sheet-metal materials

Unit reference number: T/601/2367

Level: 2

Credit value: 7

Guided learning hours: 37

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to set up and use portable simple fixed spot-welding machines, in a marine engineering environment, in accordance with approved instructions or welding procedures. Learners will be expected to check that the equipment is fit for purpose, that electrodes are correctly profiled, and that the component parts are in the correct condition for spot-welding. In preparing the equipment, learners will need to set the welding current, welding and squeeze times and electrode pressure. They must operate the equipment safely and correctly, and make any necessary adjustments to the equipment settings and parameters, within permitted tolerances, in order to achieve weld quality and tolerances that meet the specification.

Learners' responsibilities will require them to comply with organisational policy and procedures for the resistance spot-welding activities undertaken, and to report any problems or adjustments to the equipment that they cannot resolve, or are outside their permitted authority, to the relevant people. They will be expected to work to instructions, with a minimum of supervision, taking personal responsibility for their own actions and for the quality and accuracy of the work that they carry out.

Learners' knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to applying spot-welding procedures and instructions in a marine environment. They will have an understanding of how the resistance spot-welding process works, and will know about the equipment, materials and consumables, in adequate depth to provide a sound background to the process operation and for carrying out the activities to the required specification.

Learners will understand the safety precautions required when working with the resistance spot-welding equipment. They will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Use resistance spot-welding to join marine sheet-metal materials	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 ensure that the resistance spot-welding equipment is fit for purpose, by carrying out all of the following checks: • equipment range is suitable for the operations to be performed • portable equipment power leads are undamaged and securely connected • electrodes are of the correct type, size and profile • all equipment mechanical and electrical systems operate correctly • supplies of components are adequate and suitably prepared • appropriate safety screens are available 1.3 follow the relevant joining procedure and work instructions 1.4 confirm that the machine is set up and operating correctly, ready for the joining operations to be carried out			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.5 operate one of the following resistance spot-welding machines: • portable spot-welding machines • fixed simple spot-welding machines 1.6 set up the equipment parameters, in accordance with instructions and the welding procedure specification, to include setting all of the following: • electrode tip diameter/profile • welding current • welding and squeeze times • electrode pressure 1.7 check that the parent material, components, consumables and joint preparation comply with specifications 1.8 carry out and monitor the machine operations in accordance with specifications and job instructions 1.9 monitor the process operation, and make adjustments to parameters, in order to produce welded components covering both of the following: • two different components • two different material thicknesses			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.10 achieve joints of the required quality and specified dimensional accuracy 1.11 produce welded components which meet all of the following requirements: • achieve a weld quality as specified in the application standard • spot welds are correctly pitched out • welded components meet the required dimensional accuracy, within specified tolerances 1.12 achieve the rate of output as specified 1.13 deal promptly and effectively with problems within their control and report those that they cannot solve 1.14 shut down the equipment to a safe condition on conclusion of the joining activities			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
2 now how to use resistance spot-welding to join marine sheet-metal materials	2.1 explain the specific safety precautions to be taken when operating resistance welding equipment (including working with machinery, the use of appropriate personal protective equipment; the use of safety screens; operation of equipment safety devices; closing down the equipment on completion of the welding activities) 2.2 explain the statutory requirements, risk assessment procedures and relevant requirements of HASAWA, COSHH and Work Equipment Regulations, that apply to the work undertaken 2.3 describe the hazards associated with using resistance welding equipment (including danger from live internal electrical components, fumes, hot metal, expulsion of hot particles, moving parts of machines), and explain how they can be minimised 2.4 explain the basic principles of resistance welding (such as heat and pressure to form a weld, welding and pressure cycles, terminology used in welding) 2.5 describe the key components and features of the equipment used (including power source; welding head; electrical parameters such as arc voltage, current, electrode pressure and welding time; systems for parameter control; how variations in the parameters influence weld features, quality and output)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.6 explain how to extract the information required from drawings and procedure specifications 2.7 explain the operation of the equipment controls, and their function; equipment care procedures 2.8 explain how to monitor the equipment during the welding process; fine tuning parameters to maintain quality; recognition of problems, and action to be taken 2.9 describe the problems that can occur with the welding activities, materials and weld defects 2.10 explain how to carry out self-inspection of completed work 2.11 describe the organisational quality systems (such as standards to be achieved; production records to be kept) 2.12 describe the safe disposal of the waste materials 2.13 describe the extent of their own responsibility, and explain whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 74: Joining marine materials and components using adhesives

Unit reference number: J/601/2373

Level: 2

Credit value: 14

Guided learning hours: 42

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to undertake the joining of engineering materials, using adhesive bonding processes in a marine engineering environment, in accordance with approved procedures. Learners will be required to work to instructions, using appropriate or specified bonding agents for the materials to be joined, that meet the specified conditions and subsequent operating conditions to be demanded of the joint. Particular attention will be needed in the preparation of the materials and the application of the bonding agent, as well as the means of securing the joint until the setting or curing process has been completed, to ensure that the finished component meets the level of accuracy required. The adhesive bonding agents used will include impact adhesives, cold-curing adhesives, rubber mastic, solvent adhesives, epoxy resins and thermally-cured adhesives. The joint will be of two or more materials, and may include metallic and/or non-metallic materials, and joints of dissimilar materials.

Learners' responsibilities will require them to comply with organisational policies and procedures, and/or those of the bonding agent manufacturers. They will be expected to report any problems with the bonding activities, agents or materials that they cannot resolve themselves, or are outside their permitted authority, to the relevant people. Learners will be expected to work to instructions, with a minimum of supervision, taking personal responsibility for their own actions and for the quality and accuracy of the work that they carry out.

Learners' knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to the adhesive bonding activities carried out. They will have an understanding of the basic characteristics of the materials to be joined, the bonding agents used, and the procedures that go with them in adequate depth to provide a sound basis for carrying out the activities safely and correctly, and for achieving a sound and cohesive joint that is fit for purpose.

Learners will understand the precautions required when working with the various bonding agents, and the safeguards necessary for undertaking the process. They will be required to demonstrate safe working practices throughout, and will understand the responsibilities they owe to themselves and others in the workplace.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Join marine materials and components using adhesives	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the adhesive bonding process: • correctly prepare the materials for bonding • select the right constituents and bonding methods • check that the surfaces to be bonded mate properly to make a sound joint possible • ensure that the joint is rigidly secure during the curing period • remove surplus material and clean up at the appropriate time 1.3 follow the relevant bonding procedure specification and job instructions 1.4 check that the materials to be bonded and bonding agents comply with the specification 1.5 carry out adhesive bonding activities, using one of the following types of material: • metallic • non-metallic • combinations			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.6 use two of the following types of adhesives: • impact adhesives • cold-curing adhesives • epoxy resins • rubber mastic • solvent adhesives • thermally-cured adhesives 1.7 correctly prepare the parent materials and bonding agents in line with the bonding specification 1.8 carry out the bonding operations using the specified processes and techniques to position and bond the materials in their correct locations 1.9 produce bonded joints in three of the following types of marine components: • flanged joints • square vent ducting/trunking • circular ducting/trunking • sectional trunking • shower cubicles • galley equipment • stores equipment			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• toilet cubicles • stowage racks • panels and cover plates • tanks and tank covers • pipework • protective covers/cladding • work surfaces • kit lockers • pyrotechnic lockers • hoods • 1.10 use a range of bonding equipment and devices, to include three of the following: • mixing vessels • spatulas, brushes, knives • spray equipment • jigs • formers • clamps • presses • weights • temporary fixtures (such as clips, wiring)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.11 use a range of preparation and cleaning agents, to include one of the following: • detergents • petroleum products • solvents • acids 1.12 ensure that any equipment used to maintain surface contact during the bonding activities is set up and used correctly 1.13 achieve bonds of the required quality and within the specified dimensional accuracy which comply with all of the following: • components are dimensionally accurate and of the correct orientation • joints meet the required application standard • completed joints are clean and free from surplus adhesive • the completed joint has the required appearance 1.14 deal promptly and effectively with problems within their control and report those that cannot be solved			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
2 now how to join marine materials and components using adhesives	2.1 explain the specific safety precautions to be taken when bonding engineering materials, using adhesives in a marine environment (including general workshop and site safety, appropriate personal protective equipment, accident procedures) 2.2 explain the statutory regulations, risk assessment procedures and COSHH regulations that apply to the work undertaken 2.3 explain what personal protective clothing and equipment needs to be worn when carrying out bonding as part of the marine fabrication activities (such as gloves, eye protection, safety helmets, respiratory protection) 2.4 explain the specific workshop environmental conditions that must be observed when bonding marine materials (such as temperature, humidity, fume-extraction systems and equipment) 2.5 explain the requirements for working in confined spaces (including an understanding of the importance of emergency procedures and safe systems of work — including permits to work, required air quantities (RAQs) and local exhaust ventilation (LEV) to maintain safe conditions, the provision of adequate and safe lighting and avoidance of sources of ignition)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.6 explain how the usage of particular materials (such as adhesives and solvents) can result in a compartment (such as an accommodation space or tented enclosure) becoming a confined space 2.7 describe the hazards associated with bonding fabricated marine components, and explain how they can be minimised 2.8 explain how to obtain the necessary job instructions, drawings and joining specifications 2.9 explain how to interpret information from engineering drawings and related specifications, in relation to work undertaken 2.10 describe the material preparations that are required, and the equipment and consumables that are used 2.11 explain the importance of working to organisational and bonding agent manufacturers' instructions whilst carrying out the bonding activities 2.12 describe the methods and techniques used for bonding the materials (such as gluing, impact, chemical and thermal reaction techniques) 2.13 explain the precautions to be taken, when using adhesives and solvents			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.14 describe the maintenance and care of the tools and equipment 2.15 describe the methods of degreasing components and producing a keying surface 2.16 explain the types and suitability of adhesives; setting or curing requirements and time for optimal strength and appearance 2.17 describe the common causes of defects associated with the bonding processes, and explain how to avoid them 2.18 explain how to identify, select, use and clean the appropriate bonding agent holding vessels, brushes, stirrers, spatulas, scrapers, knives, clamps and weights 2.19 explain the importance of cleaning up after use, to ensure that everything can be used again and to minimise the need to replace equipment 2.20 explain the reasons for checking that components are assembled in the correct sequence, are positioned accurately and to the correct orientation in accordance with the specifications, prior to bonding 2.21 explain how to check that the completed joints are firm, sound and fit for purpose			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.22 describe the procedures for cleaning off surplus adhesive and for tidying up the appearance of joints 2.23 describe the extent of their own responsibility, and explain whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 75: Producing fillet welded joints using a manual welding process

Unit reference number: H/601/2378

Level: 2

Credit value: 44

Guided learning hours: 147

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to produce fillet welds in plate, sheet or sections, and/or fillet welded joints in pipe/tube, using a manual welding process such as manual metal arc, MIG, MAG, TIG, flux-cored wire, inert shield or gas welding equipment, in a marine environment, in accordance with instructions and/or approved welding procedures. Learners will be required to check that all the necessary workholding equipment and manipulating devices are available and are in a usable condition. They will be expected to check the welding equipment to ensure that all the leads/cables, hoses and wire feed mechanisms are securely connected and free from damage.

In preparing to weld, learners will need to set and adjust the welding conditions, in line with the instructions or welding procedure specification. They must operate the equipment safely and correctly, and make any necessary adjustments to settings, in line with their permitted authority, in order to produce the welded joints to the required specification. Learners must be able to demonstrate their capability to produce the fillet welds of the required quality, and this could be through tests according to BS 4872 or EN 287.

Learners' responsibilities will require them to comply with organisational policy and procedures for the welding activities undertaken, and to report any problems with the welding equipment or activities that they cannot resolve, or are outside their permitted authority, to the relevant people. They will be expected to work to instructions, with a minimum of supervision, taking personal responsibility for their own actions and for the quality and accuracy of the work that they produce.

Learners' knowledge will be sufficient to provide a sound basis for their work, and will provide an understanding of how the particular welding process works. They will know about the equipment, materials and consumables in adequate depth to provide a sound background for the welding operations to be performed, and for ensuring that the work output is produced to the required specification.

Learners will understand the safety precautions required when working with the welding equipment. They will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Produce fillet welded joints using a manual welding process	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 prepare for the fillet welding process, to include carrying out all of the following: • obtaining the appropriate equipment for the welding activities to be carried out (type, current capacity) • checking the condition of, and correctly connecting welding leads, earthing arrangements and electrode holder • connecting all required hoses, regulators and/or flow meters and safety devices • setting and adjusting welding conditions/parameters, in accordance with the welding procedure specification • preparing the work area for the welding activities (such as siting welding screens, positioning fume-extraction equipment) • ensuring that the components are correctly set up with regard to specified joint preparation, and are secure • obtaining and wearing appropriate personal protective equipment			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.3 follow the relevant joining procedure and job instructions 1.4 check that the joint preparation complies with the specification 1.5 check that joining and related equipment and consumables are as specified and fit for purpose 1.6 make the joints as specified using the appropriate thermal joining technique 1.7 use welding and related equipment for one of the following welding processes: • manual metal arc • MIG/MAG • TIG • plasma arc • cored wire • gas welding 1.8 weld joints according to approved welding procedures, in good access situations, in two of the following BS EN 287 positions: • flat (PA) • horizontal (PC) • horizontal vertical (PB)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• vertical upwards (PF) • vertical downwards (PG) • overhead (PE or PD) 1.9 use consumables, as specified in the welding procedure specification, covering either: • Two types of electrode from: • rutile • nickel alloy • basic • stainless steel • cellulosic • other • Or • two types of filler wire from different material groups 1.10 produce fillet welded joints in two of the following forms of material: • plate • sections • pipe/tube • sheet • other			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.11 produce joints of the required quality and of specified dimensional accuracy which: • achieve a minimum weld quality equivalent to the level given in the relevant European/International • standard (eg EN 25817/ISO 5187 and EN 30042/ISO 10042) required by the application standard • or specification • meet the required dimensional accuracy, within specified tolerance 1.12 shut down the equipment to a safe condition on completion of joining activities 1.13 deal promptly with excess and waste materials and temporary attachments, in line with approved and agreed procedures 1.14 deal promptly and effectively with problems within their control and report those that cannot be solved			
2 Know how to produce fillet welded joints using a manual welding process	2.1 explain the safe working practices and procedures to be observed when working with the selected welding equipment (to include general workshop and site safety, appropriate personal protective equipment, fire prevention, protecting other workers from 'arc eye', safety in enclosed/confined spaces; fume control)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.2 explain the statutory requirements, risk assessment procedures; accident procedures and relevant requirements of HASAWA, COSHH and Work Equipment Regulations 2.3 describe the correct handling and storage of gas cylinders (such as manual handling and use of cylinder trolleys, leak detection procedures, relevant BCGA codes of practice, cylinder identification, gas pressures, cylinder and equipment safety features, emergency shutdown procedures) 2.4 describe the hazards associated with the selected welding process (such as live electrical components, poor earthing, arc radiation, fumes and gases, gas supply leaks, spatter, hot slag and metal, grinding and mechanical metal/slag removal; elevated working, enclosed spaces, slips, trips and falls), and explain how they can be minimised 2.5 explain the manual welding process selected, and an awareness of the different types of welding equipment (such as basic principles of fusion welding, AC and DC power sources, ancillary equipment, power ranges, care of equipment, terminology used in welding, flame setting)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.6 explain how to extract the information required from drawings and welding procedure specifications (such as interpretation of welding symbols, scope, content and application of the welding procedure specification) 2.7 describe the consumables associated with the chosen welding process (such as types of electrodes and/or filler metal and their application; types of shielding gas and their application, gas supply and control; correct control, storage and drying of electrodes and filler wire) 2.8 describe the types and features of welded joints in pipe (such as fillet and butt welds, single and multi-run welds, welding positions, weld quality) 2.9 explain how to set up and restrain the joint, to achieve correct location of components and control of distortion (such as edge preparation, use of jigs and fixtures, manipulators and positioners, tack welding size and spacing in relationship to material thickness and component size, use of temporary attachments, pre-setting) 2.10 explain how to prepare the welding equipment, and the checks to be made to ensure that it is safe and ready to use (such as electrical connections, power return and earthing arrangements; equipment calibration before use, setting welding parameters, care and maintenance of the equipment)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.11 explain the techniques of operating the welding equipment, to produce a range of joints in the various joint positions (such as fine tuning parameters, correct manipulation of the welding gun or electrode, safe closing down of the welding equipment) 2.12 explain the importance of complying with job instructions and the welding procedure specification 2.13 describe the problems that can occur with the welding activities, and explain how these can be overcome (such as causes of distortion and methods of control, effects of welding on materials and sources of weld defects; methods of prevention) 2.14 describe the organisational quality systems used and weld standards to be achieved; weld inspection and test procedures used (including visual and non-destructive tests) 2.15 explain how to dispose of waste materials in a safe and environmentally friendly way 2.16 explain the personal approval tests and their applicability to their work 2.17 describe the extent of their own authority, and explain whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 76: Joining marine materials/structures using the manual metal arc (MMA) welding process

Unit reference number: D/601/2380

Level: 2

Credit value: 54

Guided learning hours: 196

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to prepare and operate manual metal arc welding equipment, in a marine environment, in accordance with instructions and/or approved welding procedures. Learners will be required to check that all the workholding equipment and manipulating devices required are available and are in a usable condition. They will be expected to check the welding equipment to ensure that all the leads/cables, electrode holder and workpiece earthing arrangements are securely connected and free from damage. In preparing to weld, learners will need to set and adjust the welding conditions, in line with the instructions or welding procedure specification. They must operate the equipment safely and correctly, and make any necessary adjustments to settings in line with their permitted authority, in order to produce the welded joints to the required specification.

Learners' responsibilities will require them to comply with organisational policy and procedures for the welding activities undertaken, and to report any problems with the welding equipment or activities that they cannot resolve, or are outside their permitted authority, to the relevant people. They will be expected to work to instructions, with a minimum of supervision, taking personal responsibility for their own actions and for the quality and accuracy of the work that they carry out.

Learners' knowledge will be sufficient to provide a sound basis for their work, and will provide an understanding of how the manual metal arc process works. They will know about the equipment, materials and consumables in adequate depth to provide a sound background for the welding operations to be performed, and for ensuring that the work output is produced to the required specification.

Learners will understand the safety precautions required when working with the welding equipment. They will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Join marine materials/structures using the manual metal arc (MMA) welding process	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 prepare for the manual metal arc welding process, to include carrying out all of the following: • obtaining the appropriate equipment for the welding activities to be carried out (type, current capacity) • checking the condition of, and correctly connecting welding leads, earthing arrangements and electrode holder • setting and adjusting welding conditions/parameters, in accordance with welding procedure specification • preparing the work area for the welding activities (such as siting welding screens, positioning fume-extraction equipment) • ensuring that the workpiece is correctly set up with regard to specified joint preparation, and that it is secure • obtaining and wearing appropriate personal protective equipment			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.3 follow the relevant joining procedure and job instructions 1.4 check that the joint preparation complies with the specification 1.5 check that joining and related equipment and consumables are as specified and fit for purpose 1.6 make the joints as specified using the appropriate thermal joining technique 1.7 use manual metal-arc welding and related equipment, to include either of the following: • alternating current (AC) equipment • direct current (DC) equipment 1.8 produce welded joints which incorporate both of the following: • fillet welds • butt welds 1.9 weld joints according to approved welding procedures, in good access situations, in two of the following BS EN 287 positions: • flat (PA) • horizontal vertical (PB) • horizontal (PC) • vertical upwards (PF) • vertical downwards (PG)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.10 use two types of electrode from the following, including two different sizes of each chosen type: • rutile • basic • stainless steel • nickel alloy • cellulosic • other electrodes 1.11 produce joints in one form of specified material from the following: • plate • section • pipe/tube • other forms 1.12 produce joints of the required quality and of specified dimensional accuracy which: • achieve a minimum weld quality equivalent to the level given in the relevant European/International • standard (eg EN 25817/ISO 5187 and EN 30042/ISO 10042) required by the application standard			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	or specification • meet the required dimensional accuracy, within specified tolerances 1.13 shut down the equipment to a safe condition on completion of joining activities 1.14 deal promptly with excess and waste materials and temporary attachments, in line with approved and agreed procedures 1.15 deal promptly and effectively with problems within their control and report those that cannot be solved			
2 Know how to join marine materials/structures using the manual metal arc (MMA) welding process	2.1 explain the safe working practices and procedures to be observed when working with MMA welding equipment (to include general workshop and site safety; appropriate personal protective equipment; fire prevention; protecting other workers from stray arcs; safety in enclosed/confined spaces; fume control) 2.2 explain the statutory requirements, risk assessment procedures; accident procedures and relevant requirements of HASAWA, COSHH and Work Equipment Regulations			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.3 describe the hazards associated with MMA welding (such as live electrical components; poor earthing; the electric arc; fumes and gases; spatter; hot slag and metal; grinding and mechanical metal/slag removal; elevated working; enclosed spaces; slips, trips and falls), and explain how they can be minimised 2.4 explain the manual metal arc welding process (such as basic principles of fusion welding, AC and DC • power sources, ancillary equipment, care of equipment, consumables, power ranges) 2.5 describe the various types of electrodes and the correct control, storage and drying of electrodes 2.6 describe the types of welded joints to be produced (such as fillet and butt welds, single and multi-run welds, joints in pipe, plate and sections, welding positions) 2.7 explain how to set up and restrain the joint (such as the use of jigs and fixtures, manipulators and positioners, restraining devices, tack welding size and spacing in relationship to material thickness)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.8 describe the checks to be made prior to welding (such as confirming the correct set-up of the joint and cleanliness of materials; condition of electrical connections, power return and earthing arrangements; operating parameters; calibration before use; care and maintenance of equipment) 2.9 explain the techniques of operating the welding equipment, to produce a range of joints in the various joint positions (such as fine tuning parameters; correct manipulation of electrode; safe closing down of the welding equipment) 2.10 explain the importance of complying with the job instructions and the welding procedure specification 2.11 describe the problems that can occur with the welding activities, and explain how these can be overcome (such as causes of distortion and methods of control; effects of welding on materials and sources of weld defects; methods of prevention) 2.12 describe the organisational quality control systems used, and weld standards to be achieved 2.13 explain the weld inspection and test procedures used (including destructive and non-destructive methods)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.14 explain the personal approval tests and their applicability to their work 2.15 explain how to dispose of waste materials in a safe and environmentally friendly way 2.16 describe the extent of their own authority, and explain whom they should report to if they have problems that they cannot resolve 2.17 explain the reporting lines and procedures, line supervision and technical experts			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 77: Joining marine materials/ structures using manual MIG/MAG and other continuous wire processes

Unit reference number: K/601/2382

Level: 2

Credit value: 54

Guided learning hours: 196

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to prepare and operate manual MIG, MAG or cored-wire arc welding equipment, in a marine environment, in accordance with instructions and/or approved welding procedures. Learners will be required to check that all the workholding equipment and manipulating devices required are available and are in a usable condition. They will be expected to check the welding equipment to ensure that all the leads/cables, shielding gas system, hoses and wire feed mechanisms are securely connected and free from damage. In preparing to weld, learners will need to set and adjust the welding conditions, in line with the instructions or welding procedure specification. They must operate the equipment safely and correctly and make any necessary adjustments to settings, in line with their permitted authority, in order to produce the welded joints to the required specification.

Learners' responsibilities will require them to comply with organisational policy and procedures for the welding activities undertaken, and to report any problems with the welding equipment or activities that they cannot resolve, or are outside their permitted authority, to the relevant people. They will be expected to work to instructions, with a minimum of supervision, taking personal responsibility for their own actions and for the quality and accuracy of the work that they carry out.

Learners' knowledge will be sufficient to provide a sound basis for their work, and will provide an understanding of how the MIG, MAG or cored-wire arc welding process works. They will know about the equipment, materials and consumables in adequate depth to provide a sound background for the welding operations to be performed, and for ensuring that the work output is produced to the required specification.

Learners will understand the safety precautions required when working with the welding equipment. They will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Join marine materials/structures using manual MIG/MAG and other continuous wire processes	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 prepare for the manual MIG/MAG or other continuous wire welding process, to include carrying out all of the following: • obtaining the appropriate equipment for the welding activities to be carried out (type, current capacity) • checking the condition of, and correctly connecting welding leads/cables, hoses, shielding gas supply and wire feed mechanisms • setting and adjusting welding conditions/parameters, in accordance with welding procedure specification • preparing the work area for the welding activities (such as siting welding screens, positioning fume-extraction equipment) • ensuring that the workpiece is correctly set up with regard to specified joint preparation, and that it is secure • obtaining and wearing appropriate personal protective equipment 1.3 follow the relevant joining procedure and job instructions			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.4 check that the joint preparation complies with the specification 1.5 check that joining and related equipment and consumables are as specified and fit for purpose 1.6 make the joints as specified using the appropriate thermal joining technique 1.7 use welding and related equipment for one of the following welding processes: • MIG • MAG • cored wire 1.8 produce welded joints which incorporate both of the following: • fillet welds • butt welds 1.9 weld joints according to approved welding procedures, in good access situations, in two of the following BS EN 287 positions: • flat (PA) • horizontal vertical (PB) • horizontal (PC) • vertical upwards (PF • vertical downwards (PG)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.10 use consumables appropriate to the material and application, to include both of the following: • two wire types from different material groups • two different shielding gases (where applicable) 1.11 produce joints in one form of specified material from the following: • plate • section • other forms • pipe/tube • sheet (<3mm) 1.12 produce joints of the required quality and of specified dimensional accuracy which: • achieve a minimum weld quality equivalent to the level given in the relevant European/International • standard (eg EN 25817/ISO 5187 and EN 30042/ISO 10042) required by the application standard or specification • meet the required dimensional accuracy, within specified tolerance 1.13 shut down the equipment to a safe condition on completion of joining activities			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.14 deal promptly with excess and waste materials and temporary attachments, in line with approved and agreed procedures 1.15 deal promptly and effectively with problems within their control and report those that cannot be solved			
2 Know how to join marine materials/structures using manual MIG/MAG and other continuous wire processes	2.1 explain the safe working practices and procedures to be observed when working with MIG, MAG or cored wire arc welding equipment (to include general workshop and site safety; appropriate personal protective equipment; fire prevention; protecting other workers from the effects of the welding arc; safety in enclosed/confined spaces; fume control) 2.2 explain the statutory requirements, risk assessment procedures; accident procedures and relevant requirements of HASAWA, COSHH and Work Equipment Regulations 2.3 describe the correct handling and storage of gas cylinders (such as manual handling and use of cylinder trolley, leak detection procedures, relevant BCGA codes of practice, cylinder identification, gas pressures, cylinder and equipment safety features, emergency shutdown procedures)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.4 describe the hazards associated with arc welding (such as live electrical components; poor earthing; the electric arc; fumes and gases; gas supply leaks; spatter, hot slag and metal; elevated working; enclosed spaces; slips, trips and falls), and explain how they can be minimised 2.5 explain the manual MIG, MAG or cored wire arc welding process (such as basic principles of fusion welding, AC and DC power sources, ancillary equipment, power ranges, care of equipment) 2.6 describe the consumables associated with MIG, MAG or cored wire arc welding (such as types of wire and their application (solid and cored), types of shielding gas and their application, gas supply and control) 2.7 describe the types of welded joints to be produced (such as fillet and butt welds, single and multi-run welds, joints in pipe, plate, sheet and sections; welding positions) 2.8 explain how to set up and restrain the joint (such as the use of jigs and fixtures, manipulators and positioners, restraining devices, tack welding size and spacing in relationship to material thickness)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.9 explain how to prepare the welding equipment, and the checks to be made to ensure that it is safe and ready to use (such as electrical connections, power return and earthing arrangements; wire feed mechanisms, gas supply, setting welding parameters, correct joint set-up, cleanliness of materials used; calibration before use; routine care and maintenance of equipment) 2.10 explain the techniques of operating the welding equipment to produce a range of joints in the various joint positions (such as fine tuning parameters, correct manipulation of the welding gun, safe closing down of the welding equipment) 2.11 explain the importance of complying with job instructions and the welding procedure specification 2.12 describe the problems that can occur with the welding activities, and explain how these can be overcome (such as causes of distortion and methods of control, effects of welding on materials and sources of weld defects; methods of prevention) 2.13 describe the organisational quality systems used and weld standards to be achieved; weld inspection and test procedures used (including visual and non-destructive tests)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.14 explain the personal approval tests, and their applicability to their work 2.15 explain how to dispose of waste materials in a safe and environmentally friendly way 2.16 describe the extent of their own authority, and explain whom they should report to if they have problems that they cannot resolve 2.17 explain the reporting lines and procedures, line supervision and technical experts			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 78: Joining marine materials/ structures using manual TIG and plasma-arc welding processes

Unit reference number: A/601/2385

Level: 2

Credit value: 54

Guided learning hours: 196

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to prepare and operate manual TIG or plasma-arc welding equipment, in a marine environment, in accordance with instructions and/or approved welding procedures. Learners will be required to check that all the workholding equipment and manipulating devices required are available and are in a usable condition. They will be expected to check the welding equipment to ensure that all the leads/cables, hoses and torch are securely connected and free from damage. In preparing to weld, learners will need to set and adjust the welding conditions, in line with the instructions or welding procedure specification. They must operate the equipment safely and correctly and make any necessary adjustments to settings, in line with their permitted authority, in order to produce the welded joints to the required specification.

Learners' responsibilities will require them to comply with organisational policy and procedures for the welding activities undertaken, and to report any problems with the welding equipment or activities that they cannot resolve, or are outside their permitted authority, to the relevant people. They will be expected to work to instructions, with a minimum of supervision, taking personal responsibility for their own actions and for the quality and accuracy of the work that they carry out.

Learners' knowledge will be sufficient to provide a sound basis for their work, and will provide an understanding of how the TIG or plasma-arc welding process works. Learners will know about the equipment, materials and consumables in adequate depth to provide a sound background for the welding operations to be performed, and for ensuring that the work output is produced to the required specification.

Learners will understand the safety precautions required when working with the welding equipment. They will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Join marine materials/structures using manual TIG and plasma-arc welding processes	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 prepare for the manual TIG or plasma arc welding process, to include carrying out all of the following: • obtaining the appropriate equipment for the welding activities to be carried out (type, current capacity) • checking the condition of, and correctly connecting welding leads/cables, hoses, shielding gas supply and wire feed mechanisms • setting and adjusting welding conditions/parameters, in accordance with welding procedure specification • preparing the work area for the welding activities (such as siting welding screens, positioning fume-extraction equipment) • ensuring that the workpiece is correctly set up with regard to specified joint preparation, and that it is secure • obtaining and wearing appropriate personal protective equipment 1.3 follow the relevant joining procedure and job instructions 1.4 check that the joint preparation complies with the specification			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.5 check that joining and related equipment and consumables are as specified and fit for purpose 1.6 make the joints as specified using the appropriate thermal joining technique 1.7 use manual welding and related equipment for one of the following welding processes: • TIG • plasma-arc 1.8 produce welded joints which incorporate the following: • butt welds and • fillet welds OR • welds made autogenously (without filler wire) 1.9 weld joints according to approved welding procedures, in good access situations, in two of the following BS EN 287 positions: • flat (PA) • horizontal (PC) • vertical upwards (PF) • horizontal vertical (PB) • vertical downwards (PG)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.10 use consumables appropriate to the material and application, to include both of the following: • one size of electrode • two types of filler wire from different material groups 1.11 produce joints in one form of specified materials from the following: • plate • section • other forms • pipe/tube • sheet (<3mm) 1.12 produce joints of the required quality and of specified dimensional accuracy which: • achieve a minimum weld quality equivalent to the level given in the relevant European/International • standard (eg EN 25817/ISO 5187 and EN 30042/ISO 10042) required by the application standard or specification • meet the required dimensional accuracy, within specified tolerance			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.13 shut down the equipment to a safe condition on completion of joining activities 1.14 deal promptly with excess and waste materials and temporary attachments, in line with approved and agreed procedures 1.15 deal promptly and effectively with problems within their control and report those that cannot be solved			
2 Know how to join marine materials/structures using manual TIG and plasma-arc welding processes	2.1 explain the safe working practices and procedures to be observed when working with TIG or plasma-arc welding equipment (to include general workshop and site safety; appropriate personal protective equipment; fire prevention; protecting other workers from the effects of the electric arc; safety in enclosed/confined spaces; fume control) 2.2 explain the statutory requirements, risk assessment procedures; accident procedures and relevant requirements of HASAWA, COSHH and Work Equipment Regulations 2.3 describe the hazards associated with arc welding (such as live electrical components; poor earthing arrangements; the electric arc; fumes and gases; gas supply leaks; spatter; hot slag and metal; grinding and mechanical metal/slag removal; elevated working; enclosed spaces; slips, trips and falls), and how they can be minimised			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.4 describe the correct handling and storage of gas cylinders (such as manual handling and use of cylinder trolleys, leak detection procedures, relevant BCGA codes of practice, cylinder identification, gas pressures, cylinder and equipment safety features, emergency shutdown procedures) 2.5 explain the manual TIG or plasma-arc welding process (such as basic principles of fusion welding; power sources; ancillary equipment; power ranges; arc initiation system; care and maintenance of equipment) 2.6 describe the consumables associated with TIG or plasma-arc welding (such as types of filler wire, types of shielding gas, welding electrodes, gas supply and control, control and storage of consumables) 2.7 describe the types of welded joints to be produced (such as fillet and butt welds, single and multi-run welds, joints in pipe plate, sheet and sections; welding positions) 2.8 explain how to set up and restrain the joint (such as confirming correct set-up of joint; cleanliness of materials used; the use of jigs and fixtures, manipulators and positioners, restraining devices; tack welding size and spacing in relationship to material thickness)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.9 explain how to prepare the equipment, and the checks to be made to ensure that it is safe to use (such as condition of electrical connections, power return and earthing arrangements, operating parameters) 2.10 explain the techniques of operating the welding equipment, to produce a range of joints in the various joint positions (such as fine tuning parameters, correct manipulation of torch, safe closing down of the welding equipment) 2.11 explain the importance of complying with job instructions and the welding procedure specification 2.12 describe the problems that can occur with the welding activities, and explain how these can be overcome (such as causes of distortion and methods of control, effects of welding on materials and sources of weld defects; methods of prevention) 2.13 describe the organisational quality systems used and weld standards to be achieved; weld inspection and test procedures used (including visual and non-destructive tests) 2.14 explain the personal approval tests and their applicability to their work 2.15 explain how to dispose of waste materials in a safe and environmentally friendly way			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.16 describe the extent of their own authority, and explain whom they should report to if they have problems that they cannot resolve 2.17 explain the reporting lines and procedures, line supervision and technical experts			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 79: Joining marine materials/ structures using the manual gas welding process

Unit reference number: L/601/2388

Level: 2

Credit value: 50

Guided learning hours: 175

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to prepare and operate manual gas welding equipment, in a marine environment, in accordance with instructions and/or approved welding procedures. Learners will be required to check that all the necessary workholding and manipulating devices are available and in a usable condition. They will be expected to check the welding equipment to ensure that the regulators, hoses, flashback arrestor and welding torch are securely connected and are free from leaks or damage. In preparing to weld, learners will need to set and adjust the gas pressures/welding conditions, in line with the instructions or welding procedure specification. They must operate the equipment safely and correctly, and make any necessary adjustments to settings, in line with their permitted authority, in order to produce the welded joints to the required specification.

Learners' responsibilities will require them to comply with organisational policy and procedures for the welding activities undertaken, and to report any problems with the welding equipment or activities that they cannot resolve, or are outside their permitted authority, to the relevant people. They will be expected to work to instructions, with a minimum of supervision, taking personal responsibility for their own actions and for the quality and accuracy of the work that they carry out.

Learners' knowledge will be sufficient to provide a sound basis for their work, and will provide an understanding of how the gas welding process works. They will know about the equipment, materials and consumables in adequate depth to provide a sound background for the welding operations to be performed, and for ensuring that the work output is produced to the required specification.

Learners will understand the safety precautions required when working with the welding equipment. They will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Join marine materials/ structures using the manual gas welding process	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 follow the relevant joining procedure and job instructions 1.3 check that the joint preparation complies with the specification 1.4 check that joining and related equipment and consumables are as specified and fit for purpose 1.5 prepare the gas welding equipment for use, to include all of the following: • checking that regulators, hoses and valves are securely connected, and are free from leaks and damage • checking/fitting the correct gas nozzle to the torch • checking that a flashback arrestor is fitted • setting appropriate gas pressures • using the correct procedure for lighting, adjusting and extinguishing the welding flame • using appropriate and safe procedures for the handling and storing of gas cylinders 1.6 make the joints as specified using the appropriate thermal joining technique			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.7 produce welded joints which incorporate the following: • butt welds and • fillet welds OR • welds made autogenously (without filler wire) 1.8 weld joints according to approved welding procedures, and in good access situations, in two of the following BS EN 287 positions: • flat (PA) • horizontal (PC) • horizontal vertical (PB) • vertical upwards (PF) • vertical downwards (PG) 1.9 use a range of filler wire, to include both of the following: • two different sizes • two different material groups 1.10 produce joints in one form of specified materials from the following: • plate • section			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• sheet (<3mm) • pipe/tube • other forms 1.11 produce joints of the required quality and of specified dimensional accuracy which: • achieve a minimum weld quality equivalent to the level given in the relevant European/International • standard (eg EN 25817/ISO 5187 and EN 30042/ISO 10042) required by the application standard or specification • meet the required dimensional accuracy, within specified tolerance 1.12 shut down the equipment to a safe condition on completion of joining activities 1.13 deal promptly with excess and waste materials and temporary attachments, in line with approved and agreed procedures 1.14 deal promptly and effectively with problems within their control and report those that cannot be solved			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
2 Know how to join marine materials/structures using the manual gas welding process	2.1 explain the safe working practices and procedures to be observed when working with gas welding equipment (to include general workshop and site safety, appropriate personal protective equipment, fire and explosion prevention, protecting other workers, safety in enclosed/confined spaces; fume control) 2.2 explain the statutory regulations; risk assessment procedures; accident procedure and relevant requirements of HASAWA, COSHH and Work Equipment Regulations; safe disposal of waste materials 2.3 describe the correct handling and storage of gas cylinders (such as manual handling and use of cylinder trolley, leak detection procedures, relevant BCGA codes of practice, cylinder identification, gas pressures, cylinder and equipment safety features, emergency shutdown procedures) 2.4 describe the hazards associated with gas welding (such as naked flames, fumes and gases, explosive gas mixtures, oxygen enrichment, spatter, hot slag and metal, grinding and mechanical slag removal, elevated working, enclosed spaces, slips, trips and falls), and explain how they can be minimised 2.5 explain the gas welding process (such as basic principles of gas welding and related equipment; care • of the equipment)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.6 describe the consumables associated with gas welding (such as types of filler wire, fluxes, gas supply and control) 2.7 describe the types of welded joints to be produced (such as fillet and butt welds, single and multi-run welds, welding positions, joints in sheet, pipe and plate) 2.8 explain how to set up and restrain the joint (such as the use of jigs/fixtures, manipulators and positioners, restraining devices, tack welding size and spacing in relationship to material thickness, correct joint set-up, cleanliness of materials used) 2.9 explain how to prepare the welding equipment, and the checks to be made to ensure that it is safe and ready to use (such as connection of hoses, torch, flashback arrestors, hose check valves, regulators, connections for leaks, setting welding parameters) 2.10 explain the techniques of operating the welding equipment to produce a range of joints in the various joint positions (such as selection of nozzle, flame adjustment, correct manipulation of torch and filler rods, safe closing down of the welding equipment) 2.11 explain the importance of complying with job instructions and the welding procedure specification			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.12 describe the problems that can occur with the welding activities, and explain how these can be overcome (such as causes of distortion and methods of control, effects of welding on materials and sources of weld defects; methods of prevention) 2.13 describe the organisational quality systems used, and weld standards to be achieved; weld inspection and test procedures used (including visual and non-destructive tests) 2.14 explain the personal approval tests and their applicability to their work 2.15 explain how to dispose of waste materials in a safe and environmentally friendly way 2.16 describe the extent of their own authority, and explain whom they should report to if they have problems that they cannot resolve 2.17 explain the reporting lines and procedures, line supervision and technical experts			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 80: Setting up and preparing loads for moving

Unit reference number: A/601/2466

Level: 2

Credit value: 12

Guided learning hours: 49

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to set up/prepare loads for moving, in a marine environment, in accordance with approved procedures. Learners will be required to access the appropriate documentation in order to assess the weight of the loads to be moved, and to determine the most suitable method of moving the load and the type of equipment required. They will be expected to select the appropriate equipment, to check that it is within current certification requirements, and that it is in a safe and usable condition. Learners will be expected to prepare for moving a variety of loads, such as sheet materials, bundles of materials, assemblies, liquid containers, corrosive and fragile materials. This will involve planning a safe route for moving the load, and ensuring that the final designated destination of the load is in a fit state to receive it.

Learners' responsibilities will require them to comply with their organisation's policies and procedures for the setting up/preparation of loads for moving. They will be required to report any problems with the setting up/preparation activities that they cannot resolve, or which are outside their defined authority, to the relevant people. Learners will be expected to work to instructions, either alone or in conjunction with others, taking personal responsibility for their own actions, and for the accuracy and safety of the work that they undertake.

Learners' knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to the setting up/preparation of loads for moving. They will have an understanding of the preparation process, and its application, and will know about the preparation requirements, equipment and materials to be used in sufficient depth to provide a sound basis for carrying out the activities to the required standards.

Learners will understand the safety precautions required when carrying out the setting up/preparation operations. They will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Set up and prepare loads for moving	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 establish the weight of the load to be moved 1.3 obtain the safe working load (SWL) and centre of gravity of the load to be moved, by using two of the following: • load documentation • third party • estimation • moving load documentation/moving procedure sheet 1.4 determine the method and select suitable equipment to move the load 1.5 check that the equipment to be used is capable of moving the load safely 1.6 ensure that the equipment to be used is suitable for the loads being lifted, and is in a safe and usable condition, by checking all of the following: • the equipment is certified and is compliant, within current test dates • all slings are free from obvious defects			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• the moving equipment selected is suitable and has a sufficient safe working load (SWL) for the application • the identification number and safe working load (SWL), are clearly marked on the equipment selected • the equipment selected is suitable for the environment of operation 1.7 establish the position of lifting points for three of the following: • single-legged sling • double-legged sling • four-legged sling • multi-legged sling • lifting beams • spreaders – whilst taking into account all of the following: • safe working load (SWL) • tension • angles • sling length			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.8 plan the moving of various types of loads, to include three of the following: • sheet materials • sections/bundles of materials • assemblies • sub-assemblies • liquid containers • awkward shapes • fragile components • corrosive/chemical • machinery 1.9 determine a suitable route for moving the load minimising risk to people and property 1.10 plan the moving route and location for the final destination of the load, to include three of the following: • differing elevations • along same elevation • transferring a load • turning a load • move as unit/part assembly			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.11 check that the load is secured and protected before moving operations start 1.12 identify and set up suitable securing devices, to ensure that the load is moved safely, using three of the following: • shackles • guide ropes • holding devices • stiffeners • protection materials • chains/wires • bottle screws/stays • seatings/fasteners 1.13 deal promptly and effectively with problems within their control and report those that cannot be solved 1.14 complete the relevant documentation for recording the moving activity, to include one of the following: • lifting procedure sheet (competent person ID) • drawings for the moving operation • inspection records/defect reports • risks assessments			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
2 Know how to set up and prepare loads for moving	2.1 explain the specific safety precautions to be taken when preparing loads for moving, and the need for ensuring load security (such as general workshop and site safety, appropriate protective equipment, protecting other workers during the lifting operations; accident procedure; statutory regulations, risk assessment procedures and COSHH regulations) 2.2 describe the hazards associated with preparing loads for moving, and explain how they can be minimised 2.3 explain their understanding of the Approved Code of Practice (ACOP) for preparing loads for moving and Lifting Operation and Lifting Equipment Regulations (LOLER) 2.4 explain the specific requirements for the marking of moving equipment, and the specific method used in the organisation in which they are working 2.5 describe the range of equipment that is to be used for moving loads (such as cranes, low loaders, fork-lift trucks) 2.6 describe the lifting equipment accessories that are to be used (such as slings, chains, wire ropes, eye bolts) 2.7 explain how to establish the weight of the load (such as using documentation, calculation from drawings and by estimation)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.8 explain how to establish the position of lifting points in relation to the slinging arrangements 2.9 explain the factors which affect the selection of the moving equipment and lifting accessories (such as weight, type of load-operating environment) 2.10 explain how to check that the lifting equipment is capable of lifting the load to be moved 2.11 explain what checks should be made on the lifting equipment prior to use, and the things that they should look for that could render them unsafe to use 2.12 explain how to carry out visual in-service inspections of the equipment, and what to do should any defective equipment be identified 2.13 explain how to plan and prepare a route for moving loads, and the things that they will need to take into account 2.14 explain the specific requirements of the organisation for the use of the moving equipment 2.15 explain the signalling techniques used to communicate with crane drivers (to include hand signals and verbal commands) 2.16 explain how the moving equipment should be stored and handled			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.17 describe the extent of their own responsibility, and explain whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 81: Moving materials and components in a marine environment

Unit reference number: J/601/2468

Level: 2

Credit value: 13

Guided learning hours: 49

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to move loads by slinging and lifting, in a marine environment, in accordance with approved procedures. Learners will be required to use correctly specified items of lifting gear, which will include hand and/or power-operated cranes and winches, and associated lifting accessories. They must check that the lifting equipment is within current authorisation dates, is undamaged and within the permitted safe working load (SWL). Learners will be expected to establish the weight of the load to be moved, and to attach the appropriate slings to suitable or designated lifting points on the load, in order to achieve a safe and balanced lift. They must check the area that the load will move through, to ensure that it is free from obstructions and is safe for the load to be moved. Learners will also be expected to be able to give the correct hand and verbal signals during the lifting activities.

Learners' responsibilities will require them to comply with organisational policy and procedures for the slinging, signalling and lifting activities undertaken, and to report any problems with the slinging and lifting equipment or activities that they cannot personally resolve, or are outside their permitted authority, to the relevant people. Learners will be expected to work to instructions, either alone or in conjunction with others, taking personal responsibility for their own actions, and for the safety and integrity of the materials or items being moved.

Learners' knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to applying slinging, signalling and lifting procedures within a marine environment. They will have an understanding of the slinging, signalling and lifting techniques used and their application, and will know about the lifting equipment and accessories for lifting in adequate depth to provide a sound basis for carrying out the activities safely and correctly.

Learners will understand the safety precautions required when slinging and lifting components, and the safeguards that are necessary for undertaking the activities. They will be required to demonstrate safe working practices throughout, and will understand the responsibilities they owe to themselves and others in the workplace.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Move materials and components in a marine environment	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 check that the equipment to be used is suitable for the materials, machinery or components being lifted, and is in a safe and usable condition, by establishing all of the following: • the equipment is certified and is compliant, within current test dates (such as LOLER regulations and health and safety requirements) • all slings are free from obvious defects • the lifting equipment selected is suitable and has a sufficient SWL for the application • the identification number and SWL are clearly marked on the equipment selected • the equipment is correctly colour coded (where applicable) 1.3 check before slinging, lifting or moving the load, that all of the following have been established: • weight of the load • route of the load is clear • those affected have been informed • landing/storage area is clear • agreed code of verbal/hand signals			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• precautions are in place in case of spillage • arrangements are made for securing/storing in the landing place 1.4 use two of the following lifting and moving methods and techniques: • crane • winch • capstan • powered lifting equipment • hand-operated lifting equipment • lifting appliances • pulling appliances • multi-sheaved block combinations • low loaders • jacks, skates and trolleys 1.5 position the moving equipment so that the weight of the load is evenly distributed 1.6 attach the appropriate handling equipment securely to the load, using approved methods to eliminate slippage 1.7 use two of the following slinging methods: • single-leg slings • spreaders			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• two-leg slings • three- and four-leg slings • lifting beams 1.8 confirm that the load is secure before moving 1.9 move the load over the selected, suitable route 1.10 move two of the following types of loads: • sheet materials • pipes, bars, joists etc. (single and/or in bundles) • liquid containers (such as drums) • fragile components • hot/radiant/toxic/corrosive • fabricated units • sub-assemblies • access structures • components/machinery with evenly distributed weight • components/machinery with unevenly distributed weight • irregularly shaped objects 1.11 position and release the load safely in its intended final location			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.12 move loads safely and correctly, and re-position in two of the following conditions: • to differing elevations • as part of an assembly • in the same elevation • rotate a load			
2 Know how to move materials and components in a marine environment	2.1 explain the specific safety precautions to be taken when slinging and lifting loads, and the need for ensuring load security (general workshop and site safety, appropriate personal protective equipment, protecting other workers during the lifting operations; accident procedure; statutory regulations, risk assessment procedures and COSHH regulations) 2.2 describe the hazards associated with slinging and lifting of loads, and explain how they can be minimised 2.3 explain their understanding of the Approved Code of Practice (ACOP) for safe use of lifting equipment and Lifting Operation and Lifting Equipment Regulations (LOLER) 2.4 explain the specific requirements for the marking of lifting equipment and the specific method used in the organisation in which they are working			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.5 describe the range of equipment to be used for the lifting operations (such as hand- and power-operated cranes, winches, pulling equipment) 2.6 describe the lifting equipment accessories to be used (such as slings, chains, wire ropes, eye bolts) 2.7 explain the checks that should be made on the lifting equipment prior to use, and things that they should look for 2.8 explain how to carry out visual in-service inspections of the equipment, and what to do should any defective equipment be identified 2.9 describe the factors which affect the selection of the lifting equipment and lifting accessories (such as weight, type of load, operating environment) 2.10 explain how to check that the lifting equipment is capable of lifting the load to be moved 2.11 explain how to plan and prepare a route for moving loads, and the things that they will need to take into account 2.12 explain the specific requirements of the organisation for the use of the lifting equipment 2.13 explain the signalling techniques used to communicate with crane drivers (to include hand signals and verbal commands) 2.14 explain how the lifting equipment should be stored and handled			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.15 describe the extent of their own responsibility, and explain whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 82: Carrying out preparations for rigging activities

Unit reference number: J/601/2471

Level: 2

Credit value: 18

Guided learning hours: 49

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to prepare for rigging activities in a marine environment, in accordance with approved procedures. Learners will be required to prepare the rigging equipment to the required specification and health and safety regulations (LOLER). They will be expected to select the appropriate equipment, and to check that it is within current certification requirements and is in a safe and usable condition. Learners will be expected to prepare the equipment in readiness for the rigging activities, and this will include such things as determining the layouts for docking and mooring, the sizes, SWL (safe working load) and lengths of fibre and wire ropes, the position of pad eyes, lugs and fairlead arrangements. In addition, they will be expected to prepare wire and fibre rope, and to check the operation and condition of ancillary machinery such as winches, cranes and rigging equipment.

Learners' responsibilities will require them to comply with their organisation's policies and procedures for the preparation of the rigging equipment. They will be required to report any problems with the preparation activities that they cannot resolve, or which are outside their defined authority, to the relevant people. Learners will be expected to work to instructions, either alone or in conjunction with others, taking personal responsibility for their own actions and for the accuracy and safety of the work that they undertake.

Learners' knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to the preparation of rigging equipment. They will have an understanding of the preparation process and its application, and will know about the preparation requirements, equipment and materials to be used in sufficient depth to provide a sound basis for carrying out the activities to the required standards.

Learners will understand the safety precautions required when carrying out the preparation operations. They will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Carry out preparations for rigging activities	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 obtain all the required equipment and ensure that it is in safe and usable condition and is suitable for the equipment being lifted by checking all of the following: • all rigging equipment, including wire/fibre ropes and chains, can be identified on the register and have relevant test certificates, inspection reports and maintenance records • where applicable, equipment has the correct colour coding • all equipment and ropes are free from obvious defects • the identification number and SWL are clearly marked on the equipment selected • the equipment selected is suitable for the environment of operation 1.3 carry out the necessary preparations to the equipment in line with work requirements	•	•	•

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.4 prepare for three of the following rigging activities: • mooring and berthing operations • preparing docks and slips for vessel operations • setting up access structures • rigging cranes • standing rigging • rigging derricks • rigging davits • rigging accommodation ladders/gangways • 'replenishment at sea' rigging arrangements • maintenance of rigging equipment • maintenance of anchors and chains 1.5 obtain information from a rigging/mooring/docking plan, to include four of the following: • dock/slip centre line • type and position of mooring lines and number of parts • length, size and SWL of topping lift wires • length, size and SWL of runners • length, size and SWL of guy wires or ropes • length, size and SWL of guy pennants	•	•	•

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• length, size and SWL of standing rigging • length, size and SWL of accommodation ladder falls • length, size and SWL of crane wires • length, size and SWL of wire/rope for multi-sheave block arrangements • lifeboat davit falls, type of wire, length, size, SWL and lead arrangements • positions of pad eyes/lugs for securing shackles/blocks • number and SWL of shackles required • number, type and SWL of blocks required • lead arrangements • other please specify 1.6 prepare ropes for rigging activities, to include both of the following: • fibre ropes • wire ropes	•	•	•

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.7 prepare the ropes for rigging activities, by carrying out two of the following operations: • cutting wire rope to length • cutting fibre rope to length • applying whippings and seizings to wire rope • applying whippings and seizings to fibre rope 1.8 check the correct operation/condition of three of the following items of machinery/equipment, prior to the rigging activity: • cranes • winches • windlass • capstans • hydraulic jacks • powered lifting equipment • hand-operated lifting equipment • chain blocks • jacks, skates and trolleys • low loaders	•	•	•

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.9 carry out checks for condition and defects on five of the following items, prior to the rigging activity: • clamps • pull lifts • rings/swivels • hooks • fibre ropes • wire ropes • pad eyes • chains • slings • shackles/eye bolts • blocks • bottle screws • hand tools 1.10 identify and use suitable protection materials for the equipment and load during the lifting operation, to include two of the following: • appropriate packaging • material to protect for sharp edges/corners • sleeves • guide ropes	•	•	•

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.11 check that the required safety arrangements are in place to protect other workers from activities likely to disrupt normal working 1.12 report completion of preparations in line with organisational procedures 1.13 complete the relevant documentation for the recording of the preparation activity, to include one of the following: • register of lifting equipment • record of arrangements for derricks, davits etc • colour coding arrangements • inspection records/defect reports 1.14 deal promptly and effectively with problems within their control and report those that cannot be solved	•	•	•

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
2 Know how to carry out preparations for rigging activities	2.1 explain what specific safety precautions need to be taken when preparing equipment for the rigging activity, and the need for ensuring the load security (such as general workshop and site safety, appropriate protective equipment, protecting other workers during the lifting operations; accident procedure; statutory regulations, risk assessment procedures and COSHH regulations) 2.2 describe the hazards associated with preparing equipment for rigging, and explain how they can be minimised 2.3 explain their understanding of the Approved Code of Practice (ACOP) for preparing equipment for the rigging activity, and Lifting Operation and Lifting Equipment Regulations (LOLER) 2.4 explain the requirements for the marking of rigging equipment, and the specific method used in the organisation in which they are working 2.5 describe the range of equipment that is to be used during the rigging process (such as cranes, windlass, capstans, hydraulic jacks, chain blocks and low loaders) 2.6 describe the lifting equipment accessories that are to be used (such as slings, chains, wire ropes, eye bolts)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.7 explain how to obtain, from the register of lifting/rigging equipment details, the status of a particular piece of equipment 2.8 describe the isolation procedures and emergency stops for the ancillary machinery being used (such as winches and cranes) 2.9 explain what checks need to be carried out on the lifting operation and on the condition of the ancillary machinery, and things that they should look for that could render the machinery unsafe to use 2.10 describe the range of rigging/berthing/mooring operations to be carried out 2.11 explain how to obtain the correct information from rigging/mooring/docking plans (including wire and fibre rope sizes, lengths and SWL) 2.12 explain how to prepare the fibre and wire ropes for the rigging activity 2.13 describe the range of equipment used in the various rigging activities, and explain what factors need to be taken into account 2.14 explain the purpose and use of the respective pieces of equipment, and the limitations (particularly with regard to SWL) 2.15 explain what checks need to be carried out on the rigging/lifting equipment, and possible defects			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.16 explain the procedures for reporting defects in machinery, rigging equipment and fibre or wire ropes, and actions to be taken 2.17 explain how the rigging equipment should be stored and handled 2.18 explain how to complete the equipment registers, and records of rigging arrangements 2.19 describe the extent of their own responsibility, and explain whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 83: Positioning and securing marine access structures

Unit reference number: R/601/2473

Level: 2

Credit value: 28

Guided learning hours: 56

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to position and secure marine access structures, in accordance with approved procedures. Learners will be required to position and secure the access structures, in compliance with health and safety requirements and Lifting Operations and Lifting Equipment Regulations (LOLER). The access structures to be set up will include such things as gangways, platforms, outer-side platforms, under-side platforms, hanging platforms and access ladders. Learners will be expected to use safe and appropriate techniques to set up, position, level, align and secure the structures in position.

Learners' responsibilities will require them to comply with health and safety regulations and their organisation's policies and procedures for the setting up of the access structures. They will be required to report any problems with the positioning and securing activities that they cannot resolve, or which are outside their defined authority, to the relevant people. Learners will be expected to work to instructions, either alone or in conjunction with others, taking personal responsibility for their own actions and for the quality and accuracy of the work that they carry out.

Learners' knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to applying the required positioning and securing procedures for marine access structures. They will have an understanding of the positioning and securing procedures used and their application, and will know about the positioning and securing requirements, equipment and materials to be used in sufficient depth to provide a sound basis for carrying out the activities to the required standards.

Learners will understand the safety precautions required when carrying out the positioning and securing operations. They will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Position and secure marine access structures	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 check that the access structure, lifting and securing components are in a usable condition, by checking all of the following: • the access structure being used is compliant with health and safety requirements (LOLER) • all wires/slings are free from defect • the lifting equipment is inspected and checked for sufficient SWL (safe working load) for the operation • the identification number and SWL are clearly marked and tagged on the structure and equipment selected • the access structure and securing equipment is suitable for the activity and environment of the work • allowances have been made for rise and fall of tides (where applicable) 1.3 identify the most appropriate location for the access structure and prepare the site for the installation 1.4 select the most appropriate access structures to ensure that safety regulations will be met			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.5 position four of the following types of access structures, using the correct sequence: • gangways • platforms • outer-side platforms • under-side platforms • hanging platforms • access ladders • other specific access structure 1.6 set up and install the access structure components in the correct sequence 1.7 use four of the following lifting and moving techniques to position the access structure: • cranes • winches • powered lifting equipment • lifting appliances • pulling appliances • block combinations • other specific equipment			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.8 locate and position the access structures, using five of the following: • powered lifts • sky climbers • hanging baskets • slings/wire ropes • harnesses • hydraulic jacks/skids • pulley blocks • man-riding baskets • chain blocks 1.9 secure the erected access structures, using three of the following: • guide wires/ropes • eye bolts/shackles • hanging frames • stays/stiffeners • pad eyes • securing lugs • bottle screw 1.10 check that the erected structures are safe, secure, stable and ready for use			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.11 deal promptly and effectively with problems within their control and report those that cannot be solved 1.12 inform the appropriate people when the installation is completed and ready for use			
2 Know how to position and secure marine access structures	2.1 explain what specific safety precautions need to be taken when positioning and securing access structures, and the need for ensuring the load security (such as general workshop and site safety, appropriate personal protective equipment, protecting other workers during the lifting operations; accident procedure; statutory regulations, risk assessment procedures and COSHH regulations) 2.2 describe the hazards associated with positioning and securing access structures, and explain how they can be minimised 2.3 explain their understanding of the Approved Code of Practice (ACOP) for safe use of lifting equipment, and Lifting Operation and Lifting Equipment Regulations (LOLER) 2.4 explain the specific requirements for the marking of lifting equipment, and the specific method used in the organisation in which they are working 2.5 describe the various types of access structures used in the marine environment (such as gangways, platforms, outer-side platforms, under-side platforms, hanging platforms and access ladders)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.6 explain the methods of assembling the access structures, and the equipment that is used 2.7 describe the range of equipment that is to be used for lifting the access structures (such as hand and power-operated cranes, winches, pulling equipment) 2.8 describe the lifting equipment accessories that are to be used (such as slings, chains, wire ropes, eye bolts) 2.9 explain what checks need to be made on the lifting equipment prior to use, and the things that they should look for 2.10 explain what to do should any defective equipment be identified 2.11 explain how to determine the approximate weight of the load to be moved 2.12 explain the factors which affect the selection of the lifting equipment and lifting accessories (such as weight, type of load operating environment) 2.13 explain how to check that the lifting equipment is capable of lifting the load to be moved 2.14 explain how to determine the centre of gravity of the load, and how to determine suitable slings and lifting points			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.15 explain how to locate and position the access structures, and the range of equipment that can be used (such as powered lifts, sky climbers, hanging baskets, slings/wire ropes, harnesses, hydraulic jacks/skids, pulley blocks, man-riding baskets and chain blocks) 2.16 explain the need to make allowances for the rise and fall of water levels due to tidal effects 2.17 explain how to secure the access structures, and the equipment that can be used 2.18 describe things that can go wrong with the positioning and securing operations, and explain how they can be avoided 2.19 describe the extent of their own responsibility, and explain whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 84: Removing marine access structures

Unit reference number: D/601/2489

Level: 2

Credit value: 28

Guided learning hours: 56

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to dismantle and remove marine access structures, in accordance with approved procedures. Learners will be required to dismantle and remove the access structures in accordance with health and safety requirements and Lifting Operations and Lifting Equipment Regulations (LOLER). The access structures to be dismantled and removed will include such things as gangways, platforms, outer-side platforms, under-side platforms, hanging platforms and access ladders. Learners will be expected to use safe and appropriate techniques to remove access structure securings, to dismantle them and remove them, without causing damage to the access structures or to surrounding structures.

Learners' responsibilities will require them to comply with health and safety regulations and their organisation's policies and procedures for the dismantling and removal of the access structures. They will be required to report any problems with the dismantling activities which they cannot resolve, or which are outside their defined authority, to the relevant people. Learners will be expected to work with a minimum of supervision, or in conjunction with others, taking personal responsibility for their own actions and for the accuracy and safety of the work that they undertake.

Learners' knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to applying the required dismantling and removal procedures to marine access structures. They will have an understanding of the dismantling procedures used and their application, and will know about the dismantling and removal requirements, equipment and materials to be used in sufficient depth to provide a sound basis for carrying out the activities to the required standards. Learners will understand the safety precautions required when carrying out the dismantling and removal operations. They will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Remove marine access structures	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 ensure that the equipment to be used is suitable for the task involved and is in a safe and usable condition, by checking all of the following: • all equipment is certified and compliant, within test dates (LOLER) • all slings/wires are free from defects • the removal equipment selected is suitable and has a sufficient SWL (safe working load) for the application • the method of removal is appropriate to the surrounding environment • the identification number and SWL are clearly marked on the equipment to be used • an appropriate storage area for removed components is available 1.3 establish and where necessary support components before removal of securing devices 1.4 remove components in the correct sequence using approved techniques			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.5 use the correct sequence to dismantle and remove four of the following types of access structures: • gangways • platforms • outer-side platforms • under-side platforms • hanging platforms • access ladders • other specific access structure 1.6 use four of the following lifting and moving techniques to remove the access structure: • cranes • winches • powered lifting equipment • lifting appliances • pulling appliances • block combinations • other specific equipment			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.7 use five of the following during the dismantling of the access structures: • powered lifts • sky climbers • hanging baskets • slings/wire ropes • harnesses • hydraulic jacks/skids • pulley blocks • man-riding baskets • chain blocks 1.8 support and remove access structures with suitable securing devices, using three of the following: • guide wires/ropes • eye bolts/shackles • bottle screws • support frames • stays/stiffeners • securing lugs			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.9 identify and attend to damage and defects in the components or structures in line with organisational requirements 1.10 store the removed components safely in an appropriate location 1.11 tidy up the site and leave it in a safe condition 1.12 deal promptly and effectively with problems within their control and report those that cannot be solved 1.13 inform the appropriate people when the dismantling is completed			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
2 Know how to remove marine access structures	2.1 explain what specific safety precautions need to be taken when dismantling and removing access structures, and the need for ensuring load security (such as general workshop and site safety, appropriate personal protective equipment, protecting other workers during the lifting operations, accident procedure; statutory regulations, risk assessment procedures and COSHH regulations) 2.2 describe the hazards associated with dismantling and removing access structures, and explain how they can be minimised 2.3 describe the various types of access structures used in the marine environment (such as gangways, platforms, outer-side platforms, under-side platforms, hanging platforms and access ladders) 2.4 explain how to dismantle the access structures and the range of equipment that can be used (such as powered lifts, sky climbers, hanging baskets, slings/wire ropes, harnesses, hydraulic jacks/skids, pulley blocks, man-riding baskets and chain blocks) 2.5 explain their understanding of the Approved Code of Practice (ACOP) for safe use of lifting equipment, and Lifting Operation and Lifting Equipment Regulations (LOLER)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.6 explain the specific requirements for the marking of lifting equipment, and the specific method used in the organisation in which they are working 2.7 describe the range of equipment to be used for the lifting operations (such as hand and power-operated cranes, winches, pulling equipment) 2.8 describe the lifting equipment accessories to be used (such as slings, chains, wire ropes, eye bolts) 2.9 explain what checks need to be made on the lifting equipment prior to use, and the things that they should look for 2.10 explain how to determine the approximate weight of the access structure/load to be moved 2.11 explain how to check that the lifting equipment is capable of lifting the access structure/load to be moved 2.12 explain how to determine the centre of gravity of the access structure/load, and how to determine suitable slinging and lifting points 2.13 explain how to plan and prepare a route for moving access structures/loads, and the things that they will need to take into account 2.14 explain the specific requirements of the organisation for the dismantling and removing of the access structures			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.15 explain the signalling techniques used to communicate with crane drivers (to include hand signals and verbal commands) 2.16 explain how the access structures should be stored, handled and maintained 2.17 describe the extent of their own responsibility, and explain whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 85: Carrying out maintenance on rigging and lifting equipment

Unit reference number: D/601/2492

Level: 2

Credit value: 30

Guided learning hours: 77

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to carry out planned maintenance activities on rigging and lifting equipment, in accordance with approved procedures, health and safety requirements and Lifting Operations and Lifting Equipment Regulations (LOLER). Learners will be required to maintain a range of rigging/lifting equipment such as cranes, winches, powered lifting gear, lifting appliances, fibre and wire ropes, pulling equipment and rigging equipment, including blocks, shackles and bottle screws. This will involve cleaning and, where appropriate, lubricating and checking the equipment for faults or defects, and removing and replacing faulty equipment. Learners will also be expected to carry out a range of checks and tests to confirm that the equipment is fit for service.

Learners' responsibilities will require them to comply with organisational policy and procedures for the maintenance activities undertaken, and to report any problems with these activities or with the tools and equipment used, that they cannot personally resolve, or are outside their permitted authority, to the relevant people. They will need to ensure that all the required maintenance documentation and rigging/lifting equipment registers are completed accurately and legibly. Learners will be expected to work to instructions, alone or in conjunction with others, taking personal responsibility for their own actions and for the quality and accuracy of the work that they carry out.

Learners' knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to applying maintenance procedures to rigging and lifting equipment. They will have an understanding of the rigging and lifting equipment, the inspection and maintenance procedures used and their application. Learners will know how the equipment functions, and the purpose of the individual components and associated defects in adequate depth to provide a sound basis for carrying out the maintenance activities and ensuring that the maintained equipment functions to the required standards.

Learners will understand the safety precautions required when carrying out the maintenance activities. They will be required to demonstrate safe working practices throughout, and will understand their responsibility for taking the necessary safeguards to protect themselves and others in the workplace.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Carry out maintenance on rigging and lifting equipment	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the maintenance of the rigging and lifting equipment: • undertake the maintenance activities to cause minimal disruption to normal working • adhere to risk assessment, COSHH and other relevant safety standards • ensure that safe access and working arrangements for the maintenance area have been provided • check that the equipment is certified and compliant with current legislation (LOLER) • check that all equipment registers are up to date • ensure that all slings/wires are inspected before use • ensure that all lifting equipment is marked with the SWL (safe working load) application • ensure that company procedures are followed with regard to colour coding equipment 1.3 follow the relevant maintenance schedules to carry out the required work			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.4 carry out the maintenance activities within the limits of their personal authority 1.5 carry out the maintenance activities in the specified sequence and in an agreed time scale 1.6 carry out all of the following maintenance activities on rigging and lifting equipment: • replace all 'lifed' items (such as ropes, wires or chains) • remove any defective or damaged components • replace defective or damaged components • set and adjust replaced components • proof load testing • clean and grease the equipment 1.7 carry out checks, including securing points, lubricate as necessary and renew as required, fibre and/or wire rope running gear on three of the following: • cranes • winches • derrick guys • derrick runners • derrick topping lifts • lifeboat falls			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• accommodation ladders • other specific equipment 1.8 carry out all of the following checks and maintenance activities: • dismantle, by removing pin and sheaves, and check if necessary • inspect the centre pin and sheaves for wear • renew the pin and sheaves, if required • lubricate, as required • re-assemble, ensuring that a locking nut and pin are fitted • check for free rotation of the swivel eye, and lubricate as necessary • re-stamp the identity number and colour code – on two of the following: • single-sheave blocks • multi-sheave blocks • snatch blocks 1.9 check, clean, adjust and lubricate, as appropriate, and renew as required, four of the following: • lifting hooks • shackles • blocks			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• clamps • bottle screws • chain blocks • hydraulic jacks • skates and trolleys • fairlead rollers 1.10 check, and renew as necessary, two of the following items of lifting equipment: • wire rope slings • wire rope grommets and strops • single and multi-legged chain slings • fibre rope and fibre slings 1.11 maintain lifting equipment, in compliance with all of the following standards: • organisational guidelines and codes of practice • equipment manufacturer's operation range • health and safety regulations (LOLER) 1.12 report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule 1.13 complete relevant maintenance records accurately and pass them on to the appropriate person			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.14 complete the relevant documentation for the maintenance activity, to include one of the following: • maintenance/renewal reports • defect reports • register of rigging/lifting equipment • repair documentation • test certificates • record of colour coding 1.15 dispose of waste materials in accordance with safe working practices and approved procedures			
2 Know how to carry out maintenance on rigging and lifting equipment	2.1 explain the health and safety requirements of the area in which the maintenance activity is to take place, and the responsibility it places on them 2.2 explain their understanding of the Approved Code of Practice (ACOP) for safe use of lifting equipment, and Lifting Operations and Lifting Equipment Regulations (LOLER) 2.3 explain the maintenance authorisation procedures that apply to the rigging and lifting equipment being maintained (such as permit to work, isolation permits, T cards, area closures, safety tags and other safe working practices)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.4 describe the specific health and safety precautions to be applied during the maintenance activities, and their effects on others 2.5 describe the hazards associated with carrying out maintenance activities on rigging and lifting equipment (such as handling oils, greases, stored pressure/force, misuse of tools, using damaged or badly maintained tools and equipment, not following laid-down maintenance procedures), and explain how they can be minimised 2.6 explain the importance of wearing personal protective equipment (PPE) during the maintenance process 2.7 explain how to obtain and interpret specifications, manufacturers' manuals and other documents needed in the maintenance process 2.8 explain the procedure for obtaining replacement parts, materials and other consumables necessary for the maintenance 2.9 explain the company policy on the repair/replacement of components during maintenance process 2.10 explain the specific requirements for the maintenance of the rigging and lifting equipment, and the maintenance methods used			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.11 describe the range and aspects of lifting equipment to be maintained (such as cranes, winches, derricks) 2.12 describe the rigging/lifting equipment/accessories to be inspected and maintained (such as slings, chains, wires, swivels, blocks, shackles) 2.13 describe the methods of checking that components are fit for purpose, and explain how to identify defects and wear characteristics 2.14 explain the basic principles of how the equipment functions, the working purpose of individual units/components and how they interact 2.15 explain the maintenance procedures and preventive measures which are undertaken to minimise equipment failure and reduce the risk of accidents 2.16 explain how to record the maintenance of rigging and lifting equipment, and how to complete the documentation 2.17 explain how to handle and store rigging and lifting equipment correctly, and how to carry out care and control maintenance during storage 2.18 describe the problems associated with the maintenance of the rigging and lifting equipment, and explain how they can be overcome 2.19 explain the organisational procedure to be adopted for the safe disposal of waste of all types of materials			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.20 describe the extent of their own responsibility, and explain whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 86: Checking rigging and lifting equipment

Unit reference number: K/601/2494

Level: 2

Credit value: 15

Guided learning hours: 42

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to carry out a thorough examination and inspection of rigging and lifting equipment and accessories, in accordance with approved codes of practice and guidance, related to the Lifting Operations and Lifting Equipment Regulations (LOLER). Learners will be required to identify the equipment or accessories to be examined from the company register, and to establish the last date on which the equipment was examined, if not an initial examination, and to locate any relevant test certificates. They will be expected to examine the specified rigging and lifting equipment and accessories, and to identify any defects due to wear and tear or accidental damage. Learners will be required to take the correct action in respect of reporting such defects, and for withdrawing the item from service.

Learners' responsibilities will require them to comply with organisational policy and procedures, in addition to those contained in the regulations and learners will be expected to work to instructions, alone or in conjunction with others, taking full responsibility for their own actions and for the quality and accuracy of their work.

Learners' knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to applying inspection and examination procedures to rigging and lifting equipment and accessories. They will have a working knowledge of the relevant parts of the Lifting Operations and Lifting Equipment Regulations. Learners will also have an understanding of defects, damage, and wear and tear that can occur to equipment and accessories, together with knowledge of company procedures and legislation with regard to recording and reporting the necessary information.

Learners will understand the safety precautions required when carrying out the inspection operations. They will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Check rigging and lifting equipment	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 confirm all of the following prior to carrying out the inspection/examination: • items to be examined/inspected have been identified from the company register • any test certificates relating to the items have been located • examinations have been planned to cause minimal disruption • any measuring/testing equipment has been checked, and is within current calibration dates • correct documentation has been obtained for recording the findings • a colour coding system for rigging equipment and accessories is implemented • all necessary people have been informed 1.3 follow the correct specification for the product or equipment being inspected 1.4 use the correct equipment to carry out the inspection 1.5 identify and confirm the inspection checks to be made and acceptance criteria to be used			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.5 identify and confirm the inspection checks to be made and acceptance criteria to be used 1.6 carry out all required inspections as specified 1.7 carry out a thorough examination of running gear on one of the following, to include condition and sufficiency of wire or fibre rope and the method of securing: • derrick • tower crane • lifeboat davits • jib crane • overhead crane • accommodation ladder • other specific equipment 1.8 carry out a thorough examination of textile slings, wire ropes and chains, and identify four of the following common faults: • cuts in textile • textile abraded • textile stretched • excessive corrosion to chain • cracks in chain • deformation of chain or stretched links • broken wire in wire ropes			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• kinks in wire • flattening of wire on drum 1.9 carry out a thorough examination of three of the following types of lifting equipment/accessories: • blocks and pulleys • bottle screws • eyebolts • lifting hooks • chain blocks • swivels • rings 1.10 identify any defects or variations from the specification 1.11 record the results of the inspection in the appropriate format 1.12 complete all of the following documentation in relation to lifting equipment and accessories: • report to the employer after thorough examination, including any defects found • details of colour coding • details of maintenance and repairs 1.13 deal promptly and effectively with problems within their control and report those that cannot be solved			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
2 Know how to check rigging and lifting equipment	2.1 explain the health and safety legislation, regulations relating to safe working practices and procedures for lifting equipment (LOLER) 2.2 explain the specific safety precautions to be taken when carrying out thorough examinations or inspections on lifting equipment and accessories 2.3 explain how to obtain data and specifications of the equipment and accessories 2.4 describe the measuring equipment that is to be used for examination of the equipment and accessories 2.5 explain the timescale for examinations, and other circumstances when inspections must be carried out 2.6 explain the responsibilities of the person carrying out the examination with regard to reporting defects to employer 2.7 explain the definition of a 'competent' person, in relation to LOLER 2.8 describe type of damage/defects likely in textile slings, wire ropes, chains etc, used in lifting operations 2.9 describe type of damage/defects likely to occur in lifting accessories (such as blocks, shackles) 2.10 explain the importance of a colour coding system with relation to examinations of lifting equipment and accessories			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.11 explain the importance of the traceability of items of lifting equipment 2.12 explain why they need evidence of examination when lifting gear is transferred 2.13 explain the effect of the environment on lifting equipment 2.14 explain how to complete the equipment register, maintenance records and record of colour coding 2.15 describe the extent of their own responsibility, and explain whom they should report to if they have a problem that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 87: Assisting in the preparation of docks and slips for vessel operations

Unit reference number: T/601/2496

Level: 2

Credit value: 30

Guided learning hours: 77

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to assist in carrying out dock and slip preparations for docking, slipping, launching or floatation activities of marine vessels or structures, within approved procedures. The facilities to be prepared will include tidal/non-tidal river and basin approach arrangements for surface, sub-surface and semi-submersible vessels. This will involve assisting in the marking out of the dock or slip arrangement to indicate the positions of the plinth, block, shore, breast, cradle and wire cable tensioning devices, in line with the vessel docking plan and associated drawings. Further sequential activities will involve the positioning and build up of the arrangements to accommodate the vessel or structure in a safe manner during and on completion of the docking/slipping process, after which breast shores, cut-up and bilge shores will be fitted and hardened off.

Learners' responsibilities will require them to comply with organisational policy and procedures for the preparation of the docks and slips, and to report any problems with these activities that they cannot personally resolve, or are outside their permitted authority, to the relevant people. They will be expected to work with either a high level of supervision or as a member of a team. Learners will take personal responsibility for their own actions and for the quality and accuracy of the work that they carry out. Where team working is involved, learners must demonstrate a significant personal contribution during the team activities in order to satisfy the requirements of the standard, and competence in all the areas required by the standard must be demonstrated.

Learners' knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to the preparation of the docks and slips. They will have an understanding of the importance and implications of the activities in docking/slipping/floating of marine vessels and structures.

Learners will understand the safety precautions required when carrying out the preparation activities, especially those that require special safeguards to protect themselves and others. They will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Assist in the preparation of docks and slips for vessel operations	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the preparation of the docks and slips: • adhere to risk assessment, COSHH and other relevant safety standards • obtain clearance to work in the dock or slip • maintain safe access and working arrangements for the preparation of the area • carry out the preparation activities, using recognised and approved procedures and techniques • leave the work area in the prescribed category of cleanliness and ready for the required operations 1.3 follow the relevant operational procedures when carrying out their activities 1.4 carry out their activities within the limits of their competence and personal authority 1.5 prepare the docks and slips correctly for the required activities			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.6 assist in carrying out all of the following dock and slip preparation activities, as appropriate to the vessel, craft or structure: • prepare the dock bottom and/or slip, using working drawings/sketches and notes from associated vessel/structure drawings, as supplied • determine the dock/slip centre line • measure and mark out the plinth, cut-up, shore, cradle and breast positions • dress the breast shores • erect sighting battens • position and secure plinths with dogs and chains • build up dock blocks on plinths, and shape if required • level and line the blocks • secure blocks to plinths with chains/rigging screws • shape and cut wooden formers and members • assemble cradles (wood, metal or concrete) • fit and secure block capping with dogs, as specified • erect and assemble cradles supplied • cap off cradles, as directed			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• form off caps to address the shape of the vessel • clear the dock slip for subsequent operations 1.7 carry out all of the following docking and slipping activities: • lay out and secure wires to the vessel • tension check and veer cables, as directed • man-up and operate wire tensioning devices and winches, as directed • man-up, pack and wedge breast shores, when directed • when vessel/structure is docked in position, man-up and position bilge cut-ups and shores, and assist in the slinging into position, and packing and wedging of the shores (as directed) 1.8 carry out all of the following undocking and floating activities: • remove bilge shores and cut-ups • man up and operate wire tensioning devices, as directed • remove breast shores when clear of the vessel • remove wires and cables from the vessel 1.9 use two of the following to assist with the levelling and alignment of the dock blocks: • u-tube			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• level line • theodolite 1.10 carry out the preparation processes, in accordance with one of the following: • contracted requirements • corporate procedures • vessel/structure docking plans • international maritime procedures 1.11 report any instances where the activities cannot be fully met. 1.12 complete relevant documentation/records accurately and pass them on to the appropriate person 1.13 dispose of waste materials in accordance with safe working practices and approved procedures 1.14 check that the required safety arrangements are in place to protect other workers from activities likely to disrupt normal working			
2 Know how to assist in the preparation of docks and slips for vessel operations	2.1 explain what specific safety practices and procedures that they need to observe when preparing docks and slips for berthing, docking, and floating operations (including legislation/regulations/codes of practice for the activities, vessels and/or structures), and the responsibility these requirements place on them			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.2 explain the permit to work procedure that applies to the preparation activities 2.3 explain the importance of wearing protective clothing and other appropriate safety equipment during the preparation and subsequent operation 2.4 explain the basic principle of dock/slip preparation, and the purpose of the individual components within the process 2.5 describe the methods of marking out the dock/slip centre line, and the tools and equipment used for this 2.6 describe the different types of capping and structures used in the processes, and their application (such as hard and soft woods, and their compressive properties) 2.7 describe the different types of structural support and cradle equipment, and their purposes 2.8 describe the types of instruments used to align and level the plinths, blocks and cradles 2.9 explain the care, handling and application of measuring/levelling instruments/devices 2.10 explain the company policy on the repair/replacement of materials, and the process for obtaining replacements, and other consumables 2.11 describe the techniques used to assemble plinths and cradles			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.12 describe the methods of securing wire tensioning devices and rigging wires for vessel manoeuvring in the process 2.13 describe the methods of providing clear markings to prepared components, to assist with the process 2.14 describe the tools and equipment used in the preparation process, their care and readiness/fitness for purpose (such as mauls, wedges, dogs and wood cutting equipment, both powered and hand-operated) 2.15 explain how to make adjustments to assemblies to ensure that they function correctly 2.16 explain the importance of final security checks before subsequent operations take place 2.17 describe typical problems that can occur during the dock/slip preparation activities, and explain how they can be overcome 2.18 describe the extent of their own authority, and explain whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 88: Assisting in mooring and berthing operations

Unit reference number: A/601/2497

Level: 2

Credit value: 30

Guided learning hours: 77

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to assist in carrying out mooring and berthing operations, in accordance with approved procedures. Learners will be required to handle mooring wires, ropes and chains, and to operate capstans, winches and windlasses correctly and safely. In addition, they will be able to position and secure gangways, walkways, platforms, pontoons, etc. Prior to carrying out mooring and berthing operations, learners must ensure that mooring wire, ropes and chains are in a suitable condition and are laid out to minimise any risk of injury to persons involved in the operations, that there is power to windlasses, winches and capstans and that they are operating correctly. Any developing or actual unsafe situations must be communicated immediately to the person who has overall responsibility for the berthing and mooring operation. During mooring and berthing operations, learners will be expected to comply with organisational procedures, which will include the proper interpretation of verbal orders, some of which will be via radio communication, and the use and interpretation of hand signals.

This unit applies to floating structures and vessels, with or without their own power, assisted by tugs or being positioned using ancillary machinery.

Learners' responsibilities will require them to comply with organisational policy and procedures for the mooring and berthing activities undertaken, and to report any problems with these activities that they cannot personally resolve, or are outside their permitted authority, to the relevant people. They will be expected to work to instructions, alone or in conjunction with others, taking full responsibility for their own actions and for the safety of themselves and others around them.

Learners' knowledge will be sufficient to provide a good understanding of mooring and berthing operations, and will provide an informed approach to applying the laid-down procedures. They will have an understanding of the handling characteristics of hawsers, wire ropes and chains, and the correct use of ancillary machinery used in the berthing and mooring operations. Learners will understand signalling and communication procedures in sufficient depth to provide a sound basis for carrying out the mooring and berthing activity safely and correctly. They will also understand the storage, maintenance and inspection requirements of the mooring equipment.

Learners will understand the safety precautions required and risks involved in the mooring and berthing operations, and the ways in which these can be minimised. They will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others, both ashore and afloat.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Assist in mooring and berthing operations	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 follow the relevant operational procedures when carrying out their activities 1.3 carry out their activities within the limits of their personal authority 1.4 prepare equipment/machinery correctly for mooring/berthing operations 1.5 check that all of the following have been carried out, prior to mooring and berthing operations: • the power supply to winches, capstans and windlasses is switched on, and they are operating correctly • hawsers, wire ropes and chains, as appropriate, are laid out in such a way as to minimise risk during the operations • communication systems are adequate and operational • rope and wire stoppers are in place • the nature of the mooring/berthing operation is understood • all hawsers, wire ropes and chains are suitable for the mooring/berthing operation, and are in good condition			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.6 establish within time constraints ship to shore link using two of the following: • heaving line • mooring boat • rocket line • tug 1.7 use signals and other communications effectively 1.8 assist in positioning and securing the vessel with regard for prevailing conditions 1.9 operate two of the following during the mooring/berthing operations: • electric windlass • hydraulic windlass • electric capstan • electric winch • hydraulic winch • hydraulic capstan 1.10 take part in the positioning of the vessel, craft or structure, ensuring fairleads, and using three of the following: • hawsers • wire ropes • chains			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• head ropes • stern lines • breast lines • letting go anchor • weighing anchor • headlines • springs 1.11 secure the vessel, craft or structure in place, ensuring adequate moorings to suit the conditions, to include carrying out three of the following operations: • using rope stoppers • using chain stoppers • using patent stoppers • turning up hawsers and wire ropes on bollards and mooring posts and making secure • setting up and adjusting tension winches 1.12 position and secure two of the following during the berthing and mooring operations: • gangways • walkways • landing stages • platforms			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• pontoons • fixed fenders 1.13 let go the vessel, craft or structure from the moorings, ensuring all of the following, as appropriate: • head and stern lines, breast lines and springs are singled up and let go in the correct sequence • relevant people are informed when letting go moorings that could foul propellers, thrusters etc • all lines are retrieved with the maximum speed, consistent with safety • where appropriate, tugs are secured prior to letting go • retrieved hawsers and wire ropes are safely coiled to avoid trip hazards			
2 Know how to assist in mooring and berthing operations	2.1 explain the specific safety precautions to be taken during mooring and berthing operations (to include personal protective equipment, safety of others, accident procedures, statutory regulations and risk assessment procedures) 2.2 describe the hazards associated with carrying out mooring and berthing operations, and explain how they can be minimised 2.3 describe the signalling techniques used during the mooring and berthing operations			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.4 explain the various verbal commands and communication methods that are used (including correct radio communication procedures) 2.5 explain the correct operation of winches, windlasses and capstans (particularly with regard to emergency stops) 2.6 explain the correct methods of laying out hawsers, wire ropes and chains, in preparation for mooring and berthing operations 2.7 explain how to establish ship-/structure-to-shore links 2.8 explain the characteristics of hawsers, of different materials, and wire ropes when being heaved, or slackened on winch, windlass and capstan drums 2.9 explain the action of the various hawsers and wires when subject to breaking strains 2.10 explain the importance of fairleads when heaving or slackening hawsers and wire ropes 2.11 describe the range of equipment and machinery necessary for mooring and berthing operations 2.12 describe the effect of environmental conditions (including tides and wind) on mooring and berthing operations 2.13 explain the purpose of headlines, springs etc, when carrying out mooring and berthing operations			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.14 describe the techniques for applying stoppers to hawsers, wire ropes and chains 2.15 explain how to secure the hawsers, wire ropes and chains to bollards, mooring posts etc 2.16 explain how to check the condition of hawsers, wire ropes, chains and associated equipment 2.17 describe how to correctly store the hawsers, wire rope and chains 2.18 describe the problems that can occur with the mooring and berthing operations, and explain how these can be overcome 2.19 explain the importance of ensuring that the completed mooring is safe and secure 2.20 explain the importance of ensuring that guard rails, chains and stanchions are correctly secured 2.21 explain what to do if they find flaws or damage in the hawsers, wire ropes or chains 2.22 describe the extent of their own responsibility, and explain whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 89: Carrying out manual splicing of wire and fibre ropes

Unit reference number: J/601/2499

Level: 2

Credit value: 25

Guided learning hours: 70

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to produce splices in wire and fibre ropes manually, in accordance with approved procedures. Learners will be required to produce a range of different splices in wire and fibre ropes, in accordance with specifications or instructions.

Learners will be expected to obtain any necessary equipment and to check that it is in a safe and usable condition. They will need to set the rope up in a suitable workholding device (where appropriate) and prepare the rope by cutting it correctly, un-laying the strands and applying whippings. Learners will also be expected to a produce a tight splice, with the relevant number of tucks and locking tucks, consistent with the type of splice or the intended use.

Learners' responsibilities will require them to comply with organisational policy and procedures for the splicing activities undertaken, and to report any problems with these activities, or with the ropes or equipment used that they cannot personally resolve, to the relevant authority. They will be expected to work to instructions, with a minimum of supervision, taking full responsibility for their own actions and for the quality of the work that they carry out.

Learners' knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to applying manual splicing procedures. They will have an understanding of the techniques and methods of splicing, and their application, and will also have an adequate understanding of the properties of wire and fibre ropes, to provide a sound basis for carrying out the splicing activity and ensuring that the completed splice is to the required specification.

Learners will understand the safety precautions to be taken when carrying out the splicing activities. They will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace.

Note: All spliced ropes will have to be tested by the appropriate authorities, in accordance with their operating environment and intended use.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Carry out manual splicing of wire and fibre ropes	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 obtain the required equipment and materials and check that they are in a safe and usable condition 1.3 prepare for the splicing activities, to include carrying out all of the following: • obtain the specification for the splice (including type of splice, size of eye (if applicable), safe working load (SWL) required, number of tucks) • obtain and check the necessary equipment (including workholding device, if applicable) • obtain the wire or fibre rope, as specified • cut the wire or fibre rope to the required length 1.4 follow instructions and any relevant specifications to produce the splice 1.5 produce the required splice using appropriate methods and techniques			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.6 prepare the wire and fibre rope for splicing, to include carrying out all of the following: • whip the rope at the extent to which it is to be unlaid • unlay and whip the ends of unlaid strands • whip the rope in way of the first tuck (wire rope, eye splice) • secure wire rope in the workholding device (where applicable) • for eye splice (where applicable), whip the thimble in place 1.7 carry out two of the following splices in wire ropes: • eye splice • short splice • long splice • other specific splice 1.8 carry out two of the following splices in fibre rope: • eye splice in multi-plait fibre rope • short or butt splice in multi-plait fibre rope • eye splice in fibre rope			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• back splice in fibre rope • short splice in fibre rope • long splice in fibre rope • other specific splice 1.9 check that the finished splice meets the requirements and make any necessary adjustments 1.10 check the completed splice against specification, for all of the following: • number and type of tucks • sequence in which strands have been spliced • tightness of the splice • deformation and kinks • dimensions (including size of eye) • thimbles are secure in eye (where applicable) • SWL is adequate for the intended purpose 1.11 complete a splice by one of the following methods: • whipping • worming, parcelling and serving 1.12 deal promptly and effectively with problems within their control and report those that cannot be solved 1.13 check that all the ropes that have been spiced are tested by the appropriate authorities before use			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.14 complete the appropriate splicing documentation, to include the following: • the records and registers relating to the splicing activity			
2 Know how to carry out manual splicing of wire and fibre ropes	2.1 explain the specific safety precautions to be taken when carrying out splicing operations with regard to health and safety legislation, safe working practices and procedures, and the safety of themselves and others working in the vicinity 2.2 describe the risks and hazards associated with carrying out splicing operations, and explain how they can be minimised 2.3 describe the correct handling and storage of wire and fibre ropes 2.4 explain how to obtain and interpret the drawings, specifications and work instructions relating to the splicing operations 2.5 describe the various types of splice, their purpose and intended use (to include short splice, long splice, back splice and eye splices) 2.6 explain what tests need to be applied to particular splices 2.7 explain the limitations and constraints associated with the respective types of splice			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.8 explain the breaking strain and safe working load (SWL) of wire and fibre ropes, and how this is affected by splicing 2.9 describe the tools, equipment and consumables used in the splicing operations 2.10 explain how to cut and unlay wire and fibre rope 2.11 explain the type and purpose of whippings in the splicing operation 2.12 describe the workholding devices used when splicing 2.13 explain the sequence, number and type of tucks to be made 2.14 explain how to complete a splice by whipping or worming, parcelling and serving; describe their purpose, and under what circumstances they would be used 2.15 explain how to check all aspects of a completed splice 2.16 explain the requirements regarding testing the completed spliced ropes, and the appropriate authority to carry out these tests (taking into account to the environment in which they are to be used, and the use/load they are intended to lift/move)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.17 describe the extent of their own responsibility, and explain whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 90: Carrying out the installation of rigging and lifting equipment

Unit reference number: M/601/2500

Level: 2

Credit value: 35

Guided learning hours: 84

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to carry out the installation of rigging and lifting equipment, in accordance with approved procedures. Learners will be required to install the rigging and lifting equipment, and to comply with health and safety requirements and Lifting Operations and Lifting Equipment Regulations (LOLER). The rigging and lifting equipment to be installed will include such things as tower, jib and overhead cranes, fixed and swinging derricks, lifeboat davits, accommodation ladders, anchor cables and standing rigging, such as stays, aerials and guy pennants. The learner will be expected to use safe and appropriate techniques to install and secure the equipment in position, ensuring that the rigging arrangements are as laid down in the plans and specifications, particularly with regard to safe working load (SWL). Prior to installation Learner must ensure that all items of equipment, including wire and fibre ropes, have relevant test certificates and are free from defects.

Learners' responsibilities will require them to comply with health and safety regulations and their organisation's policies and procedures for the installation activities undertaken, and to report any problems with these activities that they cannot resolve, or are outside their defined authority, to the relevant people. They will be expected to work to instructions, alone or in conjunction with others, taking personal responsibility for their own actions and for the accuracy and safety of the work that they undertake.

Learners' knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to applying the required installation procedures for marine rigging and lifting equipment. They will have an understanding of the layout and requirements of the rigging and lifting arrangements, their intended use, and the constraints and limitations of the respective rigs. Learners will know about the installation of the rigging and lifting equipment in adequate depth to provide a sound basis for carrying out the activities to the required specification.

Learners will understand the safety precautions required when carrying out the installation of the rigging and lifting equipment. They will be required to demonstrate safe working practices throughout, and will understand their responsibility for taking the necessary safeguards to protect themselves and others from accidents and injury in the workplace.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Carry out the installation of rigging and lifting equipment	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the installation of the rigging and lifting equipment activities: • adhere to all company safety procedures and practices, and to legislation relating to the installation of rigging and lifting equipment • ensure that safe access and working arrangements have been provided for the area in which the rigging is to take place • use specialised personal protective equipment (PPE) when working at height • check that all equipment has test certificates and is compliant with current legislation • ensure that all equipment registers are maintained • inspect all slings/wires before use, and replace any that are damaged • ensure that all rigging/lifting equipment is marked with the safe working load (SWL) • ensure that company procedures are followed with regard to colour coding			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.3 follow all relevant drawings and specifications for the installation being carried out 1.4 use the correct tools and equipment for the installation operations and check that they are in a safe and usable condition 1.5 install, position and secure the equipment and components in accordance with the specification 1.6 install rigging/lifting equipment to specification, on three of the following: • tower crane • jib crane • overhead crane • fixed derrick • swinging derrick • lifeboat davits • accommodation ladder • anchor cables 1.7 correctly install one of the following items of standing rigging: • stays • aerials • guy pennants			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.8 carry out checks of the installation, to include three of the following: • lifeboat davit leads are correct, and lifeboats can be lowered to the correct extent for lightship condition • the anchor cable runs freely over stop and windlass, with no turns in the cable, and it is correctly secured in the chain locker • crane topping lifts and hoists are of sufficient length, with fairleads to the drums • derrick topping lifts and lift wires are of sufficient length, have fairleads, and lay down correctly on the drum • guy arrangements on swinging derricks control the required arc of swing • all critical securing shackles have retaining pins or mousings fitted • accommodation ladder falls are of sufficient length to allow for lightship condition, and fairleads lay down correctly on the winch drum 1.9 check that all necessary connections to the equipment are complete 1.10 deal promptly and effectively with problems within their control and report those that cannot be solved 1.11 check that the installation is complete and that all components are free from damage			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.12 complete two of the following documentary records relating to the rigging installation activity: • rigging equipment plan/layout • record of colour coding • defect reports			
2 Know how to carry out the installation of rigging and lifting equipment	2.1 explain the specific safety precautions to be taken when installing rigging and lifting equipment, and the need for ensuring load security (such as general workshop and site safety, appropriate personal protective equipment, protecting other workers during the lifting operations; accident procedure; statutory regulations, risk assessment procedures and COSHH regulations) 2.2 explain their understanding of the Approved Code of Practice for the safe use of rigging lifting equipment and the Lifting Operations and Lifting Equipment Regulations (LOLER) 2.3 describe the hazards and precautions to be taken when working at height (including the personal protective equipment (PPE) to be used) 2.4 describe the risks relating to installing rigging and lifting equipment 2.5 explain the company procedures and practices with regard to installing rigging and lifting equipment			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.6 explain how to obtain and interpret rigging layouts, drawings and specifications 2.7 explain how to determine components required from the rigging layout (including wires, shackles, blocks, lifting hooks) 2.8 explain how to ensure that all components have the correct SWL (safe working load) 2.9 explain how to obtain the required components 2.10 explain how to check that all components have the required test certificates 2.11 explain the specific requirements for the marking of lifting equipment, and the specific method used in the organisation in which they are working 2.12 describe the checks that should be made on the rigging and lifting equipment prior to installation, and things that they should look for 2.13 explain the required SWL of the respective parts of the rigging/lifting layout 2.14 explain the correct procedure for reeving multi-sheave blocks 2.15 explain the methods and sequence of installing rigging and lifting equipment 2.16 explain the importance of the correct layout of rigging/lifting equipment, particularly with regard to fairleads			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.17 explain the limitations with regard to SWL relating to different rigs and layouts 2.18 explain how to check the correct operation of the differing rigging and lifting arrangements, and possible defects 2.19 explain the procedures for reporting defects in machinery, rigging equipment and fibre or wire ropes, and actions to be taken 2.20 explain how to record details of the installation of rigging and lifting equipment 2.21 describe the problems that can occur when installing rigging and lifting equipment, and explain how they can be resolved 2.22 describe the extent of their own responsibility, and explain whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 91: Carrying out patch preparation of material surfaces using hand and mechanical tools

Unit reference number: T/601/2501

Level: 2

Credit value: 10

Guided learning hours: 42

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to carry out patch preparations on a range of substrates (such as ferrous and non-ferrous metals, wood, ceramic, compliant rubber/polymer, plastics) to enable coating systems to be applied, in accordance with approved procedures. Learners will be required to carry out patch preparation on a variety of substrates, using both hand and mechanical tools, including the use of chemical paint strippers, where required. The process will also include degreasing using solvents, and cleaning the surface prior to the application of marine coatings.

Learners' responsibilities will require them to comply with organisational policy and procedures for the preparation activities undertaken, and to report any problems with the preparation activities that they cannot personally resolve, or are outside their permitted authority, to the relevant people. They will be expected to work to instructions, alone or in conjunction with others, taking personal responsibility for their own actions and for the quality and accuracy of the work that they carry out.

Learners' knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to applying patch preparation procedures to marine component surfaces. They will have an understanding of the preparation procedures, their application and relevant standards in adequate depth to provide a sound basis for carrying out the activities to the required specification.

Learners will understand the safety precautions required when carrying out the preparatory operations. They will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Carry out patch preparation of material surfaces using hand and mechanical tools	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the patch preparation activities: • use appropriate personal protective equipment (PPE) during the preparation activities, ensuring that it is in good condition and used correctly • confirm that all necessary husbandry and containment arrangements are in place, and are adequate • confirm that appropriate emergency arrangements are in place for any confined space or other hazardous work • ensure that safe working distance procedures are set up, where appropriate • ensure that tools and equipment are correctly prepared for the operations being performed • apply safe and appropriate working practices and procedures at all times • leave the work area in a safe and clean condition on completion of the activities			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.3 obtain and follow relevant instructions, standards and other specifications 1.4 identify the conditions of the surface to be prepared 1.5 carry out patch preparation activities on marine components, to include both of the following: • unpainted surfaces • painted surfaces 1.6 carry out patch preparation activities on four of the following types of substrate: • ferrous metals • wood • non-ferrous metals • composite materials • other materials (such as ceramic, compliant rubber/polymer, plastics) 1.7 visually inspect surfaces, and identify defects and preparation requirements for six of the following conditions: • surface corrosion • corrosion with pitting • damaged or defective deck screed/covering • surface contamination • coating detachment			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• coating cure • paint coating defects (such as cracking/crazing, flaking, blistering, cissing, pinholing, wrinkling) 1.8 select the appropriate tools and equipment and check that they are in a safe and usable condition 1.9 carry out the preparation activities using appropriate tools and techniques 1.10 prepare the surfaces using tools and techniques appropriate to the substrate, to include using four of the following: • degreasing solvents • chemical paint remover • hand abrasives • brushes or vacuum cleaner • hand tools • power wire brush • power discs • fresh water (alone or with detergent) • low-pressure water cleaning • high-pressure water cleaning			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.11 carry out the preparation activities in four of the following situations: • confined spaces (such as tanks, voids, double bottoms) • internal spaces • weather work • weather decks • outer bottoms • at height 1.12 carry out the preparation activities in both of the following marine environments: • ashore • afloat 1.13 carry out surface preparations on marine components, in accordance with one of the following standards: • BS or ISO standards and procedures • customer (contractual) standards and requirements • company standards and procedures • paint/covering manufacturer's recommendations • recognised compliance agency/body's standards			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.14 check the prepared surface to ensure that it meets the required specification 1.15 use three of the following methods to check that the prepared surfaces meet the specified standards: • visual examination • press tape • swabs • surface profile comparators 1.16 deal promptly and effectively with problems within their control and report those that cannot be resolved 1.17 shut down and secure the preparation equipment to a safe condition on completion of the activities 1.18 reinstate the work area on completion of the activities, in line with agreed organisational procedures and to include carrying out all of the following: • safely disposing of arisings and waste materials • cleaning and returning all tools and excess materials • removing protection and exclusion arrangements (if no longer required) • contributing to the completion of all required records			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
2 Know how to carry out patch preparation of material surfaces using hand and mechanical tools	2.1 explain the safe working practices and procedures to be observed when working with hand and mechanical surface preparation tools (such as general workshop and site safety, protecting other workers from the effects of the work, safety in enclosed/confined spaces, working at height, use of mobile elevated work platforms (MEWPs), atmospheric controls) 2.2 explain the statutory requirements, risk assessment procedures and relevant requirements of HASAWA and COSHH (such as the Management of Health and Safety at Work Regulations, the Provision of and Use of Work Equipment Regulations, the Noise at Work Regulations, HS(G)88 Hand Arm Vibration, the Confined Spaces Regulations, the Special Waste Regulations, the Pollution Prevention and Control Regulations, the Water Resources Act) 2.3 describe the environmental impact of the operations they are carrying out, and with the materials that are used, and explain how the impact can be minimised 2.4 explain the health and safety requirements of the work area in which they are carrying out their surface preparation activities, and the responsibility they place upon them			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.5 describe the hazards associated with carrying out surface preparation activities, and with the materials and equipment used, (such as sparks, dust/debris, hearing damage, hand/arm vibration, working at heights), and explain how they can be minimised 2.6 explain the requirements for working in confined spaces and the importance of emergency procedures and safe systems of work (including permits to work, required air quantities (RAQs) and local exhaust ventilation (LEV) to maintain safe conditions; the provision of adequate and safe lighting, and avoidance of sources of ignition) 2.7 explain how particular procedures, cleaning materials and arisings can result in a compartment or space (such as an accommodation space or tented enclosure) becoming a confined space 2.8 explain the importance of having regular medical examinations when using vibrating tools, solvent-based materials, or when exposed to hazardous arisings 2.9 explain what personal protective equipment (PPE) needs to be worn during the surface preparation activity, and its care and correct use 2.10 explain how to obtain the required work procedures, specifications and instructions, and how to interpret their requirements			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.11 explain the reasons for carrying out surface preparation, and the affects on the final finishing activities if preparations are not carried out correctly 2.12 describe the various types of substrate that may require preparing, and the types of tools and preparation methods that may be used on them 2.13 describe the damage that may result from using inappropriate tools and techniques 2.14 describe the types of defects and contamination to be found on unpainted and painted surfaces 2.15 explain how to identify defects in deck screeds and deck coverings, and the methods used to remove them 2.16 describe types of tools and equipment used for the surface preparation activities (to include setting up and safe operation, compatibility of the power tools and wheels, checking air supplies and hoses for leaks and for contamination, safety arrangements and guards, manufacturers' operating instructions, and techniques for using them) 2.17 explain the importance of the maintenance of a register of power tools, and the need to check tools against certification			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.18 describe the quality control techniques and procedures used during the preparation activities, and explain how the environmental conditions may have an effect on work output and on its quality 2.19 describe the various types of tests that are carried out on the prepared surfaces to check their compliance with the specification 2.20 explain how to dispose of waste materials safely, including the environmental impact of the materials they are using, and the minimisation of this impact 2.21 describe the extent of their own responsibility, and explain whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 92: Preparing marine coatings for application

Unit reference number: M/601/2559

Level: 2

Credit value: 10

Guided learning hours: 42

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to prepare marine coating materials (paints) for application by brush, roller or spray, in accordance with approved procedures. Learners will be required to obtain all information necessary to carry out the preparations of the coating materials. They will be expected to select the appropriate preparation or mixing equipment, and to ensure that it is fit for purpose. Learners will be expected to prepare a variety of coatings for a range of applications, which will include the painting of bare substrates and the overcoating of previously painted surfaces. They will be required to check that all paint has been prepared in accordance with manufacturers' recommendations for the application conditions.

Learners' responsibilities will require them to comply with their organisation's policies and procedures for the preparation of the coating materials, and for the disposal of surplus product, arisings and contaminated solvents. They will be required to report any problems with the preparation activities that they cannot resolve, or are outside their defined authority, to the relevant people. Learners will be expected to work to instructions, alone or in conjunction with others, taking personal responsibility for their own actions and for the quality and accuracy of the work that they carry out.

Learners' knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to the preparation of liquid marine coatings. They will have an understanding of the properties of the marine coatings and the applications for which they are intended. Learners will know about pot life, induction times, viscosity and temperature-conditioning requirements in sufficient depth to provide a sound basis for carrying out the activities, and ensuring that the coatings are prepared to the required standards.

Learners will understand the safety precautions required when carrying out the preparatory operations. They will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Prepare marine coatings for application	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the preparation activities: • obtain and work to job instructions and other relevant documentation (such as contractual specifications and coating manufacturer's specifications) • use appropriate health and safety documentation, including CHIPS data and risk assessments • use appropriate personal protective equipment (PPE) during the preparation activities, ensuring that it is in good condition and used correctly • use safe and approved preparation methods and techniques at all times • clean and secure all tools and equipment on completion of the preparation activities • leave the work area in a safe and clean condition on completion of the activities 1.3 obtain the required materials and check them for quantity and quality			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.4 obtain an estimate of the volume of paint to be prepared for the complete coating of bare substrate or for the overcoating of previously painted substrate, by spray or by brush, to include six of the following surfaces: • outer bottom • boot-top • topsides • weatherdecks • corrugated sheets • tanks • plates • pipes • beams and profiles • simple shapes 1.5 determine how the materials need to be prepared 1.6 carry out the preparations using suitable equipment 1.7 prepare marine coatings for application, by carrying out all of the following activities: • obtaining the correct type and quantities of materials • ensuring that the correct mixing ratios are adhered to			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• checking that the prepared coating material is of the correct viscosity • ensuring that the prepared material has been in the container for the induction period (if applicable) • ensuring that the prepared material is at the temperature recommended for application 1.8 prepare two of the following two-pack (two component) products: • water-based epoxies • solvent-based epoxies • epoxy shop primer Plus two more of the following: • non-skid deck paints • two-component polyurethane paint • solvent free epoxy • glass flake polyester • two-component coal tar epoxy paint • zinc ethyl silicate paint • wash primer 1.9 prepare both of the following single pack products: • conventional alkyd or silicone alkyd • acrylic paint			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	Plus two more from the following: • single pack blast primer • bituminous paint • chlorinated rubber paint • vinyl paints • vinyl tar paint • mastics • anti-fouling paint 1.10 prepare marine coating materials, in accordance with one of the following standards: • BS or ISO standards and procedures • customer (contractual) standards and requirements • company standards and procedures • paint/covering manufacturer's recommendations • recognised compliance agency/body's standards 1.11 report completion of preparations in line with organisational procedures 1.12 deal promptly and effectively with problems within their control and report those that cannot be solved			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.13 reinstate the work area on completion of the preparation activities, to include carrying out all of the following: • disposing of excess or unused paint, in accordance with approved procedures • cleaning containers to be re-used, and disposing of arisings and used solvents, in accordance with approved procedures • disposing of non-reusable containers, in accordance with approved procedures • cleaning and returning all tools and excess materials • removing protection and exclusion arrangements (if no longer required) • contributing to the completion of all required records (including for the consumption of paint and solvents)			
2 Know how to prepare marine coatings for application	2.1 explain the safe working practices and procedures to be observed when working with marine coating materials and mixing equipment (such as general workshop and site safety, protecting other workers from the effects of the work, atmospheric controls)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.2 explain the statutory requirements, risk assessment procedures and relevant requirements of HASAWA, COSHH (such as the Provision and Use of Work Equipment Regulations, HS(G)88 Hand Arm Vibration, the Special Waste Regulations, the Pollution Prevention and Control Regulations, the Water Resources Act, the Solvent Emissions Directive) 2.3 describe the hazards associated with the storage of, the preparation of, and the disposal of marine coating products and solvents 2.4 describe the type of information to be found in manufacturers' data sheets and in Chemical Hazard Information and Packaging for Supply (CHIPS) data sheets 2.5 explain what personal protective equipment (PPE) needs to be worn for the coating preparation activities 2.6 describe the environmental impact of the operations they are carrying out, and with the materials they are using, and explain how to minimise this impact 2.7 describe the hazards associated with carrying out coating material preparation activities, and with the materials and equipment used (such as inhalation of fumes, fire and explosion, contact with solvents and other chemicals), and explain how they can be minimised			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.8 describe the characteristics of, and applications for, marine coating products 2.9 explain product 'life', stock control and the use of batch numbers 2.10 describe the storage requirements (including environmental controls and containment arrangements) for marine coating products and solvents (such as thinners, cleaners) 2.11 explain how to obtain an estimate of the product volume to be prepared for a defined usage (including estimation of areas to be covered, practical paint consumption and loss factors) 2.12 describe the types of containers appropriate to defined products and usages 2.13 describe the preparation requirements (including pot life, induction times and temperature conditioning requirements) 2.14 explain the importance of stirring single pack paints (settling of pigment), and use of thinners, for marine coating products 2.15 explain the importance of mixing ratios (such as use of whole packs) for two-pack products 2.16 explain why they need to reject wrongly mixed paint 2.17 explain the use of appropriate containers, hand tools and electro-mechanical/pneumatic equipment			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.18 describe the disposal procedures for redundant materials and non-returnable containers 2.19 describe the appropriate procedures for the cleaning of re-usable containers 2.20 describe the procedures to contain and to clear away spillages, and the appropriate disposal of the arisings 2.21 describe the quality control requirements and techniques to be followed 2.22 explain the importance of the maintenance of records for paint and solvent consumption 2.23 describe the extent of their own responsibility, and explain to whom they should report if they have problems that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 93: Carrying out the manual application of marine coatings

Unit reference number: H/601/2574

Level: 2

Credit value: 25

Guided learning hours: 35

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to apply marine coatings to various substrates, using brushes or rollers, in accordance with approved procedures. Learners will be required to obtain all necessary information in order to carry out the coating operations. They will be required to check that all surfaces to be coated have been prepared, in accordance with the process specification, and that any necessary exclusion, containment, masking, protection and ventilation requirements are implemented. Learners will be expected to select the appropriate brushes and/or rollers, and to ensure that they are fit for purpose. They will be expected to apply a variety of coatings in a number of shipyard and shipboard environments.

Learners' responsibilities will require them to comply with organisational policy and procedures for the brush or roller coating activities undertaken, and to report any problems with these activities that they cannot personally resolve, or are outside their permitted authority, to the relevant people. They will be expected to work to instructions, alone or in conjunction with others, taking personal responsibility for their own actions and for the quality and accuracy of the work that they carry out.

Learners' knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to applying liquid marine coatings by brush or roller. They will have an understanding of the coating procedures and techniques used, and their application. Learners will know about the substrates, their preparation requirements, coating materials and their preparation requirements in sufficient depth to provide a sound basis for carrying out the activities, and for ensuring that the coated surfaces are to the required standards.

Learners will understand the safety precautions required when carrying out the brushing or rolling operations. They will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and to others in the workplace.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Carry out the manual application of marine coatings	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 ensure that the appropriate measures are implemented before commencing application of the coatings, to include carrying out all of the following: • use appropriate health and safety documentation, including CHIPS data and risk assessments • wear appropriate personal protective equipment (PPE) at all times during the coating operations • ensure that appropriate exclusion zones and containment facilities are set up • confirm that appropriate emergency arrangements are in place for any confined space or hazardous work (where applicable) • ensure that brushes, rollers and other tools are correctly prepared for the paint application operations • carry out masking up, and provide weather protection for the areas to be coated • provide a suitable means for curing the coating (such as heating, air supply to assist curing) • leave the work area in a safe and clean condition on completion of the activities			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.3 check that the material surfaces to be treated are suitably prepared for the finishing operations to be carried out 1.4 check that the finishing equipment and coatings are set up and maintained at satisfactory operating conditions and levels 1.5 carry out the treatment process in accordance with operating procedures and the component specification requirements 1.6 apply coatings to all of the following substrates • uncoated ferrous material • uncoated non-ferrous material • previously coated ferrous material • previously coated non-ferrous material Plus two from the following: • uncoated composite material • previously coated composite material • uncoated compliant polymers • previously coated compliant polymers • uncoated wood • previously coated wood • other coated materials • other uncoated materials			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.7 apply all of the following marine coatings: • holding primer (touch up) • solvent-based epoxies • alkyds/silicone alkyds • water-based acrylics • water-based epoxies Plus one more from the following: • bituminous paints • vinyl tar paints • tar epoxy paints • non-skid deck paints • chlorinated rubber paints • two component polyurethane paints • zinc ethyl silicate paints • mastics • anti-fouling coatings (touch up) 1.8 apply coatings, by brush or roller, to marine structures incorporating six of the following features: • corners (such as outside corners, edges, 'obscured' corners) • vertical flat surfaces			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• horizontal flat surfaces • inclined surfaces • overhead surfaces • curved surfaces • round parts • slender components 1.9 apply coatings, by brush or roller, in six of the following situations: • confined spaces (such as tanks, voids, double bottoms) • internal spaces • at height • weatherwork • outer bottoms • weather decks • machinery 1.10 apply stripe coatings to all of the following: • corners/outside corners • 'obscured' corners and edges • edges • welds			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.11 apply marine coatings in both of the following environments: • ashore • afloat 1.12 check that the treated workpiece achieves the required characteristics and meets the finishing specification 1.13 apply coatings manually, using the appropriate techniques to achieve all of the following: • correct film thickness • smooth surface free from runs or drips • uniform and complete coverage of the surface to be coated 1.14 check coating thickness using one of the following methods: • wet film thickness gauge (combs) • magnetic/electronic dry film thickness gauge (cured coating) 1.15 apply coatings to components, in accordance with one of the following standards: • BS or ISO standards and procedures • customer (contractual) standards and requirements • company standards and procedures			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• paint/covering manufacturer's recommendations • recognised compliance agency/body's standards 1.16 deal promptly and effectively with problems within their control and report those that cannot be solved 1.17 dispose of waste and excess materials in line with agreed organisational procedures 1.18 shut down the finishing equipment to a safe condition on completion of the processing activities 1.19 reinstate the work area on completion of the manual coating activities, to include carrying out all of the following: • cleaning all brushes, rollers and containers, and returning all tools and excess materials • removing protection and exclusion arrangements (if no longer required) • contributing to the completion of all relevant documentation (such as condition/pre-treatment of substrates, coating material preparation, equipment settings, confirmation of standard of finish)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
2 Know how to carry out the manual application of marine coatings	2.1 explain the safe working practices and procedures to be observed when working with marine coatings (such as general workshop and site safety; appropriate personal protective equipment (PPE); protecting other workers from the effects of the work, safety in enclosed/confined spaces, working at height, use of mobile elevated work platforms (MEWPs), atmospheric controls) 2.2 explain the statutory requirements, risk assessment procedures and relevant requirements of HASAWA, COSHH (such as the Management of Health and Safety at Work Regulations, the Provision and use of Work Equipment Regulations; the Confined Space Regulations; the Special Waste Regulations; the Pollution Prevention and Control Regulations; the Water Resources Act) 2.3 describe the hazards associated with the storage of, the preparation of, and the disposal of marine coating products (including the information to be found in manufacturers' data sheets and in Chemical Hazard Information and Packaging for Supply (CHIPS) data sheets) 2.4 explain the requirements for working in confined spaces, and the importance of emergency procedures and safe systems of work (including permits to work, required air quantities (RAQs) and local exhaust ventilation (LEV) to maintain safe conditions; the provision of adequate and safe lighting and avoidance of sources of ignition)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.5 explain how particular procedures and materials can result in a compartment or space (such as an accommodation space or tented enclosure) becoming a confined space 2.6 explain the importance of having regular medical examinations when using solvent-based materials 2.7 explain what personal protective equipment (PPE) needs to be worn during the coating activity 2.8 describe the characteristics of, and the applications for, marine coatings products (including the use of manufacturers' data sheets, requirements for the application of particular coating systems, and contractual specifications) 2.9 explain why they need to check that the substrates have been prepared correctly for the coatings to be applied 2.10 explain the importance of maintaining appropriate environmental conditions for the application and curing of the marine coating products 2.11 explain the time intervals that are required between coats, and why these must be adhered to 2.12 describe the procedures for the safe handling and use of coating materials and solvents 2.13 explain why they need to use paint thinners to adjust the viscosity of the product being applied			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.14 explain how to select the correct application equipment, to suit the materials and the finish required (to include brushes, rollers, paint pads, suitable containers) 2.15 describe the techniques required to avoid defects arising from application errors or problems for the application of marine coating products to a variety of surfaces 2.16 explain the correct use of stripe coating 2.17 describe the requirements for working afloat, on outer bottoms, and at heights 2.18 describe the procedure to contain and to clear away spillages, and the safe and appropriate disposal of waste materials 2.19 explain how to identify faults in application, and their causes and correction 2.20 describe the simple non-destructive testing procedures to be carried out to ensure that adhesion and other required performance qualities are achieved 2.21 describe the extent of their own responsibility, and explain whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 94: Carrying out the application of marine coatings using spray methods

Unit reference number: F/601/2582

Level: 2

Credit value: 25

Guided learning hours: 37

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to apply marine coatings to various substrates, using manual spray guns, in accordance with approved procedures. Learners will be required to obtain all necessary information in order to carry out the coating operations. They will be required to check that all surfaces to be coated have been prepared, in accordance with the process specification, and that any necessary exclusion, containment, masking, protection and ventilation requirements are implemented. Learners will be expected to select the appropriate and/or specified equipment and to ensure that it is correctly set up, maintained and adjusted. They will be expected to apply a variety of coatings in a number of shipyard and shipboard environments.

Learners' responsibilities will require them to comply with organisational policy and procedures for the spray coating activities undertaken, and to report any problems with these activities that they cannot personally resolve, or are outside their permitted authority, to the relevant people. They will be expected to work to instructions, alone or in conjunction with others, taking personal responsibility for their own actions and for the quality and accuracy of the work that they carry out.

Learners' knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to applying liquid marine coatings by spray methods. They will have an understanding of the spraying procedures and techniques used, and their application. Learner will know about the substrates and their preparation requirements, coating materials and their preparation requirements in sufficient depth to provide a sound basis for carrying out the activities, and for ensuring that the coated surfaces are to the required standards.

Learners will understand the safety precautions required when carrying out the spraying operations. They will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and to others in the workplace.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Carry out the application of marine coatings using spray methods	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 ensure that the appropriate measures are implemented before starting the application of the coatings, to include carrying out all of the following: • use appropriate health and safety documentation, including CHIPS data and risk assessments • wear appropriate personal protective equipment (PPE) at all times during the coating operations • ensure that appropriate exclusion zones and containment facilities are set up • ensure that equipment is correctly prepared for the spraying operations (such as spray guns, air supplies) • carry out any necessary masking • confirm that appropriate emergency arrangements are in place for any confined space or hazardous work (where applicable) • provide weather protection for the areas to be sprayed (where appropriate) • ensure that environmental conditions meet the requirements for the application of the coating (such as surface temperature, air humidity)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• provide any means required to promote the curing of the coating (such as air supply, warm air) • leave the work area in a safe and clean condition on completion of the activities 1.3 ensure the material surfaces to be treated are suitably prepared for the finishing operations to be carried out 1.4 check that the finishing equipment and coatings are set up and maintained at satisfactory operating conditions and levels 1.5 apply spray coatings using two of the following types of equipment: • conventional spray • airless spray • air-assisted airless spray Plus one more from the following: • bottom feed (deck) lance • hopper gun • electrostatic spray • plural pump system 1.6 carry out the treatment process in accordance with operating procedures and the component specification requirements			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.7 apply spray coatings to all of the following substrates: • uncoated ferrous material • uncoated non-ferrous material • previously coated ferrous material • previously coated non-ferrous material Plus one more from the following: • composite material • compliant polymers • wood • ceramics 1.8 apply all of the following marine coatings: • holding primer • solvent-based epoxies • water-based epoxies • water-based acrylics • alkyds/silicone alkyds Plus two more from the following: • non-skid deck paints • bituminous paints • chlorinated rubber paints			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• vinyl tar paints • two-component polyurethane paints • anti-fouling coatings • tar epoxy paints • zinc ethyl silicate paints • shop primer • mastics • glass flake polyester coatings 1.9 apply coatings, by spraying, to marine structures incorporating six of the following features: • corners (such as outside corners, edges, 'obscured' corners) • level surfaces • vertical flat surfaces • horizontal flat surfaces • inclined surfaces • curved surfaces • overhead surfaces • slender components • round parts			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.10 apply marine coatings, by spraying, in six of the following situations: • confined spaces (such as tanks, voids, double bottoms) • internal spaces • outer bottoms • weather decks • at height • weatherwork • machinery 1.11 apply marine coatings in two of the following environments: • ashore • afloat • in a spray cell 1.12 check that the treated workpiece achieves the required characteristics and meets the finishing specification			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.13 apply spray coatings, using the appropriate techniques, to achieve all of the following: • correct film thickness • correct banding • complete coverage of the surface to be coated • smooth surface, free from runs and drips 1.14 check coating thickness, using one of the following methods: • wet film thickness gauge (combs, wet film) • dry film thickness gauge (cured coating) 1.15 apply spray coatings to components, in accordance with one of the following standards: • BS or ISO standards and procedures • customer (contractual) standards and requirements • company standards and procedures • paint/covering manufacturer's recommendations • recognised compliance agency/body's standards 1.16 deal promptly and effectively with problems within their control and report those that cannot be solved 1.17 dispose of waste and excess materials in line with agreed organisational procedures			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.18 shut down the finishing equipment to a safe condition on completion of the processing activities 1.19 reinstate the work area on completion of the spraying activities, to include carrying out all of the following: • cleaning the spraying equipment and returning all tools and excess materials • removing protection and exclusion arrangements (if no longer required) • completing all relevant documentation (such as condition/pre-treatment of substrates, coating material preparation, equipment settings, confirmation of standard of finish)			
2 Know how to carry out the application of marine coatings using spray methods	2.1 explain the safe working practices and procedures to be observed when working with marine coatings and spray application equipment (such as general workshop and site safety, appropriate protective equipment, protecting other workers from the effects of the work, safety in enclosed/confined spaces, working at height, use of mobile elevated work platforms (MEWPs), atmospheric controls)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.2 explain the statutory requirements, risk assessment procedures and relevant requirements of HASAWA, COSHH (such as Approved Codes of Practice (ACOP), the Management of Health and Safety at Work Regulations, the Provision and use of Work Equipment Regulations, the Noise at Work Regulations, the Confined Space Regulations, the Special Waste Regulations, the Pollution Prevention and Control Regulations, the Water Resources Act) 2.3 describe the hazards associated with the storage of, the preparation of, and the disposal of marine coating products (including the information to be found in manufacturers' data sheets and in Chemical Hazard Information and Packaging for Supply (CHIPS) data sheets) 2.4 explain the requirements for working in confined spaces, and the importance of emergency procedures and safe systems of work (including permits to work, required air quantities (RAQs) and local exhaust ventilation (LEV), to maintain safe conditions; the provision of adequate and safe lighting and avoidance of sources of ignition) 2.5 explain how particular procedures and materials can result in a compartment or space (such as an accommodation space or tented enclosure) becoming a confined space			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.6 explain the importance of having regular medical examinations when using solvent-based or other hazardous materials 2.7 explain what personal protective equipment (PPE) needs to be worn during the spraying activity, its care and its correct use 2.8 describe the characteristics of, and the applications for, marine coating products (including the use of manufacturers' data sheets, requirements for the application of particular coating systems and contractual specifications) 2.9 explain the need to ensure that the substrates have been prepared correctly for the coatings to be applied 2.10 explain the importance of maintaining appropriate environmental conditions for the application and curing of the marine coating products 2.11 explain the time intervals that are required between coats, and why these must be adhered to 2.12 describe the procedures for the safe handling and use of coating materials and solvents 2.13 explain why they need to use paint thinners to adjust the viscosity of the product being applied 2.14 explain how to select the correct application equipment to suit the materials and the finish required (to include spray gun atomising and air control, tip size, fluid delivery rates and fan angle)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.15 explain the need for correct grounding and earth continuity of the equipment 2.16 explain the importance of checking lines for damage and for kinks; the use of a 'daily check list' 2.17 explain the requirements for cleaning pumps, filters, surge chambers, and the need to top up the oil cup 2.18 explain the requirements for cleaning spray guns (including the cleaning of the diffuser, tip and tip guard, the flushing of the gun and of the lines, the lubrication of the needle) 2.19 describe the techniques required for the application of marine coating products to a variety of surfaces 2.20 describe the requirements for working afloat, on outer bottoms, and at heights 2.21 explain the importance of avoiding overspray; the need for containment and for exclusion zones 2.22 describe the procedures to contain and to clear away spillages. 2.23 explain how to identify faults in application, and their causes and correction (to include distorted patterns, tailing, dry spray, overspray, and pinholing)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.24 describe the simple non-destructive testing procedures to be carried out to ensure that adhesion and other required performance qualities are achieved 2.25 explain how to minimise and handle waste materials (including the environmental impact of the materials they are using, and the minimisation of this impact) 2.26 describe the extent of their own responsibility, and explain whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 95: Carrying out the preparation of material surfaces by abrasive blasting

Unit reference number: A/601/2502

Level: 2

Credit value: 10

Guided learning hours: 42

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to prepare a range of substrates to enable coating systems to be applied, in accordance with approved procedures. Learners will be required to carry out preparation on a variety of substrates, using a range of abrasive blasting equipment and abrasives. The process will also include the cleaning of the surface prior to the application of marine coatings.

Learners' responsibilities will require them to comply with organisational policy and procedures for the preparation activities undertaken, and to report any problems with these activities, or with the tools and equipment used, that they cannot personally resolve, or are outside their permitted authority, to the relevant people. They will be expected to work to instructions, alone or in conjunction with others, taking personal responsibility for their own actions and for the quality and accuracy of the work that they carry out.

Learners' knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to applying preparation procedures to marine component/structural surfaces. They will have an understanding of the preparation procedures and relevant standards in adequate depth to provide a sound basis for carrying out the activities to the required specification.

Learners will understand the safety precautions required when carrying out the preparatory operations. They will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Carry out the preparation of material surfaces by abrasive blasting	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the abrasive blasting activities: • use appropriate personal protective equipment (PPE) during the preparation activities, ensuring that it is in good condition and used correctly • confirm that all necessary husbandry and containment arrangements are in place, and are adequate • confirm that appropriate emergency arrangements are in place for any confined space or other hazardous work • ensure that safe working distance procedures are set up, where appropriate • ensure that tools and equipment are correctly prepared for the operations being performed • apply safe and appropriate working practices and procedures at all times 1.3 obtain and follow relevant instructions, standards and other specifications 1.4 identify the conditions of the surface to be prepared			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.5 carry out preparation activities on marine components, to include both of the following: • unpainted surfaces • painted surfaces 1.6 Visually inspect surfaces, and identify surface preparation requirements for four of the following conditions: • surface corrosion • surface corrosion with millscale (ferrous) • surface corrosion with pitting • paint coating defects (such as flaking/detachment, blistering, cracking/crocodiling, chalking, bubbling, cissing, wrinkling) • removal of old coating systems 1.7 carry out both of the following for composite or compliant polymer surfaces: • identify defects and preparation requirements for unpainted surfaces • prepare the surface for painting using low pressure wet blasting 1.8 select the appropriate tools and equipment and check that they are in a safe and usable condition			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.9 carry out the preparation activities using appropriate tools and techniques 1.10 remove paint and corrosion products from ferrous and non-ferrous surfaces, using: • dry abrasive blasting Plus one more from the following: • moisture-injection abrasive blasting • slurry blasting • compressed air wet abrasive blasting • pressurised liquid blast cleaning Plus one more from the following: • vacuum recovery blasting • wheeled deck blasting machine • low pressure wet abrasive blasting • low pressure soluble abrasive blasting 1.11 remove paint and corrosion products from marine structures, and prepare surfaces incorporating five of the following features: • corners (outside corners, obscured corners and edges) • curved surfaces • slender components • round components			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• individual components (such as plates, deck fittings) • vertical flat surfaces • horizontal flat surfaces • overhead surfaces • inclined surfaces 1.12 carry out the preparation activities in four of the following situations: • confined spaces (such as tanks, voids, double bottoms) • internal spaces • weatherwork • weather decks • outer bottoms • at height 1.13 prepare marine surfaces/coatings by abrasive blasting in both of the following environments: • ashore • afloat 1.14 identify requirements, and clean the prepared surface, using all of the following: • fresh water • fresh water with detergent			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• brush • vacuum cleaner 1.15 check the prepared surface to ensure that it meets the required specification 1.16 check that the prepared surfaces meet specified standards, to include the use of three of the following methods: • visual examination • press tape • swabs • surface profile comparators 1.17 carry out marine component surface preparations, in accordance with one of the following standards: • BS or ISO standards and procedures • customer (contractual) standards and requirements • company standards and procedures • paint/covering manufacturer's recommendations • recognised compliance agency/body's standards 1.18 deal promptly and effectively with problems within their control and report those that cannot be resolved 1.19 shut down and secure the preparation equipment to a safe condition on completion of the activities			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.20 reinstate the work area on completion of the activities in line with agreed organisational procedures and to include carrying out all of the following: • safely disposing of arisings and waste materials • cleaning and returning all tools and excess materials • removing protection and exclusion arrangements (if no longer required) • completing all required records			
2 Know how to carry out the preparation of material surfaces by abrasive blasting	2.1 explain the safe working practices and procedures to be observed when working with abrasive blasting surface preparation tools (such as general workshop and site safety, protecting other workers from the effects of the work, safety in enclosed/confined spaces, working at height, use of mobile elevated work platforms (MEWPs), atmospheric controls) 2.2 explain the statutory requirements, risk assessment procedures and relevant requirements of HASAWA and COSHH (such as Approved Codes of Practice (ACOP), the Management of Health and Safety at Work Regulations, the Provision of and Use of Work Equipment Regulations, the Noise at Work Regulations, HS(G)88 Hand Arm Vibration, the Confined Spaces Regulations, the Special Waste Regulations, the Pollution Prevention and Control Regulations, the Water Resources Act)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.3 describe the environmental impact of the operations that they are carrying out, and with the materials they are using, and explain how the impact can be minimised 2.4 explain the health and safety requirements of the work area in which they are carrying out the surface preparation activities, and the responsibility they place upon them 2.5 describe the hazards associated with surface preparation using abrasive blasting (such as sparks, dust/debris, hearing damage, hand/arm vibration, working at heights), and explain how they can be minimised 2.6 explain the requirements for working in confined spaces, the importance of emergency procedures and safe systems of work (including permits to work, required air quantities (RAQs) and local exhaust ventilation (LEV) to maintain safe conditions; the provision of adequate and safe lighting and avoidance of sources of ignition) 2.7 explain what personal protective equipment (PPE) needs to be worn during the surface preparation activity			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.8 explain how to obtain the required work procedures and instructions, and how to interpret their requirements (to include the appropriate standards and specifications, use of paint manufacturers' data sheets to ascertain the surface cleanliness standards and profiles required) 2.9 explain the reasons for carrying out surface preparation, and the effects on the final finishing activities if preparations are not carried out correctly 2.10 describe the various types of substrate that may require preparing, and the types of tools and preparation methods that may be used on them 2.11 explain why different types of substrate require different preparation techniques 2.12 describe the types of defects and contamination to be found on unpainted and painted surfaces, and their causes 2.13 describe the types of equipment used, their setting up and operation, codes of practice, manufacturers' operating instructions, company procedures and instructions (including operation and techniques for use) 2.14 describe the types of abrasive used, their characteristics and application, the importance of abrasive profile and abrasive cleanliness; explain the company procedures for checking levels of contamination in abrasives			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.15 explain the limitations of abrasive blasting, the requirements for the removal of particular types of coatings, and hazards associated with the removal of particular coatings 2.16 explain the importance of maintaining a register of power tools, and the need to check tools against certification 2.17 describe the basic quality control techniques and procedures, tolerances and quality standards, measurements, environmental conditions (eg dew point, relative humidity), and their effect on work output and on its quality 2.18 describe the various types of test that are carried out on the prepared surfaces to check their compliance with the specification 2.19 explain how to dispose of waste materials safely (including the environmental impact of the materials they are using, and the minimisation of this impact) 2.20 describe the extent of their own responsibility, and explain whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 96: Preparing surfaces by ultra high pressure (UHP) water jetting

Unit reference number: H/601/2509

Level: 2

Credit value: 10

Guided learning hours: 42

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to prepare metallic surfaces using ultra high pressure (UHP) water jetting, in accordance with approved procedures. Learners will be required to obtain all information necessary to carry out the UHP water jetting activities. They will be required to check that any necessary exclusion, containment and masking protection requirements are implemented. Learners will be expected to select the appropriate and specified equipment, and to ensure that it is correctly maintained and adjusted. They will prepare surfaces using UHP water jetting in a number of shipyard and shipboard environments.

Learners' responsibilities will require them to comply with organisational policy and procedures for the UHP water jetting activities undertaken, and to report any problems with the preparation activities, or with the tools and equipment used, that they cannot personally resolve, or are outside their permitted authority, to the relevant people. They will be expected to work to instructions, alone or in conjunction with others, taking personal responsibility for their own actions and for the quality and accuracy of the work that they carry out.

Learners' knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to undertaking surface preparation using UHP water jetting. They will know about the surface preparation requirements of the metallic substrate, and the capabilities of the jetting procedure in sufficient depth to provide a sound basis for carrying out the activities and for ensuring that the prepared surfaces are to the required standard.

Learners will understand the safety precautions required when carrying out the UHP water jetting operations. They will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Prepare surfaces by ultra high pressure (UHP) water jetting	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the UHP water jetting activities: • ensure that the equipment is correctly prepared for the surface preparation activities undertaken, and that all lines and joints are in good and safe condition • use appropriate personal protective equipment (PPE) correctly, checking that it is fit for service • confirm that the substrate to be jetted will not be damaged by the process • confirm that all necessary husbandry and containment arrangements are in place and are adequate, ensuring that no fluids or residues from the process enter controlled waters • confirm that appropriate emergency arrangements are in place for any confined space work or other hazardous work • ensure that necessary and appropriate exclusion and safe working arrangements are in place • apply safe and appropriate working practices and procedures at all times			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• leave the work area in a safe and clean condition on completion of the activities 1.3 obtain and follow relevant instructions, standards and other specifications 1.4 identify the conditions of the surface to be prepared 1.5 carry out preparation activities on either of the following: • unpainted surfaces • painted surfaces 1.6 visually inspect surfaces, and identify surface preparation requirements for all of the following conditions: • surface corrosion • surface corrosion with pitting • paint coating defects (such as flaking/detachment, blistering, cracking/crocodiling, wrinkling) • removal of old coating systems 1.7 select the appropriate tools and equipment and check they are in a safe and usable condition 1.8 carry out the preparation activities using appropriate tools and techniques			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.9 use UHP water jetting to remove paint and corrosion products from marine structures, and prepare surfaces incorporating five of the following features: • corners (such as outside corners, edges, 'obscured' corners) • inclined surfaces • horizontal flat surfaces • overhead surfaces • individual components (such as plates, deck fittings) • vertical flat surfaces • slender components • round parts • curved surfaces 1.10 remove paint and corrosion products, using UHP water jetting, in two of the following situations: • confined spaces (such as tanks, voids, double bottoms)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	Plus two more of the following: • weatherwork • outer bottoms • individual components (such as plates, deck fittings) • internal spaces • weather decks 1.11 prepare marine surfaces/coatings by UHP water jetting, in both of the following environments: • ashore • afloat 1.12 check the prepared surface to ensure that it meets the required specification 1.13 check that the prepared surfaces meet the specified standards, to include the use of both of the following methods: • visual examination • comparators 1.14 carry out surface preparation of marine structures, in accordance with one of the following standards: • BS or ISO standards and procedures • customer (contractual) standards and requirements			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• company standards and procedures • paint/covering manufacturer's recommendations • recognised compliance agency/body's standards 1.15 deal promptly and effectively with problems within their control and report those that cannot be resolved. 1.16 shut down and secure the preparation equipment to a safe condition on completion of the activities 1.17 reinstate the work area on completion of the activities in line with agreed organisational procedures and to include carrying out all of the following: • safely disposing of arisings and waste materials • cleaning and returning all tools and excess materials • removing protection and exclusion arrangements (if no longer required) • contributing to the completion of all required records			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
2 Know how to prepare surfaces by ultra high pressure (UHP) water jetting	2.1 explain the safe working practices and procedures to be observed when preparing surfaces by UHP water jetting (such as general workshop and site safety, appropriate personal protective equipment (PPE), protecting other workers from the effects of the work, safety in enclosed/confined spaces, working at height, use of mobile elevated work platforms (MEWPs), atmospheric controls) 2.2 explain the statutory requirements, risk assessment procedures and relevant requirements of HASAWA, COSHH (such as Approved Codes of Practice (ACOP), Health and Safety at Work Regulations, the Provision and use of Work Equipment Regulations, the Noise at Work Regulations, the Confined Space Regulations, the Special Waste Regulations, the Pollution Prevention and Control Regulations, the Water Resources Act) 2.3 describe the hazards associated with surface preparation using UHP water jetting (such as the cutting action of the water jet, reactive force, noise (hearing damage), water mist, debris, working at height, working in confined spaces) 2.4 explain the requirements for working in confined spaces, and the importance of emergency procedures and safe systems of work (including permits to work, required air quantities (RAQs) and local exhaust ventilation (LEV) to maintain safe conditions; the provision of adequate and safe lighting and avoidance of sources of ignition)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.5 explain what personal protective equipment (PPE) needs to be worn during the surface preparation activity 2.6 describe the types of substrates which can be prepared using UHP water jetting; the substrates on which the technique must not be used; the functions of surface preparation; the limitation of surface preparation by water jetting; flash rusting of ferrous substrates 2.7 explain the reasons for carrying out surface preparation, and the effects on the final finishing activities if preparations are not carried out correctly 2.8 describe the types of defects and contamination to be found on unpainted and painted surfaces 2.9 explain how to obtain the required work procedures and instructions, and how to interpret their requirements (to include the appropriate standards and specifications; use of paint manufacturers' data sheets to ascertain the surface cleanliness standards and profiles required) 2.10 explain the limitations of UHP water jetting, the requirements for the removal of particular types of coatings, and hazards associated with the removal of particular coatings			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.11 describe the types of UHP water jetting equipment; how to set up and operate the equipment, codes of practice, manufacturers' operating instructions, company procedures and instructions 2.12 explain the requirements to contain, or to recover for filtration, the water contaminated by products of the surface preparation 2.13 describe the tests which are carried out on the prepared surfaces, to check their compliance with the specification 2.14 explain how to dispose of waste materials safely (including the environmental impact of the materials they are using, and the minimisation of this impact) 2.15 describe the extent of their own responsibility, and explain whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 97: Carrying out the application of deck screeds and other deck coverings

Unit reference number: H/601/2588

Level: 2

Credit value: 25

Guided learning hours: 35

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to apply deck screeds and other deck coverings, in accordance with approved procedures. Learners will be required to obtain all necessary information in order to carry out the application of the deck screeds and other deck coverings. They will be required to check that all surfaces to which coverings are to be applied have been prepared, in accordance with the process specification, and that any necessary exclusion, containment, masking, protection and ventilation requirements are implemented. Learners will be expected to select the appropriate and specified tools and equipment, and to ensure that they are fit for purpose. They will be expected to apply a variety of deck coverings, in a number of shipyard and shipboard environments.

Learners' responsibilities will require them to comply with organisational policy and procedures for the deck-covering activities undertaken, and to report any problems with these activities that they cannot personally resolve, or are outside their permitted authority, to the relevant people. They will be expected to work to instructions, alone or in conjunction with others, taking personal responsibility for their own actions and for the quality and accuracy of the work that they carry out.

Learners' knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to the application of marine deck coverings. They will have an understanding of the deck screed, the covering procedures and techniques used, and their application. Learner will know about the substrates, their preparation requirements, deck covering materials and their preparation requirements in sufficient depth to provide a sound basis for carrying out the activities and for ensuring that the deck coverings are to the required standards.

Learners will understand the safety precautions required when carrying out the deck-covering operations. They will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and to others in the workplace.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Carry out the application of deck screeds and other deck coverings	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 ensure that the appropriate measures are implemented before commencing application of the coatings, to include carrying out all of the following: • obtain and work to job instructions and other relevant documentation (such as contractual specifications and coating manufacturer's specifications) • use appropriate health and safety documentation, including CHIPS data and risk assessments • ensure that appropriate emergency arrangements are in place for work in confined spaces • wear appropriate personal protective equipment (PPE) at all times during the coating/covering operations • ensure that appropriate exclusion zones and containment facilities are set up • ensure that any mechanical mixing equipment is correctly prepared for use			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• carry out any necessary masking • provide weather protection for the areas to be sprayed (where appropriate) • ensure that environmental conditions meet the requirements for the application of the coating (such as surface temperature, air humidity) 1.3 check that the material surfaces to be treated are suitably prepared for the finishing operations to be carried out 1.4 check that the finishing equipment and coatings are set up and maintained at satisfactory operating conditions and levels 1.5 mix and prepare for use three of the following: • underlay screed • finishing screed • self-levelling screed • profiled (non-slip) screed • adhesive for sheet or tile material 1.6 carry out the treatment process in accordance with operating procedures and the component specification requirements			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.7 apply deck coverings (screeds and/or screeds and sheet or tiles) to two of the following substrates: • ferrous (steel) • non-ferrous (aluminium) • composite material • wood 1.8 apply deck screeds in five of the following areas: • accommodation spaces • technical/electrical compartments • food preparation compartments • navigation/operational spaces • passageways • weather decks • bathrooms • storerooms 1.9 lay one of the following: • polymeric sheet • polymeric tiles • ceramic tiles			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	– in two of the following areas: • accommodation spaces • navigation/operational spaces • food preparation spaces • passageways • bathrooms • technical/operational spaces 1.10 carry out one of the following: • lay carpet material • use a polymeric screed repair kit 1.11 ensure that the treated workpiece achieves the required characteristics and meets the finishing specification 1.12 lay deck coverings, using the appropriate techniques to achieve all of the following: • correct screed depth • smooth surfaces, free from ripples • specified surface characteristics • any slope or gully specified for drainage (where appropriate)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• complete coverage of defined area • any dado specified 1.13 apply deck coverings, in accordance with one of the following standards: • BS or ISO standards and procedures • customer (contractual) standards and requirements • company standards and procedures • covering manufacturer's recommendations • recognised compliance agency/body's standards 1.14 deal promptly and effectively with problems within their control and report those that cannot be solved 1.15 dispose of waste and excess materials in line with agreed organisational procedures 1.16 shut down the finishing equipment to a safe condition on completion of the processing activities 1.17 reinstate the work area on completion of the deck covering application activities, to include carrying out all of the following: • clean and return all tools, equipment and excess materials • remove protection and exclusion arrangements (if no longer required) • leave the work area in a safe and clean condition			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• contribute to the completion of all relevant documentation (such as for condition/pre-treatment of substrates, coating material preparation, equipment settings, confirmation of standard of finish)			
2 Know how to carry out the application of deck screeds and other deck coverings	2.1 explain the safe working practices and procedures to be observed when working with marine coating materials and mixing equipment (such as general workshop and site safety, appropriate personal protective equipment (PPE), protecting other workers from the effects of the work, safety in enclosed/confined spaces, atmospheric controls) 2.2 explain the statutory requirements, risk assessment procedures and relevant requirements of HASAWA, COSHH (such as Approved Codes of Practice (ACOP), the Management of Health and Safety at Work Regulations, the Provision and use of Work Equipment Regulations, the Confined Space Regulations, the Special Waste Regulations, the Pollution Prevention and Control Regulations, the Water Resources Act) 2.3 describe the hazards associated with the storage of, the preparation of and the disposal of marine coating products and solvents (including the information to be found in manufacturers data sheets and in Chemical Hazard Information and Packaging for Supply (CHIPS) data sheets)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.4 explain the requirements for working in confined spaces, and the importance of emergency procedures and safe systems of work (including permits to work, required air quantities (RAQs) and local exhaust ventilation (LEV) to maintain safe conditions; the provision of adequate and safe lighting and avoidance of sources of ignition) 2.5 explain how the usage of particular materials (such as adhesives) can result in a compartment (such as a tented enclosure or accommodation space) becoming a confined space 2.6 explain what personal protective equipment (PPE) needs to be worn during the coating activity 2.7 describe the characteristics of, and applications for, deck screeds and deck coverings; the use of manufacturers' data sheets and the requirements for the application of particular products, in order to comply with the contractual specifications 2.8 explain the incompatibility of different types of deck screed 2.9 describe the preparation requirement for particular deck screed products (such as correct mixing tools and speeds, adding aggregate to mix for profiled screeds, the adjustment of consistency of certain products to aid spreading such as by the addition of small volumes of water)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.10 describe how to prepare the adhesives required for particular deck coverings, and explain the importance of shelf life and of batch numbers 2.11 explain the need to ensure that the substrates have been prepared correctly for the deck screeds/coverings to be applied 2.12 explain the importance of appropriate environmental conditions for the application of particular products and for the curing of screeds 2.13 explain how to carry out a moisture test of the mix and of the deck 2.14 explain the importance of the cure of an underlay before applying finishing screed 2.15 explain the requirement to seam weld certain polymeric materials (such as ethylene propylene di-ene monomer (EPDM) in electrical compartments) 2.16 describe the techniques required for applying deck screeds and deck coverings, and the incorporation of gullies if specified 2.17 explain the use of deck screed repair kits 2.18 describe the quality control requirements and techniques to be observed 2.19 explain how to identify faults in application, their causes and their correction			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.20 describe the safe and appropriate disposal of waste materials 2.21 describe the extent of their own responsibility, and explain whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 98: Carrying out the application of signature reduction coverings

Unit reference number: H/601/2591

Level: 2

Credit value: 25

Guided learning hours: 35

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to apply signature reduction coverings, such as acoustic tiles, radar absorbent sheet (RASH), and radar absorbent material (RAM), in accordance with approved procedures. Learners will be required to obtain all necessary information in order to carry out the application of the signature reduction coverings. They will be required to check that all surfaces to which coverings are to be applied have been prepared, in accordance with the process specification, and that any necessary exclusion, protection and ventilation requirements are implemented. Learners will be expected to select the appropriate and/or specified tools and equipment, and to ensure that they are in a safe and usable condition.

Learners' responsibilities will require them to comply with organisational policy and procedures for the signature-reduction covering activities undertaken, and to report any problems with these activities that they cannot personally resolve, or are outside their permitted authority, to the relevant people. They will be expected to work to instructions, alone or in conjunction with others, taking personal responsibility for their own actions and for the quality and accuracy of the work that they carry out.

Learners' knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to the application of marine signature-reduction coverings. They will have an understanding of the procedures and techniques used, and their application. Learners will know about the substrates, their preparation requirements, signature-reduction covering materials and their preparation requirements in sufficient depth to provide a sound basis for carrying out the activities and for ensuring that the signature reduction coverings are to the required standards.

Learners will understand the safety precautions required when carrying out the signature reduction covering operations. They will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and to others in the workplace.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Carry out the application of signature reduction coverings	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 ensure that the appropriate measures are implemented before undertaking the application of the signature-reduction coverings, to include carrying out all of the following: • obtain and work to job instructions and other relevant documentation (such as contractual specifications and covering manufacturer's specifications) • use appropriate health and safety documentation, including CHIPS data and risk assessments • implement appropriate emergency arrangements for work in confined spaces • wear appropriate personal protective equipment (PPE) at all times during the coating/covering operations • ensure that appropriate exclusion zones are set up • leave the work area in a safe and clean condition on completion of the activities 1.3 check that the material surfaces to be treated are suitably prepared for the finishing operations to be carried out			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.4 check that the finishing equipment and coatings are set up and maintained at satisfactory operating conditions and levels 1.5 carry out the treatment process in accordance with operating procedures and the component specification requirements 1.6 prepare for and carry out the application of the signature reduction coverings, to include carrying out all of the following: • ensure that environmental requirements (such as surface temperature, air humidity), meet the requirements for the application of the covering system • ensure that the surface to which the coverings are to be applied is correctly prepared and primed for the adhesive system specified • cut the coverings to shape, as necessary • prepare and apply the adhesive, as specified • apply the signature reduction materials, using the specified method and procedure • apply polymeric grouting, where specified • provide any means specified to promote the adhesion of the coverings (such as vacuum bags for tiles)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.7 apply one of the following marine signature-reduction coverings: • acoustic tiles • radar-absorbent material (RAM) • radar-absorbent sheet (RASH) 1.8 apply signature-reduction coverings to marine structures, to include four of the following features: • level surfaces • vertical flat surfaces • horizontal flat surfaces • corners • inclined surfaces • curved surfaces (including those with double curvature) • round parts 1.9 apply signature-reduction coverings in two of the following situations: • weather work • weapons systems • superstructure • weather deck features • submarine pressure hull			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• submarine casing/fin • submarine control surfaces 1.10 check that the treated work piece achieves the required characteristics and meets the finishing specification 1.11 apply signature-reduction coverings to achieve all of the following: • complete adhesion • smooth surface, free from bubbles, wrinkles, ripples • complete coverage of defined area 1.12 apply marine signature-reduction coverings, in accordance with one of the following standards: • BS or ISO standards • other accepted international standards • customer (contractual) standards and requirements • company standards and procedures • covering manufacturer's recommendations • recognised compliance agency/body's standards 1.13 deal promptly and effectively with problems within their control and report those that cannot be solved			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.14 dispose of waste and excess materials in line with agreed organisational procedures 1.15 shut down the finishing equipment to a safe condition on completion of the processing activities 1.16 reinstate the work area on completion of the activities, to include carrying out all of the following: • clean and return all tools, equipment and excess materials • remove protection and exclusion arrangements (if no longer required) • leave the work area in a safe and clean condition • contribute to the completion of all relevant documentation (such as for condition/pre-treatment of substrates, adhesive system used, confirmation of standard of finish)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
2 Know how to carry out the application of signature reduction coverings	2.1 explain the safe working practices and procedures to be observed when working with marine signature reduction materials and adhesives (such as general workshop and site safety; appropriate personal protective equipment (PPE), protecting other workers from the effects of the work, safety in enclosed/confined spaces, atmospheric controls) 2.2 explain the statutory requirements, risk assessment procedures and relevant requirements of HASAWA and COSHH (to include Approved Codes of Practice (ACOP), the Management of Health and Safety at Work Regulations, the Provision and use of Work Equipment Regulations, the Confined Space Regulations, the Special Waste Regulations) 2.3 describe the hazards associated with the preparation, use and disposal of signature reduction materials and adhesives (including the information to be found in manufacturers' data sheets and in Chemical Hazard Information and Packaging for Supply (CHIPS) data sheets) 2.4 explain the requirements for working in confined spaces, and the importance of emergency procedures and safe systems of work (including permits to work, required air quantities (RAQs) and local exhaust ventilation (LEV) to maintain safe conditions; the provision of adequate and safe lighting and avoidance of sources of ignition)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.5 explain how the usage of particular materials (such as adhesives) can result in a compartment (such as a tented enclosure) becoming a confined space 2.6 explain what personal protective equipment (PPE) needs to be worn during the covering activity 2.7 describe the characteristics of, and applications for, signature reduction coverings; the use of manufacturers' data sheets, and requirements for the application of particular products in order to comply with the contractual specifications 2.8 describe the preparation and use of the adhesives used to apply the coverings, and explain the importance of shelf life 2.9 explain the need to ensure that the substrates have been correctly prepared for the coverings to be applied, and the adhesives to be used 2.10 describe the techniques required for applying particular signature-reduction materials 2.11 explain the requirement to grout acoustic tiles 2.12 explain the importance of appropriate environmental conditions for the application of particular products, and for the curing of the adhesives used 2.13 describe the quality control requirements and techniques to be observed			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.14 explain how to identify faults in application, their causes and their correction 2.15 explain how to dispose of waste materials safely and correctly 2.16 describe the extent of their own responsibility, and explain whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 99: Applying fairing, filling and specialist protective coatings to marine components

Unit reference number: J/601/2602

Level: 2

Credit value: 38

Guided learning hours: 84

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to apply special products to various marine substrates, in accordance with approved procedures. Learners will be required to obtain all necessary information in order to carry out the coating application. They will be required to check that all surfaces to which coatings are to be applied have been prepared in accordance with the process specification, and that any necessary exclusion, containment, masking, protection and ventilation requirements are implemented. Learners will be expected to select the appropriate and/or specified equipment and to ensure that it is fit for purpose, and is correctly set up, maintained and adjusted. They will be expected to apply a variety of special finishes, in a number of shipyard and shipboard environments.

Learners' responsibilities will require them to comply with organisational policy and procedures for the specialist coating activities undertaken, and to report any problems with these activities that they cannot personally resolve, or are outside their permitted authority, to the relevant people. They will be expected to work to instructions, alone or in conjunction with others, taking personal responsibility for their own actions and for the quality and accuracy of the work that they carry out.

Learners' knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to applying special marine finishes. They will have an understanding of the specialist coating procedures and techniques used, and their application. Learners will know about the substrates, their preparation requirements, the special coating materials and their preparation requirements in sufficient depth to provide a sound basis for carrying out the activities, correcting faults, and for ensuring that the treated surfaces are to the required standards.

Learners will understand the safety precautions required when carrying out the specialist coating operations. They will be required to demonstrate safe working practices throughout, and will understand the responsibility that they owe to themselves and to others in the workplace.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Apply fairing, filling and specialist protective coatings to marine components	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 ensure that the appropriate measures are implemented before applying the coatings, to include carrying out all of the following: • use appropriate health and safety documentation, including CHIPS data and risk assessments • implement appropriate emergency arrangements for work in confined spaces • ensure that appropriate personal protective equipment (PPE) is available, correctly maintained and correctly used • ensure that appropriate exclusion zones and containment facilities are set up • carry out any necessary masking • provide weather protection for the areas to be coated (where appropriate) • ensure that environmental conditions meet the requirements for the application of the coating (such as surface temperature, air humidity) • provide any means required to promote the curing of the product used (eg air supply, warm air, heating)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.3 check that the material surfaces to be treated are suitably prepared for the finishing operations to be carried out 1.4 check that the finishing equipment and coatings are set up and maintained at satisfactory operating conditions and levels 1.5 carry out the treatment process in accordance with operating procedures and the component specification requirements 1.6 carry out two of the following specialist activities: (a) specialised erosion-resistant coatings: apply coatings to two of the following: • stabiliser fins • rudders • shaft brackets • other underwater fitting (b) fairing/filling/repairing: for the application of fairing/filling/repair compounds, carry out all of the following activities: • confirm that the product is correctly specified • prepare the product in accordance with the manufacturer's recommendations • select appropriate tools, as recommended by the product manufacturer			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• apply the product in accordance with manufacturer's recommendations Plus apply fairing/filling/repair compounds for two of the following uses: • fairing in way of sonar domes • other hull fairing • caulking interiors of tanks • fairing other minor blemishes • repairing wasted material • fairing shaft couplings (c) powder coating: for powder coating of components, undertake all of the following activities: • confirm that surface preparation meets the specification • check that the surface is free from contaminants • apply power coating electrostatically • correctly position powdered components in the curing oven/cabinet • operate the facility to cure powder coatings • inspect cured components			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.7 check that the treated workpiece achieves the required characteristics and meets the finishing specification 1.8 apply specialist materials and finishes to achieve all of the following: • correct film thickness • complete coverage of the surface to be coated • profile specified (fairing) • smooth surface, free from runs and drips 1.9 apply specialist finishes, in accordance with one of the following standards: • BS/EN or ISO standards and procedures • customer (contractual) standards and requirements • company standards and procedures • product manufacturer's recommendations • recognised compliance agency/body's standards 1.10 deal promptly and effectively with problems within their control and report those that cannot be resolved 1.11 dispose of waste and excess materials in line with agreed organisational procedures 1.12 shut down the finishing equipment to a safe condition on completion of the processing activities			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.13 reinstate the work area on completion of the specialist coating activities, to include carrying out all of the following: • cleaning and returning all tools, equipment and excess materials • removing protection and exclusion arrangements (if no longer required) • leaving the work area in a safe and clean condition • completing all relevant documentation (such as for condition/pre-treatment of substrates, coating material preparation, equipment settings, confirmation of standard of finish)			
2 Know how to apply fairing, filling and specialist protective coatings to marine components	2.1 explain the safe working practises and procedures to be observed when working with hand and mechanical tools (such as general workshop and site safety, appropriate protective equipment, protecting other workers from the effects of the work, safety in enclosed/confined spaces, working at height, use of mobile elevated work platforms (MEWPs), atmospheric controls)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.2 explain the statutory requirements, risk assessment procedures and relevant requirements of HASAWA, COSHH (such as Approved Codes of Practice (ACOP), the Management of Health and Safety at Work Regulations, the Provision and use of Work Equipment Regulations 1998; the Confined Space Regulations 1997; the Special Waste Regulations 1996; the Pollution Prevention and Control Regulations 2000; the Water Resources Act 1991) 2.3 describe the hazards associated with the storage, preparation, use and disposal of the products to be used (including information to be found in manufacturers' data sheets and in Chemical Hazard Information and Packaging for Supply (CHIPS) data sheets, and with tools and equipment used (solvent vapours, dermatitis exposure, airborne particles, heat) working at heights and over water, confined spaces and the importance of adequate and safe lighting) 2.4 describe the environmental impact of the operations they are carrying out, and of the materials they are using, and explain how to minimise this impact 2.5 explain the health and safety requirements of the work area in which they are carrying out the fairing, filling and protective coating treatment activities, and the responsibility they place upon them			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.6 explain the requirements for working in confined spaces (including an understanding of the importance of emergency procedures and safe systems of work including permits to work, required air quantities (RAQs) and local exhaust ventilation (LEV) to maintain safe conditions, the provision of adequate and safe lighting and avoidance of sources of ignition) 2.7 explain how particular procedures and materials can result in a compartment or space (such as an accommodation space or tented enclosure) becoming a confined space 2.8 explain the importance of having regular medical examinations when using solvent-based or other hazardous materials 2.9 explain what personal protective equipment (PPE) needs to be worn during the coating preparation and application processes 2.10 explain how to obtain the required work procedures and instructions, and how to use these to achieve the specified outcomes 2.11 explain the need to ensure that the substrate has been correctly prepared for the product to be applied 2.12 explain the importance of maintaining appropriate environmental conditions for the application and curing of the product being applied			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.13 describe the procedures for the safe handling and safe use of the products being applied 2.14 explain how to select the correct tools and equipment, for the preparation and application of the materials to be used 2.15 describe the techniques required for the application of the materials to a variety of surfaces 2.16 explain the requirements for working afloat, on outer bottoms and at height 2.17 explain any requirements for exclusion zones 2.18 describe the procedures to contain and to clear away spillages 2.19 describe the quality control requirements and techniques to be observed 2.20 explain how to identify faults in the product application, their causes and their correction 2.21 describe the simple non-destructive testing procedures to be used to ensure that the required performance qualities are achieved 2.22 describe the safe and appropriate disposal of waste materials 2.23 describe the extent of their own responsibility, and explain whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 100: Carrying out the installation of cable runs and circuits in yachts and boats

Unit reference number: D/601/2606

Level: 2

Credit value: 28

Guided learning hours: 70

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to install cable runs/circuits in yachts or boats, in accordance with approved procedures. Learners will install the appropriate cable enclosures which could include conduit and trunking systems, and will be expected to position, align and secure these in the correct locations, using the specified/appropriate techniques and bulkhead/screen penetration and fastening devices. The circuitry will include vessel power supply cables, internal and external lighting cables and system cable assemblies. Learners will be expected to terminate these cables to the relevant circuit-breaker panels, distribution panels and relay panels.

Learners' responsibilities will require them to comply with organisational policy and procedures for the cable installation activities undertaken, and to report any problems with the cable installation activities that they cannot personally resolve, or are outside their permitted authority, to the relevant people. They will be expected to work with either a high level of supervision or as a member of a team. Learners will take personal responsibility for their own actions and for the quality and accuracy of the work that they carry out. Where team working is involved they must demonstrate a significant personal contribution during the team activities in order to satisfy the requirements of the standard, and competency in all the areas required by the standard must be demonstrated.

Learners' knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to applying electrical cable installation techniques and procedures in yachts or boats. They will have an understanding of the circuits being installed, and their application, and will know about the installation methods, tools and techniques used in adequate depth to provide a sound basis for carrying out the activities to the required specification.

Learners will understand the safety precautions required when carrying out the installation of the cables. They will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace, both ashore and afloat.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Carry out the installation of cable runs and circuits in yachts and boats	1.1 work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines 1.2 carry out all of the following during the electrical cable installation activities: • ensure they have the necessary information to carry out the installation of the cable runs (such as job instructions or drawings) • adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations • obtain clearance to work on the system, and observe the power isolation and safety procedures • maintain safe access and working arrangements for the work area • carry out the cable installation activities using appropriate techniques and procedures • return all tools and equipment to the correct location on completion of the activities • leave the work area in a safe condition and to the prescribed category of cleanliness 1.3 follow all relevant drawings and specifications for the installation being carried out			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.4 use the correct tools and equipment for the installation operations and check that they are in a safe and usable condition 1.5 install, position and secure the cabling and components in accordance with the specification 1.6 install one of the following types of wiring enclosures: • non-metallic conduit systems • metal conduit systems • non-metallic trunking systems • metal trunking system • traywork systems • bulkhead/screen/deck penetration 1.7 apply three of the following cable installation methods and techniques: • positioning and securing conduit/trunking using mechanical fixings • carrying out through-bulkhead penetration • determining size and lengths of cables required • laying in cables without twisting or plaiting • leaving sufficient slack for termination and movement			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.8 install cable runs in support of two of the following types of yacht or boat electrical/electronic systems: • power supply circuits • services/domestic electrical systems • emergency/temporary power supplies • autopilot systems • pumping systems (such as freshwater systems, bilge pumping systems, sanitary systems) • motor/rotating equipment circuits (such bow/stern thrusters, anchor windlass, trim tabs winches and hoists) • lighting systems (such as internal, external navigational) • alarm systems (such as fire, flood/liquid level, gas, intruder) • entertainment systems (such as sound systems, video entertainment systems) • communications systems (such as very high frequency (VHF) radio, SSB, satellite communications (SATCOM), Navtex, weather fax, on-board entertainment systems, intercom) • positioning systems (such as chart plotter, global positioning system (GPS), long range navigation (LORAN), compass, gyro)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• instrument systems (such as speed, depth, wind, velocity made good) • sensor systems (such as RADAR) • other specific electrical circuits 1.9 install two of the following types of cable run: • single-core cables • multicore cables • PVC twin and earth • wiring looms • coaxial • screened cables • steel wire armoured (SWA) cables • mineral insulated (MI) cables • data/communication/fibre-optic cables 1.10 carry out five of the following cable termination activities: • stripping cable sheaths without damage to conductor insulation • removing cable insulation • connecting accessories (such as plugs, sockets multi-way connectors • making mechanical/screwed/clamped connections			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• crimping (such as spade end, loops, tags and pins) • secure wires and cables (such as clips, plastic strapping, lacing, harnessing) • soldering and de-soldering • terminating armoured cables • terminating mineral insulated cables • attaching suitable cable identification • heat shrinking (devices and boots) • screening • earth bonding 1.11 check that all necessary connections and terminations are complete 1.12 install cable runs and circuits in yachts and boats which comply with one of the following standards: • BS or ISO standards and procedures • other accepted international standards • customer (contractual) standards and requirements • company standards and procedures • specific equipment requirements/manufacturer's data • BS 7671/IEE Wiring Regulations			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• recognised compliance agency/body's standards (such as Lloyds, Boat Safety Scheme, BMEA Code) 1.13 deal promptly and effectively with problems within their control and report those that cannot be solved 1.14 check that the installation is complete and that all components are fit for purpose 1.15 complete the relevant paperwork, to include one from the following, and pass it to the appropriate people: • job cards • installation records • system log • vessel/craft wiring documentation			
2 Know how to carry out the installation of cable runs and circuits in yachts and boats	2.1 explain the specific safety practices and procedures that they need to observe when installing cable runs/circuits in yachts or boats (including any specific legislation, regulations/codes of practice for the activities, equipment or materials) 2.2 describe the hazards and risks associated with installing cable runs/circuits in yachts or boats structure, and with the tools and equipment used, (such as using sharp instruments for stripping cable insulation) and explain how they can be minimised			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.3 explain what protective equipment they need to use for both personal protection and protection of the vessel/equipment 2.4 explain how to obtain the necessary job instructions required for the work being carried out 2.5 explain the cable runs/circuits to be installed, and their function within the particular system 2.6 explain the different types of cabling (multi-core cables, single-core cables, SWA cables, MI cables, screened cables), fittings and their application 2.7 explain the different types of electrical components used (such as plugs, switches, lighting and fittings, junction boxes, consumer units) 2.8 describe the techniques used to position, align, adjust, carry, support, secure and distribute the cabling through the vessel/craft 2.9 explain how to extract and insert cables in wiring enclosures (such as conduit, trunking and through-bulkhead penetration) without causing damage to cables or components 2.10 describe the techniques used to terminate electrical cables (such as plugs and sockets; soldering; screwed, clamped and crimped connections, glands and sealed connectors) and explain the importance of adhering to these procedures			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.11 describe the methods and techniques to be used for soldering, de-soldering, crimping, and heat shrinking and explain the importance of adhering to these procedures 2.12 describe the methods of attaching markers/labels to components or cables to assist with identification (such as colour coding conductors, using coded tabs) 2.13 describe the various mechanical fasteners/termination that will be used, and explain their method of installation 2.14 describe the quality control procedures that need to be followed during the installation operations 2.15 explain the importance of ensuring that the completed installation is free from damage and of ensuring that any exposed components are protected and advisory notices are placed 2.16 explain the procedures for ensuring that they have the correct tools, equipment, components and fasteners for the activities 2.17 explain why electrical bonding is critical, and why it must be both mechanically and electrically secure 2.18 describe the procedure for the safe disposal of waste materials 2.19 describe the tools and equipment used in the installation activities, and explain their calibration/care and control procedures			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.20 explain why tool/equipment control is critical, and what to do if a tool or piece of equipment is unaccounted for on completion of the activities 2.21 describe the problems that can occur with the cable installation operations, and explain how these can be overcome 2.22 explain the recording documentation to be completed for the activities undertaken 2.23 describe the extent of their own responsibility and explain whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 101: Assisting in the installation of electrical/electronic equipment in yachts and boats

Unit reference number: H/601/2610

Level: 2

Credit value: 32

Guided learning hours: 91

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to assist in the installation of electrical/electronic equipment in yachts or boats, in accordance with approved procedures. The installation activities will involve installing equipment at component or unit level on a variety of different types of yacht or boat electrical assemblies and sub-assemblies such as power supply and distribution equipment, lighting, domestic services, alarm, motor/rotating equipment, pumping equipment, entertainment equipment, instrument systems, positioning systems, autopilot systems, communication systems and radar systems.

Learners' responsibilities will require them to comply with organisational policy and procedures for the installation of the electrical/electronic equipment, and to report any problems with the installation activities that they cannot personally resolve, or are outside their permitted authority, to the relevant people. They will be expected to work with either a high level of supervision or as a member of a team. Learners will take personal responsibility for their own actions and for the quality and accuracy of the work that they carry out. Where team working is involved they must demonstrate a significant personal contribution during the team activities in order to satisfy the requirements of the standard, and competency in all the areas required by the standard must be demonstrated.

Learners' knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to applying the appropriate electrical/electronic installation techniques and procedures in yachts or boats. They will have an understanding of the basic knowledge behind the equipment being installed and its application, and will know about the installation equipment and fastening devices in adequate depth to provide a sound basis for carrying out the activities to the required specification.

Learners will understand the safety precautions required when carrying out the installation of the yacht or boat electrical equipment, especially those for ensuring any power supplies are correctly isolated. They will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the work area, both ashore and afloat.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Assist in the installation of electrical/electronic equipment in yachts and boats	1.1 work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines 1.2 carry out all of the following during the installation of the yacht or boat electrical/electronic equipment: • ensure they have the necessary information to assist with the installation activities (such as job instructions or drawings) • adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations • maintain safe access and working arrangements for the work area • carry out the installation activities using appropriate techniques and procedures • produce installations which comply with the specification • return all tools and equipment to the correct location on completion of the activities • leave the work area in a safe and tidy condition 1.3 follow all relevant drawings and specifications for the installation being carried out			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.4 use the correct tools and equipment for the installation operations and check that they are in a safe and usable condition 1.5 install, position and secure the equipment and components in accordance with the specification 1.6 assist in the installation and termination of four of the following types of yacht or boat electrical/electronic equipment: • power supply equipment (such as batteries, generators, alternators, wind and solar) • power distribution panel • lighting (such as cabin lighting, navigation lighting, cockpit and deck lighting) • services/domestic equipment (such as heating, cooking, air-conditioning and refrigeration systems) • alarm equipment (such as flood and liquid level detection, security/intruder detection, gas and fire detection) • motor/rotating equipment (such as bow thrusters, anchor windlasses, trim tabs, winches and hoists) • pumping equipment (such as freshwater systems, bilge pumping systems, sanitary systems)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• entertainment equipment (such as sound systems, video entertainment systems) • communications equipment (such as very high frequency (VHF) radio, SSB, satellite communications (SATCOM), Navtex, weather fax, on-board entertainment systems, intercom) • positioning equipment (such as chart plotter, global positioning system (GPS), long range navigation (LORAN), compass, gyro) • instrumentation (such as speed, depth, wind, velocity made good) • autopilot equipment • sensor equipment (such as RADAR) 1.7 install yacht or boat electrical/electronic equipment to include carrying out all of the following: • determining the correct/appropriate position for the equipment • positioning and securing the equipment using the specified or appropriate fastening devices • checking correct level and alignment • terminating the equipment using the correct devices			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.8 make five of the following types of electrical/electronic connection: • junction boxes • power cables • multicore cables • deck plugs and sockets • co-axial connections • free plugs and sockets • multi-pin plugs and sockets • terminal blocks • free plugs • crimp connectors • cable glands • earth bonding points • solder connectors 1.9 check that all necessary connections to the equipment are complete 1.10 carry out all of the following on the installed electrical/electronic equipment: • visual checks (such as completeness of installation, signs of damage, incorrect termination)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• movement checks (such as loose fittings and connections) • assist in testing that the equipment operates to the circuit specification 1.11 assist in installing yacht or boat electrical/electronic equipment which complies with one of the following: • BS or ISO standards and procedures • other accepted international standards • customer (contractual) standards and requirements • company standards and procedures • specific equipment requirements/manufacturer's data • BS 7671/IEE Wiring Regulations • recognised compliance agency/body's standards (such as Lloyds, Boat Safety Scheme, BMEA Code) 1.12 deal promptly and effectively with problems within their control and report those that cannot be solved 1.13 check that the installation is complete and that all components are free from damage			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.14 complete the relevant paperwork, to include one from the following, and pass to the appropriate people: • job cards • installation records • system log • vessel/craft wiring documentation			
2 Know how to assist in the installation of electrical/electronic equipment in yachts and boats	2.1 explain the specific safety practices and procedures that they need to observe when assisting in the installation and termination of electrical/electronic equipment in yachts or boats (including any specific legislation, regulations/codes of practice for the activities, equipment or materials) 2.2 describe the hazards associated with the installation of electrical equipment in yachts and boats, and with the tools and equipment used, and explain how they can be minimised 2.3 explain what protective equipment they need to use for both personal protection and protection of the vessel/craft 2.4 explain how to obtain the necessary job instructions required for the work being carried out 2.5 describe the equipment and components to be installed, and explain their function within the particular system			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.6 describe the various mechanical fasteners that will be used, and explain their method of installation (including threaded fasteners, special securing and locking devices) 2.7 explain why some securing devices need to be locked, and the different methods that are used 2.8 explain the importance of using the specified electrical terminations, connections and fasteners for the particular installation process, and why they must not substitute others 2.9 describe the quality control procedures to be followed during the electrical/electronic installation operations 2.10 explain the procedures for ensuring that they have the correct tools, equipment, electrical components and fasteners for the activities 2.11 describe the techniques used to position, align, adjust and secure the electrical equipment, components and circuitry to the vessel/compartment structure without damage 2.12 describe the methods of lifting, handling and supporting the components/equipment during the installation activities 2.13 explain the use of seals, sealants, adhesives and anti-electrolysis barriers, and the precautions that need to be taken			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.14 explain why unit electrical bonding/earth prevention and continuity is critical, and why it must be both mechanically and electrically secure 2.15 describe what checks need to be carried out to ensure the equipment and system integrity, functionality, accuracy and quality of the installation (such as visual checks for signs of damage, movement checks for security of connections and fastenings, functional checks of the equipment) 2.16 explain the importance of ensuring that the completed installation is to the category of cleanliness prescribed, and any exposed components are correctly covered/protected 2.17 describe the tools and equipment used in the electrical installation activities, and explain their calibration/care and control procedures 2.18 describe the extent of their own responsibility and explain whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 102: Assisting in the installation of engines/propulsion systems in yachts and boats

Unit reference number: T/601/2613

Level: 2

Credit value: 32

Guided learning hours: 91

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to assist in the installation of engine/propulsion systems and equipment in yachts or boats, in accordance with approved procedures. The engine/propulsion systems to be installed could include inboard engines (petrol or diesel), outboard engines, direct current electric motors or steam engines. Learners will be expected to use the appropriate equipment and installation techniques, based on the operations to be carried out and the components to be installed. The engine/propulsion components to be installed will include fuel, exhaust and cooling system components, shafts, engine control units and other associated equipment. The installation activities will include making all necessary checks and adjustments to ensure that components are correctly positioned, aligned, locked and fastened.

Learners' responsibilities will require them to comply with organisational policy and procedures for the installation of the engine/propulsion equipment, and to report any problems with the installation activities that they cannot personally resolve, or are outside their permitted authority, to the relevant people. Learners will be expected to work either with a high level of supervision or as a member of a team. They will take personal responsibility for their own actions and for the quality and accuracy of the work that they carry out. Where team working is involved, learners must demonstrate a significant personal contribution during the team activities in order to satisfy the requirements of the standard, and competency in all the areas required by the standard must be demonstrated.

Learners' knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to applying the appropriate installation techniques and procedures for yacht or boat engine/propulsion systems. They will have an understanding of the basic knowledge behind the equipment being installed and its application, and will know about the installation equipment and fastening devices in adequate depth to provide a sound basis for carrying out the activities to the required specification.

Learners will understand the safety precautions required when carrying out the yacht or boat engine/propulsion equipment installation operations. They will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the work area, both ashore and afloat.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Assist in the installation of engines/propulsion systems in yachts and boats	1.1 work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines 1.2 carry out all of the following during the installation of the yacht or boat engine/propulsion system: • ensure they have the necessary information to assist with the installation activities (such as job instructions or drawings) • adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations • maintain safe access and working arrangements for the work area • carry out the installation activities using appropriate techniques and procedures • ensure that correct part numbers are used (including port or starboard items) • return all tools and equipment to the correct location on completion of the installation • leave the work area in a safe and tidy condition 1.3 follow all relevant drawings and specifications for the installation being carried out			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.4 use the correct tools and equipment for the installation operations and check that they are in a safe and usable condition 1.5 install, position and secure the equipment and components in accordance with the specification 1.6 assist in the installation of one of the following types of yacht or boat engine/propulsion systems: • in-board engine (such as petrol or diesel) • out-board engine • direct current electric motor • steam engine 1.7 assist in connecting engine components, to include four of the following: • electrical cables • power supply • engine control unit • fuel system • exhaust system • cooling system • shafts/couplings • bearings/bearing blocks • seals/gaskets • instrumentation			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.8 use six of the following installation methods and techniques: • marking/setting out of locating and securing positions • preparing holes (such as drilling, cleaning out threads) • positioning equipment/components • levelling equipment • aligning equipment • assembly/connection of components or sub-assemblies • setting timing • setting and adjusting equipment • torque setting of mechanical fasteners • lifting and handling • lubricating • making pipe connections • connecting wires and cables • securing using mechanical fixings • securing using adhesives • sealing • applying screw fastener locking devices			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• earth bonding • ensuring the system cleanliness (such as covering exposed pipe ends or components) 1.9 use two of the following types of fasteners and securing devices: • studs with nuts • screws • dowels • nuts and bolts • locking devices (such as split, parallel, clevis or taper pin) 1.10 check that all necessary connections to the equipment are complete 1.11 assist in the installation of yacht or boat engine/propulsion systems which comply with one of the following: • BS or ISO standards and procedures • other accepted international standards • customer (contractual) standards and requirements • company standards and procedures • specific equipment requirements/manufacturer's data			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• recognised compliance agency/body's standards (such as Lloyds, Boat Safety Scheme, BMEA Code) 1.12 deal promptly and effectively with problems within their control and report those that cannot be solved 1.13 check that the installation is complete and that all components are free from damage 1.14 complete the relevant paperwork, to include one from the following, and pass to the appropriate people: • job cards • installation records • system log • vessel/craft wiring documentation			
2 Know how to assist in the installation of engines/propulsion systems in yachts and boats	2.1 explain the specific safety practices and procedures that they need to observe when assisting in the installation of engine/propulsion systems in yachts or boats (including any specific legislation, regulations/codes of practice for the activities, equipment or materials) 2.2 describe the procedures to be carried out before starting work on the installation (such as obtaining permits to work, obtaining and complying with risk assessments and other health and safety requirements)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.3 describe the hazards associated with installing yacht or boat engine/propulsion systems, and with the tools and equipment used, and explain how these can be minimised 2.4 explain what protective equipment they need to use for both personal protection and protection of the system and craft 2.5 explain how to obtain the necessary job instructions required for the work being carried out 2.6 describe the components to be installed, and explain their function within the particular engine and propulsion system 2.7 describe the various mechanical fasteners that will be used, and their method of installation (including threaded fasteners, special securing and locking devices) 2.8 explain the importance of using the specified fasteners and locking devices for the particular installation, and why they must not substitute others 2.9 explain why securing devices need to be locked and labelled, and the different methods that are used 2.10 explain the torque loading requirements on the fasteners, and why this is important 2.11 describe the quality control procedures to be followed during the installation operations			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.12 describe the techniques used to position, align, adjust and secure the components without damage 2.13 describe the methods of lifting, handling and supporting the components/equipment during the installation activities 2.14 explain the use of seals, sealant and adhesives, and the precautions to be taken 2.15 explain what checks need to be carried out to ensure the system integrity, functionality, accuracy and quality of the installation 2.16 explain the importance of ensuring that the completed installation is free from foreign object debris and that any exposed components or pipe ends are correctly covered/protected 2.17 describe the tools and equipment used in the installation activities, and explain their calibration/care and control procedures 2.18 describe the extent of their own responsibility and explain whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 103: Assisting in the installation of ancillary equipment in yachts and boats

Unit reference number: F/601/2615

Level: 2

Credit value: 30

Guided learning hours: 84

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to assist in the installation of ancillary equipment in yachts or boats, in accordance with approved procedures. The ancillary equipment and components to be installed will include items such as fuel and water; holding tanks and pipework; bow and stern thrusters; trim tabs, pumps (such as sea water, fresh water and jet), gear boxes, steering gear, bearing brackets; seals and propellers; battery charging equipment (such as wind generators and solar panels) and lifting equipment (such as anchor windlass, winches and hoists). Learners will be expected to use the appropriate equipment and installation techniques, based on the operations to be carried out and the components to be installed. The installation activities will include making all necessary checks and adjustments to ensure that components are correctly positioned, aligned, locked and fastened.

Learners' responsibilities will require them to comply with organisational policy and procedures for the installation of the ancillary equipment, and to report any problems with the installation activities that they cannot personally resolve, or are outside their permitted authority, to the relevant people. They will be expected to work either with a high level of supervision or as a member of a team. Learners will take personal responsibility for their own actions and for the quality and accuracy of the work that they carry out. Where team working is involved, they must demonstrate a significant personal contribution during the team activities in order to satisfy the requirements of the standard, and competency in all the areas required by the standard must be demonstrated.

Learners' knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to applying the appropriate installation techniques and procedures for yacht or boat ancillary equipment. They will have an understanding of the basic knowledge behind the equipment being installed and its application, and will know about the installation equipment and fastening devices in adequate depth to provide a sound basis for carrying out the activities to the required specification.

Learners will understand the safety precautions required when carrying out the yacht or boat ancillary equipment installation operations. They will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the work area, both ashore and afloat.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Assist in the installation of ancillary equipment in yachts and boats	1.1 work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines 1.2 carry out all of the following during the installation of the yacht or boat ancillary equipment: • ensure they have the necessary information to assist with the installation activities (such as job instructions or drawings) • adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations • obtain clearance to work on the equipment, and observe the power isolation procedures • maintain safe access and working arrangements for the work area • carry out the installation activities using appropriate techniques and procedures • ensure that correct part numbers are used (including port or starboard items) • produce installations which comply with the specification			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• return all tools and equipment to the correct location on completion of the installation • leave the work area in a safe and tidy condition 1.3 follow all relevant drawings and specifications for the installation being carried out 1.4 use the correct tools and equipment for the installation operations and check that they are in a safe and usable condition 1.5 install, position and secure the equipment and components in accordance with the specification 1.6 assist in the installation of yacht or boat ancillary equipment and components, to include four of the following: • bow thrusters • stern thrusters • trim tabs • anchor windlass • passerelle • generators • wind generator • solar panels • fuel tanks and pipework • p-brackets/a-brackets			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• propellers • water tanks and pipework • holding tanks and pipework • helm consoles • out drive/Z-drive • gearbox • steering gear • davits • jet pumps • deck wash • bathing platform • exhaust system • sea water pump • winches/hoists/lifting equipment • deck fittings (such as bollards, hand rails, rope lashings) 1.7 use six of the following installation methods and techniques: • marking/setting out of locating and securing positions • preparing holes (such as drilling, cleaning out threads) • positioning equipment/components			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• aligning of equipment • levelling of equipment • securing by using mechanical fixings • assembly/connection of components or sub-assemblies • shaft coupling (such as propellers, compressor or pump) • setting and adjusting equipment operating parameters (such as timings, working clearance, travel) • making flexible hose connections • making pipe connections • securing by using adhesives • torque setting of mechanical fasteners • applying screw fastener locking devices • sealing to prevent water ingress • flushing out pipes and components • lubricating components • connecting wires and cables • carrying out earth bonding • lifting and handling • ensuring the system cleanliness (such as covering exposed pipe ends or components)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.8 use two of the following types of fasteners and securing devices: • studs with nuts • screws • dowels • nuts and bolts • locking devices (such as split, parallel, clevis or taper pin) 1.9 check that all necessary connections to the equipment are complete 1.10 assist in the installation of yacht or boat ancillary systems and equipment which comply with one of the following: • BS or ISO standards and procedures • other accepted international standards • customer (contractual) standards and requirements • company standards and procedures • specific equipment requirements/manufacturer's data • BS 7671/IEE Wiring Regulations (current edition) • recognised compliance agency/body's standards (such as Lloyds, Boat Safety Scheme, BMEA Code)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.11 deal promptly and effectively with problems within their control and report those that cannot be solved 1.12 check that the installation is complete and that all components are free from damage 1.13 complete the relevant paperwork, to include one from the following, and pass to the appropriate people: • job cards • installation records • system log • vessel/craft wiring documentation			
2 Know how to assist in the installation of ancillary equipment in yachts and boats	2.1 explain the specific safety practices and procedures that they need to observe when assisting in the installation of ancillary equipment in yachts or boats (including any specific legislation, regulations/codes of practice for the activities, equipment or materials) 2.2 describe the procedures to be carried out before starting work on the installation of the ancillary equipment (such as obtaining permits to work, obtaining and complying with risk assessments and other health and safety requirements) 2.3 describe the hazards associated with installing yacht or boat ancillary systems and equipment, and with the tools and equipment used, and explain how they can be minimised			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.4 explain what protective equipment they need to use for both personal protection and protection of the equipment and the vessel/craft 2.5 explain how to obtain the necessary job instructions required for the work being carried out 2.6 describe the components to be installed, and explain their function within the particular ancillary system being installed 2.7 describe the various mechanical fasteners that will be used, and their method of installation (including threaded fasteners, special securing and locking devices) 2.8 explain the importance of using the specified fasteners and locking devices for the particular installation, and why they must not substitute others 2.9 explain why securing devices need to be locked, and the different methods that are used 2.10 explain the torque loading requirements on the fasteners, and why this is important 2.11 describe the quality control procedures to be followed during the installation operations 2.12 describe the techniques used to position, align, adjust and secure the ancillary equipment and components to the craft/vessel without damage			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.13 describe the methods of lifting, handling and supporting the components/equipment during the installation activities 2.14 explain the use of seals, sealants and adhesives, and the precautions to be taken 2.15 explain what checks need to be carried out to ensure the system integrity, functionality, accuracy and quality of the installation 2.16 explain how to recognise installation defects (such as poor seals, misalignment, ineffective fasteners or contamination) 2.17 explain the importance of ensuring that the completed installation is free from foreign object debris, and that any exposed components or pipe ends are correctly covered/protected 2.18 describe the tools and equipment used in the installation activities, and explain their calibration/care and control procedures 2.19 describe the extent of their own responsibility and explain whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 104: Assisting in the installation of domestic equipment in yachts and boats

Unit reference number: L/601/2617

Level: 2

Credit value: 28

Guided learning hours: 70

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to assist in the installation of domestic equipment in yachts or boats in accordance with approved procedures. The domestic equipment and components to be installed will include items such as air-conditioning equipment, heating equipment, shower equipment, domestic hot and cold water equipment, waste and sanitary equipment, deck drains and bilge equipment. Learners will be expected to use the appropriate equipment and installation techniques, based on the operations to be carried out and the components to be installed. The installation activities will include making all necessary checks and adjustments to ensure that components are correctly positioned, aligned, locked and fastened.

Learners' responsibilities will require them to comply with organisational policy and procedures for the installation of the domestic equipment, and to report any problems with the installation activities that they cannot personally resolve, or are outside their permitted authority, to the relevant people. They will be expected to work either with a high level of supervision or as a member of a team. Learners will take personal responsibility for their own actions and for the quality and accuracy of the work that they carry out. Where team working is involved, they must demonstrate a significant personal contribution during the team activities in order to satisfy the requirements of the standard, and competency in all the areas required by the standard must be demonstrated.

Learners' knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to applying the appropriate installation techniques and procedures for yacht or boat domestic equipment. They will have an understanding of the basic knowledge behind the equipment being installed and its application, and will know about the installation equipment and fastening devices in adequate depth to provide a sound basis for carrying out the activities to the required specification.

Learners will understand the safety precautions required when carrying out the yacht or boat domestic equipment installation operations. They will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the work area, both ashore and afloat.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Assist in the installation of domestic equipment in yachts and boats	1.1 work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines 1.2 carry out all of the following during the installation of the yacht or boat domestic systems and equipment: • ensure they have the necessary information to assist with the installation activities (such as job instructions or drawings) • adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations • obtain clearance to work on the equipment, and observe the power isolation procedures • maintain safe access and working arrangements for the work area • carry out the installation activities using appropriate techniques and procedures • ensure that correct part numbers are used (including port or starboard items where appropriate) • produce installations which comply with the specification			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• return all tools and equipment to the correct location on completion of the installation • leave the work area in a safe and tidy condition 1.3 follow all relevant drawings and specifications for the installation being carried out 1.4 use the correct tools and equipment for the installation operations and check that they are in a safe and usable condition 1.5 install, position and secure the equipment and components in accordance with the specification 1.6 assist in the installation of yacht or boat domestic equipment, to include two of the following: • air-conditioning systems • heating systems • shower systems • food preparation equipment • refrigeration equipment • gas systems • domestic cold water systems • domestic hot water systems • waste and sanitary systems • deck drainage systems • bilge systems			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.7 assist in the installation of four of the following yacht or boat domestic system components • metallic pipes (such as copper or stainless steel) • rigid plastic pipes • flexible pipes/hoses • fresh and waste holding tanks • pumps • valves (such as gas and water isolation) • heaters • fans/blowers • sinks • taps • shower cubicles/trays • toilet units • macerators • drains 1.8 use six of the following installation methods and techniques: • marking/setting out of locating and securing positions • preparing holes (such as drilling, cleaning out threads)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• positioning equipment/components • aligning of equipment • levelling of equipment • securing by using mechanical fixings • assembly/connection of components or sub-assemblies • setting and adjusting equipment operating parameters (such as timings, working clearance, travel) • making flexible hose connections • making pipe connections • securing by using adhesives • torque setting of mechanical fasteners • applying screw fastener locking devices • sealing to prevent water ingress • flushing out pipes and components • lubricating components • connecting wires and cables • carrying out earth bonding • lifting and handling • ensuring the system cleanliness (such as covering exposed pipe ends or components)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.9 use two of the following types of fasteners and securing devices: • studs with nuts • screws • dowels • nuts and bolts • locking devices (such as split, parallel, clevis or taper pin) 1.10 check that all necessary connections to the equipment are complete 1.11 assist in installing yacht or boat domestic systems and equipment which comply with one of the following: • BS or ISO standards and procedures • other accepted international standards • customer (contractual) standards and requirements • company standards and procedures • specific equipment requirements/manufacturer's data • BS 7671/IEE Wiring Regulations (current edition) • recognised compliance agency/body's standards (such as Lloyds, Boat Safety Scheme, BMEA Code)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.12 deal promptly and effectively with problems within their control and report those that cannot be solved 1.13 check that the installation is complete and that all components are free from damage			
2 Know how to assist in the installation of domestic equipment in yachts and boats	2.1 explain the specific safety practices and procedures that they need to observe when assisting in the installation of yacht or boat domestic equipment (including any specific legislation, regulations/codes of practice for the activities, equipment or materials) 2.2 describe the procedures to be carried out before starting work on the installation of the domestic equipment (such as obtaining permits to work, obtaining and complying with risk assessments and other health and safety requirements) 2.3 describe he hazards associated with installing yacht or boat domestic equipment, and with the tools and equipment used, and explain how they can be minimised 2.4 explain what protective equipment they need to use for both personal protection and protection of the equipment and vessel/craft 2.5 explain how to obtain the necessary job instructions required for the work being carried out 2.6 describe the components to be installed, and explain their function within the domestic equipment			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.7 describe the various mechanical fasteners that will be used, and their method of installation (including threaded fasteners, special securing and locking devices) 2.8 explain the importance of using the specified fasteners and locking devices for the particular installation, and why they must not substitute others 2.9 explain why securing devices need to be locked, and the different methods that are used 2.10 explain the torque loading requirements on the fasteners, and why this is important 2.11 describe the quality control procedures to be followed during the installation operations 2.12 describe the techniques used to position, align, adjust and secure the domestic equipment and components to the vessel/craft without damage 2.13 describe the methods of lifting, handling and supporting the components/equipment during the installation activities 2.14 explain the use of seals, sealants and adhesives, and the precautions to be taken			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.15 describe the various methods of connecting the components including snap-in connectors, screwed and cemented joints 2.16 explain why it is important to produce pipework system layouts that are neat and tidy 2.17 explain the key factors of pipe connection that ensure a watertight joint 2.18 explain how components need to be configured and connected with regard to orientation and direction of flow 2.19 explain what checks need to be carried out to ensure the system integrity, functionality, accuracy and quality of the installation 2.20 explain how to recognise installation defects (such as poor seals, misalignment, ineffective fasteners or contamination) 2.21 explain the importance of ensuring that the completed installation is free from foreign object debris, and that any exposed components or pipe ends are correctly covered/protected 2.22 describe the tools and equipment used in the installation activities, and explain their calibration/care and control procedures 2.23 describe the extent of their own responsibility and explain whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 105: Cutting and shaping wooden components for yachts and boats using hand tools

Unit reference number: R/601/2618

Level: 2

Credit value: 50

Guided learning hours: 119

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to cut and shape wood and manufactured board components for yachts or boats using hand tools, in accordance with approved procedures. Learners will be required to interpret the drawings and work instructions, and to use the appropriate tools, based on the type of operations to be performed, the size of the components to be produced and the materials to be used. The size and complexity of the components produced will vary and it is anticipated that the production of the components will involve roughing out the components using fixed or portable machine tools and finally finishing them using hand tools. The components produced will cover structural components (such as hull frames, deck and hull planks, bulk heads, hatch covers, doors and windows/ports, spars, floors) and furniture or trim items (such as navigational and helm consoles, bunks, top boxes, storage boxes, ladders, steps, decorative mouldings, frames, cases, storage units, furniture and other structures).

Learners' responsibilities will require them to comply with organisational policy and procedures for the woodwork manufacturing activities undertaken, and to report any problems with the manufacturing activities, or with the tools, equipment and materials used, that they cannot personally resolve, or are outside their permitted authority, to the relevant people. They will need to complete all necessary job/task documentation accurately and legibly. Learners will work to instructions, with a minimum of supervision, and take personal responsibility for their own actions and for the quality and accuracy of the work that they carry out.

Learners' knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to the production of yacht or boat wooden components using hand woodworking tools and procedures. They will have an understanding of the equipment being used, and its application, and will know about the cutting tools, their function and maintenance requirements in adequate depth to provide a sound basis for carrying out the activities to the required specification. Learners will be able to identify blunt and damaged cutting tools and know how to sharpen and adjust them in use in order for them to work efficiently.

Learners will understand the safety precautions required when carrying out the hand cutting and shaping activities. They will be required to demonstrate safe working practices throughout and will understand the responsibility they owe to themselves and others in the workplace.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Cut and shape wooden components for yachts and boats using hand tools	1.1 work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines 1.2 carry out all of the following during the cutting and shaping of the yacht or boat wooden components: • obtain all the necessary information to carry out the hand shaping/fitting activities (such as job instructions, drawings, specifications) • adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations • check that the hand tools are in a safe and usable condition • ensure that the work area is free from hazards • use safe and approved cutting and hand shaping techniques at all times • ensure the cutting tools are maintained in a serviceable condition 1.3 follow relevant specifications for the component to be produced 1.4 obtain the appropriate tools and equipment for the shaping operations and check they are in a safe and usable condition			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.5 use four of the following hand tools to cut and shape the materials to specification: • saws (rip or tenon) • fret/bow/coping saws • jack or smoothing planes • spokeshaves • chisels/gouges • drills/braces • sanding blocks/paper • portable powered hand tools • other specific tool 1.6 shape the materials using appropriate methods and techniques 1.7 cut/shape yacht or boat wooden components which combine different features and cover six of the following profiles: • flat faces • parallel faces • square faces • angular/tapered faces • rebates • curved profiles			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• concave profiles • convex profiles • circular/round profiles • chamfers and radii • drilled holes • mortise and tenon joints • scarph joints • halving joints • housing joints • mitres • slots/grooves • other joints (such as dovetail, combed) 1.8 cut/shape materials for four of the following yacht or boat components: • bulkhead(s) • bunks • furniture units with drawers • furniture units with doors • hull frames • keel/backbone • stem			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• moulds • horn timber • hull planks/strakes • deck beams • deck planks • transom • doors and door frames • mouldings (such as door frame) • ladders • steps • bulwarks • floors • stringers • carlins • cabin • coach roof • top boxes • helm consoles • navigational consoles • windows/ports • rudder			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• tiller • wheel • mast • hatch/hatch covers • engine/machinery bearers 1.9 cut/shape components made from one of the following materials: • hard woods • soft woods • manufactured boards 1.10 check that all the required shaping operations have been completed to the required specification 1.11 cut/shape yacht or boat wooden components which meet all of the following: • dimensionally accurate within specification tolerances • free from false tool cuts and material defects • interlocking components (joints) are secure • have an appropriate cosmetic finish • meet the drawing requirements • meet company and customer requirements 1.12 deal promptly and effectively with problems within their control and report those that cannot be solved			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
2 Know how to cut and shape wooden components for yachts and boats using hand tools	2.1 explain the specific safety precautions to be taken whilst using hand tools to cut and shape the yacht or boat wooden structural components (including any specific legislation, regulations or codes of practice relating to the activities, equipment or materials) 2.2 explain the health and safety requirements of the work area in which they are carrying out the woodworking activities, and the responsibility they place on them 2.3 explain what personal protective equipment and clothing needs to be worn during the woodworking activities 2.4 describe the hazards associated with cutting and shaping wood and manufactured board materials, and with the tools and equipment that is used, and explain how they can be minimised 2.5 explain the precautions to be observed in the handling and lifting of long lengths of timber and sheet materials 2.6 explain how to obtain the necessary job instructions required for the work being carried out 2.7 describe the various hand tools that are used to cut and shape the materials, and the range of operations they are capable of performing (such as rip saws, tenon saws, fret/bow/coping saws; smoothing planes, jack planes, rebating planes; chisels and gouges; spokeshaves)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.8 explain how to check that the cutting tools are in a usable and safe condition; and the procedure for sharpening and adjusting these when required 2.9 explain how to identify the wood to be used (to include type, colour, grain structure, size) 2.10 describe the common defects that occur in the wood to be used and the types of defects that would render the materials unfit for use 2.11 explain the importance of colour matching and grain convention when using wood and wood-based materials 2.12 describe the various methods used to hold the components that are being shaped, formed or dressed by hand 2.13 describe the approved methods of removing material to avoid damaging or distorting the finished components 2.14 describe the methods used to cut square, angular and circular/curved profiles 2.15 explain how to conduct any necessary checks to ensure the accuracy and quality of the components produced, and the type of equipment that is used 2.16 explain how to recognise defects in the components (which may be material defects or those produced through the cutting and shaping activities)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.17 explain why it is important to keep the tools and equipment clean and free from damage, to practice good housekeeping of tools and equipment, and to maintain a clean and unobstructed working area 2.18 describe the standards to be attained, and the company/customer quality control procedures 2.19 explain the recording documentation that needs to be completed for the activities undertaken and, where appropriate, the importance of marking and identifying specific pieces of work in relation to the documentation 2.20 describe the extent of their own responsibility and explain whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 106: Cutting and shaping wooden components for yachts and boats using machines

Unit reference number: Y/601/2619

Level: 2

Credit value: 28

Guided learning hours: 77

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to cut and shape wood and manufactured board components for yachts or boats using machine tools, in accordance with approved procedures. The production of the components will involve the use of both fixed and portable conventional machines, which are designed specifically for wood and composite materials. Learners will be required to interpret the drawings and work instructions, and to use the appropriate equipment, based on the type of operations to be performed and the size of the components to be produced. They will monitor the work produced and make any necessary adjustments during machining, in order that the parts produced meet the required specification. The components produced will cover structural components (such as hull frames, deck and hull planks, bulk heads, hatch covers, doors and windows/ports, spars, floors) and furniture or trim items (such as navigational and helm consoles, bunks, top boxes, storage boxes, ladders, steps, decorative mouldings, frames, cases, storage units, furniture and other structures).

Learners' responsibilities will require them to comply with organisational policy and procedures for the woodwork machining activities undertaken, and to report any problems with the machining activities, or with the tools, equipment and materials used, that they cannot personally resolve, or are outside their permitted authority, to the relevant people. They will need to complete all necessary job/task documentation accurately and legibly. Learners will work to instructions, with a minimum of supervision, and take personal responsibility for their own actions and for the quality and accuracy of the work that they carry out.

Learners' knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to the production of yacht or boat wooden components using woodwork machining procedures. They will have an understanding of the equipment being used, and its application, and will know about the tooling, machine setting/adjustment arrangements, and tool maintenance and safety devices in adequate depth to provide a sound basis for carrying out the activities to the required specification.

Learners will be able to identify blunt and damaged cutting tools, and will know when to replace them, in order for them to work efficiently.

Learners will understand the safety precautions required when carrying out the machining activities, especially those for using machine guards, and for isolating the equipment when adjusting or changing cutting tools. They will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Cut and shape wooden components for yachts and boats using machines	1.1 work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines 1.2 carry out all of the following during the wood machining activities: • obtain all the necessary information to carry out the machining activities (such as job instructions, drawings, specifications) • adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations • check that the machine and its cutting tools are in a safe and usable condition • ensure that the work area is free from hazards • ensure that all machine guards and safety devices are correctly positioned • check that dust extraction equipment is functioning correctly • set and adjust the machine to produce the components to the required specification • use safe and approved machining techniques at all times			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.3 use fixed and portable machines, to include four of the following: • circular saw • band saw • sander (eg face, belt, bobbin) • router • planer/thicknesser • morticer/tenoner • combing machine • lathe • spindle moulder (single or double) • bench or pedestal drill • other special purpose machine 1.4 confirm that the machine is set up and ready for the machining activities to be carried out 1.5 manipulate the machine tool controls safely and correctly in line with operational procedures 1.6 cut and shape components which combine different features and cover six of the following profiles: • flat faces • parallel faces • square faces			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• angular/tapered faces • stepped features • plain diameters • stepped diameters • tapers • slots/grooves • tenons • mortices • half lap joints • combed joints • dovetail joints • rebates • curved profiles • concave profiles • convex profiles • drilled holes 1.7 cut and shape materials for four of the following yacht or boat components: • bulkhead(s) • bunks • furniture units with drawers			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• furniture units with doors • hull frames • keel/backbone • stem • moulds • horn timber • hull planks/strakes • deck beams • deck planks • transom • doors and door frames • mouldings (such as door frame) • ladders • steps • bulwarks • floors • stringers • carlins • cabin • coach roof • top boxes			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• helm consoles • navigational consoles • windows/ports • rudder • tiller • wheel • mast • hatch/hatch covers • engine/machinery bearers 1.8 produce components made from one of the following materials: • soft woods • hard woods • manufactured board 1.9 carry out quality sampling checks at suitable intervals 1.10 produce components to the required quality and within the specified dimensional accuracy 1.11 cut/shape yacht or boat wooden components which meet all of the following: • dimensionally accurate within specification tolerances • free from false tool cuts and material defects			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• interlocking components (joints) are secure • have an appropriate cosmetic finish • meet the drawing or specification requirements • free from defects due to stress relief (twisting/warping) and excessive burrs • meet company and customer requirements 1.12 deal promptly and effectively with problems within their control and report those that cannot be solved 1.13 shut down the equipment to a safe condition on conclusion of the machining activities			
2 Know how to cut and shape wooden components for yachts and boats using machines	2.1 explain the safe working practices and procedures to be observed when cutting and shaping yacht or boat wooden components using woodworking machines (including working with machinery; the use of appropriate personal protective equipment; machine guards; operation of machine safety devices; stopping the machine in an emergency; closing the machine down on completion of activities; statutory requirements, risk assessment procedures and relevant requirements of HASAWA, COSHH, Work Equipment Regulations and Woodworking Regulations) 2.2 explain the health and safety requirements of the work area in which they are carrying out the machining activities, and the responsibility they place on them			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.3 explain the importance of checking that the machinery used is working correctly, and that the cutting tools are undamaged and are in a safe and sharp condition 2.4 explain how to set up and use dust extraction equipment, and the importance of ensuring that this equipment is operating correctly 2.5 explain what personal protective equipment and clothing needs to be worn during the wood machining activities 2.6 describe the hazards associated with machining wood and composite materials, and explain how they can be minimised 2.7 explain the importance of ensuring that all machines and portable tools are used correctly and within their permitted operating range 2.8 explain the need to ensure that all plugs, sockets and cables on portable machines are in a safe and usable condition 2.9 explain how to obtain the necessary job instructions required for the work being carried out 2.10 describe the various machines that are used in wood machining, and the range of operations they are capable of performing (such as sawing, planing, rebating, profiling)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.11 explain how to check that the cutting tools are in a usable and safe condition, and the procedure for changing and adjusting these when required 2.12 explain how different types of machines require different methods to feed the material to the cutting tool 2.13 describe the various methods used to hold/guide the components that are being cut and shaped 2.14 describe the methods used to cut square, angular and circular/curved profiles 2.15 explain what checks need to be carried out to ensure the accuracy and quality of the components produced, and the type of equipment that is used to carry out these checks 2.16 explain how to recognise defects in the components (which may be material defects or those produced through machining) 2.17 explain why it is important to keep the tools and equipment clean and free from damage, to practice good housekeeping of tools and equipment, and to maintain a clean and unobstructed working area 2.18 describe the quality standards to be attained, and the company/customer quality control procedures			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.19 explain the recording documentation that needs to be completed for the activities undertaken and, where appropriate, the importance of marking and identifying specific pieces of work in relation to the documentation 2.20 describe the extent of their own responsibility and explain whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 107: Assisting in the assembly of wooden furniture/outfitting units for yachts and boats

Unit reference number: L/601/2620

Level: 2

Credit value: 22

Guided learning hours: 56

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to assist in the assembly of wooden furniture/outfitting units for yachts or boats, using mechanical fixing devices and adhesives, in accordance with approved procedures. Assemblies produced will include such things as bunks, top boxes, furniture units, helm and navigational consoles and other similar outfitting units. Learners will be expected to use the appropriate tools and equipment, based on the operations to be performed and the types of component to be assembled. They will also be expected to align the components correctly, and to assemble them in the correct order, using the appropriate fixing devices and adhesives. Learners will need to identify and/or create any datums that will be required to locate the components during the assembly process.

The size, shape and complexity of the parts to be assembled and the finished workpiece will vary, and it is anticipated that some components will be sub-assembled prior to the final assembly taking place. The assembly activities will also include making all necessary visual and dimensional checks, to ensure that the assembly meets the required specification, that fasteners are securely tightened, and that the completed assembly is free from damage and has an appropriate cosmetic appearance.

Learners' responsibilities will require them to comply with organisational policy and procedures for the assembly activities undertaken, and to report any problems with the activities that they cannot personally resolve, or are outside their permitted authority, to the relevant people. They will be expected to work either with a high level of supervision or as a member of a team. Learners will take personal responsibility for their own actions and for the quality and accuracy of the work that they carry out. Where team working is involved, they must demonstrate a significant personal contribution during the team activities in order to satisfy the requirements of the standard, and competency in all the areas required by the standard must be demonstrated.

Learners' knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to the assembly of yacht or boat wooden furniture/outfitting units. They will have an understanding of the basic knowledge behind the equipment being assembled and its application, and will know about the assembly techniques, components, equipment, relevant materials, adhesives and fastening devices in adequate depth to provide a sound basis for carrying out the activities to the required specification.

Learners will understand the safety precautions required when carrying out the assembly operations, especially those involved in the use of adhesives. They will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Assist in the assembly of wooden furniture/ outfitting units for yachts and boats	1.1 work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines 1.2 carry out all of the following during the assembly of the yacht or boat wooden furniture/outfitting units: • ensure they have the necessary information to assist in the assembly activities (such as job instructions or drawings) • adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations • maintain safe access and working arrangements for the work area • use approved assembly techniques and procedures at all times • produce assemblies which comply with the specification • return all tools and equipment to the correct location on completion of the activities • leave the work area in a safe and tidy condition 1.3 follow the relevant instructions, assembly drawings and any other specifications 1.4 check that the specified components are available and that they are in a usable condition			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.5 use the appropriate methods and techniques to assemble the components in their correct positions 1.6 carry out all of the following during the assembly activities: • check that all components are free from damage before assembling them • use the correct 'hand' of component at the appropriate position (left or right handed) • ensure the correct orientation, position and alignment of the components • use cramps and clamps to hold the components during the assembly activities • secure the components using mechanical fasteners (such as pins, screws, nails, special fasteners) • secure components using prepared joints • secure components using adhesives • fit all required accessories (such as hinges, locks, handles, catches) 1.7 assist in the production of four of the following yacht or boat furniture/outfitting assemblies: • bunks • top boxes • bulkheads			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• helm consoles • navigational consoles • ladders • steps • furniture units without drawers and doors • doors and door frames • furniture units with drawers • furniture units with doors • other specific assemblies 1.8 secure the components using the specified connectors and securing devices 1.9 check the completed assembly to ensure that all operations have been completed and the finished assembly meets the required specification 1.10 assist in producing yacht or boat wooden furniture/outfitting assemblies which meet all of the following: • dimensionally and geometrically accurate within specification tolerances • free from defects (such as damage, excess adhesive) • interlocking components (joints) are secure • doors and drawers are correctly aligned and open freely (where applicable)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• meet the drawing or specification requirements • meet company and customer requirements 1.11 deal promptly and effectively with problems within their control and report those that cannot be solved			
2 Know how to assist in the assembly of wooden furniture/outfitting units for yachts and boats	2.1 explain the specific safety precautions to be taken whilst assisting in the woodwork assembly activities (including any specific legislation, regulations or codes of practice relating to the activities, equipment or materials) 2.2 explain the health and safety requirements of the work area in which they are carrying out the woodwork assembly activities, and the responsibility they place on them 2.3 explain what personal protective equipment and clothing needs to be worn during the woodwork assembly activities 2.4 describe the hazards associated with producing wood and manufactured board assemblies, and explain how they can be minimised 2.5 explain how to obtain the necessary job instructions required for the work being carried out 2.6 explain how to identify the components to be used, component identification systems (such as codes and component orientation indicators, left and right handing)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.7 describe the preparations to be undertaken on the components prior to fitting them into the assembly 2.8 describe the assembly methods and procedures to be used, and explain the importance of adhering to these procedures 2.9 explain the importance of assembling components in the correct order 2.10 explain how the components are to be aligned, oriented and positioned prior to securing them, and the tools and equipment that are used for this 2.11 explain why some types of assembly require the use of jigs and gauges to aid the assembly 2.12 describe the various mechanical fasteners that will be used to secure the components, and their method of installation (such as pins, nails, screws and special securing devices) 2.13 explain the application of adhesives within the assembly activities, and the precautions that must be taken when working with them 2.14 explain how to conduct any necessary checks to ensure the accuracy and quality of the assembly produced 2.15 explain how to recognise defects, blemishes, poor alignment, ineffective fasteners and damaged components within the assembly			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.16 explain how to check that the assembly tools and equipment to be used are in a safe and serviceable condition 2.17 explain why it is important to keep the tools and equipment clean and free from damage, to practice good housekeeping of tools and equipment, and to maintain a clean and unobstructed working area 2.18 describe the standards to be attained, and the company/customer quality control procedures 2.19 describe the extent of their own responsibility and explain whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 108: Assisting in the installation of wooden furniture/outfitting units in yachts and boats

Unit reference number: R/601/2621

Level: 2

Credit value: 28

Guided learning hours: 77

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to assist in the installation of wooden furniture/outfitting units into yachts or boats, in accordance with approved procedures. Learners will be required to use the appropriate tools and equipment, based on the operations to be performed and the furniture/outfitting units to be installed. The items to be installed will include doors and frames, built in storage units, top boxes, bunks, furniture units, helm and navigational consoles, and other similar outfitting items. The size, shape and complexity of the parts to be installed will vary, and it is anticipated that some parts will be trial-assembled prior to the installation taking place.

Learners will be required to use the appropriate or specified fixing methods and devices, based on the size and weight of the components and units being installed, and the materials to which the units are being fastened. They will also be expected to create or follow all necessary datums that are required to locate the units correctly during the installation activities The installation activities will include making all necessary checks and adjustments to ensure that the components and structures are correctly positioned and aligned and, where appropriate, that they function correctly.

Learners' responsibilities will require them to comply with organisational policy and procedures for the installation activities undertaken, and to report any problems with the activities that they cannot personally resolve, or are outside their permitted authority, to the relevant people. They will be expected to work either with a high level of supervision or as a member of a team. Learners will take personal responsibility for their own actions and for the quality and accuracy of the work that they carry out. Where team working is involved, they must demonstrate a significant personal contribution during the team activities in order to satisfy the requirements of the standard, and competency in all the areas required by the standard must be demonstrated.

Learners' knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to the installation of yacht or boat wooden furniture/outfitting units. They will have an understanding of the basic knowledge behind the items being installed and their application, and will know about the installation techniques, relevant fastening and securing devices in adequate depth to provide a sound basis for carrying out the activities to the required specification.

Learners will understand the safety precautions required when carrying out the installation operations, especially when working in confined spaces, and when using adhesives and sealing materials. They will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace, both ashore and afloat.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Assist in the installation of wooden furniture/outfitting units in yachts and boats	1.1 work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines 1.2 carry out all of the following during the installation of the yacht or boat wooden furniture/outfitting assemblies: • ensure they have the necessary information to assist with the installation activities (such as job instructions or drawings) • adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations • maintain safe access and working arrangements for the work area • use approved installation techniques and procedures at all times • produce installations which comply with the specification • return all tools and equipment to the correct location on completion of the activities • leave the work area in a safe and tidy condition			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.3 follow all relevant drawings and specifications for the installation being carried out 1.4 use the correct tools and equipment for the installation operations and check that they are in a safe and usable condition 1.5 use a range of tools and equipment during the installation, to include four of the following: • hand tools • portable power tools • measuring equipment • clamps/cramps • lifting and handling equipment • temporary fixing/supporting equipment 1.6 install, position and secure the equipment and components in accordance with the specification 1.7 assist in the installation of four of the following types of yacht or boat wooden furniture/outfitting units: • bulkheads • bunks • furniture units with drawers • furniture units with doors • doors and door frames			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• mouldings (such as door frame) • ladders • steps • top boxes • helm consoles • navigational consoles • other units (specify) 1.8 assist in the preparation of the vessel/craft to receive the sub-assemblies, to include carrying out both of the following: • checking level • determining sub-assembly datums 1.9 apply installation methods and techniques, to include all of the following: • positioning and aligning • levelling • applying sealants • drilling and securing • setting working clearance			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.10 assist in using two of the following methods to check the level and alignment of the units: • spirit level • laser light • water line • plumb line 1.11 use three of the following types of mechanical securing devices: • wood screws • adhesives • cavity fixing devices • nuts and bolts • special purpose or quick-release fasteners 1.12 assist in carrying out checks on the installed furniture/outfitting units to include all of the following: • dimensional accuracy is within specification/job requirements • installed structures are correctly aligned, level and secure • all moving parts operate correctly, without sticking • the installation has the appropriate cosmetic finish			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.13 assist in installing yacht or boat wooden furniture/outfitting which complies with one of the following: • BS or ISO standards and procedures • other accepted international standards • customer (contractual) standards and requirements • company standards and procedures • specific equipment requirements/manufacturer's data • recognised compliance agency/body's standards (such as Lloyds, Boat Safety Scheme, BMEA Code) 1.14 check that all necessary connections to the equipment are complete 1.15 deal promptly and effectively with problems within their control and report those that cannot be solved 1.16 check that the installation is complete and that all components are free from damage			
2 Know how to assist in the installation of wooden furniture/outfitting units in yachts and boats	2.1 explain the specific safety practices and procedures that they need to observe when assisting in the installation of yacht or boat wooden furniture/outfitting units (including any specific legislation, regulations/codes of practice for the activities, equipment or materials)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.2 describe the hazards associated with installing yacht or boat wooden furniture/outfitting assemblies, and with the tools and equipment used, and explain how they can be minimised 2.3 explain what protective equipment they need to use for both personal protection and protection of the units and craft 2.4 explain how to obtain the necessary job instructions required for the work being carried out 2.5 describe the tools and equipment used in the installation activities, and explain how to check that they are in a safe and usable condition 2.6 explain the need to check that all plugs, sockets and cables on extension leads are in a safe and undamaged condition 2.7 explain the terminology used for the furniture/outfitting units to be used 2.8 explain how to recognise the furniture/outfitting units and components and how to interpret the labelling 2.9 describe the methods and equipment to be used for lifting, handling, supporting and manoeuvring the units into their correct positions during the installation activities 2.10 describe the tools and equipment that can be used to set up and level the units and assemblies (such as spirit levels, plumb-bobs and laser levelling devices)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.11 describe the techniques used to position, align, adjust and secure the components to the required surfaces without causing damage to the vessel structure or surrounding areas 2.12 explain the importance of positional accuracy 2.13 describe the various types of fixing devices that are used to secure the structures to the required surfaces (such as wood screws, cavity fixing devices, adhesives and nuts and bolts) 2.14 explain the importance of using the correct fasteners for the particular installation 2.15 explain the use of sealants and adhesives, and the precautions to be taken when using them 2.16 explain what checks need to be carried out to ensure the integrity, functionality, accuracy and quality of the installation 2.17 explain how to recognise installation defects (such as misalignment, ineffective fasteners, damage or contamination) 2.18 describe the standards to be attained, and the company/customer quality control procedures 2.19 describe the extent of their own responsibility and explain whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 109: Assisting in the assembly of wooden structural components to produce yachts and boats

Unit reference number: Y/601/2622

Level: 2

Credit value: 40

Guided learning hours: 98

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to assist with the assembly of wooden structural components/timbers to produce yachts or boats, in accordance with approved procedures. Learners will be required to use the appropriate tools and equipment, based on the operations to be performed and the components or structural sub-assemblies to be installed. The size, shape and complexity of the parts to be assembled will vary, and it is anticipated that some parts will be trial-assembled prior to the final assembly taking place. The components being assembled will include such things as hull frames, keel/backbone, stem, bulk heads, hull and deck planks, transom, cabin/coach roof, rudder, tiller and wheel, mast, windows/ports, hatch covers and other similar structural components.

Learners will be required to use the appropriate or specified fixing methods and devices, based on the size and weight of the components and structures being assembled. They will also be expected to create or follow all necessary datums that are required to locate the units correctly during the assembly activities. The assembly activities will include making all necessary checks and adjustments to ensure that the components and structures are correctly positioned, aligned and secured.

Learners' responsibilities will require them to comply with organisational policy and procedures for the assembly activities undertaken, and to report any problems with the activities that they cannot personally resolve, or are outside their permitted authority, to the relevant people. They will be expected to work either with a high level of supervision or as a member of a team. Learners will take personal responsibility for their own actions and for the quality and accuracy of the work that they carry out. Where team working is involved, they must demonstrate a significant personal contribution during the team activities in order to satisfy the requirements of the standard, and competency in all the areas required by the standard must be demonstrated.

Learners' knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to applying appropriate boat-building techniques and procedures to wooden yachts or boats. They will have an understanding of the basic knowledge behind the items being assembled, and will know about the assembly techniques, relevant fastening and securing devices in adequate depth to provide a sound basis for carrying out the activities to the required specification.

Learners will understand the safety precautions required when carrying out the assembly operations, especially when working in confined spaces, and when using adhesives and sealing materials. They will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace, both ashore and afloat.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Assist in the assembly of wooden structural components to produce yachts and boats	1.1 work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines 1.2 carry out all of the following during the yacht or boat-building activities: • ensure they have the necessary information to assist with the assembly activities (such as job instructions or drawings) • adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations • maintain safe access and working arrangements for the work area • use approved assembly techniques and procedures at all times • produce assemblies which comply with the specification • return all tools and equipment to the correct location on completion of the activities • leave the work area in a safe and tidy condition 1.3 follow the relevant instructions, assembly drawings and any other specifications 1.4 check that the specified components are available and that they are in a usable condition			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.5 use the appropriate methods and techniques to assemble the components in their correct positions 1.6 assist in the assembly/installation of six of the following yacht or boat wooden structural components: • hull frames • keel/backbone • stem • moulds • horn timber • hull planks/strakes • deck beams • deck planks • transom • bulkhead • bulwarks • floors • stringers • carlins • cabin • coach roof • windows/ports			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• rudder • tiller • wheel • mast • hatch/hatch covers • engine/machinery bearers 1.7 assist in carrying out three of the following wooden yacht or boat-building activities: • constructing and erecting backbone and moulds for planking • assembling, fitting and fastening side frames • assembling and fitting keel and stem • assembling hull and deck structures • timbering out • setting out shift of butts for fitting of planking • assembling and fitting planking with allowances for caulking seams • assembling and fitting floors and cargo hold linings			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.8 assist in applying six of the following boat building assembly/installation methods and techniques: • determining sub-assembly datums • ensuring that correct and undamaged components are used • ensuring that the correct 'hand' of component is used at the appropriate position (left or right handed) • ensuring the correct orientation, position and alignment of components • ensuring assemblies are correctly horned and braced • using cramps and clamps to hold the components during the assembly activities • drilling holes • securing components using correct/appropriate fastenings (such as screws, nails, nuts and bolts, pins/dowels) • caulking all seams • planning down and sanding/fairing all seams and butts • applying appropriate compounds to seal all seams			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.9 use a range of tools and equipment during the boat building activities, to include four of the following: • hand tools • portable power tools • measuring equipment • levelling and alignment equipment • bracing equipment • clamps/cramps • lifting and handling equipment • temporary fixing/supporting equipment • jacks or wedges • other specific equipment 1.10 assist in using two of the following methods to check the level and alignment of the components and structures: • spirit level • laser light • water line • plumb line 1.11 secure the components using the specified connectors and securing devices			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.12 check the completed assembly to ensure that all operations have been completed and the finished assembly meets the required specification 1.13 assist in carrying out checks on the build to include four of the following: • dimensional accuracy is within specification/job requirements • installed structures are correctly aligned, level and secure • shape of the frame/hull is to the templates • all plank fastenings line up with frames or beams • the specified type and quantity of fastenings are used, and they are correctly spaced out • scarphs and joins are fitted with no gap in the interface • seams and butts are evenly caulked, watertight with no internal splitting • the overall cosmetic appearance is to specification			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.14 assist in building wooden yachts or boats in compliance with one of the following: • BS or ISO standards and procedures • other accepted international standards • customer (contractual) standards and requirements • company standards and procedures • recognised compliance agency/body's standards (such as Lloyds, Boat Safety Scheme, BMEA Code) 1.15 deal promptly and effectively with problems within their control and report those that cannot be solved			
2 Know how to assist in the assembly of wooden structural components to produce yachts and boats	2.1 explain the specific safety practices and procedures that they need to observe when assisting in the building of wooden yachts or boats (including any specific legislation, regulations/codes of practice for the activities, equipment or materials) 2.2 explain the health and safety requirements of the work area where they are carrying out the boat building activities, and the responsibility they place on them 2.3 describe the hazards associated with building wooden yachts or boats, and with the tools and equipment used, and explain how they can be minimised			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.4 explain what protective equipment they need to use for both personal protection and protection of the structural units and craft 2.5 explain how to obtain the necessary job instructions required for the work being carried out 2.6 explain the terminology used for the structural components and sub-assemblies 2.7 explain how to recognise the sub-assemblies and components and how to interpret the labelling 2.8 describe the tools and equipment used in the assembly/installation activities, and explain how to check that they are in a safe and usable condition 2.9 explain the need to check that all plugs, sockets and cables on extension leads are in a safe and undamaged condition 2.10 describe the methods of erecting the yacht or boat backbone and aligning the keel and stem into the hull to ensure a straight line 2.11 describe the methods of supporting and bracing the backbone and other assemblies as the build progresses 2.12 describe the types of joints and connections between frames, planks and keel or stem			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.13 describe the methods and equipment to be used for lifting, handling, supporting and manoeuvring the structural components/sub-assemblies into their correct positions during the building activities 2.14 describe the methods and types of fastenings used to fix frames and other structural components, hull and deck planking, floors and cargo hold linings into the vessel (including wood screws, nails, nuts and bolts and adhesives) 2.15 describe the tools and equipment that can be used to set up and level the structural components and assemblies (such as spirit levels, plumb-bobs, water gauges and laser levelling devices) 2.16 describe the techniques used to position, align, adjust and secure the components to the required surfaces without causing damage to the vessel structure or surrounding areas 2.17 explain the importance of positional accuracy of all components 2.18 explain the use of sealants and adhesives, and the precautions to be taken when using them 2.19 explain what checks need to be carried out to ensure the integrity, functionality, accuracy and quality of the build 2.20 explain how to recognise build defects (such as misalignment, inappropriate gaps in planking, ineffective fasteners, damage or contamination)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.21 describe the extent of their own responsibility and explain whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 110: Applying surface finishes to yacht and boat wooden assemblies

Unit reference number: D/601/2623

Level: 2

Credit value: 25

Guided learning hours: 70

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to apply surface finishes to yacht or boat wooden assemblies or installations by hand methods, in accordance with approved procedures. Learners will be required to select the appropriate equipment to use, based on the materials to be applied and the surface area to be covered. They will be expected to use the specified or appropriate techniques to seal, prime, colour, varnish, stain, wax or polish the various parts, using brushes, rollers, pads or cloths, as applicable to the task.

Learners' responsibilities will require them to comply with organisational policy and procedures for the surface finishing activities undertaken, and to report any problems with the treatment activities, components or equipment that they cannot personally resolve, or are outside their permitted authority, to the relevant people. They will be expected to work to instructions, with a minimum of supervision, taking personal responsibility for their own actions and the quality and accuracy of the work that they carry out.

Learners' knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to applying hand surface finishing techniques and procedures to yacht or boat woodwork assemblies or installations. They will have an understanding of the surface finishing procedures used and their application, and will know about the surface finishing techniques, paints or coatings and equipment used in adequate depth to provide a sound basis for carrying out the activities, and ensuring the work is carried out to the required quality.

Learners will understand the safety precautions required when carrying out the surface finishing operations. They will be required to demonstrate safe working practices throughout and will understand the responsibility they owe to themselves and others in the workplace, both ashore and afloat.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Apply surface finishes to yacht and boat wooden assemblies	1.1 work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines 1.2 carry out all of the following during the surface finishing of the yacht or boat wooden assemblies or installations: • obtain and follow the relevant job instructions and surface treatment specifications • adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations • prepare the tools and materials in readiness for the surface treatment operations • wear suitable protective clothing and, where appropriate, breathing apparatus • clean and return all tools and equipment to the correct location on completion of the surface treatment activities • leave the work area in a safe and tidy condition 1.3 prepare the work surfaces in readiness to receive the appropriate surface finish			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.4 prepare to carry out the surface finishing operations by carrying out three of the following activities: • cleaning • flattening down • sealing • masking • pre-surface treatments • mixing of colour • mixing primers • stripping old finishes • re-activating treatments 1.5 use three of the following consumables: • masking medium/tape • rubbing paper • abrasive pads • cleaning materials 1.6 prepare the required finishing materials for use 1.7 apply the finishes to the surfaces using appropriate techniques and procedures			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.8 apply surface finishes to four of the following yacht or boat wooden furniture/outfitting units: • bulkheads • bulwarks • bunks • furniture units • doors and door frames • mouldings (such as door frame) • ladders • steps • masts and spars • structural components • top boxes • helm consoles • decks • navigational consoles • other items (specify)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.9 apply four types of the following finishing materials, using appropriate hand tools and techniques: • sanding sealer • water-based paints • oil/alkyd based paints • synthetic paints • polyurethane varnish • lacquer • stain • wax • french polish • temporary protective coatings • other special finishes (specify) 1.10 apply surface finishes to a range of surfaces, to include three of the following: • flat • horizontal • vertical • overhead • curved or cylindrical 1.11 check the finished surface achieves the required characteristics and meets the finishing specification			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.12 apply surface finishes to yacht or boat wooden assemblies or installations which comply with all of the following: • the final finish is in line with specification or job requirements • the final finish achieves acceptable colour match and where applicable, gloss levels • the finished surface is free from surface defects (such as runs, drips, dust or brush marks) • the finished surface meets customer/company requirements 1.13 deal promptly and effectively with problems within their control and seek help and guidance from the relevant people when they have problems they cannot resolve 1.14 dispose of waste material safely and correctly in line with organisational procedures 1.15 leave the work area in a safe condition on completion of the finishing activities			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
2 Know how to apply surface finishes to yacht and boat wooden assemblies	2.1 explain the specific health and safety precautions which must be taken when preparing surfaces and applying surface treatments to yacht or boat wooden assemblies or installations (such as wearing protective clothing and protective equipment, using fume and dust extraction equipment) 2.2 explain the health and safety requirements of the work area in which they are carrying out the surface treatment activity, and the responsibility they place on them 2.3 describe the hazards associated with preparing surfaces and applying surface treatments in a boat building environment (such as using chemicals for cleaning activities, dust and fume inhalation; including the information to be found in manufacturers' data sheets) and explain how they can be minimised 2.4 explain what personal protective equipment (PPE) should be used during the surface treatment activity, how to obtain it and check that it is in a safe and usable condition (such as eye protection, overalls, face masks, breathing equipment) 2.5 explain the requirements for working in confined spaces and safe systems of work (including Required Air Quantities (RAQs) and local exhaust ventilation (LEV)) to maintain safe conditions; the provision of adequate and safe lighting and avoidance of sources of ignition)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.5 explain the requirements for working in confined spaces and safe systems of work (including Required Air Quantities (RAQs) and local exhaust ventilation (LEV)) to maintain safe conditions; the provision of adequate and safe lighting and avoidance of sources of ignition) 2.6 explain how to obtain the necessary job instructions required for the work being carried out 2.7 describe the surface preparation methods and techniques to be undertaken prior to applying the treatments (such as carrying out repairs to the surface or making good any damaged or defective surfaces; filling and flatting down; masking surfaces to prevent overspill/spray) 2.8 describe the specific surface treatments to be used (such as paints, polyurethane varnish, lacquer, stain, wax polish) 2.9 describe the preparation methods and techniques for mixing paints, varnishes, lacquers, stains and polishes 2.10 describe the various methods of applying the required treatments using brushes, rollers, paint pads, cloths and sprays 2.11 explain the time intervals that are required between coats, and why these must be adhered to			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.12 describe the cleaning and maintenance procedures for the tools and equipment that are used (such as brushes, rollers, containers, spray guns) 2.13 describe the procedures for dealing with used consumables and surplus finishing materials safely and correctly 2.14 explain how to check and assess the finished work (such as for appearance, colour, coating, thickness, coverage) 2.15 explain how to recognise surface defects (such as bubbles, contamination, runs, dust and orange peel) 2.16 describe the standards to be attained, and the company/customer quality control procedures 2.17 describe the extent of their own responsibility and explain whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 111: Fitting seating, interior panels, soft furnishing and trim in yachts and boats

Unit reference number: K/601/2625

Level: 2

Credit value: 28

Guided learning hours: 77

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to fit seating, interior panels, soft furnishings and trim in yachts or boats, in accordance with approved procedures. Learners will be required to use the appropriate tools and equipment, based on the operations to be performed and components to be fitted. The items to be fitted will include things such as cabin seating, wheel house seats, deck seating, deckhead panels, bulkhead panels, dado panels, trim, carpets, vinyl floors, blinds, curtains, decorative panels and seat covers. The fitting activities will include making all necessary checks and adjustments to ensure that the seating, panels, soft furnishings and trim are correctly positioned, aligned and secured, their cosmetic appearance is acceptable and that they function as per the specification.

Learners' responsibilities will require them to comply with organisational policy and procedures for the fitting of the seating, panels and soft furnishing, and to report any problems with the fitting activities, materials or equipment used, that they cannot personally resolve, or are outside their permitted authority, to the relevant people. They will be expected to work either with a high level of supervision or as a member of a team. Learners will take personal responsibility for their own actions and for the quality and accuracy of the work that they carry out. Where team working is involved, they must demonstrate a significant personal contribution during the team activities in order to satisfy the requirements of the standard, and competency in all the areas required by the standard must be demonstrated.

Learners' knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to applying appropriate fitting techniques and procedures for seating, interior panels, soft furnishings and trim in yachts or boats. They will have an understanding of the seating and furnishings being fitted, and will know about the relevant fastening and securing devices, in adequate depth to provide a sound basis for carrying out the activities to the required specification.

Learners will understand the safety precautions required when carrying out the fitting of the seating and furnishings. They will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace, both ashore and afloat.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Fit seating, interior panels, soft furnishing and trim in yachts and boats	1.1 work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines 1.2 carry out all of the following during the fitting of the yacht or boat seating, interior panels and trim: • ensure they have the necessary information to carry out the fitting of the seating and furnishings (such as job instructions) • adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations • maintain safe access and working arrangements for the work area • carry out the fitting activities using appropriate techniques and procedures • produce installations which comply with the specification • return all tools and equipment to the correct location on completion of the activities • leave the work area in a safe and tidy condition			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.3 follow all relevant drawings and specifications for the installation being carried out 1.4 use the correct tools and equipment for the installation operations and check that they are in a safe and usable condition 1.5 install, position and secure the equipment and components in accordance with the specification 1.6 fit three of the following yacht or boat items of equipment: • seating (such as cabin, deck, wheel house) • panels (such as deckhead, dado, bulkhead, decorative) • bunks or beds • hard trim • carpets vinyl floors • blinds/curtains • seat covers • other specific interior trim			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.7 apply three of the following fitting methods and techniques: • positioning • aligning • securing • setting and adjusting • carrying out functional checks 1.8 use four of the following types of fixing techniques: • nuts and bolts • torque load bolts • locking devices • cavity fixing devices • screws • quick-release fasteners • Velcro • adhesives (such as tapes, heat gun, spray) • carpet fixings (such as gripers, trim, adhesive) 1.9 check that all necessary connections to the equipment are complete 1.10 deal promptly and effectively with problems within their control and report those that cannot be solved			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.11 check that the installation is complete and that all components are free from damage 1.12 carry out all of the following quality and accuracy checks during the fitting activities: • cosmetic appearance • accuracy of installation/furnishing lines • freedom from damage 1.13 fit seating, interior panels and soft furnishing/trim in yachts or boats in compliance with one of the following: • BS or ISO standards and procedures • other accepted international standards • customer (contractual) standards and requirements • company standards and procedures • recognised compliance agency/body's standards (such as Lloyds, Boat Safety Scheme, BMEA			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.14 complete the relevant paperwork, to include one from the following, and pass to the appropriate people: • build records • quality/acceptance documentation • craft/vessel log • job cards • work authorisation documents			
2 Know how to fit seating, interior panels, soft furnishing and trim in yachts and boats	2.1 explain the specific safety practices and procedures that they need to observe when fitting seating, interior panels, soft furnishing and trim in yachts or boats (including any specific legislation, regulations/codes of practice for the activities, equipment or materials) 2.2 describe the hazards associated with fitting seating, interior panels, soft furnishing and trim, and with the tools and equipment used, and explain how they can be minimised 2.3 explain what protective equipment they need to use for both personal protection and protection of the equipment, vessel or craft 2.4 explain how to obtain the necessary job instructions required for the work being carried out 2.5 explain the terminology used for the seating and furnishings to be fitted			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.6 explain how to recognise the seating, panels, furnishings and trim components to be fitted, and how to interpret the labelling 2.7 describe the various fasteners that will be used, and their method of installation (including threaded fasteners and special securing devices) 2.8 explain the importance of using the specified fasteners for the particular installation, and why they must not substitute others 2.9 describe the methods and techniques used for joining different types of soft furnishings 2.10 describe the quality control procedures to be followed during the installation operations 2.11 explain the procedures for ensuring that they have the correct tools, equipment, components and fasteners for the activities 2.12 describe the techniques used to position, align, adjust and secure the seating, interior panels, trim and soft furnishings to the craft/vessel without damage 2.13 describe the methods of lifting, handling and supporting the seats or interior panels during the fitting activities 2.14 explain the use of seals, sealant and adhesives, and the precautions that need to be taken			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.15 describe the checks that need to be carried out to ensure the system integrity, functionality, accuracy and quality of the fitted items 2.16 explain how to recognise fitting defects (such as cosmetic appearance, poor fitting, misalignment, ineffective fasteners, damage or contamination) 2.17 describe the tools and equipment used in the installation activities, and explain their care and control procedures 2.18 describe the problems that can occur with the fitting operations, and explain how these can be overcome 2.19 explain what recording documentation needs to be completed for the activities undertaken 2.20 describe the procedure for the safe disposal of waste materials 2.21 describe the extent of their own responsibility and explain whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 112: Carrying out repairs to yacht and boat wooden components and assemblies

Unit reference number: M/601/2626

Level: 2

Credit value: 40

Guided learning hours: 77

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to carry out repairs to yacht or boat wooden components, in accordance with approved procedures. Learners will be required to repair a range of yacht or boat wood components and assemblies. This will include carrying out activities such as cutting out and removing defective/damaged parts, manufacturing new parts, replacing the new parts and reworking the surface finish. Learners will be required to use the appropriate equipment, based on the nature of the repair required, the operations that will need to be carried out and the accuracy required. Repair activities will cover structural components (such as deck and hull planks, hatch covers, doors and windows/ports, spars, floors) and furniture or trim items (such as navigational and helm consoles, bunks, top boxes, storage boxes, ladders, steps, decorative mouldings).

In repairing the components, learners will be expected to use a range of hand tools, machine tools, portable power tools, and shaping and fitting techniques, appropriate to the type of material and repair being performed. These activities will include such things as sawing (hand, machine), drilling/bracing, planing (hand or machine), routing, sanding and mortising and tenoning. Materials to be used will include soft woods, hard woods and manufactured boards.

Learners' responsibilities will require them to comply with organisational policy and procedures for the repair activities undertaken, and to report any problems with the repair activities, materials or equipment used, that they cannot personally resolve, or are outside their permitted authority, to the relevant people. They will be expected to work either with a high level of supervision or as a member of a team. Learners will take personal responsibility for their own actions and for the quality and accuracy of the work that they carry out. Where team working is involved, they must demonstrate a significant personal contribution during the team activities in order to satisfy the requirements of the standard, and competency in all the areas required by the standard must be demonstrated.

Learners' knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to applying specified repair techniques and procedures to yacht or boat wooden components and assemblies. They will understand the function and operating conditions of the components being repaired in sufficient depth to ensure the repairs carried out are safe and practical in operation.

Learners will understand the safety precautions required when carrying out the repair activities, especially those for using portable power-operated tools and woodworking machine equipment. They will be required to demonstrate safe working practices throughout, and will understand their responsibility for taking the necessary safeguards to protect themselves and others in the workplace, both ashore and afloat.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Carry out repairs to yacht and boat wooden components and assemblies	1.1 work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines 1.2 carry out all of the following during the repair of the yacht or boat wooden components: • ensure they have the necessary information to carry out the repair activities (such as job instructions) • adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations • maintain safe access and working arrangements for the work area • carry out the repair activities using appropriate techniques and procedures • produce repairs which comply with the specification • return all tools and equipment to the correct location on completion of the repair activities • leave the work area in a safe and tidy condition 1.3 follow the relevant specifications for the component to be repaired 1.4 prepare the component for repair			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.5 carry out the repairs within agreed timescale using approved materials and components and methods and procedures 1.6 carry out repairs to four of the following types of yacht or boat wooden components: • bulkhead(s) • bunks • furniture units • hull frames • hull planks/strakes • deck beams • deck planks • transom • carlins • doors and door frames • mouldings (such as door frame) • ladders/steps • bulwarks • floors • stringers • cabin • coach roof			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• top boxes • helm consoles • navigational consoles • windows/ports • rudder • tiller • wheel • spars • hatch/hatch covers • engine/machinery bearers 1.7 use a range of methods and techniques to repair the components, to include four of the following: • sawing (by hand or machine) • drilling (by hand or machine) • sanding (by hand or machine) • planing (by hand, machine) • spoke shaving • routing • carving/shaping • chiselling • turning • other specific method			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• jointing (such as mortice and tenon, scarph, housing and halving, mitres) 1.8 repair components which combine different features and cover six of the following: • flat faces • parallel faces • square faces • angular/tapered faces • rebates • curved profiles • concave profiles • convex profiles • circular/round profiles • chamfers and radii • slots/grooves • drilled holes • tenons • mortices • scarph joints • halving joints • housing joints • other joints (such as dovetail, combed)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.9 repair components made from different types of material, to include one of the following: • soft woods • hard woods • manufactured boards 1.10 check that the repaired component meets the specified operating conditions 1.11 carry out checks and ensure the completed repair meets all of the following: • dimensionally accurate within job requirements • free from false tool cuts and material defects • interlocking components (joints) are secure • has an appropriate cosmetic finish 1.12 repair yacht or boat wooden components which complies with one of the following: • BS or ISO standards and procedures • other accepted international standards • customer (contractual) standards and requirements • company standards and procedures • specific equipment requirements/manufacturer's data			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• recognised compliance agency/body's standards (such as Lloyds, Boat Safety Scheme, BMEA Code) 1.13 produce accurate and complete records of all repair work carried out 1.14 complete the relevant paperwork, to include one from the following, and pass it to the appropriate people: • work authorisation documents • acceptance documentation • craft/vessel log • job cards			
2 Know how to carry out repairs to yacht and boat wooden components and assemblies	2.1 explain the safe working practices and procedures to be observed when repairing yacht or boat wooden components (including working with machinery; statutory requirements, risk assessment procedures and relevant requirements of HASAWA, COSHH, Work Equipment Regulations and Woodworking Regulations) 2.2 explain the health and safety requirements of the work area in which they are carrying out the repair activities, and the responsibility they place on them 2.3 explain what personal protective equipment and clothing needs to be worn during the repairing activities			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.4 describe the hazards associated with carrying out repairs to yacht or boat wooden components (such as working in confined spaces using power-operated equipment), and explain how they can be minimised 2.5 explain the importance of checking that the machinery used is working correctly, and that the cutting tools are undamaged and are in a safe and sharp condition 2.6 explain how to obtain the necessary job instructions required for the work being carried out 2.7 describe the types of repair that can be made to the various components in order to prolong their useful life (such as splicing in new wood or replacing sections of damaged wood) 2.8 explain the need to liaise with other departments in order to have specialised operations carried out on the craft/vessel (such as removal of electrical/electronic equipment, disconnection of supplies such as gas) 2.9 describe the types and application of portable power tools that can be used for the repair operations 2.10 explain how to check that portable power tools and extension cables are in a safe usable condition			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.11 explain the importance of ensuring that all machine and portable tools are used correctly and within their permitted operating range 2.12 explain how to set up and use dust extraction equipment, and the importance of ensuring that this equipment is operating correctly 2.13 explain how to check that the cutting tools are in a usable and safe condition, and the procedure for changing, sharpening and adjusting these when required 2.14 describe the methods used to cut and shape a range of shapes/profiles (such as square, angular, circular/curved profiles, mortice and tennon joints and halving, housing, scarph and mitred joints) 2.15 explain why it is important to keep the tools and equipment clean and free from damage, to practice good housekeeping of tools and equipment, and to maintain a clean and unobstructed working area 2.16 explain what recording documentation needs to be completed for the repair activities undertaken and, where appropriate, the importance of marking and identifying specific pieces of work in relation to the documentation 2.17 describe the extent of their own responsibility and explain whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 113: Carrying out repairs to yacht and boat composite components

Unit reference number: T/601/2627

Level: 2

Credit value: 40

Guided learning hours: 98

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to carry out repairs to composite components fitted to yachts or boats, in accordance with approved procedures. Learners will be required to obtain all necessary documentation relating to the repair, to obtain the tools and equipment required for the repair operations, and to check that they are in a safe and usable condition. In carrying out the repair, learners will be required to follow company procedures and specified repair techniques. They will repair a range of composite components such as craft/vessel structural components and ancillary components such as panels and covers. This will require the use of a range of resin and fibre materials and appropriate repair techniques.

Learners' responsibilities will require them to comply with organisational policy and procedures for the repair activities undertaken, and to report any problems with the repair activities, materials or equipment used that they cannot personally resolve, or are outside their permitted authority, to the relevant people. They will be expected to work either with a high level of supervision or as a member of a team. Learners will take personal responsibility for their own actions and for the quality and accuracy of the work that they carry out. Where team working is involved, they must demonstrate a significant personal contribution during the team activities in order to satisfy the requirements of the standard, and competency in all the areas required by the standard must be demonstrated.

Learners' knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to applying specified repair techniques and procedures to yacht or boat composite components and assemblies. They will understand the repair techniques used, and their application, in adequate depth to provide a sound basis for carrying out the activities to the required specification.

Learners will understand the safety precautions required when carrying out the repair activities, and when using the associated tools and equipment. They will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace, both ashore and afloat.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Carry out repairs to yacht and boat composite components	1.1 work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines 1.2 carry out all of the following during the repair of the yacht or boat composite components: • ensure they have the necessary information to carry out the repair activities (such as job instructions) • adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations • maintain safe access and working arrangements for the work area • carry out the repair activities using appropriate techniques and procedures • produce repairs which comply with the specification • return all tools and equipment to the correct location on completion of the repair activities • leave the work area in a safe and tidy condition			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.3 follow the relevant specifications for the component to be repaired 1.4 carry out all of the following when preparing for the repair activity: • identify what needs to be repaired • determine the extent of the damage to be repaired • identify the method of repair to be used • obtain the correct equipment for the activity • check that the equipment is suitable for use • check the availability of ancillary materials required • identify and protect the repair materials in the work area 1.5 prepare the component for repair 1.6 carry out the repairs within agreed timescale using approved materials and components and methods and procedures 1.7 carry out repairs to three of the following yacht or boat composite components: • hull • cabins or wheel houses • rudders • radar/navigational domes			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• steering equipment (such as wheel, tiller) • consoles (such as navigational or helm) • casings and covers • vanity units • superstructure • masts and spars • bulkhead • berths • air intakes/vents • fairings • hatches • shower units • skegs • tanks • davits • seats • other specific components			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.8 repair defects in composite mouldings, using three of the following methods: • localised curing • fettling • surface filling • colour matching • relieving distortion • separation of bonds • bonding • polishing • resin injection • wet-lay patching • pre-preg patching • osmosis • core patching • insert/core potting • repair patches/kits • laminating			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.9 repair defects, using techniques/materials applicable to both of the following: • resins (such as polyester, vinyl ester, epoxy, phenolic, bismaleimide, cyanate ester, acrylic) • fibres (such as polyethylene, glass, aramid, carbon, hybrid materials) 1.10 repair four of the following types of defect in yacht or boat composite components: • holes • fractures • gouges • damaged surface finish • distortion • fire damage • blisters • de-lamination • broken fibres • water ingress • voids • disbonds • dents or 'dings' • damaged cores • wrong inserts			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• insert positions • impact damage • abrasion/erosion 1.11 check that the repaired component meets the specified operating conditions 1.12 repair yacht or boat composite components which comply with one of the following: • BS or ISO standards and procedures • other accepted international standards • customer (contractual) standards and requirements • company standards and procedures • specific equipment requirements/manufacturer's data • recognised compliance agency/body's standards (such as Lloyds, Boat Safety Scheme, BMEA Code) 1.13 produce accurate and complete records of all repair work carried out			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
2 Know how to carry out repairs to yacht and boat composite components	2.1 explain the 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 2.2 describe the hazards associated with using composite materials, consumables, tools and equipment, and explain how to minimise these in the work area 2.3 explain what protective equipment (PPE) is needed for personal protection and, where required, the protection of others 2.4 explain the application of COSHH regulations in relation to the storage, use and disposal of composite materials and consumables 2.5 explain the specific workshop environmental conditions the must be observed when repairing yacht or boat composite components (such as temperature, humidity, styrene levels to threshold limits, fume/dust extraction systems and equipment) 2.6 explain the requirements for working in confined spaces including an understanding of the importance of emergency procedures and safe systems of work including permits to work, Required Air Quantities (RAQs) and local exhaust ventilation (LEV) to maintain safe conditions, the provision of adequate and safe lighting and avoidance of sources of ignition			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.7 explain how to obtain the necessary job instructions required for the work being carried out 2.8 explain the conventions and terminology used when repairing composite mouldings (such as disbonds, de-lamination, resin injection, resin voids, core potting, repair patches) 2.9 describe the different types of composite resin systems, fibres and reinforcements, and the repair techniques that can be used 2.10 describe the different forms of damage or defect that can occur in the composite components, and explain how this affects the type of repair selected 2.11 describe the methods of cleaning and preparing the components in readiness for the repair 2.12 explain the importance of ensuring that the repair conforms to the repair specification 2.13 describe the various bonding agents and methods used 2.14 describe the correct methods of storage and handling of composite materials 2.15 describe the tools and equipment used for the various activities associated with repairing composite mouldings 2.16 describe the extent of their own responsibility and explain whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 114: Preparing yacht and boat surfaces for painting/finishing

Unit reference number: A/601/2628

Level: 2

Credit value: 10

Guided learning hours: 42

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to prepare a range of yacht or boat substrates (such as wood, composite, metal) to enable painting/finishing systems to be applied to the substrates, in accordance with approved procedures. Learners will be required to carry out preparation on a variety of substrates, using both hand and mechanical tools, including the use of chemical paint strippers where required. The process will also include degreasing using solvents, and cleaning the surface prior to the application of the coatings.

Learners' responsibilities will require them to comply with organisational policy and procedures for the preparation activities undertaken, and to report any problems with the preparation activities, materials or equipment used, that they cannot personally resolve, or are outside their permitted authority, to the relevant people. They will be expected to work either with a high level of supervision or as a member of a team. Learners will take personal responsibility for their own actions and for the quality and accuracy of the work that they carry out. Where team working is involved, learners must demonstrate a significant personal contribution during the team activities in order to satisfy the requirements of the standard, and competency in all the areas required by the standard must be demonstrated.

Learners' knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to applying specified preparation procedures to yacht or boat component surfaces. They will have an understanding of the preparation procedures, their application, and relevant standards in adequate depth to provide a sound basis for carrying out the activities to the required specification.

Learners will understand the safety precautions required when carrying out the preparatory operations. They will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace, both ashore and afloat.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Prepare yacht and boat surfaces for painting/finishing	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the preparation activities: • ensure they have the necessary information to carry out the preparation activities (such as job instructions) • adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations • confirm that all necessary husbandry and containment arrangements are in place, and are adequate • maintain safe access and working arrangements for the work area • carry out the preparation activities using appropriate techniques and procedures • prepare surfaces which comply with the specification • leave the work area in a safe and tidy condition 1.3 obtain and follow relevant instructions, standards and other specifications 1.4 identify the conditions of the surface to be prepared			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.5 carry out preparation activities on yacht or boat surfaces, to include both of the following: • unpainted surfaces • painted surfaces 1.6 carry out preparation activities on two of the following types of substrate: • wood • composite materials • non-ferrous metals • ferrous metals • other materials (such as ceramic, compliant rubber/polymer, plastics) 1.7 visually inspect surfaces, and identify defects and preparation requirements for three of the following conditions: • surface contamination • coating detachment • damaged or defective deck screed/covering • surface corrosion • coating cure • paint coating defects (such as cracking/crazing, flaking, blistering, cissing, chalking, pinholing, wrinkling)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.8 select the appropriate tools and equipment and check that they are in a safe and usable condition 1.9 carry out the preparation activities using appropriate tools and techniques 1.10 prepare the surfaces using tools and techniques appropriate to the substrate, to include using four of the following: • degreasing solvents • chemical paint remover • hand abrasives • brushes or vacuum cleaner • hand tools • power wire brush • power discing • fresh water (alone or with detergent) • low-pressure water cleaning • high-pressure water cleaning 1.11 carry out the preparation activities in three of the following situations: • internal spaces • covered exteriors • exposed exteriors • weather decks			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• outer bottoms • hull bottoms • at height • confined spaces (such as tanks, voids, double bottoms) 1.12 carry out the preparation activities in two of the following boatyard environments: • ashore • outside environment • afloat • workshop 1.13 carry out surface preparations on yacht or boat components, in accordance with one of the following: • BS or ISO standards and procedures • other accepted international standards • customer (contractual) standards and requirements • company standards and procedures • specific equipment requirements/manufacturer's data • recognised compliance agency/body's standards (such as Lloyds, Boat Safety Scheme, BMEA Code)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.14 check the prepared surface to ensure that it meets the required specification 1.15 use three of the following methods to check that the prepared surfaces meet the specified standards: • visual examination • press tape • swabs • surface profile comparators • adhesion test • acid test 1.16 deal promptly and effectively with problems within their control and report those that cannot be resolved 1.17 shut down and secure the preparation equipment to a safe condition on completion of the activities 1.18 reinstate the work area on completion of the activities, in line with agreed organisational procedures and to include carrying out all of the following: • safely disposing of arisings and waste materials • cleaning and returning all tools and excess materials • removing protection and exclusion arrangements (if no longer required)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• contributing to the completion of all required records • leave the work area in a safe and tidy condition			
2 Know how to prepare yacht and boat surfaces for painting/finishing	2.1 explain the safe working practices and procedures to be observed when carrying out preparations of yacht and boat surfaces and with the hand and mechanical surface preparation tools (such as general workshop and site safety, protecting other workers from the effects of the work, safety in enclosed/confined spaces, working at height, use of mobile elevated work platforms (MEWPs), atmospheric controls) 2.2 explain the statutory requirements, risk assessment procedures and relevant requirements of HASAWA and COSHH) 2.3 describe the environmental impact of the operations they are carrying out, and with the materials that are used, and explain how the impact can be minimised 2.4 explain the health and safety requirements of the work area in which they are carrying out the surface preparation activities, and the responsibility they place upon them			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.5 describe the hazards associated with carrying out surface preparation activities, and with the materials and equipment used, (such as dust/debris, hearing damage, hand/arm vibration, working at heights), and explain how they can be minimised 2.6 explain the requirements for working in confined spaces and the importance of emergency procedures and safe systems of work (including permits to work, Required Air Quantities (RAQs) and local exhaust ventilation (LEV) to maintain safe conditions; the provision of adequate and safe lighting, and avoidance of sources of ignition 2.7 explain how particular procedures, cleaning materials and arisings can result in a compartment or space (such as an accommodation space or tented enclosure) becoming a confined space 2.8 explain the importance of having regular medical examinations when using vibrating tools, solvent-based materials, or when exposed to hazardous arisings 2.9 explain what personal protective equipment (PPE) needs to be worn during the surface preparation activity, and its care and correct use 2.10 explain how to obtain the necessary job instructions required for the work being carried out			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.11 explain the reasons for carrying out surface preparation, and the effects on the final finishing activities if preparations are not carried out correctly 2.12 describe the various types of substrate that may require preparing, and the preparation methods that may be used on them 2.13 describe the damage that may result from using inappropriate tools and techniques 2.14 describe the types of defects and contamination to be found on unpainted and painted surfaces 2.15 describe the types of tools and equipment used for the surface preparation activities (to include setting up and safe operation, compatibility of the power tools and wheels, checking air supplies and hoses for leaks and for contamination, safety arrangements and guards, manufacturers' operating instructions, and techniques for using them) 2.16 explain the importance of the maintenance of a register of power tools, and the need to check tools against certification 2.17 describe the quality control techniques and procedures used during the preparation activities, and explain how the environmental conditions may have an effect on work output and on its quality			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.18 describe the various types of tests that are carried out on the prepared surfaces to check their compliance with the specification 2.19 explain how to dispose of waste materials safely, including the environmental impact of the materials they are using, and the minimisation of this impact 2.20 describe the extent of their own responsibility and explain whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 115: Preparing yacht and boat paints/coating materials for application

Unit reference number: F/601/2629

Level: 2

Credit value: 10

Guided learning hours: 42

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to prepare yacht or boat paints for application by brush, roller or spray methods, in accordance with approved procedures. Learners will be required to obtain all information necessary to carry out the preparations of the paints/coating materials. They will be expected to use the appropriate preparation or mixing equipment, and to ensure that it is fit for purpose. Learners will be expected to prepare a variety of coatings for a range of applications, which will include the painting of bare substrates and the overcoating of previously painted surfaces. They will be required to check that all paint has been prepared in accordance with manufacturers' recommendations for the application conditions.

Learners' responsibilities will require them to comply with organisational policy and procedures for the preparation of the paint/coating materials, and to report any problems with the preparation activities, materials or equipment used that they cannot personally resolve, or are outside their permitted authority, to the relevant people. They will be expected to work either with a high level of supervision or as a member of a team. Learners will take personal responsibility for their own actions and for the quality and accuracy of the work that they carry out. Where team working is involved, they must demonstrate a significant personal contribution during the team activities in order to satisfy the requirements of the standard, and competency in all the areas required by the standard must be demonstrated.

Learners' knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to the preparation of paints/coatings used on yachts or boats. They will understand the properties of the coatings and the applications for which they are intended. Learners will know about pot life, induction times, viscosity and temperature conditioning requirements in sufficient depth to provide a sound basis for carrying out the activities, and ensuring that the paint/coating materials are prepared to the required specification.

Learners will understand the safety precautions required when carrying out the preparatory operations. They will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Prepare yacht and boat paints/coating materials for application	1.1 work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines 1.2 carry out all of the following during the preparation of the paint/coating materials: • ensure they have the necessary information to carry out the paint/coating preparation activities (such as job instructions, contractual specifications and coating manufacturer's specifications) • adhere to procedures or systems in place for risk assessment, COSHH, CHIPS data, personal protective equipment and other relevant safety regulations • use safe and approved preparation methods and techniques at all times • clean and secure all tools and equipment on completion of the preparation activities • leave the work area in a safe and clean condition on completion of the activities 1.3 obtain the required materials and check them for quantity and quality			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.4 obtain an estimate of the volume of paint to be prepared for the complete coating of bare substrate or for the overcoating of previously painted substrate, by spray or by brush, to include four of the following surfaces: • outer bottom • hull bottom • boot-top • topsides • weather decks • cabins/coach house • tanks • hatch covers • pipes • beams and profiles • simple shapes • other specific items 1.5 determine how the materials need to be prepared 1.6 carry out the preparations using suitable equipment			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.7 prepare paint/coatings for application, by carrying out all of the following activities: • obtaining the correct type and quantities of materials • ensuring that the correct mixing ratios are adhered to • checking that the prepared coating material is of the correct viscosity • ensuring that the prepared material has been in the container for the induction period (if applicable) • ensuring that the prepared material is at the temperature recommended for application 1.8 prepare two of the following two-pack (two component) products for application: • water-based epoxies • solvent-based epoxies • epoxy shop primer • non-skid deck paints • two-component polyurethane paint • solvent-free epoxy • glass flake polyester • two-component coal tar epoxy paint			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• zinc ethyl silicate paint • wash primer 1.9 prepare two of the following single pack products: • conventional alkyd or silicone alkyd • single pack blast primer • bituminous paint • chlorinated rubber paint • anti-fouling paint • acrylic paint • vinyl paints • vinyl tar paint • mastics 1.10 prepare yacht or boat coating materials in accordance with one of the following: • BS or ISO standards and procedures • other accepted international standards • customer (contractual) standards and requirements • company standards and procedures • paint/covering manufacturer's recommendations • recognised compliance agency/body's standards (such as Lloyds, Boat Safety Scheme, BMEA Code)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.11 report completion of preparations in line with organisational procedures 1.12 deal promptly and effectively with problems within their control and report those that cannot be solved 1.13 reinstate the work area on completion of the preparation activities, to include carrying out all of the following: • disposing of excess or unused paint/coating material, in accordance with approved procedures • cleaning containers to be reused, and disposing of arisings and used solvents, in accordance with approved procedures • disposing of non-reusable containers, in accordance with approved procedures • cleaning and returning all tools and excess materials • removing protection and exclusion arrangements (if no longer required) • contributing to the completion of all required records (including consumption of paint and of solvents) • leave the work area in a safe and tidy condition			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
2 Know how to prepare yacht and boat paints/coating materials for application	2.1 explain the safe working practices and procedures to be observed when preparing yacht or boat paints/coating materials and using mixing equipment (such as general workshop and site safety, protecting other workers from the effects of the work, atmospheric controls) 2.2 explain the statutory requirements, risk assessment procedures and relevant requirements of HASAWA and COSHH 2.3 describe the hazards associated with carrying out yacht or boat paints/coating material preparation activities, and with the materials and equipment used (such as inhalation of fumes, fire and explosion, contact with solvents and other chemicals), and explain how they can be minimised 2.4 describe the type of information to be found in manufacturers' data sheets and in Chemical Hazard Information and Packaging for Supply (CHIPS) data sheets 2.5 explain what personal protective equipment (PPE) needs to be used for the paint preparation activities 2.6 describe the environmental impact of the operations they are carrying out with the materials they are using, and explain how to minimise this impact 2.7 describe the characteristics of, and applications for, yacht and boat coating products			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.8 explain product 'life', stock control and the use of batch numbers 2.9 describe the storage requirements, including environmental controls and containment arrangements, for the coating products and solvents (such as thinners, cleaners) 2.10 explain how to obtain an estimate of the product volume to be prepared for a defined usage (including estimation of areas to be covered, practical paint consumption and loss factors) 2.11 describe the types of containers appropriate to defined products and usages 2.12 explain the preparation requirements, including pot-life, induction times and temperature conditioning requirements 2.13 explain the importance of stirring single pack paints and epoxy's (settling of pigment) and use of thinners, for coating products 2.14 explain the importance of mixing ratios (such as use of whole packs) for two-pack products 2.15 explain why they need to reject paint mixed incorrectly 2.16 explain the use of appropriate containers, hand tools and electro-mechanical/pneumatic equipment 2.17 describe the disposal procedures for redundant materials			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.18 describe the appropriate procedures for the disposal of, or the cleaning of, used containers 2.19 describe the procedures to contain and to clear away spillages, and the appropriate disposal of the arisings 2.20 describe the quality control requirements and techniques to be followed 2.21 explain the importance of the maintenance of records of paint and solvent consumption 2.22 describe the extent of their own responsibility and explain to whom they should report if they have problems that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 116: Applying yacht and boat paints/coating materials manually

Unit reference number: T/601/2630

Level: 2

Credit value: 25

Guided learning hours: 35

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to apply yacht or boat paint/surface coatings to various substrates, using brushes or rollers, in accordance with approved procedures. Learners will be required to obtain all information necessary to carry out the manual painting/surface coating activities. They will be required to check that all surfaces to be painted/coated have been correctly prepared, and that any necessary exclusion, containment, masking, protection and ventilation requirements are implemented. Learners will be expected to select the appropriate brushes and/or rollers, and to ensure that they are fit for purpose. They will be expected to apply a variety of coatings in a number of boatyard environments.

Learners' responsibilities will require them to comply with organisational policy and procedures for the yacht or boat painting/surface coating activities undertaken, and to report any problems with the painting/coating activities, materials or equipment used that they cannot personally resolve, or are outside their permitted authority, to the relevant people. They will be expected to work either with a high level of supervision or as a member of a team. The learner will take personal responsibility for their own actions and for the quality and accuracy of the work that they carry out. Where team working is involved, they must demonstrate a significant personal contribution during the team activities in order to satisfy the requirements of the standard, and competency in all the areas required by the standard must be demonstrated.

Learners' knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to applying liquid paints/surface coatings to yachts or boats using manual methods. They will understand the painting/coating procedures and techniques used, and their application. Learners will know about the substrates, their preparation requirements, paint/coating materials and their preparation requirements in sufficient depth to provide a sound basis for carrying out the activities to the required specification.

Learners will understand the safety precautions required when carrying out the yacht or boat manual painting/surface coating operations. They will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and to others in the workplace, both ashore and afloat.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Apply yacht and boat paints/coating materials manually	1.1 work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines 1.2 carry out all of the following during the painting/surface coating activities: • ensure they have the necessary information to carry out the painting/surface coating activities (such as job instructions) • adhere to procedures or systems in place for risk assessment, COSHH, CHIPS data, personal protective equipment and other relevant safety regulations • ensure that appropriate exclusion zones and containment facilities are set up • confirm that appropriate emergency arrangements are in place for any confined space or hazardous work (where applicable) • ensure that brushes, rollers and other tools are correctly prepared for the paint/surface coating application • carry out masking up, and provide weather protection for the areas to be coated • provide a suitable means for curing the paint/surface coating (such as heating, air supply to assist curing)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.3 check that the material surfaces to be treated are suitably prepared for the finishing operations to be carried out 1.4 check that the finishing equipment and coatings are set up and maintained at satisfactory operating conditions and levels 1.5 carry out the treatment process in accordance with operating procedures and the component specification requirements 1.6 apply paint/surface coatings to four of the following yacht or boat substrates • uncoated composite material • previously coated composite material • uncoated wood • previously coated wood • uncoated compliant polymers • previously coated compliant polymers • uncoated ferrous material • uncoated non-ferrous material • previously coated ferrous material • previously coated non-ferrous material • other coated or uncoated materials			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.7 apply four of the following paints/surface coatings: • holding primer (touch up) • solvent-based epoxies • water-based acrylics • anti-fouling coatings (touch up) • alkyds/silicone alkyds • bituminous paints • vinyl tar paints • tar epoxy paints • shop primer (touch up) • non-skid deck paints • chlorinated rubber paints • two component polyurethane paints • zinc ethyl silicate paints • mastics 1.8 apply paint/coatings, by brush/roller/paint pads, to yacht or boat structures incorporating four of the following features: • corners (such as outside corners, edges, 'obscured' corners) • level surfaces • vertical flat surfaces			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• horizontal flat surfaces • inclined surfaces • overhead surfaces • structural joints • curved surfaces • round parts • slender components • machinery 1.9 apply paint/coatings, by brush or roller, in three of the following situations: • confined spaces (such as tanks, voids, double bottoms) • internal spaces • at height • covered exterior • exposed exterior • outer bottoms • hull bottoms • weather decks			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.10 apply paint/surface coatings in two of the following environments: • ashore • outside environment • afloat • workshop 1.11 check that the treated workpiece achieves the required characteristics and meets the finishing specification 1.12 apply paint/surface coatings manually, using the appropriate techniques to achieve all of the following: • correct film thickness • smooth surface free from runs or drips • uniform and complete coverage of the surface to be coated • correct gloss level (where appropriate) 1.13 check paint/surface coating thickness using one of the following methods: • wet film thickness gauge (combs) • dry film thickness gauge (cured coating)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.14 apply paint/surface coatings to yacht or boat components, in accordance with one of the following: • BS or ISO standards and procedures • other accepted international standards • customer (contractual) standards and requirements • company standards and procedures • paint/covering manufacturer's recommendations • recognised compliance agency/body's standards (such as Lloyds, Boat Safety Scheme, BMEA Code) 1.15 deal promptly and effectively with problems within their control and report those that cannot be solved 1.16 dispose of waste and excess materials in line with agreed organisational procedures 1.17 shut down the finishing equipment to a safe condition on completion of the processing activities 1.18 reinstate the work area on completion of the manual painting/surface coating activities, to include carrying out all of the following: • cleaning all brushes, rollers and containers, and returning all tools and excess materials • removing protection and exclusion arrangements (if no longer required)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• completing all relevant documentation • leave the work area in a safe and clean condition on completion of the activities			
2 Know how to apply yacht and boat paints/coating materials manually	2.1 explain the safe working practices and procedures to be observed when carrying out manual painting/surface coating activities on yacht or boat components (such as general workshop and site safety; appropriate personal protective equipment (PPE); protecting other workers from the effects of the work, safety in enclosed/confined spaces, working at height, use of mobile elevated work platforms (MEWPs), atmospheric controls) 2.2 explain the statutory requirements, risk assessment procedures and relevant requirements of HASAWA and COSHH 2.3 describe the hazards associated with the use and the disposal of yacht and boat paints/surface coating products (including the information to be found in manufacturers' data sheets and in Chemical Hazard Information and Packaging for Supply (CHIPS) data sheets) 2.4 explain the requirements for working in confined spaces, and the importance of emergency procedures and safe systems of work (including permits to work, Required Air Quantities (RAQs) and local exhaust ventilation (LEV)) to maintain safe conditions; the provision of adequate and safe lighting and avoidance of sources of ignition			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.5 explain what personal protective equipment (PPE) needs to be worn during the surface coating activity 2.6 describe the characteristics of, and the applications for, yacht or boat paints/surface coating products (including the use of manufacturers' data sheets, requirements for the application of particular coating systems, and contractual specifications) 2.7 explain the need to ensure that the substrates have been prepared correctly for the coatings to be applied 2.8 explain the importance of maintaining appropriate environmental conditions for the application and curing of the surface coating products 2.9 explain the time intervals that are required between coats, and why these must be adhered to 2.10 describe the procedures for the handling and safe use of coating materials and solvents 2.11 explain why they need to use paint thinners to adjust the viscosity of the product being applied 2.12 explain how to select the correct application equipment, to suit the materials and the finish required (to include brushes, rollers, paint pads, suitable containers) 2.13 describe the techniques required to avoid defects arising from application errors or problems for the application of yacht or boat surface coating products to a variety of surfaces			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.14 describe the requirements for working afloat, on outer bottoms, and at heights 2.15 describe the procedure to contain and to clear away spillages, and the safe and appropriate disposal of waste materials 2.16 explain how to identify faults in application, and their causes and correction 2.17 describe the simple non-destructive testing procedures to be carried out to ensure that colour, gloss, adhesion and other required performance qualities are achieved 2.18 describe the extent of their own responsibility and explain whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 117: Applying yacht and boat paints/coating materials using spray methods

Unit reference number: F/601/2632

Level: 2

Credit value: 25

Guided learning hours: 35

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to apply yacht or boat paints/surface coatings to various substrates, using spray guns, in accordance with approved procedures. Learners will be required to obtain all information necessary to carry out the spray painting/surface coating activities. They will be required to check that all surfaces to be painted/coated have been correctly prepared, and that any necessary exclusion, containment, masking, protection and ventilation requirements are implemented. Learners will be expected to use the appropriate and/or specified equipment and to ensure that it is correctly set up, maintained and adjusted. They will be expected to apply a variety of paint/surface coatings in a number of boatyard environments.

Learners' responsibilities will require them to comply with organisational policy and procedures for the yacht or boat spray painting/surface coating activities undertaken, and to report any problems with the spray painting/coating activities, materials or equipment used that they cannot personally resolve, or are outside their permitted authority, to the relevant people. They will be expected to work either with a high level of supervision or as a member of a team. Learners will take personal responsibility for their own actions and for the quality and accuracy of the work that they carry out. Where team working is involved, they must demonstrate a significant personal contribution during the team activities in order to satisfy the requirements of the standard, and competency in all the areas required by the standard must be demonstrated.

Learners' knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to applying liquid paints/surface coatings to yachts or boats using spray methods. They will understand the spraying procedures and techniques used, and their application. Learners will know about the substrates, their preparation requirements, coating materials and their preparation requirements in sufficient depth to provide a sound basis for carrying out the activities to the required specification.

Learners will understand the safety precautions required when carrying out the yacht or boat spray painting/surface coating operations. They will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and to others in the workplace, both ashore and afloat.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Apply yacht and boat paints/coating materials using spray methods	1.1 work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines 1.2 carry out all of the following during the spray painting/surface coating activities: • ensure they have the necessary information to carry out the spray painting/surface coating activities (such as job instructions) • adhere to procedures or systems in place for risk assessment, COSHH, CHIPS data, personal protective equipment and other relevant safety regulations • ensure that appropriate exclusion zones and containment facilities are set up • ensure that equipment is correctly prepared for the spraying operations (such as spray guns, air supplies) • carry out any necessary masking • confirm that appropriate emergency arrangements are in place for any confined space or hazardous work (where applicable) • carry out masking up, and provide weather protection for the areas to be painted/coated (where appropriate)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• ensure that environmental conditions meet the requirements for the application of the paint/coating (such as surface temperature, air humidity) • provide any means required to promote the curing of the paint/surface coating (such as air supply, warm air) • leave the work area in a safe and clean condition on completion of the activities 1.3 check that the material surfaces to be treated are suitably prepared for the finishing operations to be carried out 1.4 check that the finishing equipment and coatings are set up and maintained at satisfactory operating conditions and levels 1.5 apply paint/surface coatings using one of the following types of spray equipment: • conventional spray • bottom feed (deck) lance • hopper gun • airless spray • air-assisted airless spray • electrostatic spray • plural pump system • high-volume low-pressure spray (HVLP)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.6 carry out the treatment process in accordance with operating procedures and the component specification requirements 1.7 apply paint/surface coatings to three of the following yacht or boat substrates: • uncoated composite material • previously coated composite material • uncoated wood • previously coated wood • uncoated compliant polymers • previously coated compliant polymers • uncoated ferrous material • uncoated non-ferrous material • previously coated ferrous material • previously coated non-ferrous material • other coated or uncoated materials 1.8 apply three of the following yacht or boat paints/surface coatings: • holding primer • solvent-based epoxies • water-based epoxies • non-skid deck paints			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• bituminous paints • chlorinated rubber paints • vinyl tar paints • two-component polyurethane paints • water-based acrylics • anti-fouling coatings • alkyds/silicone alkyds • tar epoxy paints • zinc ethyl silicate paints • shop primer • glass flake polyester coatings 1.9 apply paint/surface coatings, by spraying, to yacht or boat structures incorporating four of the following features: • corners (such as outside corners, edges, 'obscured' corners) • level surfaces • vertical flat surfaces • horizontal flat surfaces • inclined surfaces • overhead surfaces • structural joints			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• curved surfaces • round parts • slender components • machinery 1.10 apply paint/surface coatings, by spraying, in three of the following situations: • confined spaces (such as tanks, voids, double bottoms) • internal spaces • at height • covered exterior • exposed exterior • outer bottoms • hull bottoms • weather decks 1.11 apply paint/surface coatings in one of the following environments: • ashore • afloat • in a spray cell 1.12 check that the treated workpiece achieves the required characteristics and meets the finishing specification			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.13 apply spray paint/surface coatings using the appropriate techniques, to achieve all of the following: • correct film thickness • correct banding/surface overlap • smooth surface free from defects (such as run, drips and dust) • complete coverage of the surface to be coated • correct gloss level (where appropriate) 1.14 check paint/surface coating thickness, using one of the following methods: • wet film thickness gauge (combs, wet film) • dry film thickness gauge (cured coating) 1.15 apply spray paint/surface coatings to yacht or boat components, in accordance with one of the following: • BS or ISO standards and procedures • other accepted international standards • customer (contractual) standards and requirements • company standards and procedures • paint/covering manufacturer's recommendations • recognised compliance agency/body's standards (such as Lloyds, Boat Safety Scheme, BMEA Code)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.16 deal promptly and effectively with problems within their control and report those that cannot be solved 1.17 dispose of waste and excess materials in line with agreed organisational procedures 1.18 shut down the finishing equipment to a safe condition on completion of the processing activities 1.19 reinstate the work area on completion of the spraying activities, to include carrying out all of the following: • cleaning the spraying equipment and returning all tools and excess materials • removing protection and exclusion arrangements (if no longer required) • completing all relevant documentation • leave the work area in a safe and clean condition on completion of the activities			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
2 Know how to apply yacht and boat paints/coating materials using spray methods	2.1 explain the safe working practices and procedures to be observed when carrying out manual spray painting/surface coating activities on yacht or boat components (such as general workshop and site safety, appropriate protective equipment, protecting other workers from the effects of the work, safety in enclosed/confined spaces, working at height, use of mobile elevated work platforms (MEWPs), use of atmospheric controls) 2.2 explain the statutory requirements, risk assessment procedures and relevant requirements of HASAWA and COSHH) 2.3 describe the hazards associated with the use and the disposal of yacht and boat paints/surface coating products (including the information to be found in manufacturers' data sheets and in Chemical Hazard Information and Packaging for Supply (CHIPS) data sheets) 2.4 explain the requirements for working in confined spaces, and the importance of emergency procedures and safe systems of work (including permits to work, Required Air Quantities (RAQs) and Local Exhaust Ventilation (LEV), to maintain safe conditions; the provision of adequate and safe lighting and avoidance of sources of ignition			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.5 explain what personal protective equipment (PPE) needs to be worn during the spraying activity 2.6 describe the characteristics of, and the applications for, yacht or boat paint/surface coating products (including the use of manufacturers' data sheets, requirements for the application of particular coating systems) 2.7 explain the need to ensure that the substrates have been prepared correctly for the coatings to be applied 2.8 explain the importance of maintaining appropriate environmental conditions for the application and curing of the surface coating products 2.9 explain the time intervals that are required between coats, and why these must be adhered to 2.10 describe the procedures for the handling and safe use of coating materials and solvents 2.11 explain why they need to use paint thinners to adjust the viscosity of the product being applied 2.12 explain how to select the correct application equipment to suit the materials and the finish required (to include spray gun atomising and air control, tip size, fluid delivery rates and fan angle) 2.13 describe the principles of correct air flow and its effect on quality and safety 2.14 explain the need for correct grounding and earth continuity of the equipment			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.15 explain the requirements for cleaning spray guns (including the cleaning of the diffuser, tip and tip guard, the flushing of the gun and of the lines, the lubrication of the needle) 2.16 describe the techniques required for the application of paint/surface coating products to a variety of surfaces 2.17 describe the requirements for working afloat, on outer bottoms, and at heights 2.18 explain the importance of avoiding overspray; the need for containment and for exclusion zones 2.19 describe the procedure to contain and to clear away spillages. 2.20 explain how to identify faults in application, and their causes and correction (to include distorted patterns, tailing, dry spray, over spray, and pinholing) 2.21 describe the simple non-destructive testing procedures to be applied to ensure that colour, gloss, adhesion and other required performance qualities are achieved 2.22 explain how to minimise and handle waste materials (including the environmental impact of the materials they are using, and the minimisation of this impact)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.23 describe the extent of their own responsibility and explain whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 118: Preparing yacht and boat material surfaces by abrasive blasting

Unit reference number: D/601/2721

Level: 2

Credit value: 10

Guided learning hours: 42

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to prepare a range of yacht or boat substrates to enable coating systems to be applied, in accordance with approved procedures. Learners will be required to carry out the preparations on a variety of substrates using abrasive blasting equipment and abrasives. The process will also include the cleaning of the surface prior to the application of the coatings.

Learners' responsibilities will require them to comply with organisational policy and procedures for the preparation activities undertaken, and to report any problems with the preparation activities, materials or equipment used that they cannot personally resolve, or are outside their permitted authority, to the relevant people. They will be expected to work either with a high level of supervision or as a member of a team. Learners will take personal responsibility for their own actions and for the quality and accuracy of the work that they carry out. Where team working is involved, they must demonstrate a significant personal contribution during the team activities in order to satisfy the requirements of the standard, and competency in all the areas required by the standard must be demonstrated.

Learners' knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to applying specified preparation procedures to yacht or boat component surfaces using abrasive blasting techniques. They will have an understanding of the preparation procedures, their application, and relevant standards in adequate depth to provide a sound basis for carrying out the activities to the required specification.

Learners will understand the safety precautions required when carrying out the preparatory operations. They will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace, both ashore and afloat.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Prepare yacht and boat material surfaces by abrasive blasting	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the abrasive blasting activities: • ensure they have the necessary information to carry out the abrasive blasting activities (such as job instructions) • adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations • confirm that all necessary husbandry and containment arrangements are in place, and are adequate • maintain safe access and working arrangements for the work area • ensure that safe working distance procedures are set up, where appropriate • ensure that tools and equipment are correctly prepared for the operations being performed • apply safe and appropriate working practices and procedures at all times 1.3 obtain and follow relevant instructions, standards and other specifications			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.4 identify the conditions of the surface to be prepared 1.5 carry out preparation activities on yacht or boat components, to include both of the following: • unpainted surfaces • painted surfaces 1.6 visually inspect surfaces, and identify surface preparation requirements for two of the following conditions: • surface corrosion • paint coating defects (such as flaking/detachment, blistering, cracking/crocodiling, chalking, bubbling, cissing, wrinkling) • removal of old coating systems 1.7 select the appropriate tools and equipment and check that they are in a safe and usable condition 1.8 carry out the preparation activities using appropriate tools and techniques 1.9 remove paint and/or corrosion products, using two of the following methods: • dry abrasive blasting • moisture-injection abrasive blasting • slurry blasting • compressed air wet abrasive blasting			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• pressurised liquid blast cleaning • vacuum recovery blasting • wheeled deck blasting machine • low pressure wet abrasive blasting • low pressure soluble abrasive blasting 1.10 remove paint and corrosion products from yacht or boat component surfaces incorporating five of the following features: • corners (outside corners, obscured corners and edges) • curved surfaces • slender components • round components • individual components (such as plates, deck fittings) • vertical flat surfaces • horizontal flat surfaces • overhead surfaces • inclined surfaces 1.11 carry out the preparation activities in three of the following situations: • internal spaces • weather decks			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• covered exteriors • exposed exteriors • outer bottoms • hull bottoms • at height • confined spaces (such as tanks, voids, double bottoms) 1.12 prepare yacht or boat surfaces/coatings by abrasive blasting in two of the following environments: • ashore • outside environment • afloat • workshop 1.13 identify requirements, and clean the prepared surface, using all of the following: • fresh water • fresh water with detergent • brush • vacuum cleaner 1.14 check the prepared surface to ensure that it meets the required specification			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.15 check that the prepared surfaces meet the specified standards, to include the use of three of the following methods: • visual examination • press tape • swabs • surface profile comparators • adhesion test • acid test 1.16 carry out yacht or boat surface preparations, in accordance with one of the following standards: • BS or ISO standards and procedures • other accepted international standards • customer (contractual) standards and requirements • company standards and procedures • specific equipment requirements/manufacturer's data • recognised compliance agency/body's standards (such as Lloyds, Boat Safety Scheme, BMEA Code) 1.17 deal promptly and effectively with problems within their control and report those that cannot be resolved			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.18 shut down and secure the preparation equipment to a safe condition on completion of the activities 1.19 reinstate the work area on completion of the activities in line with agreed organisational procedures and to include carrying out all of the following: • safely disposing of arisings and waste materials • cleaning and returning all tools and excess materials • removing protection and exclusion arrangements (if no longer required) • contributing to the completion of all required records • leave the work area in a safe and tidy condition			
2 Know how to prepare yacht and boat material surfaces by abrasive blasting	2.1 explain the safe working practices and procedures to be observed when carrying out preparations of yacht and boat surfaces using abrasive blasting equipment (such as general workshop and site safety, protecting other workers from the effects of the work, safety in enclosed/confined spaces, working at height, use of mobile elevated work platforms (MEWPs), atmospheric controls) 2.2 explain the statutory requirements, risk assessment procedures and relevant requirements of HASAWA and COSHH)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.3 describe the environmental impact of the operations that they are carrying out, and with the materials they are using, and explain how the impact can be minimised 2.4 describe the hazards associated with surface preparation using abrasive blasting (such as sparks, dust/debris, hearing damage, hand/arm vibration, working at heights), and explain how they can be minimised 2.5 explain the requirements for working in confined spaces, the importance of emergency procedures and safe systems of work (including permits to work, Required Air Quantities (RAQs) and local exhaust ventilation (LEV)) to maintain safe conditions; the provision of adequate and safe lighting and avoidance of sources of ignition 2.6 explain what personal protective equipment (PPE) needs to be worn during the surface preparation activity 2.7 explain how to obtain the necessary job instructions required for the work being carried out 2.8 explain the reasons for carrying out surface preparation, and the affects on the final finishing activities if preparations are not carried out correctly			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.9 explain why different types of substrate require different preparation techniques to be used 2.10 describe the types of defects and contamination to be found on unpainted and painted surfaces, and their causes 2.11 describe the types of equipment used, their setting up and operation, codes of practice, manufacturers' operating instructions, company procedures and instructions (including operation and techniques for use) 2.12 describe the types of abrasive used, their characteristics and application, the importance of abrasive profile and abrasive cleanliness, company procedures for checking levels of contamination in abrasives 2.13 explain the limitations of abrasive blasting, the requirements for the removal of particular types of coatings, and hazards associated with the removal of particular coatings 2.14 explain the importance of maintaining a register of power tools, and the need to check tools against certification 2.15 describe the various types of tests that are carried out on the prepared surfaces to check their compliance with the specification			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.16 explain how to safely dispose of waste materials, including the environmental impact of the materials they are using, and the minimisation of this impact 2.17 describe the extent of their own responsibility and explain whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 119: Carrying out the application of fairing/filling compounds to yachts and boats

Unit reference number: K/601/2723

Level: 2

Credit value: 20

Guided learning hours: 63

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to apply fairing/filling compounds to yacht and boat substrates, in accordance with approved procedures. Learners will be required to obtain all information necessary to carry out the fairing/filling activities. They will be required to check that all surfaces to which fairing/filling compound is to be applied have been correctly prepared, and that any necessary exclusion, containment, masking, protection, ventilation and heating requirements are implemented. Learners will be expected to use the appropriate and/or specified equipment and ensure that it is correctly set up, maintained and adjusted.

Learners' responsibilities will require them to comply with organisational policy and procedures for the fairing/filling activities undertaken, and to report any problems with the fairing/filling activities, materials or equipment used that they cannot personally resolve, or are outside their permitted authority, to the relevant people. They will be expected to work either with a high level of supervision or as a member of a team. Learners will take personal responsibility for their own actions and for the quality and accuracy of the work that they carry out. Where team working is involved, they must demonstrate a significant personal contribution during the team activities in order to satisfy the requirements of the standard, and competency in all the areas required by the standard must be demonstrated.

Learners' knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to applying fairing/filling compounds to yachts or boats. They will understand the fairing/filling procedures and techniques used, and their application. Learners will know about the substrates and their preparation requirements, and fairing/filling materials and their preparation requirements, in sufficient depth to provide a sound basis for carrying out the activities to the required standard.

Learners will understand the safety precautions required when carrying out the fairing/filling applications. They will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and to others in the workplace, both ashore and afloat.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Carry out the application of fairing/filling compounds to yachts and boats	1.1 work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines 1.2 carry out all of the following during the fairing/filling activities: • ensure they have the necessary information to carry out the fairing/filling activities (such as job instructions) • adhere to procedures or systems in place for risk assessment, COSHH, CHIPS data, personal protective equipment and other relevant safety regulations • confirm that all necessary husbandry and containment arrangements are in place, and are adequate • maintain safe access and working arrangements for the work area • carry out any necessary protection of non-treated areas by means of masking, taping, covering • provide weather protection for the areas to be faired/filled (where appropriate)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• carry out the fairing/filling activities using appropriate techniques and procedures • ensure that environmental conditions meet the requirements for the application of the fairing/filling compounds (such as surface temperature, air humidity, ambient temperature, dew point) • provide any means required to promote the curing of the product used (such as air supply, warm air, heating) 1.3 check that the material surfaces to be treated are suitably prepared for the fairing/filling compound applications 1.4 check that the appropriate equipment and tools are set up and maintained at satisfactory operating conditions and levels 1.5 carry out the fairing and filling process in accordance with operating procedures and the component/project specification requirements 1.6 carry out the all of following when applying the fairing/filling compounds: • confirm that the product is correctly specified • prepare the product in accordance with manufacturers' recommendations			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• select appropriate and correct tools as recommended and/or specified by the product manufacturer • apply product in accordance with manufacturers recommendations and specifications ie temperature, mixing ratios, thicknesses 1.7 apply fairing/filling compounds on three of the following surfaces: • horizontal 'flat' surfaces • vertical 'flat' surfaces • inclined surfaces • curved surfaces • round parts • corners (such as outside corners, edges, obscured corners) • fairing other minor blemishes, spot repairs 1.8 check that the treated workpiece achieves the required fairness and meets the industry and contractual standards and customer's acceptance criteria 1.9 apply fairing/filling layer(s) to achieve all of the following: • applied fairing/filling layer(s) without defects (such as air-pockets, surface contamination, excessive overfill areas)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• smooth surface, free from all surface irregularities (such as pinholes, lumps, sharp edges) • uniform material colour without streaks or lumps • correct component/project surface profile which meets industry and contractual standards and customer acceptance criteria 1.10 apply fairing/filling, in accordance with one of the following: • BS or ISO standards and procedures • other accepted international standards • customer (contractual) standards and requirements • company standards and procedures • product manufacturer's specifications and recommendations • recognised compliance agency/body's standards (such as Lloyds, Boat Safety Scheme, BMEA Code) 1.11 deal promptly and effectively with problems within their control and report those that cannot be solved 1.12 dispose of waste and excess materials in line with agreed organisational procedures 1.13 shut down the equipment to a safe condition on completion of the fairing/filling activities			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.14 reinstate the work area on completion of the fairing/filling activities, to include carrying out all of the following: • cleaning and returning all tools, equipment and excess materials • remove protection and exclusion arrangements (if no longer required) • complete all relevant documentation • leave the work area in a safe and tidy condition			
2 Know how to carry out the application of fairing/filling compounds to yachts and boats	2.1 explain the safe working practices and procedures to be observed when working with fairing/filling materials and application tools (such as general workshop and site safety, appropriate protective equipment, protecting other workers from the effects of the work, safety in enclosed/confined spaces, working at height, atmospheric controls) 2.2 explain the statutory requirements, risk assessment procedures and relevant requirements of HASAWA and COSHH)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.3 describe the hazards associated with the fairing/filling products to be applied (including information to be found in manufacturers' data sheets and in Chemical Hazard Information and Packaging for Supply (CHIPS) data sheets, and with any tools and equipment used (solvent vapours, dermatitis exposure, airborne particles, heat) working at heights and over water, confined spaces, and the importance of adequate and safe lighting) 2.4 describe the environmental impact of the operations they are carrying out, and of the materials they are using, and explain how to minimise this impact 2.5 explain the requirements for working in confined spaces, and the importance of emergency procedures and safe systems of work (including permits to work, Required Air Quantities (RAQs) and local exhaust ventilation (LEV) to maintain safe conditions, the provision of adequate and safe lighting and avoidance of sources of ignition 2.6 explain what personal protective equipment (PPE) needs to be worn during the fairing/filling processes 2.7 explain how to obtain the necessary job instructions required for the work being carried out 2.8 explain the need to ensure that the substrate has been correctly prepared for the fairing/filling product to be applied			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.9 explain the importance of maintaining appropriate environmental conditions for the application and curing of the product being applied 2.10 describe the procedures for the safe handling and safe use of the products being applied 2.11 explain how to select the correct tools and equipment for the preparation and application of the materials to be used 2.12 describe the techniques used to apply the materials to a variety of surfaces 2.13 describe the requirements for working afloat, on outer bottoms and at height 2.14 describe the procedure to contain and to clear away spillages 2.15 describe the quality control requirements and techniques to be observed 2.16 explain how to identify faults in application, their causes and their correction 2.17 describe the safe and appropriate disposal of waste materials 2.18 describe the extent of their own responsibility and explain whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 120: Assisting in the disconnection and removal of yacht and boat electrical/electronic equipment

Unit reference number: M/601/2724

Level: 2

Credit value: 20

Guided learning hours: 42

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to assist with the disconnection and removal of yacht and boat electrical/electronic equipment in preparation for activities such as repair or refit in accordance with approved procedures. This will involve disconnecting and removing equipment at component or unit level on a variety of different types of electrical/electronic equipment such as power supply and distribution equipment, lighting, domestic equipment, alarm, motor/rotating equipment, pumping equipment, entertainment equipment, instrument systems, positioning systems, autopilot systems, communication systems and radar systems.

Learners' responsibilities will require them to comply with organisational policy and procedures for the disconnecting and removal of the yacht or boat electrical/electronic equipment, and to report any problems with the disconnection/removal activities that they cannot personally resolve, or are outside their permitted authority, to the relevant people. They will be expected to work either with a high level of supervision or as a member of a team. Learners will take personal responsibility for their own actions and for the quality and accuracy of the work that they carry out. Where team working is involved, they must demonstrate a significant personal contribution during the team activities in order to satisfy the requirements of the standard, and competency in all the areas required by the standard must be demonstrated.

Learners' knowledge will be sufficient to provide a sound basis for their work, and provide an informed approach to applying disconnection and removal techniques on yacht and boat electrical/electronic equipment. They will have an understanding of the disconnection and removal methods and procedures used, and their application. Learners will know about the electrical/electronic equipment being removed in adequate depth to provide a sound basis for carrying out the disconnection and removal activities to the required specification.

Learners will understand the safety precautions required when carrying out the electrical/electronic equipment disconnection and removal activities, especially those for isolating the equipment and taking the necessary safeguards to protect themselves and others in the workplace. They will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace, both ashore and afloat.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Assist in the disconnection and removal of yacht and boat electrical/electronic equipment	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the disconnection and removal activities: • ensure they have the necessary information to carry out the disconnection and removal activities (such as job instructions or disconnection documentation) • adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations • obtain clearance to work on the system and observe the appropriate power isolation and safety procedures • maintain safe access and working arrangements for the work area • in conjunction with others, carry out the disconnection and removal activities using appropriate techniques and procedures • return all tools and equipment to the correct location on completion of the activities • leave the work area in a safe and tidy condition			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.3 establish and where appropriate mark component for re-assembly 1.4 ensure that any stored energy or substances are released safely and correctly 1.5 make all isolations and disconnections to the equipment in line with approved procedures 1.6 take part in the disconnection and removal of three of the following types of yacht or boat electrical/electronic equipment: • power distribution panel • autopilot equipment • power supply equipment (such as batteries, generators, alternators, wind and solar) • lighting (such as cabin lighting, navigation lighting , cockpit and deck lighting) • services/domestic equipment (such as heating, cooking, air-conditioning and refrigeration systems) • alarm equipment (such as flood and liquid level detection, security/intruder detection, gas and fire detection) • motor/rotating equipment (such as bow thrusters, anchor windlasses, trim tabs winches and hoists)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• pumping equipment (such as freshwater systems, bilge pumping systems, sanitary systems) • entertainment equipment (such as sound systems, video entertainment systems) • communications equipment (such as very high frequency (VHF) radio, SSB, satellite communications (SATCOM), Navtex, weather fax, on-board entertainment systems, intercom) • positioning equipment (such as chart plotter, global positioning system (GPS), long range navigation (LORAN), compass, gyro) • instrumentation (such as speed, depth, wind, velocity made good) • sensor equipment (such as RADAR) 1.7 carry out the disconnection and removals to the agreed level using correct tools and techniques 1.8 assist in carrying out eight of the following dismantling and removal activities: • isolating and locking off equipment • disconnecting wires and cables • attaching suitable cable identification markers • removing wiring enclosures (where applicable) • removing electrical/electronic units/components • making safe all disconnected service supplies			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• supporting equipment to be removed • removing mechanical fastening devices • safely storing all peripheral units which are not part of the repair/overhaul • protecting and preparing removed components for transportation for repair/overhaul 1.9 assist in dismantling and removing yacht or boat electrical/electronic equipment in accordance with one of the following: • BS or ISO standards and procedures • other accepted international standards • customer (contractual) standards and requirements • company standards and procedures • specific equipment requirements/manufacturer's data • BS 7671/IEE Wiring Regulations (current edition) • recognised compliance agency/body's standards (such as Lloyds, Boat Safety Scheme, BMEA Code) 1.10 store components for re-use in approved locations 1.11 dispose of unwanted components and substances in accordance with approved procedures			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.12 deal promptly and effectively with problems within their control and report those that cannot be solved			
2 Know how to assist in the disconnection and removal of yacht and boat electrical/electronic equipment	2.1 explain the specific safety practices and procedures that they need to observe when assisting in the disconnection and removal of electrical/electronic equipment in yachts or boats, including any specific legislation, regulations/codes of practice for the activities, equipment or materials 2.2 explain the isolation and lock off procedure or permit to work procedure that applies to the disconnection and removal activities (to include electrical isolation, locking off switch gear, removal of fuses, placing maintenance warning notices, proving the isolation has been achieved and secured) 2.3 explain the importance of wearing protective clothing and other appropriate safety equipment during the electrical disconnection and removal activities 2.4 explain how to obtain the necessary job instructions required for the work being carried out 2.5 explain the extent to which the equipment is to be dismantled for removal 2.6 explain the different types of cabling used in the yacht or boat electrical/electronic installations and their method of disconnection (such as multi-core cables, single-core cables, steel wire armoured (SWA), mineral insulated (MI), screened cables)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.7 explain the different types of wiring enclosures that are used to include conduit and trunking systems and the methods of removing them 2.8 describe the techniques used to disconnect and remove electrical/electronic equipment (such as unplugging, de-soldering, removal of screwed, clamped and crimped connections) 2.9 explain the methods of removing and replacing cables and wires in wiring enclosures without causing damage to existing cables 2.10 describe the methods of attaching identification marks/labels to removed components or cables to assist with re-assembly 2.11 describe the methods of supporting and lifting the equipment being removed 2.12 describe the tools and equipment used in the disconnection activities including the use of soldering irons and torches, gland disconnecting tools 2.13 explain the storage requirements of removed units and assemblies which are not part of the repair/overhaul process 2.14 describe the methods used to protect and prepare the removed equipment during transportation to the place of repair/overhaul			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.15 explain the generation of maintenance documentation and/or reports following the disconnection and removal activity 2.16 describe the sort of problems that can occur during the electrical/electronic disconnection and removal activity and explain how they can be overcome 2.17 describe the extent of their own authority and explain who they should report to when they have a problem they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 121: Assisting in the disconnection and removal of yacht and boat mechanical and ancillary equipment

Unit reference number: A/601/2726

Level: 2

Credit value: 30

Guided learning hours: 56

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to assist with the disconnection and removal of yacht and boat mechanical equipment in preparation for activities such as repair or refit in accordance with approved procedures. The activities will involve disconnecting and removing equipment at component or unit level on a variety of different types of yacht or boat mechanical assemblies and sub-assemblies, such as outboard engines, direct current electric motors or steam engines, gear boxes, stabilisers, pumps (such as sea water, fresh water and jet), propeller shafts, steering and rudder arrangements, lifting equipment (such as anchor windlass, winches and hoists), domestic equipment and other specific yacht or boat mechanical/ancillary equipment.

Learners' responsibilities will require them to comply with organisational policy and procedures for the disconnecting and removal of the yacht or boat mechanical equipment, and to report any problems with the disconnection/removal activities that they cannot personally resolve, or are outside their permitted authority, to the relevant people. They will be expected to work either with a high level of supervision or as a member of a team. Learners will take personal responsibility for their own actions and for the quality and accuracy of the work that they carry out. Where team working is involved, they must demonstrate a significant personal contribution during the team activities in order to satisfy the requirements of the standard, and competency in all the areas required by the standard must be demonstrated.

Learners' knowledge will be sufficient to provide a sound basis for their work, and provide an informed approach to applying disconnection and removal techniques on yacht and boat mechanical equipment. They will have an understanding of the disconnection and removal methods and procedures used, and their application. Learners will know about the mechanical equipment being removed in adequate depth to provide a sound basis for carrying out the disconnection and removal activities to the required specification.

Learners will understand the safety precautions required when carrying out the disconnection and removal of the yacht or boat mechanical equipment, especially those for isolating and/or depressurising the equipment and taking the necessary safeguards to protect themselves and others in the workplace. They will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others, both ashore and afloat.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Assist in the disconnection and removal of yacht and boat mechanical and ancillary equipment	1.1 work safely at all times, complying with health and safety and other relevant regulations and guidelines 1.2 carry out all of the following during the disconnection and removal of the yacht or boat mechanical equipment: • ensure they have the necessary information to carry out the disconnection and removal activities (such as job instructions or disconnection documentation) • adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations • obtain clearance to work on the system and observe the appropriate power isolation and safety procedures • maintain safe access and working arrangements for the work area • in conjunction with others, carry out the disconnection and removal activities using appropriate techniques and procedures • return all tools and equipment to the correct location on completion of the activities • leave the work area in a safe and tidy condition			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.3 establish and where appropriate mark component for re-assembly 1.4 ensure that any stored energy or substances are released safely and correctly 1.5 make all isolations and disconnections to the equipment in line with approved procedures 1.6 take part in the disconnection and removal of three of the following types of marine mechanical equipment: • engines (such as outboard engines, direct current electric motors or steam engines) • propulsion gear box (either single reduction, double reduction, 'V' or 'Z' drive) • propeller mechanisms (such as shafts, p-brackets/a-brackets, either Fixed Blade or Controllable Pitch Propeller (CPP systems) • trim tabs • thrusters (either bow or stern, jet pumps) • stabiliser (either fixed or retractable) • pump (either salt water, fresh water, deck wash) • steering gear and rudder arrangements • pantry and galley equipment (such as food preparation equipment) • power generation equipment (such as wind generator, solar panels)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• lifting and handling equipment (such as anchor windlass, winches/hoists/lifting equipment, davits) • tanks and pipework (such as water tanks, holding tanks) • deck fittings (such as bollards, hand rails, rope lashings) • domestic equipment (such as wash basins, showers, air-conditioning and heating) 1.7 release four of the following types of fasteners and securing devices: • studs with nuts • swing bolts • wing nuts • screws • bolts • dowels • flexible bellows • quick release fasteners • locking devices (such as split, parallel, clevis or taper pin) • keys/keyways (such as slotted, semi circular, woodruff, taper)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.8 carry out the dismantling to the agreed level using correct tools and techniques 1.9 assist in carrying out eight of the following disconnection and removal methods and techniques: • isolating and locking off equipment • bringing system to atmospheric pressure • draining off fluids • disconnecting wires and cables • attaching suitable cables/parts identification markers • dismantling equipment to unit/sub-assembly level • making safe all disconnected service supplies • supporting equipment to be removed • removing mechanical fastening devices • proof marking/labelling of components for re-assembly • securing or safely storing all peripheral units which are not part of the repair or refit process • protecting and preparing removed components for transportation for repair/overhaul • fitting blanks to open systems to prevent entry of contaminating debris			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.10 assist in the disconnection and removal of yacht or boat mechanical and ancillary equipment in accordance with one of the following: • BS or ISO standards and procedures • other accepted international standards • customer (contractual) standards and requirements • company standards and procedures • specific equipment requirements/manufacturer's data • BS 7671/IEE Wiring Regulations (current edition) • recognised compliance agency/body's standards (such as Lloyds, Boat Safety Scheme, BMEA Code) 1.11 store components for re-use in approved locations 1.12 dispose of unwanted components and substances in accordance with approved procedures 1.13 deal promptly and effectively with problems within their control and report those that cannot be solved			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
2 Know how to assist in the disconnection and removal of yacht and boat mechanical and ancillary equipment	2.1 explain the specific safety practices and procedures that they need to observe when assisting with the disconnection and removal of yacht or boat mechanical and ancillary equipment, including any specific legislation, regulations/codes of practice for the activities, equipment or materials 2.2 explain the procedures to be carried out before starting work on the disconnection and removal (such as obtaining permits to work, obtaining and complying with risk assessments and other health and safety requirements) 2.3 describe the hazards associated with disconnecting and removing yacht or boat mechanical equipment and with the tools and equipment used, and explain how these can be minimised 2.4 explain what protective equipment they need to use for both personal protection and protection of the equipment or system 2.5 explain how to obtain the necessary job instructions required for the work being carried out 2.6 explain the extent to which the equipment is to be dismantled for removal 2.7 describe the various mechanical fasteners that will be removed and their method of release, including threaded fasteners, special securing and locking devices			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.8 explain the importance of using the specified release devices for the particular items being removed 2.9 explain why securing devices need to be correctly unlocked and labelled and the different unlocking methods that are used 2.10 explain what methods may be used to assist in the release of equipment and components where difficulty in releasing items is experienced 2.11 describe the procedures for ensuring they have the correct type of tools and equipment for the activities 2.12 explain the techniques used to secure loose items without damage, once equipment has been removed 2.13 describe the methods of lifting, handling and supporting the components/equipment during the removal activities 2.14 explain how to remove seals, sealant and adhesives and the precautions that need to be taken 2.15 explain why electrical bonding is critical and must be removed correctly 2.16 describe the procedure for the safe disposal of waste materials			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.17 explain the importance of ensuring that the removal site is free from foreign object debris and that any exposed components or pipe ends are correctly covered/protected 2.18 describe the tools and equipment used in the removal activities and explain their care and control procedures 2.19 describe the sort of problems that can occur with the removal operations and explain how these can be overcome 2.20 explain what recording documentation needs to be completed for the activities undertaken 2.21 describe the extent of their own responsibility and explain who they should report to if they have problems that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 122: Carrying out routine servicing of yacht and boat mechanical and ancillary equipment

Unit reference number: J/601/2728

Level: 2

Credit value: 28

Guided learning hours: 63

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to carry out routine servicing activities on yacht or boat mechanical and ancillary equipment, in accordance with approved procedures. Learners will be required to carry out the servicing activities on a range of mechanical and ancillary equipment such as fuel and water holding tanks and pipework, bow and stern thrusters, trim tabs, pumps (such as sea water, fresh water and jet), gear boxes, steering gear, bearing brackets, seals and propellers, battery charging equipment (such as wind generators and solar panels) and lifting equipment (such as anchor windlass, winches and hoists). This will involve checking equipment, such as pipework, control valves, pumps and motors for damage or wear, reporting any defects found, and adjusting the equipment where required, to maintain optimal operational performance.

Learners' responsibilities will require them to comply with organisational policy and procedures for the servicing of the yacht or boat mechanical and ancillary equipment, and to report any problems with the activities that they cannot personally resolve, or are outside their permitted authority, to the relevant people. They will be expected to work either with a high level of supervision or as a member of a team. Learners will take personal responsibility for their own actions and for the quality and accuracy of the work that they carry out. Where team working is involved, they must demonstrate a significant personal contribution during the team activities in order to satisfy the requirements of the standard, and competency in all the areas required by the standard must be demonstrated.

Learners' knowledge will be sufficient to provide a sound basis for their work, and provide an informed approach to applying appropriate routine servicing procedures on yacht and boat mechanical and ancillary equipment. They will have an understanding of the checking and servicing procedures used, and their application. Learners will know about the mechanical and ancillary equipment being serviced in adequate depth to provide a sound basis for carrying out the activities to the required specification.

Learners will understand the safety precautions required when carrying out the servicing activities, especially those for isolating the equipment and taking the necessary safeguards to protect the equipment and associated systems. They will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace, both ashore and afloat.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Carry out routine servicing of yacht and boat mechanical and ancillary equipment	1.1 work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines 1.2 carry out all of the following during the servicing of the yacht or boat mechanical and ancillary equipment: • ensure they have the necessary information to carry out the servicing activities (such as job instructions or servicing documentation) • adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations • obtain clearance to work on the system and observe the appropriate power isolation and safety procedures • maintain safe access and working arrangements for the work area • carry out the servicing activities, using appropriate techniques and procedures • return all tools and equipment to the correct location on completion of the activities • leave the work area in a safe and tidy condition 1.3 follow the relevant maintenance schedules to carry out the required work			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.4 carry out the maintenance activities within the limits of their personal authority 1.5 carry out the maintenance activities in the specified sequence and in an agreed time scale 1.6 carry out servicing activities on four of the following types of yacht or boat mechanical and ancillary equipment: • engines (such as outboard engines, direct current electric motors or steam engines) • propulsion gear box (either single reduction, double reduction, 'V' or 'Z' drive) • propeller mechanisms (such as shafts, p-brackets/a-brackets, either Fixed Blade or Controllable Pitch Propeller (CPP systems) • lifting and handling equipment (such as anchor windlass, winches/hoists/lifting equipment, davits) • domestic equipment (such as wash basins, showers, air-conditioning and heating) • pantry and galley equipment (such as food preparation equipment) • power generation equipment (such as wind generator, solar panels) • steering gear and rudder arrangements • thrusters (either bow or stern, jet pumps)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• stabiliser (either fixed or retractable) • pump (either salt water, fresh water, deck wash) • tanks and pipework (such as water tanks, holding tanks) • deck fittings (such as bollards, hand rails, rope lashings) 1.7 carry out ten of the following activities, as applicable to the equipment being serviced: • removing excessive dirt and grime from the mechanical and ancillary equipment being serviced • examination of the condition and security of the equipment (such as equipment locating and securing devices, hand rails and guards) • checking pipes, unions and joints for leaks • monitoring the condition/deterioration of components (such as bearings, chains, belts, gears, cams, couplings, levers and links, turnbuckles) • replacing 'lifed' consumables (such as oil, grease, belts, gaskets and seals) • monitoring the condition and security of electrical components (such as cables, connectors, switches, contactors)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• replacing damaged or missing locking and retaining devices (nuts, bolts, locking devices/pins, cable ties, clips, proprietary fasteners) • checking that fastenings are secure and to the required torque • checking that any safety equipment or controls are operating correctly • checking the operation of instrumentation (such as gauges, sensors and indicators) • making sensory checks (such as sight, sound, smell) • replacing damaged or defective connectors/linkages • checking alignment of running/sliding components • carrying out specified lubrication • measuring and adjusting moving part clearance • making routine adjustments of components • monitoring component condition/deterioration • recording the results of the servicing, and reporting any defects found • reporting any defects that require immediate attention (such as excessive wear in components, damaged or faulty components)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.8 carry out four of the following during the servicing of the ancillary equipment: • earth bonding tests • serviceability checks • power supply • check security of pipework/hoses • flushing pipework and systems • checking shaft coupling (to compressor or pump) • checking condition and security of cables and wiring • checking alignment of equipment • mechanical measuring checks (such as measuring operating clearance, travel, timings) 1.9 check that the serviced ancillary equipment meets all of the following: • all connections are safe and sound • all systems are leak free • equipment functions to specification • all components and subassemblies are fit for purpose • all servicing activities have been completed to the required schedule • all potential defects are identified, recorded and reported for future action			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.10 service yacht or boat ancillary equipment in compliance with one of the following: • BS or ISO standards and procedures • other accepted international standards • customer (contractual) standards and requirements • company standards and procedures • specific craft/engine requirements/manufacturer's data • recognised compliance agency/body's standards (such as Lloyds, Boat Safety Scheme, BMEA Code) 1.11 report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule 1.12 complete relevant maintenance records accurately and pass them on to the appropriate person, to include one of the following: • job cards • system log • servicing logs or reports • work authorisation documents • vessel/craft documentation 1.13 dispose of waste materials in accordance with safe working practices and approved procedures			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
2 Know how to carry out routine servicing of yacht and boat mechanical and ancillary equipment	2.1 explain the specific safety practices and procedures that they need to observe when carrying out routine checks and servicing on mechanical and ancillary equipment in yachts or boats (including any specific legislation, regulations/codes of practice for the activities, equipment or materials) 2.2 describe the isolation procedure that applies to the servicing activities for the specific mechanical and ancillary equipment being worked on 2.3 explain what protective equipment they need to use for both personal protection and protection of the equipment and vessel/craft 2.4 describe the hazards associated with carrying out servicing activities on yacht or boat mechanical/ancillary equipment (such as handling oils/greases, stored pressure/force, using damaged or badly maintained tools and equipment, not following laid-down maintenance procedures), and explain how they can be minimised 2.5 explain how to obtain the necessary job instructions and servicing schedules required for the work being carried out 2.6 explain the basic principle of operation of the mechanical and ancillary equipment being serviced			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.7 describe the different types of yacht or boat mechanical and ancillary equipment, and peripheral devices, and their servicing requirements 2.8 explain the methods of checking that components are fit for purpose, and the need to replace 'lifed' items such as filters, belts, seals and gaskets 2.9 explain how to recognise defects in yacht or boat mechanical and ancillary equipment (such as under or over performance) 2.10 explain how to make sensory checks by sight, sound, smell, touch 2.11 describe the adjustments required to maintain the equipment at operational standard 2.12 describe the application and use of a range of mechanical operating mechanisms (such as levers and links, pulleys and belts, pivots, bearings, turnbuckles), and the likely functions that will require checking) 2.13 describe the different types of pipes and hoses that are used, and what to check during the servicing activities 2.14 explain the organisational policy on repair/replacement of components during the servicing activities 2.15 explain how to check that the replacement components meet the required specification/operating conditions			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.16 explain the procedure for obtaining consumables to be used during the servicing activity 2.17 explain the importance of ensuring that the equipment is maintained to the prescribed standard of cleanliness 2.18 explain how to compile servicing records/logs/reports which satisfy organisational policy and procedures 2.19 describe the problems that can occur whilst carrying out the servicing activities, and explain how they can be avoided 2.20 describe the organisational procedure to be adopted for the safe disposal of waste of all types of materials 2.21 describe the extent of their own authority and explain whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 123: Carrying out routine servicing of yacht and boat electrical/electronic equipment

Unit reference number: F/601/2730

Level: 2

Credit value: 28

Guided learning hours: 63

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to carry out routine servicing activities on electrical/electronic equipment in yachts or boats, in accordance with approved procedures. Learners will be required to carry out the servicing activities on a range of electrical/electronic equipment, such as power supply and distribution, lighting, domestic services, alarm equipment, motor/rotating and pumping equipment, entertainment equipment, instrument systems, positioning systems, autopilot systems, communication systems and radar systems. This will involve checking equipment and cables for signs of wear or damage and reporting any defects found, replacing lifed items (such as weather seals, filters, back up batteries) and checking and servicing of battery systems.

Learners' responsibilities will require them to comply with organisational policy and procedures for the servicing of the yacht or boat electrical/electronic equipment, and to report any problems with the activities that they cannot personally resolve, or are outside their permitted authority, to the relevant people. They will be expected to work either with a high level of supervision or as a member of a team. Learners will take personal responsibility for their own actions and for the quality and accuracy of the work that they carry out. Where team working is involved, they must demonstrate a significant personal contribution during the team activities in order to satisfy the requirements of the standard, and competency in all the areas required by the standard must be demonstrated.

Learners' knowledge will be sufficient to provide a sound basis for their work, and provide an informed approach to applying appropriate routine servicing procedures on yacht and boat electrical/electronic equipment. They will have an understanding of the checking and servicing procedures used, and their application. Learners will know about the electrical/electronic equipment being serviced in adequate depth to provide a sound basis for carrying out the activities to the required specification.

Learners will understand the safety precautions required when carrying out the servicing activities, especially those for isolating the equipment and taking the necessary safeguards to protect the equipment and associated systems. They will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace, both ashore and afloat.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Carry out routine servicing of yacht and boat electrical/electronic equipment	1.1 work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines 1.2 carry out all of the following during the servicing of the yacht or boat electrical/electronic equipment and systems: • ensure they have the necessary information to carry out the servicing activities (such as job instructions or servicing documentation) • adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations • obtain clearance to work on the system and observe the appropriate power isolation and safety procedures • maintain safe access and working arrangements for the work area • carry out the servicing activities, using appropriate techniques and procedures • return all tools and equipment to the correct location on completion of the activities • leave the work area in a safe and tidy condition			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.3 follow the relevant maintenance schedules to carry out the required work 1.4 carry out the maintenance activities within the limits of their personal authority 1.5 carry out the maintenance activities in the specified sequence and in an agreed time scale 1.6 carry out routine servicing activities on four of the following types of yacht or boat electrical/electronic equipment: • power supply equipment (such as batteries, generators, alternators, wind or solar generation equipment) • power-distribution panel • lighting (such as cabin lighting, navigation lighting , cockpit and deck lighting) • services/domestic equipment (such as heating, cooking, air-conditioning and refrigeration systems) • alarm systems (such as flood and liquid level detection, security/intruder detection, gas and fire detection) • motor/rotating equipment (such as bow thrusters, anchor windlasses, trim tabs, winches and hoists)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• pumping systems (such as freshwater systems, bilge pumping systems, sanitary systems) • entertainment systems (such as sound systems, video entertainment systems) • electronic system components (such as aerials, radar scanners, speaker units, hull transducers) 1.7 carry out ten of the following activities, as applicable to the equipment being serviced: • visual examination of the condition and security of wiring enclosures (such as conduit and trunking) • removing excessive dirt and dust from panels • making visual checks of equipment and cables • checking the integrity of all connections • monitoring the condition of switches/contactors • inspecting and cleaning sensors • making sensory checks (such as sight, sound, smell) • replacing damaged or defective connectors • replacing 'lifed' items (such as seals, fuses, motor brushes, back up batteries) • servicing battery systems • monitoring component condition/deterioration • making 'off-load' checks before powering up			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• replacing damaged or missing locking and retaining devices (cable ties, clips, proprietary fasteners) • recording the results of the servicing, and reporting any defects found 1.8 check that the serviced yacht or boat electrical/electronic equipment meets all of the following: • all components and subassemblies are fit for purpose • all connections are safe and sound • all cables are safe and sound • all potential defects are identified, recorded and reported for future action 1.9 maintain yacht or boat electrical equipment in compliance with one of the following: • BS or ISO standards and procedures • other accepted international standards • customer (contractual) standards and requirements • company standards and procedures • specific equipment requirements/manufacturer's data • BS 7671/IEE Wiring Regulations (current edition)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• recognised compliance agency/body's standards (such as Lloyds, Boat Safety Scheme, BMEA Code) 1.10 report any instances where the maintenance activities cannot be fully met or where there are identified defects outside the planned schedule 1.11 complete relevant maintenance records accurately and pass them on to the appropriate person, to include one of the following: • job cards • system log • servicing logs or reports • work authorisation documents • vessel wiring documentation 1.12 dispose of waste materials in accordance with safe working practices and approved procedures			
2 Know how to carry out routine servicing of yacht and boat electrical/electronic equipment	2.1 explain the specific safety practices and procedures that they need to observe when carrying out routine checks and servicing on electrical/electronic equipment in yachts or boats (including any specific legislation, regulations/codes of practice for the activities, equipment or materials) 2.2 describe the isolation procedure that applies to the servicing activities for the specific electrical/electronic equipment being worked on			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.3 explain what protective equipment they need to use for both personal protection and protection of the equipment and vessel/craft 2.4 describe the hazards associated with carrying out maintenance activities on yacht or boat electrical/electronic equipment (such as exposure to live conductors, misuse of tools), and explain how they can be minimised 2.5 explain how to obtain the necessary job instructions and servicing schedules required for the work being carried out 2.6 explain the basic principle of operation of the yacht or boat electrical/electronic equipment/circuits being checked/serviced 2.7 describe the different types of yacht or boat electrical/electronic equipment, control equipment and peripheral devices, and their maintenance requirements 2.8 describe the application and use of a range of electrical components (such as module blocks, terminal blocks, multi-pin plugs/sockets, tray-mounted sockets, earth bonding points, RF and video connections), and the likely functions that will require checking 2.9 describe the various cable distribution characteristics and circuit protection devices			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.10 describe the different types of wiring enclosures that are used (such as conduit, trunking systems and bulkhead penetrations), and explain what to check during the servicing activities 2.11 explain the methods of checking that components are fit for purpose, and the need to replace 'lifed' items 2.12 explain how to recognise defects in yacht or boat electrical/electronic equipment (such as under or over performance) 2.13 explain the procedure for obtaining consumables to be used during the maintenance activity 2.14 describe the appropriate checking/testing procedures to be adopted during the servicing activity 2.15 explain the importance of ensuring that the equipment is serviced to the prescribed standard of cleanliness 2.16 explain how to compile servicing records/logs/reports which satisfy company policy and procedures 2.17 describe the problems that can occur whilst carrying out the servicing activities, and explain how they can be avoided 2.18 describe the organisational procedure to be adopted for the safe disposal of waste of all types of materials			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.19 describe the extent of their own authority and explain whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Unit 124: Assisting in modifying and adding electrical circuits in yachts and boats

Unit reference number: R/601/2733

Level: 2

Credit value: 22

Guided learning hours: 70

Unit summary

This unit covers the skills and knowledge needed to prove the competences required to assist with the modification or addition of electrical circuits in yachts or boats, in accordance with approved procedures. The yacht or boat electrical circuits to be modified or added will include power supplies, distribution panels, control systems, motor and pumping systems, lighting circuits, entertainment systems, domestic systems, communication systems, positioning systems, instrument and autopilot systems. Learners will be expected to assist in removing and replacing cables, adding new cables, changing breakout points and changing the routeing of cables. They will need to show proficiency in using various tools and equipment for cutting, stripping, crimping and soldering, and in the installation of the various wires, cables and components that make up the yacht and boat electrical circuits.

Learners' responsibilities will require them to comply with organisational policy and procedures for the modification or addition of the electrical wiring, and to report any problems with the activities that they cannot personally resolve, or are outside their permitted authority, to the relevant people. They will be expected to work either with a high level of supervision or as a member of a team. Learners will take personal responsibility for their own actions and for the quality and accuracy of the work that they carry out. Where team working is involved, they must demonstrate a significant personal contribution during the team activities in order to satisfy the requirements of the standard, and competency in all the areas required by the standard must be demonstrated.

Learners' knowledge will be sufficient to provide a sound basis for their work, and will provide an informed approach to applying the appropriate modification or rewiring techniques and procedures in yachts or boats. They will have an understanding of the basic knowledge behind the circuits being modified or installed and their application, and will know about the methods, tools and equipment to be used in adequate depth to provide a sound basis for carrying out the activities to the required specification.

Learners will understand the safety precautions required when carrying out the electrical wiring modification activities, especially those for ensuring any power supplies are correctly isolated. They will be required to demonstrate safe working practices throughout, and will understand the responsibility they owe to themselves and others in the workplace, both ashore and afloat.

Assessment requirements/evidence requirements

This unit must be assessed in a work environment and must be assessed in accordance with the Semta Assessment Strategy. Detailed information is given in *Annexe C.*

Assessment methodology

This unit is assessed in the workplace or in conditions resembling the workplace. Learners can enter the types of evidence they are presenting for assessment and the submission date against each assessment criterion. Alternatively, centre documentation should be used to record this information.

Learning outcomes and assessment criteria

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
1 Assist in modifying and adding electrical circuits in yachts and boats	1.1 work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines 1.2 carry out all of the following during the modification or addition of the yacht or boat electrical circuits: • ensure they have the necessary information to assist with the electrical wiring modification activities (such as job instructions or modification drawings) • adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations • obtain clearance to work on the electrical system, and observe the appropriate power isolation and safety procedures • maintain safe access and working arrangements for the work area • assist in modifying or adding electrical circuits, using approved techniques and procedures • return all tools and equipment to the correct location on completion of the activities • leave the work area in a safe and tidy condition 1.3 obtain and follow the relevant modification specifications and job instructions			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.4 confirm and agree what modifications are to be carried out to meet the specification 1.5 prepare the electrical system for the required modification 1.6 carry out the system modification using approved materials, methods and procedures 1.7 assist in carrying out modifications or additions of three of the following yacht or boat electrical systems: • power supply circuits • services/domestic electrical systems • pumping systems (such as freshwater systems, bilge pumping systems, sanitary systems) • motor/rotating equipment circuits (such bow/stern thrusters, anchor windlass, trim tabs winches and hoists) • lighting systems (such as internal, external navigational) • alarm systems (such as fire, flood/liquid level, gas, intruder) • emergency/temporary power supplies • entertainment systems (such as sound systems, video entertainment systems)			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• communications systems (such as very high frequency (VHF) radio, SSB, satellite communications (SATCOM), Navtex, weather fax, on-board entertainment systems, intercom) • positioning systems (such as chart plotter, global positioning system (GPS), long range navigation (LORAN), compass, gyro) • autopilot systems • instrument systems (such as speed, depth, wind, velocity made good) • sensor systems (such as RADAR) • other specific electrical circuits 1.8 carry out four of the following types of modification to the electrical circuits and equipment: • replacing cables of different size or length • changing the position or angle of breakout points • adding or removing components from circuits • changing the route of cables • adding new looms or mains circuits • changing or adding conduit runs • changing or adding trunking and trays • making changes to looms or mains circuits • changing the position of electrical units • fitting new electrical systems			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	• removal of cables • addition of cables • removing and replacing cable end fittings • changing or adding components to panels or sub-assemblies 1.9 carry out three of the following types of electrical connection: • terminating PVC cables • making mechanical/screwed/clamped connections • creating earth bonding points • soldering and de-soldering • terminating screened cables • terminating fibre-optic cables • terminating co-axial cable • terminating mineral and armoured cables • sealing and protecting cable connections • heat shrinking (devices and boots) • crimping (tags and pins) • allocating identification markings 1.10 complete the modification within the agreed timescale 1.11 check that the modified electrical system meets the specified operating condition			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.12 assist in modifying or rewiring yacht or boat electrical systems which comply with one of the following: • BS or ISO standards and procedures • other accepted international standards • customer (contractual) standards and requirements • company standards and procedures • specific equipment requirements/manufacturer's data • BS 7671/IEE Wiring Regulations (current edition) • recognised compliance agency/body's standards (such as Lloyds, Boat Safety Scheme, BMEA Code) 1.13 produce accurate and complete records of all modification work carried out 1.14 complete the relevant paperwork, to include one from the following, and pass to the appropriate people: • job cards • installation records • system log • vessel/craft wiring documentation			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	1.15 deal promptly and effectively with problems within their control and report those that cannot be solved			
2 Know how to assist in modifying and adding electrical circuits in yachts and boats	2.1 explain the specific safety precautions and procedures to be observed whilst assisting with the modifications or addition of the yacht or boat electrical circuits (including any specific legislation, regulations or codes of practice relating to the activities, equipment or materials) 2.2 describe the hazards associated with carrying out modifications or additions of yacht or boat electrical systems, and explain how they can be minimised 2.3 explain what personal protective equipment and clothing needs to be worn during the electrical wiring modification activities 2.4 explain how to obtain the necessary job instructions required for the work being carried out 2.5 explain the different types of cabling and their application (such as multicore cables, single-core cables, solid and multi-stranded cables, steel wire armoured (SWA), mineral insulated (MI), screened cables, data/communications cables, fibre optics) 2.6 explain the different types of electrical components (such as plugs, switches, lighting and fittings, junction boxes, consumer units) 2.7 describe the preparations to be undertaken on the circuit prior to carrying out the modification			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.8 explain how to extract and insert cables in wiring enclosures (such as conduit, trunking and through-bulkhead penetration) without causing damage to cables or components 2.9 explain the techniques used to terminate electrical cables (such as plugs and sockets; soldering; screwed, clamped and crimped connections, glands and sealed connectors) and the importance of adhering to these procedures 2.10 explain the methods and techniques to be used for crimping and heat shrinking, and the importance of adhering to these procedures 2.11 describe the various mechanical fasteners that will be used, and explain their method of installation 2.12 explain the methods of attaching markers/labels to components or cables to assist with identification (such as colour coding conductors, using coded tabs) 2.13 explain the importance of ensuring that the modified electrical circuit is free from foreign objects, and that all terminations are sound and secure			

Learning outcomes	Assessment criteria	Evidence type	Portfolio reference	Date
	2.14 explain the importance of conducting inspections and checks to ensure that the completed modification or added circuit complies with all required standards before reconnecting to the supply (such as visual examination for loose or exposed conductors, excessive solder or solder spikes which may allow short circuits to occur, strain on terminations, insufficient slack cable at terminations, continuity and polarity checks) 2.15 explain why electrical bonding is critical, and why it must be both mechanically and electrically secure 2.16 explain how to check that tools and equipment are free from damage or defect, are in a safe and usable condition, and are configured correctly for the intended purpose 2.17 describe the problems that can occur with the modification or rewiring operations, and explain how these can be overcome 2.18 describe the procedure for the safe disposal of waste materials 2.19 describe the extent of their own authority and explain whom they should report to if they have problems that they cannot resolve			

Learner name: _____ Date: _____

Learner signature: _____ Date: _____

Assessor signature: _____ Date: _____

Internal verifier signature: _____ Date: _____
(*if sampled*)

Further information

To get in touch with us visit our 'Contact us' pages:

- Edexcel, BTEC and Pearson Work Based Learning contact details: qualifications.pearson.com/en/support/contact-us.html
- books, software and online resources for UK schools and colleges: www.pearsonschoolsandfecolleges.co.uk

Key publications

- *Adjustments for candidates with disabilities and learning difficulties, Access and Arrangements and Reasonable Adjustments, General and Vocational qualifications* (Joint Council for Qualifications (JCQ))
- *Supplementary guidance for reasonable adjustments and special consideration in vocational internally assessed units* (Pearson)
- *General and Vocational qualifications, Suspected Malpractice in Examination and Assessments: Policies and Procedures* (JCQ)
- *Equality Policy* (Pearson)
- *Recognition of Prior Learning Policy and Process* (Pearson)
- *UK Information Manual* (Pearson)
- Pearson Edexcel NVQs, SVQs and competence-based qualifications – Delivery Requirements and Quality Assurance Guidance (Pearson)

All of these publications are available on our website: qualifications.pearson.com

Further information and publications on the delivery and quality assurance of NVQ/Competence-based qualifications are available at our website on the Delivering BTEC pages. Our publications catalogue lists all the material available to support our qualifications. To access the catalogue and order publications, please go to the resources page of our website.

Useful publications

Related information and publications include:

- *Centre Handbook for Pearson NVQs and Competence-based Qualifications* published annually
- functional skills publications – specifications, tutor support materials and question papers
- the current Pearson publications catalogue and update catalogue.

Pearson publications concerning the Quality Assurance System and the internal and standards verification of vocationally related programmes can be found on the Edexcel website.

NB: Some of our publications are priced. There is also a charge for postage and packing. Please check the cost when you order.

How to obtain National Occupational Standards

To obtain the National Occupational Standards please go to www.ukstandards.org.uk.

Professional development and training

Pearson supports UK and international customers with training related to NVQ and BTEC qualifications. This support is available through a choice of training options offered in our published training directory or through customised training at your centre.

The support we offer focuses on a range of issues including:

- planning for the delivery of a new programme
- planning for assessment and grading
- developing effective assignments
- building your team and teamwork skills
- developing student-centred learning and teaching approaches
- building functional skills into your programme
- building effective and efficient quality assurance systems.

The national programme of training we offer can be viewed on our website qualifications.pearson.com. You can request customised training through the website or by contacting one of our advisers in the Training from the Pearson team via Customer Services to discuss your training needs.

The training we provide:

- is active
- is designed to be supportive and thought provoking
- builds on best practice
- may be suitable for those seeking evidence for their continuing professional development.

Annexe A: Quality assurance

Key principles of quality assurance

- A centre delivering Pearson qualifications must be a Pearson recognised centre and must have approval for qualifications that it is offering.
- The centre agrees, as part of gaining recognition, to abide by specific terms and conditions relating to the effective delivery and quality assurance of assessment. The centre must abide by these conditions throughout the period of delivery.
- Pearson makes available to approved centres a range of materials and opportunities to exemplify the processes required for effective assessment and provide examples of effective standards. Approved centres must use the guidance on assessment to ensure that staff who are delivering Pearson qualifications are applying consistent standards.
- An approved centre must follow agreed protocols for: standardisation of assessors; planning, monitoring and recording of assessment processes; internal verification and recording of internal verification processes and dealing with special circumstances, appeals and malpractice.

Quality assurance processes

The approach to quality assured assessment is made through a partnership between a recognised centre and Pearson. Pearson is committed to ensuring that it follows best practice and employs appropriate technology to support quality assurance processes where practicable. The specific arrangements for working with centres will vary. Pearson seeks to ensure that the quality-assurance processes it uses do not inflict undue bureaucratic processes on centres, and works to support them in providing robust quality-assurance processes.

The learning outcomes and assessment criteria in each unit within this specification set out the standard to be achieved by each learner in order to gain each qualification. Pearson operates a quality-assurance process, designed to ensure that these standards are maintained by all assessors and verifiers.

For the purposes of quality assurance, all individual qualifications and units are considered as a whole. Centres offering these qualifications must be committed to ensuring the quality of the units and qualifications they offer, through effective standardisation of assessors and internal verification of assessor decisions. Centre quality assurance and assessment processes are monitored by Pearson.

The Pearson quality-assurance processes will involve:

- gaining centre recognition and qualification approval if a centre is not currently approved to offer Pearson qualifications
- annual visits to centres by Pearson for quality review and development of overarching processes and quality standards. Quality review and development visits will be conducted by a Pearson quality development reviewer
- annual visits by occupationally competent and qualified Pearson Standards Verifiers for sampling of internal verification and assessor decisions for the occupational sector
- the provision of support, advice and guidance towards the achievement of National Occupational Standards.

Centres are required to declare their commitment to ensuring quality and appropriate opportunities for learners that lead to valid and accurate assessment outcomes. In addition, centres will commit to undertaking defined training and online standardisation activities.

Annexe B: Centre certification and registration

Pearson Standards Verifiers will provide support, advice and guidance to centres to achieve Direct Claims Status (DCS). Pearson will maintain the integrity of Pearson NVQs through ensuring that the awarding of these qualifications is secure. Where there are quality issues identified in the delivery of programmes, Pearson will exercise the right to:

- direct centres to take action
- limit or suspend certification
- suspend registration.

The approach of Pearson in such circumstances is to work with the centre to overcome the problems identified. If additional training is required, Pearson will aim to secure the appropriate expertise to provide this.

What are the access arrangements and special considerations for the qualification in this specification?

Centres are required to recruit learners to Pearson qualifications with integrity.

Appropriate steps should be taken to assess each applicant's potential and a professional judgement should be made about their ability to successfully complete the programme of study and achieve the qualification. This assessment will need to take account of the support available to the learner within the centre during their programme of study and any specific support that might be necessary to allow the learner to access the assessment for the qualification. Centres should consult Pearson's policy on learners with particular requirements.

Pearson's policy on access arrangements and special considerations for Pearson qualifications aims to enhance access to the qualifications for learners with disabilities and other difficulties (as defined by the 2010 Equality Act) without compromising the assessment of skills, knowledge, understanding or competence. Please refer to *Access Arrangements, Reasonable Adjustments and Special Consideration for General and Vocational Qualifications* for further details. qualifications.pearson.com

Annexe C: Assessment Strategy

The Semta Assessment Strategy will be available on the Pearson website, alongside the full specification on the Engineering NVQ/Competence page.

Annexe D: Additional requirement for qualifications that use the term 'NVQ' in a QCF qualification title

For information please go to www.ofqual.gov.uk to access the document *'Operating rules for using the term 'NVQ' in a QCF qualification title'*.

October 2017

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