NOVA SCOTIA
APPRENTICESHIP CURRICULUM STANDARD

for the occupation of

BOATBUILDER

July 2016

Developed by the
Nova Scotia Boatbuilders Association

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Foreword

"Boatbuilder" means a person who builds custom or semi-custom boats including pleasure craft (from small row boats to large yachts), passenger vessels, tour boats, workboats and fast rescue craft that are up to 24 metres (78 ft) in length. An individual completing this apprentice program will gain the knowledge and skills required to be recognized and qualified as a competent Boatbuilder. In this trade, an apprentice must choose one of three (3) pathways depending on the type of material a boat is constructed from. Depending on the pathway they choose, apprentices gain a comprehensive and detailed understanding of all aspects of wood boat construction, composite (fibreglass) boat construction or metal boat construction.

The skills and knowledge an apprentice will gain include a general knowledge of the boatbuilding industry, health and safety, boats drawings, lofting techniques, pattern making calculations, correct use of all boatbuilding tools and the construction of interior and exterior components, frames, hulls, decks and superstructures.

This Boatbuilder trade was initially developed by the marine industry in New Zealand to meet the needs of boatyards for qualified competent workers. The Boatbuilder trade and the majority of the training materials were adopted by Nova Scotia with a few modifications, as recommended by an industry working group, so that the program would better meet the needs of the boatbuilding industry in the Province.

Certain Core Competencies, expected of all boatbuilder apprentices, are covered in compulsory units while other units cover specific competencies required for building boats from the following materials:

- COMPOSITES

  Also known as the Fibre-Reinforced Plastics (FRP) or the Fibre-Reinforced Composites (FRC) pathway, this is the pathway taken by apprentices learning to build, repair, or restore composite boats - like NS fishing boats and pleasure craft.

- METAL

  The Metal pathway is for apprentices learning to form, shape and assemble boats from steel and aluminium plates. Steel and aluminium are often used in workboats and large pleasure boats like trawler yachts.

- WOOD

  Wooden boatbuilding is the traditional art form best known to most Nova Scotians. Apprentices studying on this pathway will construct wooden frameworks and joinery, and sheath a boat's framework using wood and FRP/composites. Wood (or wood epoxy) boats include small and large pleasure craft like dories and schooners.

Requirements for a Certificate of Apprenticeship

The Boatbuilder apprenticeship program is administered by the Nova Scotia Boatbuilders Association (NSBA) on behalf of the Province of Nova Scotia.

The Boatbuilder apprenticeship program contains 87 competency units. Twenty-one (21) of the units are core to the trade and are compulsory for everyone. Thirty-five (35) of the units are specific to the pathways and the remaining twenty-six (26) units are elective. Completion of each competency unit gives the apprentice a number of credits depending on how difficult the unit is to complete. To obtain a Certificate of Apprenticeship as a Boatbuilder, an individual must complete the 21 compulsory units, all of the required units specific to the pathway they are following (wood, composite or metal) and enough of the elective units to give them 50 additional credits.

Completion of an apprenticeship as a boatbuilder will require a minimum of three years full time employment in the trade and in most cases can be completed within five years. However, the variety of activities that an apprentice is exposed to in the workplace and the training opportunities that are available at any time will have a significant effect on how fast they can complete the program.

Provincial regulations require that an individual be employed in the trade for at least three months before they can register as an apprentice.

Individuals who are considering Boatbuilding as a career should visit the NSBA website at www.nsboats.com for further information or contact the NSBA Training Coordinator at: (902) 423-2378 or by email: nsbatc@eastlink.ca

Training and Assessment

As an apprentice, learning to become a boatbuilder will require self study of a workbook (available from the NSBA) and on acquiring the practical skills on-the-job for each of the compulsory and elective units that are required to complete the pathway that the apprentice chooses to follow. For some of the units (e.g. welding), the knowledge and skills can be obtained from off-job training providers.

Apprentices will be assessed fairly and accurately throughout the program on the knowledge and skills required to be a professional Boatbuilder. Each unit workbook has questions that the apprentice must answer to demonstrate their knowledge and activities that they must complete to demonstrate that they can perform the required skills competently. Assessment activities are designed to provide feedback and allow for further development of skills that have been identified as essential for on-the-job performance.

Forms of assessment may include:

- Written assessment at the workplace or at a training provider's facility
- Demonstration of skills at the workplace or at a training provider's facility
- Oral questioning to verify underpinning knowledge and documented evidence of competency
- Obtaining certification from the American Boat and Yacht Council (for certain competencies)

The emphasis in this trade is on demonstrated knowledge and workplace skill development that make the individual an effective Boatbuilder.

Acknowledgements

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List of Units

Complusory Units			
Unit No.	**Description**	**Credits**	**Page**
497NS	Protect health and safety in the workplace	1	14
4249NS	Demonstrate care & timeliness as an employee	3	15
18158NS	Select, use and care of hand tools used in boat building	3	16
18159NS	Select, use and care of portable power tools used in boat building	3	17
18160NS	Operate a range of stationary power tools used in boat building	4	18
9913NS	Demonstrate a knowledge of the Nova Scotia boatbuilding industry	5	19
9917NS	Demonstrate knowledge of boat building methods	4	21
2399NS	Dismantle, inspect, assember and test components – supervised	10	22
9915NS	Identify and explain causes of material deterioration in the marine environment (See Note 1)	2	23
9916NS	Recomment measures to prevent material deterioration in the marine environment (See Note 1)	4	24
18161NS	Perform measurements and calculations used in boat building	5	25
18166NS	Particiapte in a team project in the boating industry	4	26
9922NS	Take templates and patterns from existing boats	4	27
9923NS	Install internal and external boat hardware fittings	4	28
9939/12942NS	Build boat frameworks	25	29
18162NS	Calculate quantities and costs for boatbuilding projects	4	30
18164NS	Demonstrate knowledge of insulation and install insulation in boats	2	31
18165NS	Demonstrate knoweldge of computer technology used in the boating industry	6	32
9933NS	Install exterior boat joinery	10	33
18163NS	Demonstrate knowledge of boatbuilding construction drawings and produce related freehand sketches	2	34
18170NS	Contribute to a team project in the boating industry	3	35
9934NS	Construct interior wooden support structures for boats	15	36

Note 1: Units 9915NS and 9916NS must be completed together.

Wood Pathway Units			
Unit No.	**Description**	**Credits**	**Page**
3152NS	Prepare wooden & substrate surfaces for finishing including wood filling open grains	3	38
3154NS	Apply preparaton coatings for furniture surfaces	4	39
3160NS	Produce laminated polyester resin item to composite product specifications	5	40
3161NS	Produce an epoxy resin item to a product specification for composites	5	41
9936NS	Construct exterior boat joinery in wood	20	42
11787NS	Prepare wooden substrates for marine surface coatings	5	43
9930NS	Plank a boat framework	23	44
9940NS	Sheath a boat framework using wood and fibre-reinforced composites	35	45
18168NS	Demonstrate knowledge of wood and adhesives used in boat building (See Note 2)	4	47
143NS	Fillet wood for air or kiln drying (See Note 2)	2	48
18169NS	Laminate and join wood materials used in boat building	4	49

Note 2: Units 143NS and 18169NS must be completed together

FRP / Composite Pathway Units			
Unit No.	**Description**	**Credits**	**Page**
3160NS	Produce a laminted polyester resin item to a product specification for compoosites	5	51
3161NS	Produce an epoxy resin item to a product specification for composites	5	52
3162NS	Produce a vinylester resin item to a product specification for composites	5	53
3168NS	Deposit a gel coat by hand for composites	4	54
3170NS	Produce a laminate by vacuum bagging for composites	2	55
3171NS	Produce a cored laminate for composites	3	56
3185NS	De-mould laminated items for composites (See Note 3)	6	57
3186NS	Finish produce to specification for composites (See Note 3)	5	58
3169NS	Deposit a gel coat by spray methods for composites	6	59
3181NS	Produce a plug or pattern for composites	12	61
3183NS	Produce pre-form materials for lamination for composites	4	62
3193NS	Apply quantity surveying to composite production	2	63
9941NS	Carry out the repair, restoration & structural alteration of composite boats	20	64
3192NS	Provide for and attach fixings and fastenings in composites	4	66
9942NS	Construct internal & external boat joinery in fibre-reinforced composites (FRC)	15	67
11788NS	Prepare – fibre-reinforced composite substrates for marine surface coatings	5	68

Note 3: Units 3185NS and 3186NS must be completed together.

Metal Pathway Units			
Unit No.	**Description**	**Credits**	**Page**
2415NS	Form and shape fabrication materials – supervised	10	70
9944NS	Identify the characteristics of aluminum alloys relevant to boat building	2	71
2416NS	Assemble and mechanically join plate & sheet – supervised	10	72
2418NS	Lay out and mark off the regular fabrication shapes – supervised	15	74
2421NS	Mechanically cut fabrication materials using powered machinery – supervised	10	76
2675NS	Weld aluminum with the gas metal arc welding process in the down-hand position	6	77
2676NS	Weld to a general purpose qualiyt with the gas tungsten arc process	6	79
2683NS	Cut metals using manual thermal processes	4	81
2422NS	Lay out and mark off complex fabrication shapes	15	82
2423NS	Form and shape fabrication materials	15	84
2425NS	Mechanically cut sheet, plate, tube, pipe & structural sections	10	85
9946NS	Assemble multiple and complex metal boat components for joining	10	86
11790NS	Prepare aluminum substates for marine surface coating	5	88
9949NS	Identify the characteristics of steels relevant to boatbuilding	2	89
11789NS	Prepare steel substrates for marine surface coating	5	90

Electives

Elective – FRP / Composite:			
Unit No.	**Description**	**Credits**	**Page**
3166NS	Produce an item using resin pre-impregnated reinforcement for composites	5	92
3167NS	Deposit composite matrix with depositor or chopper gun	6	93
3179NS	Porduce a laminate using a pre-wet machine for composites	2	94
9940NS	Sheath a boat framework using wood and fibre-reinforced composites	35	95

Elective – Welding:			
Unit No.	**Description**	**Credits**	**Page**
2686NS	Weld aluminum with th egas metal arc welding process in all positions	10	97
2688NS	Weld stainless steel tubes in position with the gas tungsten process	10	99
2671NS	Weld structural steel work with the manual metal arc welding process in down-hand positions	6	101
2684NS	Weld structural steel work with the gas metal arc welding process in all positions	10	103
2685NS	Weld structural steel work with the manual arc welding process in all positions	10	105
2687NS	Weld stainless steel sheet & plate with the gas metal arc welding process in all positons	10	107

Elective – Mechanical:			
Unit No.	**Description**	**Credits**	**Page**
11777NS	Install production boat engine packages	10	109
241NS	Describe the operation of a diesel fuel system & perform minor servicing tasks	3	110
15404NS	Demonstrate knowledge of diesel engine air intake & exhaust systems; inspect & test them	6	112
9938NS	Install pipe work in boats	12	114
9937NS	Install exterior boat systems	10	115

Elective – Electrical:			
Unit No.	**Description**	**Credits**	**Page**
401 NS	NSBA Marine Electrical Certification	25	116
5433NS	Describe the application of electricity & electronics for mariners	8	117

Elective – Drawing / Lofting:			
Unit No.	**Description**	**Credits**	**Page**
10836NS	Produce scale drawings of boat surfaces from corrected offsets	6	119
10837NS	Prepare a lofting floor for boatbuilding (See note 4)	4	120
10838NS	Draw full sized hulls from corrected offsets under supervision (See note 4)	4	121
10842NS	Draw fair lines for boatbuilding (See note 4)	10	122

Elective – Filling and Fairing:			
Unit No.	**Description**	**Credits**	**Page**
9950NS	Fill and fair boat surfaces	6	123

Elective – Painting:			
Unit No.	**Description**	**Credits**	**Page**
97NS	Apply surface coatings by conventional spray techniques (See Note 5)	15	124
100NS	Apply liquid coatings by airless spray techniques (See Note 5)	-	126
5712NS	Use and maintain spray guns; rectify spray gun defects (See Note 5)	-	128
1071NS	Describe, select, use and maintain paint rollers (See Note 6)	4	130
1073NS	Describe, select, use and maintain paint brushes (See Note 6)	-	131
11791NS	Apply build coats and finish coats for marine paint systems	20	132
11786NS	Anti-foul a boat	2	133

Elective – Wood:			
Unit No.	**Description**	**Credits**	**Page**
9931NS	Overlay boat deck with teak	15	134

Elective – Spars and Rigging:			
Unit No.	**Description**	**Credits**	**Page**
18171NS	Demonstrate knowledge of spars and rigging	5	136

Note 4: Units 10837NS, 10838NS and 10842NS must completed together.
Note 5: Units 97NS, 100NS and 5712NS must completed together.
Note 6: Units 1071NS and 1073NS must completed together.

Detailed Unit Descriptions

Unit: 497NS PROTECT HEALTH AND SAFETY IN THE WORKPLACE

Objectives

This unit introduces learners to workplace health and safety legislation and enables them to play an active role in ensuring the health and safety of themselves and others in the workplace.

Elements and Performance Criteria

1. Recognise statutory rights and responsibilities

    1.1 Requirements are identified as they apply to employees under the NS Occupational Health and Safety Act.

    1.2 Right are identified as they apply to employees under the NS Occupational Health and Safety Act.

2. Protect health and safety

    2.1 Procedures outlined would enable the learner to identify potential health and safety hazards within a workplace.

    2.2 Strategies determined would enable the learner to help ensure health and safety hazards are reduced or eliminated.

    2.3 Procedures outlined would enable the learner to deal with hazardous events or situations when not covered by employer emergency plans.

Unit: 4249NS DEMONSTRATE CARE & TIMELINESS AS AN EMPLOYEE

Objectives

People credited with this unit will have, for a period of 20 consecutive working days, exercised care in terms of personal presentation and behaviour, and workplace health and safety; have shown a responsible attitude to equipment and materials; and have demonstrated timeliness in terms of punctuality, attendance, deadlines, and notification of absences.

Elements and Performance Criteria

1. Exercise care as an employee.

    1.1 Personal presentation is suitable to the work performed and meets establishment requirements.

    1.2 Personal behaviour is free from conduct which can lead to disciplinary action, including dismissal.

    1.3 Moderation is exercised in the use of language and in relating to supervisors, co-workers and any customers and/or visitors.

    1.4 Practice of workplace health and safety meets legal minimum standards, and organizational requirements.

    1.5 Equipment and materials are treated with due care and attention as per organizational requirements.

2. Demonstrate timeliness as an employee.

    2.1 Work is commenced and recommenced at no later than agreed times.

    2.2 Meetings and appointments are attended on time.

    2.3 Tasks are completed to required standards on time, unless good reasons prevent this from occurring.

    2.4 Absences are notified as early as possible and in accordance with organizational procedure.

Unit: 18158NS SELECT, USE AND CARE FOR HAND TOOLS USED IN BOATBUILDING

Objectives

People credited with this unit are able to select, use, and care for a range of hand tools used in the boatbuilding industry.

Elements and Performance Criteria

1. Select boatbuilding hand tools.

    1.1 Boatbuilding hand tools are identified in terms of the work operations to be completed.

    1.2 Use of tools is described in terms of safety requirements.

    1.3 Hand tools are selected to meet the job requirements.

2. Use boatbuilding hand tools.

    2.1 Safety hazards are identified in using hand tools, and precautions are taken in accordance with worksite procedures.

    2.2 Hand tools are used as recommended by the manufacturer to meet job requirements.

3. Care for boatbuilding hand tools.

    3.1 Cutting edges are evaluated to determine the cutting efficiency.

    3.2 Hand tools which are unsafe, faulty or in need of repair and/or maintenance are identified and corrective actions taken in accordance with worksite procedures.

    3.3 Hand tools are cleaned, serviced and stored in accordance with worksite procedures.

Unit: 18159NS SELECT, USE AND CARE FOR PORTABLE POWER TOOLS USED IN BOATBUILDING

Objectives

People credited with this unit are able to select, use, and care for a range of portable power tools used in the boatbuilding industry.

Elements and Performance Criteria

1. Select portable power tools used in boatbuilding, and their power source.

    1.1 Boatbuilding hand tools are identified in terms of the work operations to be completed.

    1.2 Use of tools is described in terms of safety requirements.

    1.3 Portable power tools are selected to meet the job requirements.

2. Use boatbuilding portable power tools

    2.1 Safe work practice eliminates, isolates and/or minimises hazards in accordance with worksite procedures.

    2.2 Portable power tools are used to meet job requirements in accordance with manufacturer's recommendations.

3. Care for boatbuilding power tools.

    3.1 Portable power tools which are unsafe, faulty or in need of repair and/or maintenance are identified and corrective actions taken in accordance with worksite procedures.

    3.2 Portable power tools are cleaned, serviced, maintained and stored in accordance with worksite procedures.

Unit: 18160NS OPERATE MECHANICAL STATIONARY POWER TOOLS USED IN BOATBUILDING

Objectives

People credited with this unit are able to prepare to operate mechanical plant tools used in boatbuilding , and operate at least four mechanical production processes used in boatbuilding.

Elements and Performance Criteria

1. Prepare to operate mechanical stationary power tools used in boatbuilding.

    1.1 Machines, ancillary equipment, product and material hazards are identified and precautions taken in accordance with worksite procedures and occupational safety and health standards.

    1.2 The process and sequence of operation are identified according to worksite requirements.

    1.3 Mechanical plant is prepared for operation according to worksite procedures and manufacturer's recommendations.

2. Operate mechanical production processes.

    2.1 Raw material is identified, inspected and loaded according to job requirements.

    2.2 Production process is carried out according to job specifications.

    2.3 Finished product is inspected, stored and/or dispatched in accordance with worksite requirements.

    2.4 Scrap processing procedures are performed to worksite requirements.

Unit: 9913NS DEMONSTRATE KNOWLEDGE OF THE NOVA SCOTIA BOATBUILDING INDUSTRY

Objectives

People credited with this unit are able to: identify the purpose and interrelationships of the boating industry's sectors; explain the geographic spread of boating industry activity in Nova Scotia; identify the boating industry's domestic and export markets; identify trends affecting the future of the boating industry; identify features of boats and their operation; and identify career opportunities within the boating industry.

Elements and Performance Criteria

1. Identify the purpose and interrelationships of the boating industry's sectors.

    1.1 The purpose and inter-relationships of the boatbuilding industry sectors are explained in terms of the life cycle of a boat.

    1.2 Skills shared with other industries and between boatbuilding industry sectors are identified in terms of fields.

2. Explain the geographic spread of boating industry activity in Nova Scotia.

    2.1 Explanation identifies the geographic spread of boatbuilding industry activity in terms of volume and type.

    2.2 Explanation describes the geographic spread of boatbuilding industry activity in terms of resource availability, market demands and trends.

3. Identify the boating industry's domestic and export markets.

    3.1 Nova Scotia’s domestic and export markets are identified by volume, value, boat size, and boat type.

    3.2 Work done on international boats brought to Nova Scotia for servicing is identified by its type, the skills required, and the types of boats involved.

4. Identify trends affecting the future of the boating industry.

    4.1 Trends in the characteristics of boats being built are identified in terms of boat size and type and materials used.

    4.2 Trends in boatbuilding activity are identified in terms of lifestyle and demographics.

    4.3 Trends within the boatbuilding activity are identified in terms of increasing regulation of boat construction and protection of the environment.

5. Identify features of boats and their operation.

5.1 Boat features are identified from actual items and/or pictures and/or diagrams.

5.2 Boat features are identified using terminology in accordance with the reference text.

6. Identify career opportunities within the boating industry. Identify career opportunities within the boating industry.

6.1 Entry points to the boatbuilding industry are identified in terms of the learner's own experience, interests, and geographic location.

6.2 Possible career paths within the boatbuilding industry are identified in terms of the learner's own interests and expectations.

Unit: 9917NS DEMONSTRATE KNOWLEDGE OF BOAT BUILDING METHODS

Objectives

People credited with this unit are able to: demonstrate knowledge of building framed boats covered with wood; demonstrate knowledge of metal boatbuilding; and demonstrate knowledge of boatbuilding in fibre-reinforced plastic (FRP). This unit is for people who are entering, or wishing to enter, the boating industry and provides a context for further learning.

Elements and Performance Criteria

1. Demonstrate knowledge of building framed boats covered with wood.

   1.1 Methods of constructing framed boats covered with wood are explained in terms of the tools used.

   1.2 Wood covering systems are identified from samples and/or pictures.

   1.3 Fastening systems are identified from samples and/or pictures, and are matched to wood covering systems.

   1.4 Advantages and disadvantages of wood covering and fastening systems are identified in terms of their end uses.

   1.5 Explanations of waterproofing and protection systems establish their purposes.

   1.6 Explanations of terminology establish its traditional use.

2. Demonstrate knowledge of metal boatbuilding.

   2.1 Explanations of traditional metal boat construction methods establish their similarities with and differences from modern methods.

   2.2 Uses of metal boats are identified in terms of their operating environment.

   2.3 Characteristics of metal boats are identified in terms of their advantages and disadvantages in comparison with wood-covered boats.

3. Demonstrate knowledge of boatbuilding in FRP.

   3.1 Methods of constructing FRP boats are explained in terms of the equipment used.

   3.2 Explanation of the construction environment for FRP boats establishes the requirements for the control of temperature, humidity, and contamination.

   3.3 Characteristics of FRP boats are identified in terms of their advantages and disadvantages in comparison with boats constructed of wood and metal.

Unit: 2399NS DISMANTLE, INSPECT, ASSEMBLE AND TEST COMPONENTS - SUPERVISED

Objectives

This unit is useful for learners, or those employed in the mechanical and marine engineering industry and those in maintenance operations of process industries. People credited with this unit are able to, under supervision, dismantle components, inspect for faults, carry out repairs, and reassemble and test components for correct functioning. The types of components may include but are not limited to: valves (gate, ball, and diaphragm types), single stage pumps, single reduction gearboxes, single stage fans, couplings.

Elements and Performance Criteria

1. Dismantle and clean components.

    1.1 Components and supporting data are established.

    1.2 Method, tools and procedure for disassembly are established and verified with supervisor.

    1.3 Components are dismantled into parts in accordance with worksite procedure.

    1.4 Parts are cleaned in accordance with worksite procedure.

2. Inspect and replace parts.

    2.1 Component parts are inspected for conformance to manufacturer's or customer requirements, and verified with supervisor.

    2.2 Faulty parts are assessed for repair, or replacement, in accordance with worksite procedure.

    2.3 Defective parts are replaced in accordance with worksite procedure.

3. Assemble and test components

    3.1 Components are re-assembled in accordance with worksite procedure, and checked with supervisor.

    3.2 Components are tested and conformance to manufacturer's or customer specification is confirmed in accordance with worksite procedure, and verified with supervisor.

    3.3 Component records are completed in accordance with worksite procedure.

Unit: 9915NS IDENTIFY AND EXPLAIN CAUSES OF MATERIAL DETERIORATION IN THE MARINE ENVIRONMENT

Objectives

People credited with this unit are able to identify examples of deterioration, and recommend measures to prevent recurrence.

Elements and Performance Criteria

1. Identify examples of material deterioration in the marine environment.

    1.1 Examples are identified from samples and from photographs.

    1.2 Examples are identified using sight alone.

    1.3 Examples are identified without the use of reference material.

2. Explain causes and prevention of material deterioration in the marine environment.

    2.1 The role of electrolysis in marine metal corrosion is explained in terms of electrolytes and electrodes.

    2.2 Electric potential is predicted for pairs of metals using a galvanic chart.

    2.3 Locations of deterioration on boats are identified in accordance with the reference texts.

    2.4 Preventions are explained in accordance with the reference texts.

Unit: 9916NS RECOMMEND MEASURES TO PREVENT MATERIAL DETERIORATION IN THE MARINE ENVIRONMENT

Objectives

People credited with this unit are able to identify examples of deterioration, and recommend measures to prevent recurrence.

Elements and Performance Criteria

1. Identify examples of deterioration.

    1.1 Examples are identified from actual samples, from photographs and from verbal descriptions.

    1.2 Examples are identified using sight, touch and smell.

2. Recommend measures to prevent recurrence.

    2.1 Causes of deterioration are identified on the basis of inspection of the whole vessel and consideration of its operating environment.

    2.2 Recommended preventive measures are practical and cost-effective, and prevent recurrence of the identified form of deterioration for the particular vessel in its own operating environment.

    2.3 Selection of sacrificial anode type, size and location matches boat size, materials and operating environment.

Unit: 18161NS PERFORM MEASUREMENTS AND CALCULATIONS USED IN BOAT BUILDING

Objectives

People credited with this unit are able to select measuring devices, and complete measurement tasks and perform calculations to meet boatbuilding requirements.

Elements and Performance Criteria

1. Select measuring devices for use in boatbuilding.

    1.1 Techniques for using measuring devices to meet task requirements are established for each device..

    1.2 Measuring device is selected to meet the task requirements.

2. Complete measurement tasks and perform calculations for boatbuilding.

    2.1 Type of calculation required is identified in terms of area, volume, dimensions and weight.

    2.2 Measurements are taken to meet the requirements of the working drawings.

    2.3 Measurements obtained are recorded according to worksite procedures.

    2.4 Calculations are completed accurately to meet task requirements.

Unit: 18166NS PARTICIPATE IN A TEAM PROJECT IN THE BOATING INDUSTRY

Objectives

People credited with this unit are able to identify the requirements of working in a project team, and actively contribute to problem solving in a project team in the boating industry.

Elements and Performance Criteria

1. Identify the requirements of working in a project team in the boating industry.

    1.1 Advantages of a team approach are explained in terms of improved outcomes.

    1.2 Requirements of working in a team are explained in terms of purpose and function.

2. Actively contribute to problem solving in a project team in the boating industry.

    2.1 Contributions made are focused on the subject matter and project team objectives.

    2.2 Contributions to decision making are made on the basis of available data and reflect project team members' viewpoints and ideas.

Unit: 9922NS TAKE TEMPLATES AND PATTERNS FROM EXISTING BOATS

Objectives

People credited with this unit are able to: identify required locations on existing boats for taking templates and patterns; prepare for template and pattern making; and produce templates and patterns. This unit is applicable to the building, repair, restoration, or alteration of boats constructed in wood, fibre-reinforced plastic (FRP), or metal.

Elements and Performance Criteria

1. Identify required locations on existing boats for taking templates and patterns.

    1.1 Location lines are established from standard marine terminology.

    1.2 Identified potential problems are reported in accordance with company procedures.

2. Prepare for template and pattern making.

    2.1 Selected method meets company requirements for minimization of materials wastage.

    2.2 Materials for patterns and templates are selected to meet job requirements.

    2.3 Drawings and data are completed to meet manufacturing requirements.

3. Produce templates and patterns.

    3.1 Templates and patterns are produced using tools and equipment in accordance with job requirements for the materials used.

    3.2 Completed templates and patterns meet job requirements for tolerance, finish, and orientation.

    3.3 Templates and patterns are notated to company and customer's requirements.

Unit: 9923NS INSTALL INTERNAL AND EXTERNAL BOAT HARDWARE FITTINGS

Objectives

People credited with this unit are able to: select the required internal and external boat hardware and fastenings; locate installation position; and fit hardware and test installation against specifications. This unit is applicable to boats constructed in wood, fibre-reinforced plastic (FRP), or metal.

Elements and Performance Criteria

1. Select the required internal and external boat hardware and fastenings.

    1.1 Hardware and fastenings are selected in accordance with customer's requirements and intended end use.

    1.2 Selected fastenings are compatible with hardware and substrate materials, and meet job requirements for durability and appearance.

2. Locate installation position.

    2.1 Installation position is located in accordance with job requirements.

    2.2 Position is checked as not compromising the boat's structural integrity, and as being suitable for installation as defined by joinery manufacturer's specifications and instructions.

    2.3 Positioning enables the subsequent attachment of any associated drive system.

    2.4 Where a departure from the intended installation position is required, the situation is reported in accordance with company procedures.

    2.5 Surfaces are prepared in accordance with job requirements and joinery manufacturer's specifications and instructions.

3. Fit hardware and test installation against specifications.

    3.1 Hardware and fastenings are installed in accordance with job requirements and/or hardware manufacturer's specifications and instructions.

    3.2 Completed installation provides a watertight contact between hardware and substrate.

    3.3 Completed installation does not interfere with other boat systems or weaken the boat's structure.

Unit: 9939/12942NS BUILD BOAT FRAMEWORKS

Objectives

People credited with this unit are able to setup a building frame, manufacture frame components, install and secure framework components, and fair the components and framework.

Elements and Performance Criteria

1. Setup a building frame.

    1.1 Floor is prepared and grid is marked out accurately to job requirements.

    1.2 Section frames are positioned and braced correctly.

2. Manufacture frame components.

    2.1 Materials selected meet job specifications and requirements of the intended use.

    2.2 Manufactured members meet job specifications for shape and size.

    2.3 Components are finished to job requirements.

3. Install and secure framework components.

    3.1 Components are installed so that job requirements for fair lines can be achieved.

    3.2 Temporary components are secured so that they can be removed in accordance with job requirements.

    3.3 Components are secured in accordance with job requirements.

4. Fair the components and framework.

    4.1 Selection or production of battens enabling fair lines to be established to job specifications.

    4.2 Hull or deck framework is checked by batten and any areas of non-fairness are identified and marked.

    4.3 Unfair areas are corrected.

Unit: 18162NS CALCULATE QUANTITIES AND COSTS FOR BOATBUILDING PROJECTS

Objectives

People credited with this unit are able to identify the process for estimating quantities of materials, and calculate costs for boatbuilding projects.

Elements and Performance Criteria

1. Identify the process for estimating quantities of materials used in boatbuilding.

    1.1 Type of calculation required is identified in terms of area and/or volume of hull form, decks and tank approximations, and materials used.

    1.2 Boatbuilding terminology is explained in terms of design.

    1.3 The process for estimating quantities of materials used in boatbuilding is described in terms of calculating the area, volume, weight and thickness for the required medium.

2. Calculate costs for boatbuilding projects.

    2.1 Written specification includes materials required to meet project requirements.

    2.2 All resources required are listed clearly and accurately.

    2.3 Terms used in costing are explained in terms of labour costs and material costs.

    2.4 The impact of changing individual components is described in terms of the effect on project costs.

    2.5 Project costs are calculated and documented according to worksite procedures.

Unit: 18164NS DEMONSTRATE KNOWLEDGE OF INSULATION AND INSTALL INSULATION IN BOATS

Objectives

People credited with this unit are able to demonstrate knowledge of insulation and install basic insulation in boats.

Elements and Performance Criteria

1. Demonstrate knowledge of types of insulation.

    1.1 Thermal insulation is explained in terms of its purpose and placement.

    1.2 Acoustic insulation is explained in terms of its purpose and placement.

    1.3 Fire insulation is explained in terms of its purposes.

    1.4 Vibration control insulation is explained in terms of its purposes.

    1.5 Materials used for insulation are identified in terms of their type.

2. Install basic insulation in boats.

    2.1 Type of insulation required is selected to meet job specifications.

    2.2 Boat and/or components are insulated according to industry requirements.

Unit: 18165NS DEMONSTRATE KNOWLEDGE OF COMPUTER TECHNOLOGY USED IN THE BOATING INDUSTRY

Objectives

People credited with this unit are able to describe computer applications, computer design applications, computer aided manufacturing processes and computer onboard systems used in the boatbuilding industry.

Elements and Performance Criteria

1. Describe computer applications used in the boating industry.

    1.1 Computer applications are identified in terms of type.

    1.2 Computer applications are described in terms of their use in daily workplace operations.

2. Describe computer design applications used in the boating industry.

    2.1 Computer design applications are identified in terms of type.

    2.2 Computer design applications are described in terms of their use in daily workplace operations.

3. Describe computer aided manufacturing processes used in the boating industry.

    3.1 Computer aided manufacturing processes are identified in terms of type.

    3.2 Computer aided manufacturing processes are described in terms of their impact on workplace operations.

4. Describe computer onboard systems used in the boating industry.

    4.1 Onboard computer systems are described in terms of type and uses.

Unit: 9933NS INSTALL EXTERIOR BOAT JOINERY

Objectives

People credited with this unit are able to: prepare for installation of exterior boat joinery; carry out the installation; and test the installation against specifications.

Elements and Performance Criteria

1. Prepare for installation of exterior boat joinery.

    1.1 Selected fastenings and sealants are compatible with hardware and substrate materials, and meet job requirements for durability and appearance.

    1.2 Installation position is located in accordance with job requirements.

    1.3 Position is checked for not compromising the boat's structural integrity, and as being suitable for installation as defined by joinery manufacturer's specifications and instructions.

    1.4 Where a departure from the intended installation position is required, the situation is reported in accordance with company procedures.

    1.5 Surfaces are prepared in accordance with job requirements and joinery manufacturer's specifications and instructions.

2. Carry out the installation.

    2.1 Opening and frame sizes are checked for accuracy in accordance with job requirements and specifications.

    2.2 Joinery units are attached to the boat structure in accordance with job requirements and specifications.

    2.3 Water proofing is installed to job requirements and specifications.

3. Test the installation against specifications.

    3.1 Completed installation provides a watertight contact between the joinery and the boat structure.

    3.2 Completed installation does not interfere with boat systems, or weaken the boat's structure.

Unit: 18163NS DEMONSTRATE KNOWLEDGE OF BOATBUILDING CONSTRUCTION DRAWINGS AND PRODUCE RELATED FREEHAND SKETCHES

Objectives

People credited with this unit are able to demonstrate knowledge of vessel construction drawings, and produce freehand sketches of vessels and/or vessel components.

Elements and Performance Criteria

1. Demonstrate knowledge of vessel construction drawings.

    1.1 Types of vessel construction drawings are identified in terms of their use and purpose.

    1.2 Components of vessel construction drawings are identified in terms of their relationship to the drawing.

    1.3 Drawings and dimensions of critical measurements are interpreted to scale, with imperial and metric conversions.

    1.4 Process for approving vessel construction drawings is described in terms of client approval and industry requirements.

2. Produce freehand sketches of vessels and/or vessel components.

    2.1 Vessel and/or component to be sketched is identified and measured to meet job requirements.

    2.2 Sketches produced communicate job requirements.

    2.3 Dimensions and related notes meet job requirements.

Unit: 18170NS CONTRIBUTE TO A TEAM PROJECT IN THE BOATING INDUSTRY

Objectives

People credited with this unit are, in the context of the boating industry, able to contribute to project team function and identify project improvements.

Elements and Performance Criteria

1. Contribute to project team function in the boating industry.

    1.1 The process for consulting with other trade disciplines involved in a boatbuilding project team is identified in terms of method, roles and responsibilities.

    1.2 Factors that could affect working relationships in the project team are identified in terms of potential conflict situations.

    1.3 Working relationships with members of the project team are supported in terms of respecting team members' workmanship.

2. Identify project improvements in the boating industry.

    2.1 Areas for project improvement are identified by type.

    2.2 The process for project improvement is described in terms of method and the project requiring improvement.

Unit: 9934NS CONSTRUCT INTERIOR SUPPORT STRUCTURES FOR BOATS

Objectives

People credited with this unit are able to: establish job requirements for the construction of interior wooden support structures; prepare for joinery construction; and construct joinery to specifications.

Elements and Performance Criteria

1. Establish job requirements for the construction of interior wooden support structures.

    1.1 Job specifications are verified in accordance with company procedures.

    1.2 Construction requirements are determined from inspection of drawings, plans, and the actual boat.

2. Prepare for joinery construction.

    2.1 Development of sketches and templates enables support structure to be constructed to customer's requirements for functionality, and to customer's and company's requirements for resource usage.

    2.2 Wood, adhesives, and fastenings are selected and ordered to meet job requirements.

    2.3 Construction method is selected to meet accessibility, time, and cost factors.

    2.4 Selected method enables the completed joinery to retain its shape and function in spite of boat movement.

    2.5 Selected method is confirmed with company and/or clients before commencing construction.

3. Construct joinery to specifications.

    3.1 Tools are selected according to job requirements.

    3.2 Joints are constructed to job requirements for tightness, durability, and finish.

    3.3 Completed joinery meets job requirements for size, shape, weight, surface equilibrium, and fairness.

    3.4 Installation instructions are provided in accordance with company requirements.

Detailed Unit Descriptions

Wood Pathway Units

Unit: 3152NS PREPARE WOODEN & SUBSTRATE SURFACES FOR FINISHING INCLUDING WOOD FILLING OPEN GRAINS

Objectives

People credited with this unit are able to: establish job requirements for the construction of People credited with this unit are able to establish the job requirements for furniture finishing, and prepare and fill wooden and substrate surfaces for furniture finishing. They are responsible for their own work quality and work under supervision.

Elements and Performance Criteria

1. Establish job requirements for the construction of interior wooden support structures.

    1.1 Job specifications are obtained, understood, and verified with the supervisor according to in-company working practices.

    1.2 Safety equipment is obtained and worn according to the supervisor's instructions and the company's requirements.

2. Prepare and fill wooden and substrate surfaces for furniture finishing.

    2.1 Undercoats and sealants are sanded according to the supervisor's instructions.

    2.2 Surfaces are prepared according to the supervisor's instructions.

    2.3 Fillers and stoppers are selected and used according to supervisor's instructions.

    2.4 Surfaces are sanded according to the supervisor's instructions.

    2.5 Open grain woods and veneers are wood filled to choke the grain according to the supervisor's instructions.

    2.6 Equipment and work area are left clean, clear, and tidy according to in-company working practice.

Unit: 3154NS APPLY PREPARATION COATINGS FOR FURNITURE SURFACES

Objectives

People credited with this unit are able to establish the job requirements for furniture finishing, and apply preparation coatings to furniture surfaces. They are responsible for their own work quality and work under supervision.

Elements and Performance Criteria

1. Establish the job requirements for furniture finishing.

    1.1 Job specifications are obtained, understood, and verified with the supervisor according to in-company working practices.

    1.2 Safety equipment is obtained and worn according to the supervisor's instructions and the company's requirements.

    1.3 Tools and equipment for the job are selected and used according to the supervisor's instructions.

2. Apply preparation coatings to furniture surfaces.

    2.1 Sealer or undercoat is mixed and is reduced according to the supervisor's instructions.

    2.2 Application method matches the supervisor's instructions.

    2.3 Sealer or undercoat is applied by the trainee according to the supervisor's instructions.

    2.4 Drying method matches the supervisor's instructions.

    2.5 Product is sanded, cleaned, and confirmed ready for the subsequent coating according to the supervisor's instructions.

    2.6 Equipment and work area are left clean, clear, and tidy according to in-company working practice.

Unit: 3160NS PRODUCE LAMINATED POLYESTER RESIN ITEM TO COMPOSITE PRODUCT SPECIFICATIONS

Objectives

People credited with this unit are able to produce a laminated polyester resin item against a product specification by preparing for production, producing the item to a process specification, and carrying out specified safety precautions

Elements and Performance Criteria

1. Prepare for production.

    1.1 Equipment is verified as being in working condition.

    1.2 Equipment matches the requirements of the product and process specifications.

    1.3 Safety equipment is complete, in working order, & matches the requirements of the task.

    1.4 Materials match the requirements of the product specification.

    1.5 Materials are prepared in accordance with manufacturer's specification

2. Produce the item.

    2.1 Process specifications are met.

    2.2 Remedial action ensures that product meets specification.

3. Carry out specified safety precautions.

    3.1 Materials are handled according to safety data sheet recommendations.

    3.2 Safety equipment is used according to worksite practice.

Unit: 3161NS PRODUCE AN EPOXY RESIN ITEM TO A PRODUCT SPECIFICATION FOR COMPOSITES

Objectives

People credited with this unit are able to produce an epoxy resin item against a product specification by preparing for production, producing the item to a process specification, and carrying out specified safety precautions.

Elements and Performance Criteria

1. Prepare for production.

    1.1 Equipment is verified as being in working condition.

    1.2 Equipment matches the requirements of the product and process specifications.

    1.3 Safety equipment is complete, in working order, & matches the requirements of the task

    1.4 Materials match the requirements of the product specification.

    1.5 Materials are prepared in accordance with manufacturer's specification

2. Produce the item.

    2.1 Process specifications are met.

    2.2 Remedial action ensures that product meets specification.

3. Carry out specified safety precautions.

    3.1 Materials are handled according to safety data sheet recommendations.

    3.2 Safety equipment is used according to worksite practice.

Unit: 9936NS CONSTRUCT EXTERIOR BOAT JOINERY IN WOOD

Objectives

People credited with this unit are, in the context of the boating industry, able to contribute to project team function and identify project improvements.

Elements and Performance Criteria

1. Establish job requirements for the construction of exterior boat joinery in wood.

    1.1 Job specifications are verified in accordance with company procedures.

    1.2 Construction requirements are determined from inspection of drawings, plans and the actual boat.

2. Prepare for joinery construction.

    2.1 Development of sketches and templates enables joinery to be constructed to customer's requirements for functionality, and to customer's and company's requirements for resource usage.

    2.2 Wood, adhesives, and fastenings are selected and ordered to meet job requirements.

    2.3 Construction method is selected to meet accessibility, time, and cost factors.

    2.4 Selected method enables the completed joinery to retain its shape and function in spite of boat movement.

    2.5 Selected method is confirmed with company and / or clients commencing construction.

3. Construct joinery to specifications.

    3.1 Tools are selected according to job requirements.

    3.2 Joints are constructed to job requirements for tightness, durability, and finish.

    3.3 Completed cabinetry meets job requirements for size, shape, weight, surface equilibrium, and quality of finish.

    3.4 Installation instructions are provided in accordance with company requirements.

Unit: 11787NS PREPARE WOODEN SUBSTRATES FOR MARINE SURFACE COATINGS

Objectives

People credited with this unit are able to check and clean wooden substrates, and prepare wooden substrates. This unit covers preparation activities to the point where the substrate can be filled and faired. It does not include filling and fairing, or the application of any surface coatings.

Elements and Performance Criteria

1. Check and clean wooden substrates.

    1.1 Wood is checked for soundness and deterioration in accordance with job specifications and manufacturer's specifications.

    1.2 Actions are taken in accordance with company and customer's requirements in the event that unsound or deteriorated areas are found.

    1.3 Use of degreasing agents ensures that the substrate is free of contamination in accordance with manufacturer's specifications and recommendations

2. Prepare wooden substrates.

    2.1 Prepared surface achieves coating manufacturer's requirements for profile and cleanliness.

    2.2 Work area is left free of possible surface contaminants.

    2.3 Protection for areas not to be coated is provided in accordance with company and/or customer's requirements.

Unit: 9930NS PLANK A BOAT FRAMEWORK

Objectives

People credited with this unit are select planking materials, prepare wood for fitting and fixing, fit and fix wood to a framework, and make planking watertight.

Elements and Performance Criteria

1. Select planking materials.

    1.1 Wood is selected to meet job requirements.

    1.2 Fastenings are selected to meet job requirements.

2. Prepare wood for fitting and fixing.

    2.1 Wood is cut to size so that it can be fixed to frames in accordance with job requirements, and fair lines can be achieved to design requirements.

    2.2 Wood pieces are pre-shaped in accordance with job requirements for jointing to adjacent pieces.

    2.3 Wood is pre-coated to job requirements.

3. Fit and fix wood to a framework.

    3.1 Framework is faired to job specifications and tolerances for fair lines.

    3.2 Wood is fitted and fixed in accordance with job requirements for fastening type and location.

    3.3 All joint surfaces are in contact with each other.

    3.4 Wood is fitted and fixed to relieve all stress that could potentially open up the joints.

4. Make planking watertight.

    4.1 Materials are selected and prepared in accordance with job requirements and manufacturer's specifications and instructions.

    4.2 Materials are applied to job requirements and in accordance with manufacturer's specifications and instructions.

    4.3 Water tightness is established using visual methods.

Unit: 9940NS SHEATH A BOAT FRAMEOWRK USING WOOD AND FIBRE-REINFORCED COMPOSITES (FRC)

Objectives

People credited with this unit are able to select sheathing materials, prepare wood for fitting and fixing, fit and fix wood to a framework and apply an FRC sheath.

Elements and Performance Criteria

1. Select sheathing materials.

    1.1 Wood is selected to meet job requirements.

    1.2 FRC materials are selected to meet job requirements.

    1.3 Fastenings are selected to meet job requirements.

2. Prepare wood for fitting and fixing.

    2.1 Wood is cut to size so that it can be fixed to frames in accordance with job requirements, and fair lines can be achieved to design requirements.

    2.2 Wood pieces are pre-shaped in accordance with job requirements for jointing to adjacent pieces.

    2.3 Wood is pre-coated to job requirements.

3. Fit and fix wood to a framework.

    3.1 Framework is faired to job specifications and tolerances for fair lines.

    3.2 Wood is fitted and fixed in accordance with job requirements for fastening type and location.

    3.3 All joint surfaces are in contact with each other.

    3.4 Wood is fitted and fixed to relieve all stress that could potentially open up the joints.

4. Apply an FRC sheath.

    4.1 Substrate is prepared to job requirements, and in accordance with FRC manufacturer's specifications and instructions.

    4.2 FRC materials are mixed in accordance with manufacturer's specifications and instructions.

4.3 Materials are applied to job requirements and in accordance with manufacturer's specifications and instructions.

Unit: 18168NS DEMONSTRATE KNOWLEDGE OF WOOD AND ADHESIVES USED IN BOATBUILDING

Objectives

People credited with this unit are able to: identify woods for use in boatbuilding; select woods for use in boatbuilding; and identify adhesives used in wooden boatbuilding.

Elements and Performance Criteria

1. Identify woods for use in boatbuilding.

    1.1 Woods used in boatbuilding are identified in terms of their use.

    1.2 Woods used in boatbuilding are identified in terms of their type.

2. Select woods for use in boatbuilding.

    2.1 Factors that affect wood selection are identified in terms of suitability for use.

    2.2 Woods are selected to meet job requirements.

    2.3 Factors that affect wood storage are identified in terms of product protection.

3. Identify adhesives used in wooden boatbuilding.

    3.1 Glues used in boatbuilding are identified by type and application.

    3.2 Procedures for using adhesives are explained in terms of health and safety, storage and application.

Unit: 143NS DEMONSTRATE KNOWLEDGE OF WOOD AND ADHESIVES USED IN BOATBUILDING

Objectives

People credited with this unit are able to stack wood for air or kiln drying.

Elements and Performance Criteria

1. Stack wood for air or kiln drying.

    1.1 Characteristics of material suitable for spacers are identified in terms of straightness, strength, length, thickness, species, and degrade-freeness.

    1.2 Spacers that could damage or degrade stacked wood are identified and rejected to maintain product quality.

    1.3 Disposal methods for non-conforming spacers are identified in accordance with company requirements.

    1.4 Packets are stacked in accordance with company requirements.

    1.5 Spacers are transported and stored in accordance with company requirements for avoidance of spacer degrade.

    1.6 Wood is spaced at a rate that meets company production requirements.

Unit: 18169NS LAMINATE AND JOIN WOOD MATERIALS USED IN BOAT BUILDING

Objectives

People credited with this unit are able to laminate wood, and join wood used in boatbuilding.

Elements and Performance Criteria

1. Laminate wood used in boatbuilding.

    1.1 Woods that require laminating are identified in terms of their purpose.

    1.2 Wood is laminated according to job specifications.

2. Join wood used in boatbuilding.

    2.1 Methods of joining wood are identified in terms of join type.

    2.2 Wood is joined according to job specifications.

    2.3 Joins are finished according to job specifications.

Detailed Unit Descriptions

FRP / Composites Pathway Units

Unit: 3160NS PRODUCE LAMINATED POLYESTER RESIN ITEM TO COMPOSITE PRODUCT SPECIFICATIONS

Objectives

People credited with this unit are able to produce a laminated polyester resin item against a product specification by preparing for production, producing the item to a process specification, and carrying out specified safety precautions

Elements and Performance Criteria

1. Prepare for production.

    1.1 Equipment is verified as being in working condition.

    1.2 Equipment matches the requirements of the product and process specifications.

    1.3 Safety equipment is complete, in working order, & matches the requirements of the task.

    1.4 Materials match the requirements of the product specification.

    1.5 Materials are prepared in accordance with manufacturer's specification

2. Produce the item.

    2.1 Process specifications are met.

    2.2 Remedial action ensures that product meets specification.

3. Carry out specified safety precautions.

    3.1 Materials are handled according to safety data sheet recommendations.

    3.2 Safety equipment is used according to worksite practice.

Unit: 3161NS PRODUCE AN EPOXY RESIN ITEM TO A PRODUCT SPECIFICATION FOR COMPOSITES

Objectives

People credited with this unit are able to produce an epoxy resin item against a product specification by preparing for production, producing the item to a process specification, and carrying out specified safety precautions.

Elements and Performance Criteria

1. Prepare for production.

    1.1 Equipment is verified as being in working condition.

    1.2 Equipment matches the requirements of the product and process specifications.

    1.3 Safety equipment is complete, in working order, & matches the requirements of the task

    1.4 Materials match the requirements of the product specification.

    1.5 Materials are prepared in accordance with manufacturer's specification

2. Produce the item.

    2.1 Process specifications are met.

    2.2 Remedial action ensures that product meets specification.

3. Carry out specified safety precautions.

    3.1 Materials are handled according to safety data sheet recommendations.

    3.2 Safety equipment is used according to worksite practice.

Unit: 3162NS PRODUCE A VINYLESTER RESIN ITEM TO A PRODUCT SPECIFICATION FOR COMPOSITES

Objectives

People credited with this unit are able to produce a vinylester resin item against a product specification by preparing for production, producing the item to a product specification, and carrying out specified safety precautions.

Elements and Performance Criteria

1. Prepare for the production of a vinylester resin item.

    1.1 Equipment is confirmed as being in working condition.

    1.2 Equipment matches the requirements of the product and process specifications.

    1.3 Safety equipment is complete, in working order, and matches the requirements of the task and is used in accordance with the code of practice.

    1.4 Materials match the requirements of the product specification.

    1.5 Materials are prepared in accordance with manufacturer's specification.

2. Produce the vinylester resin item.

    2.1 Process specifications are met in accordance with worksite procedures.

    2.2 Remedial action ensures that product meets specification.

3. Carry out specified safety precautions while producing a vinylester resin item.

    3.1 Materials are handled according to material safety data sheet recommendations and the code of practice.

    3.2 Safety equipment is used according to worksite practice.

Unit: 3168NS DEPOSIT A GEL COAT BY HAND FOR COMPOSITES

Objectives

People credited with this unit are able to deposit a gel coat by hand to a process specification by preparing for production, depositing the gel coat, taking the required safety precautions and remedial actions, and meeting a product specification.

Elements and Performance Criteria

1. Carry out specified safety precautions while depositing gel coat by hand.

    1.1 Materials are handled according to safety data sheet recommendations and the code of practice.

    1.2 Safety equipment is used according to worksite procedures.

    1.3 Safety precautions are carried out according to the equipment manufacturer's recommendations.

2. Prepare to deposit a gel coat by hand.

    2.1 Equipment is confirmed as being in working condition.

    2.2 Equipment matches the requirements of the product and process specifications.

    2.3 Safety equipment is complete, in working order, matches the requirements of the task and is used in accordance with the code of practice.

    2.4 Materials match the requirements of the product specification.

    2.5 Materials are used in accordance with the manufacturer's specifications.

3. Deposit a gel coat by hand.

    3.1 Process specifications are met in accordance with worksite procedure.

    3.2 Materials are used in accordance with manufacturer's specifications and stored in accordance with worksite procedures.

    3.3 Remedial action ensures that product meets product specification.

    3.5 Worksite is left ready for next operation in accordance with worksite procedures.

Unit: 3170NS PRODUCE A LAMINATE BY VACUUM BAGGING FOR COMPOSITES

Objectives

People credited with this unit are able to produce a laminate by vacuum bagging by preparing for production, producing the item to product specification, carrying out specified safety precautions, and meeting a product specification.

Elements and Performance Criteria

1. Prepare for the production of a laminate item by vacuum bagging.

    1.1 Equipment is confirmed as being in working condition.

    1.2 Equipment matches the requirements of product and process specifications.

    1.3 Safety equipment is complete, in working order, matches the requirements of the task and is used in accordance with the code of practice.

    1.4 Materials match the requirements of the product specification.

    1.5 Materials are prepared in accordance with manufacturer's specifications.

2. Produce a laminate item by vacuum bagging.

    2.1 Process specifications are met in accordance with worksite procedures.

    2.2 Remedial action ensures that product meets product specifications.

3. Carry out specifications safety precautions while producing a laminate item by vacuum bagging.

    3.1 Materials are handled according to safety data sheet recommendations and the code of practice.

    3.2 Safety equipment is used according to worksite procedures.

Unit: 3171NS PRODUCE A CORED LAMINATE FOR COMPOSITES

Objectives

People credited with this unit are able to produce a cored laminate by assembling equipment, preparing materials, producing an item to process specification, carrying out specified safety precautions, taking required remedial action, and meeting product specification.

Elements and Performance Criteria

1. Prepare for production of cored laminate item.

    1.1 Equipment is confirmed as being in working condition.

    1.2 Equipment matches the requirements of the product and process specifications.

    1.3 Safety equipment is complete, in working order, matches the requirements of the task, and is used in accordance with the code of practice.

    1.4 Materials match the requirements of the product specification.

    1.5 Materials are prepared in accordance with manufacturer specification.

2. Produce a cored laminate item.

    2.1 Process specifications are met in accordance with worksite procedures.

    2.2 Remedial action ensures that cored laminate meets product specification.

3. Carry out specifications safety precautions while producing a cored laminate meeting.

    3.1 Materials are handled according to safety data sheet recommendations and the code of practice.

    3.2 Safety equipment is used according to worksite procedures.

Unit: 3185NS DE-MOULD LAMINATED ITEMS FOR COMPOSITES

Objectives

People credited with this unit are able to de-mould laminated items against a product specification by preparing for de-moulding, de-moulding the item to product specification, and carrying out specified safety precautions.

Elements and Performance Criteria

1. Prepare for de-moulding.

    1.1 Equipment is confirmed as being in working condition.

    1.2 Equipment matches the product and process specifications.

    1.3 Safety equipment is safe, in working condition, matches the requirements of the task and is used in accordance with the code of practice.

    1.4 Materials match the requirements of the product specification.

    1.5 Materials are used in accordance with manufacturer's specifications.

2. De-mould item.

    2.1 De-moulding process meets process specifications.

    2.2 Remedial action meets process specification.

3. Carry out specified safety precautions while de-moulding laminated items.

    3.1 Materials are handled according to safety data sheet recommendations and the code of practice.

    3.2 Safety equipment is used according to worksite procedures.

Unit: 3186NS FINISH PRODUCT TO SPECIFICATION FOR COMPOSITES

Objectives

People credited with this unit are able to finish a product to specification by preparing for finishing, finishing the item to a product specification, and carrying out specified safety precautions.

Elements and Performance Criteria

1. Prepare for finishing of product.

    1.1 Equipment is confirmed as being in working condition.

    1.2 Equipment matches the product and process specifications.

    1.3 Safety equipment is safe, in working condition, matches the requirements of the task and is used in accordance with the code of practice.

    1.4 Materials match the requirements of the product specification.

    1.5 Materials are used in accordance with manufacturer's specifications.

2. Finish the item.

    2.1 Product specifications are met.

    2.2 Remedial action ensures that item meets product specifications.

3. Carry out specified safety precautions while finishing product to specification.

    3.1 Materials are handled according to safety data sheet recommendations and the code of practice.

    3.2 Safety equipment is used according to worksite procedures.

Unit: 3169NS DEPOSIT A GEL COAT BY SPRAY METHODS FOR COMPOSITES

Objectives

People credited with this unit are able to deposit a gel coat by spray method by taking the required safety precautions, calibrating equipment, loading and cleaning the machine, and depositing to the product specification.

Elements and Performance Criteria

1. Carry out specified safety precautions while depositing a gel coat by the spray method.

    1.1 Materials are handled according to safety data sheet recommendations and the code of practice.

    1.2 Safety equipment is used according to worksite procedures.

    1.3 Safety precautions are carried out according to the equipment manufacturer's recommendations.

2. Calibrate equipment for depositing a gel coat by the spray method.

    2.1 Test results match the gel coat specification.

    2.2 Controls are adjusted to calibration requirements of equipment.

    2.3 Controls are adjusted according to equipment manufacturer's recommendations and process specification requirements.

3. Load and clean the machine.

    3.1 Materials meet gel coat specifications.

    3.2 Materials are loaded into the machine according to manufacturer's recommendations.

    3.3 Machine is cleaned according to manufacturer's recommendations.

4. Deposit polyester gel coat by spray.

    4.1 Process specifications are met in accordance with worksite procedures.

    4.2 Materials and equipment are used in accordance with manufacturer's specifications and stored according to worksite procedures.

    4.3 Remedial action ensures that product meets specification.

4.4 Worksite and equipment is left ready for the next operation in accordance with worksite procedures.

Unit: 3181NS PRODUCE A PLUG OR PATTERN FOR COMPOSITES

Objectives

People credited with this unit are able to produce a plug or pattern against product specification by preparing for production, producing the plug or pattern to specification, and carrying out specified safety precautions.

Elements and Performance Criteria

1. Prepare for production of a plug or pattern.

    1.1 Equipment is confirmed as being in working condition.

    1.2 Equipment matches the requirements of the product and process specifications.

    1.3 Safety equipment is complete, in working order, matches the requirements of the task, and is used in accordance with the code of practice.

    1.4 Materials match the requirements of the product specification.

    1.5 Materials are used in accordance with manufacturer's specifications.

2. Produce a plug or pattern.

    2.1 Process specifications are met in accordance with worksite procedures.

    2.2 Remedial action ensures that plug or pattern meets product specification.

3. Carry out specified safety precautions while producing a plug or pattern.

    3.1 Materials are handled according to safety data sheet recommendations and the code of practice.

    3.2 Safety equipment is used according to worksite procedures.

Unit: 3183NS PREPARE PRE-FORM MATERIALS FOR LAMINATION FOR COMPOSITES

Objectives

People credited with this unit are able to prepare pre-form materials for lamination against a product specification by preparing for production and carrying out specified safety precautions.

Elements and Performance Criteria

1. Prepare pre-form materials for production.

    1.1 Pre-form equipment is confirmed as being in working condition.

    1.2 Pre-form equipment matches requirements of the product and process specification.

    1.3 Safety equipment is complete, in working order, matches the requirements of the task and is used in accordance with the code of practice.

    1.4 Pre-form materials match the requirements of the product specification.

    1.5 Pre-form materials are used in accordance with manufacturer's specifications.

2. Carry out specified safety precautions while preparing pre-form materials.

    2.1 Materials are handled according to safety data sheet recommendations and the code of practice.

    2.2 Safety equipment is used according to worksite procedures.

Unit: 3193NS APPLY QUANTITY SURVEYING TO COMPOSITE PRODUCTION

Objectives

People credited with this unit are able to apply quantity surveying by calculating from specifications the material requirements for the composite product.

Elements and Performance Criteria

1. Determine quantities for composite product components.

    1.1 Evidence of area calculations shown according to process specifications.

    1.2 Evidence of volume calculations shown according to process specifications.

    1.3 Evidence of thickness calculations shown according to process specifications.

2. Calculate composite product material requirements from product specifications.

    2.1 Materials quantities calculated meet area, volume and thickness requirements according to the product specification.

    2.2 Material quantities meet product specification.

Unit: 9941NS CARRY OUT REPAIR, RESTORATION & STRUCTURAL ALTERATION OF COMPOSITE BOATS

Objectives

People credited with this unit are able to: establish job requirements for the repair, restoration, and structural alteration of boats; prepare boats for the required work; carry out the required work; and prepare boats for handing over to clients.

Elements and Performance Criteria

1. Establish job requirements for the repair, restoration, and structural alteration of boats.

    1.1 Job specifications are obtained and verified in accordance with company procedures.

    1.2 Boat is examined to determine the nature and extent of work required according to job specifications, and anomalies are reported in accordance with company procedures.

    1.3 Existing defects and damage not subject to the specified work are identified and communicated in accordance with company procedures.

2. Prepare boats for the required work.

    2.1 Materials and tools required for the job are selected and obtained in accordance with job specifications.

    2.2 Support is provided for boats so that they remain stable, and their original shape is retained, throughout the work.

    2.3 Protection is provided for existing equipment, fittings, furnishings, and surfaces in accordance with company procedures.

3. Carry out the required work.

    3.1 Parts to be repaired are disassembled according to job specifications.

    3.2 Joint types are examined, repaired, and replaced according to job specifications.

    3.3 Broken components are examined, repaired and replaced according to job specifications.

    3.4 Replacement components and materials are selected and installed according to job specifications.

4. Prepare boats for handing over to clients.

    4.1 Surfaces and finishes are reinstated according to job specifications.

4.2 Protected items are checked according to job specifications.

4.3 Action is taken in accordance with company procedures in the event of unforseen circumstances which prevent the achievement of job specifications.

Unit: 3192NS PROVIDE FOR AND ATTACH FIXINGS AND FASTENINGS IN COMPOSITES

Objectives

People credited with this unit are able to provide for and attach fixings and fastenings in composites by preparing the product, fixing the product to a process specification, and carrying out specified safety precautions.

Elements and Performance Criteria

1. Prepare materials and structures for the attachment of fixings and fastenings.

    1.1 Equipment is confirmed as being in working condition.

    1.2 Equipment matches the requirements of the process specification cedures.

    1.3 Safety equipment is complete, in working order, matches the requirements of the task, and is used in accordance with the code of practice.

    1.4 Materials match the requirements of the process specification.

2. Attach fixings and fastenings to product.

    2.1 Materials are used in accordance with manufacturer's specifications.

    2.2 Process specifications are met.

    2.3 Fixings and fastenings meet operational requirements.

3. Carry out specified safety precautions while providing for and attaching fixings and fastenings to products.

    3.1 Materials are handled according to data safety sheet recommendations and the code of practice.

    3.2 Safety equipment is used in according to worksite procedures.

Unit: 9942NS CONSTRUCT INTERNAL & EXTERNAL BOAT JOINERY IN FIBRE-REINFORCED COMPOSITES (FRC)

Objectives

People credited with this unit are able to: establish job requirements for the construction of internal and external boat joinery; prepare for joinery construction; and construct joinery to specifications.

Elements and Performance Criteria

1. Establish job requirements for the construction of internal and external boat joinery.

    1.1 Job specifications are verified in accordance with company procedures.

    1.2 Construction requirements are determined from inspection of drawings, plans, and the actual boat.

2. Prepare for joinery construction.

    2.1 Composite materials, adhesives, and fastenings are selected and ordered to make job requirements.

    2.2 Construction method is selected to meet accessibility, time, and cost factors.

    2.3 Selected method enables the completed joinery to retain its shape and function in spite of boat movement.

    2.4 Selected method is confirmed with company and / or clients before commencing construction.

3. Construct joinery to specifications.

    3.1 Tools are selected according to job requirement.

    3.2 Completed joinery meets job requirements for size, shape, weight, balance, and finish.

    3.3 Installation instructions are provided in accordance with company requirements.

Unit: 11788NS PREPARE FIBRE-REINFOCED COMPOSITE SUBSTRATES FOR MARINE SURFACE COATINGS

Objectives

People credited with this unit are able to check and clean fibre-reinforced composite (FRC) substrates, and prepare FRC substrates.This unit covers preparation activities to the point where the substrate can be filled and faired. It does not include filling and fairing, or the application of any surface coatings.

Elements and Performance Criteria

1. Check and clean FRC substrates.

    1.1 Substrate is checked for soundness and deterioration in accordance with job specifications and manufacturer's specifications.

    1.2 Actions are taken in accordance with company and customer's requirements in the event that unsound or deteriorated areas are found.

    1.3 Use of degreasing agents ensures that the substrate is free of contamination in accordance with manufacturer's specifications and recommendations.

2. Prepare FRC substrates.

    2.1 Prepared surface achieves coating manufacturer's requirements for profile and cleanliness.

    2.2 Work area is left free of possible surface contaminants.

    2.3 Protection for areas not to be coated is provided in accordance with company and/or customer's requirements.

Detailed Unit Descriptions

Metal Pathway Units

Unit: 2415NS FORM AND SHAPE FABRICATION MATERIALS - SUPERVISED

Objectives

People credited with this unit are able to form and shape plate and / or sheet metal under supervision using hand tools and equipment as used in the fabrication industry.

Elements and Performance Criteria

1. Prepare for forming and shaping of materials under supervision.

    1.1 Materials are identified and selected in accordance with job specifications.

    1.2 Equipment is identified to enable forming process in accordance with job specification.

    1.3 Calculations for zero and mean radius are performed in accordance with worksite procedure.

    1.4 Hand operated equipment is set up to achieve job specified tolerances.

    1.5 Potential hazards are identified and preventative action taken in accordance with approved codes of worksite practice.

2. Perform forming and shaping processes of materials under supervision.

    2.1 Materials are formed and shaped in accordance with worksite procedures.

    2.2 Material properties are restored after forming and shaping in accordance with worksite procedures.

3. Verify forming and shaping of materials under supervision.

    3.1 Fabricated items are inspected and measured for compliance to job specifications.

    3.2 Corrective actions address the causes of non-conformance to job specifications in accordance with worksite procedure.

Unit: 9944NS IDENTIFY THE CHARACTERISTICS OF ALUMINUM ALLOYS RELEVANT TO BOAT BUILDING

Objectives

People credited with this unit are able to form identify the chemical composition of aluminum alloys, and identify the engineering characteristics of aluminum alloys.

Elements and Performance Criteria

1. Identify the chemical composition of aluminum alloys.

    1.1 Characteristics of aluminum alloy compositions are identified in terms of their physical property.

    1.2 The chemical compatibility of different aluminum alloys is explained in terms of their compositions.

2. Identify the engineering characteristics of aluminum alloys.

    2.1 Characteristics of aluminum alloys are identified and explained in terms of their applications.

    2.2 Manufacturing processing affects are identified and related to the characteristics of aluminum alloys.

Unit: 2416NS ASSEMBLE AND MECHANICALLY JOIN PLATE & SHEET - SUPERVISED

Objectives

People credited with this unit are able to prepare to assemble and mechanically join materials under supervision, perform assembly and mechanical joining of materials under supervision, and verify assembly and mechanical joining of plate and sheet under supervision.

Elements and Performance Criteria

1. Prepare to assemble and mechanically join materials under supervision.

    1.1 Materials are identified in accordance with job specifications.

    1.2 Type of joining method is identified in accordance with job specifications.

    1.3 Assembly procedures are identified to achieve the job specifications.

    1.4 Calculations for joining allowances are performed in accordance with worksite procedures.

    1.5 Tools and equipment for joining and assembly are identified in accordance with worksite procedures.

    1.6 Potential hazards are identified and preventative action is taken in accordance with worksite safety procedures.

2. Perform assembly and mechanical joining of materials under supervision.

    2.1 Materials are assembled in accordance with job specifications.

    2.2 Materials are mechanically joined in accordance with job specifications.

    2.3 Datum points and assembly lines are used in accordance with worksite procedures.

    2.4 Jigs and fixtures are used to ensure assembly in accordance with worksite procedures.

    2.5 Assembly and mechanical joining problems are identified and communicated to supervisor.

    2.6 Finishing is carried out in accordance with job specifications and / or worksite procedures.

3. Verify assembly and mechanical joining of plate and sheet under supervision.

    3.1 Assembly and mechanical joints are inspected and measured for compliance with job specifications.

3.2 Non-conformance with job specifications is identified and reported to supervisor.

Unit: 2418NS LAY OUT AND MARK OFF THE REGULAR FABRICATION SHAPES - SUPERVISED

Objectives

People credited with this unit are able under supervision to lay out and mark off templates, structural sections and irregular surface developments as used in the fabrication industry.

Elements and Performance Criteria

1. Prepare for lay out and mark off of materials under supervision.

    1.1 Materials are identified as per job specifications.

    1.2 Cutting lists are drawn up as per job specifications.

    1.3 Pattern calculations are performed in relation to job requirements.

    1.4 The importance of codes and standards and their effects on dimensional accuracy are identified as per job specifications.

    1.5 CAD development packages are identified to aid job related development problems as per job requirements.

    1.6 Structural details are identified as per job specifications.

    1.7 Potential hazards are identified and preventative action taken in accordance with approved codes of worksite practice.

2. Mark out templates.

    2.1 Templates for automatic cutting equipment are made to suit job specifications.

    2.2 Machine allowances and variables are identified and accommodated to suit job specifications.

    2.3 Datum points are established and transferred to material as per job requirements.

3. Mark out structural sections under supervision.

    3.1 Bolted and or welded structural connections are marked out to drawing specifications.

    3.2 Rectangular hollow section connections are marked out to drawing specifications.

    3.3 Handed problems are identified and solved as per job specifications.

4. Mark out surface developments under supervision.

4.1 Surface to be developed is defined as per job specifications.

4.2 Method of development is selected as per job specifications.

4.3 Joint lines are identified and used as per specification and or codes of practice.

4.4 Notching and punching lines are shown as per job specifications.

4.5 Datum points are established and marked to aid fabrication.

4.6 Marking out is carried out to job specification.

4.7 Patterns are produced using CAD software to job requirements.

5. Verify marking off and laying out of materials under supervision.

5.1 Datum points are verified to aid fabrication.

5.2 Laying out and marking off practice is consistent with job specification.

5.3 Patterns, sections and templates are inspected and measured for compliance to job specifications.

5.4 Non conformance to job specifications is identified and reported to supervisor.

Unit: 2421NS MECHANICALLY CUT FABRICATION MATERIALS USING POWERED MACHINERY - SUPERVISED

Objectives

People credited with this unit are able to prepare for mechanical cutting of materials under supervision, perform mechanical cutting of materials under supervision, and verify mechanical cutting of fabrication materials using powered machinery under supervision.

Elements and Performance Criteria

1. Prepare for mechanical cutting of materials under supervision.

    1.1 Cutting machines and lubricants are identified and selected in accordance with worksite procedures.

    1.2 Material characteristics are verified with supervisor.

    1.3 Machines are inspected and checked in readiness to achieve job specifications.

    1.4 Machines are set to job specifications and settings are verified.

    1.5 Potential hazards are identified and preventative action is taken in accordance with worksite procedures.

2. Perform mechanical cutting of materials under supervision.

    2.1 Materials are cut in accordance with job specifications.

    2.2 Blade clearances are confirmed to achieve shearing consistent with job specifications.

    2.3 Cut edges conform to job specification or worksite procedure.

3. Verify mechanical cutting of fabrication materials using powered machinery under supervision.

    3.1 Cut materials are inspected and measured for compliance with job specifications.

    3.2 Non-conformity with job specifications is identified and reported to the supervisor.

Unit: 2675NS WELD ALUMINUM WITH THE GAS METAL ARC WELDING PROCESS IN THE DOWN-HAND POSITION

Objectives

People credited with this unit are able to safely use gas metal arc welding (GMAW) to join aluminium in the down hand position to the standards required by industries such as marine and transport. They are able to prepare the equipment and materials, and control the quality of the completed weld under supervision.

Elements and Performance Criteria

1. Create a safe worksite.

    1.1 Welding hazards are identified prior to welding.

    1.2 Work is undertaken in accordance with worksite and/or approved codes of practice, under supervision.

2 Prepare equipment to weld aluminium.

    2.1 The features of GMAW as used to join aluminium are identified as inert gas shielding, spray transfer and consumable electrode.

    2.2 Equipment is set up to weld aluminium.

    2.3 Consumables used comply to approved welding procedure specification (WPS).

    2.4 Maintenance is performed on the welding gun, wire drive system and work connection to manufacturers and/or worksite instructions.

3. Demonstrate an understanding of materials used.

    3.1 Joints are prepared and assembled to welding procedure specification.

    3.2 Electrodes are handled and stored to prevent damage or contamination.

    3.3 The designation system for aluminium is recognised as classifying materials according to their alloying elements.

    3.4 The 5000 series alloys are recognised as non-heat treatable sheet and plate.

    3.5 The 6000 series alloys are recognised as heat treatable extruded sections.

    3.6 The properties of aluminium are identified as affecting its weld-ability.

4. Join aluminum with GMAW.

4.1 Welding parameters are established to an approved welding procedure specification.

4.2 Welds are deposited to industry standard AS 1665 Category B (or equivalent) in the AWS 1F, 2F and 1G positions.

5. Control the quality of the completed weld.

5.1 Imperfections are identified by visual examination and workshop tests.

5.2 Incorrect welding parameters are identified as potential causes of imperfections and action taken meets WPS.

5.3 Weld defects are repaired to industry standard.

5.4 Distortion control measures are followed under supervision.

Unit: 2676NS WELD TO A GENERAL PURPOSE QUALITY WITH THE GAS TUNGSTEN ARC PROCESS

Objectives

People credited with this unit are able to: create a safe worksite; prepare the equipment for welding; demonstrate an understanding of the metals welded; weld to a general purpose quality using the GTAW process; and control the quality of the completed weld.

Elements and Performance Criteria

1. Create a safe worksite.

    1.1 Hazards are identified prior to welding.

    1.2 Welding activity undertaken is in accordance with worksite safety practices.

2. Welding activity undertaken is in accordance with worksite safety practice.

    2.1 Functions of GTAW equipment are described, and features that can be used to advantage for welding stainless steel are explained, in accordance with worksite procedure.

    2.2 Equipment is selected and set up to weld in accordance with worksite procedure.

    2.3 Maintenance is performed on the welding equipment to manufacturer's and/or worksite safety practices.

3. Demonstrate an understanding of the metals welded.

    3.1 Welding practice is explained in terms of the properties and characteristics of the metal to be welded.

    3.2 Joining practice assures the properties of the metal being welded, in accordance with worksite procedure.

4. Weld to a general purpose quality using the GTAW process.

    4.1 Welding parameters are established in accordance with an approved welding procedure specification.

    4.2 Welds are deposited in accordance with an industry standard.

5. Control the quality of the completed weld.

    5.1 Welds are assessed in the workshop to identify any imperfections, in accordance with worksite procedure.

5.2 Causes of weld imperfections are identified and preventative action is taken in accordance with worksite procedure.

5.3 Weld defects are repaired in accordance with the relevant industry standard.

5.4 Distortion control measures are performed in accordance with worksite procedure, under supervision.

Unit: 2683NS CUT METALS USING MANUAL THERMAL PROCESSES

Objectives

People credited with this unit are able to maintain a safe worksite, prepare the equipment for cutting, cut metals with the Oxy / fuel gas and plasma processes, and control the quality of the cut.

Elements and Performance Criteria

1. Maintain a safe worksite.

    1.1 Potential hazards are identified prior to cutting.

    1.2 Metal cutting undertaken is in accordance with worksite safety practices.

2. Prepare the equipment for cutting.

    2.1 The Oxy/fuel gas process is compared to the plasma arc cutting process for the cutting of metals in accordance with worksite procedure.

    2.2 Equipment is set-up and maintained to the worksite requirements and/or manufacturer's instructions.

    2.3 Consumables are identified by composition and/or specification in accordance with worksite procedure.

    2.4 Material is positioned and supported for cutting in accordance with worksite procedure.

3. Cut metals with the Oxy/fuel gas and plasma processes.

    3.1 Cutting parameters are established in accordance with worksite procedure.

    3.2 Steel, stainless steel and aluminum are cut in accordance with worksite procedure.

4. Control the quality of the cut.

    4.1 Corrective actions address the causes of cutting faults in accordance with worksite procedure.

    4.2 Cuts are assessed by visual examination in accordance with worksite procedure.

    4.3 A planned cutting sequence is followed to minimize material distortion in accordance with worksite procedure.

Unit: 2422NS LAY OUT AND MARK OFF COMPLEX FABRICATION SHAPES

Objectives

People credited with this unit are able to: prepare to layout and mark off materials; mark out templates and patterns; lay out and mark off light sections; mark off surface developments; and verify laying out and marking off of materials.

Elements and Performance Criteria

1. Prepare to lay out and mark off materials.

    1.1 Materials are identified in accordance with job specifications.

    1.2 Marking out tools are evaluated and used in accordance with job requirements.

    1.3 Pattern calculations are performed in accordance with job specifications.

    1.4 Lines of intersection are determined in accordance with job specifications.

    1.5 Modification sketches are made in accordance with job requirements.

    1.6 Alternative methods of pattern development are identified to suit a specific manufacturer's requirements.

    1.7 Appropriate level marks are identified and noted in accordance with job specifications.

    1.8 Potential hazards are determined and preventative action is taken in accordance with worksite safety practices.

2. Mark out templates and patterns.

    2.1 Templates and patterns using 'x' and 'y' co-ordinates are made in accordance with job requirements.

    2.2 Tube connections are marked out in accordance with job specifications.

    2.3 Datum points are established and transferred to material in accordance with job requirements.

    2.4 Templates for connections between light sections are produced in accordance with job specifications.

3. Lay out and mark off light sections.

    3.1 Sketches are used to communicate job requirements to others in accordance with worksite procedure.

3.2 Fabrications made up of light sections are laid out in accordance with job specifications.

3.3 Sections are marked off in accordance with job specifications.

4. Mark off surface developments.

4.1 Pattern developments are carried out in accordance with job requirements.

4.2 Surface developments using neutral surface calculations are carried out in accordance with job specifications.

4.3 Surface developments are completed with allowances for joint preparation in accordance with job specifications.

4.4 Alternative methods of pattern development are used to suit specific job requirements.

4.5 Right, oblique and transition patterns are generated from computer development packages, under supervision, in accordance with job requirements.

5. Verify laying out and marking off of materials.

5.1 Surface developments are inspected and measured for compliance with job specifications.

5.2 Templates are inspected and measured for compliance with job specifications.

5.3 Components are inspected and measured for compliance with job specifications.

5.4 Any non-conformance that cannot be rectified to job specification is reported to supervisor in accordance with worksite procedure.

5.5 Reporting requirements are carried out in accordance with worksite procedure.

Unit: 2423NS FORM AND SHAPE FABRICATION MATERIALS

Objectives

People credited with this unit are able to prepare for forming and shaping of materials, form and shape materials and verify forming and shaping of materials.

Elements and Performance Criteria

1. Preparation for forming and shaping of materials.

    1.1 Material characteristics are ascertained in respect to forming and shaping in accordance with job specifications.

    1.2 Calculations of force and leverage are performed in accordance with worksite procedure.

    1.3 Machines are selected in accordance with worksite procedure.

    1.4 Sequencing of forming and shaping operations is composed in accordance with worksite procedures.

    1.5 Potential hazards are determined and preventative action is taken in accordance with worksite procedures.

2. Perform forming and shaping of materials.

    2.1 Machines for forming are set to achieve specified results in accordance with job specifications.

    2.2 Materials are formed in accordance with job specifications.

    2.3 Materials are straightened in accordance with job specifications.

3. Verify forming and shaping of fabrication materials.

    3.1 Methods of verifying forming and shaping operations are described.

    3.2 Visual examination and dimensional checks are performed on formed materials in accordance with job specifications.

    3.3 Corrective actions are taken in accordance with worksite procedures.

Unit: 2425NS MECHANICALLY CUT SHEET, PLATE, TUBE, PIPE & STRUCTURAL SECTIONS

Objectives

People credited with this unit are able to prepare for mechanical cutting of materials, perform mechanical cutting of materials, and verify mechanical cutting of materials.

Elements and Performance Criteria

1. Prepare for mechanical cutting of materials.

    1.1 Cutting machines and lubricants are identified and selected in accordance with job specifications.

    1.2 Material characteristics are verified in accordance with job specifications.

    1.3 Tools and machines are checked and set to achieve job specified tolerances.

    1.4 Machines are set and settings verified to achieve cutting in accordance with job specifications.

    1.5 Potential hazards are identified and preventative action is taken in accordance with worksite safety practices.

2. Perform mechanical cutting of materials.

    2.1 Materials are cut in accordance with job specifications.

    2.2 Blade clearance settings are confirmed to achieve shearing in accordance with job specifications.

    2.3 Cut edges conform to job specifications.

3. Verify mechanical cutting of materials.

    3.1 Cut materials are inspected and measured for compliance with job specifications.

    3.2 Non-conformance is identified, documented and rectified in accordance with job specifications.

    3.3 Any non-conformance which cannot be rectified to job specification is reported to the supervisor in accordance with worksite procedure.

    3.4 Reporting requirements are carried out according to worksite procedures.

Unit: 9946NS ASSEMBLE MULTIPLE AND COMPLEX METAL BOAT COMPONENTS FOR JOINING

Objectives

People credited with this unit are able to prepare to assemble multiple and complex metal boat components, perform assembly of metal components, and verify the assembly of metal components.

Elements and Performance Criteria

1. repare to assemble multiple and complex metal boat components.

    1.1 Metal components are identified to job specifications.

    1.2 Assembly methods and procedures are evaluated and identified to meet job specifications.

    1.3 Types of joining methods and procedures are identified to meet job specifications and company procedures.

    1.4 Calculations for joint allowances are made in accordance with job specifications.

    1.5 Limitations of the specified assembly and joining techniques are analysed in accordance with company procedures.

    1.6 Potential hazards are identified, and preventative action is taken in accordance with company procedures.

2. Perform assembly of metal components.

    2.1 Metal components are assembled to job specifications.

    2.2 Jigs and fixtures are constructed to ensure assembly and joining to job specifications.

    2.3 Site erection and layout are performed in accordance with company procedures.

    2.4 Distortion is corrected by mechanical and / or thermal means to ensure compliance with job specifications.

3. Verify the assembly of metal components.

    3.1 Assemblies are inspected and measured in accordance with job specifications and company procedures.

    3.2 Non-conformance is identified, documented, and rectified to job specifications.

3.3 Any non-conformance which cannot be rectified to job specification is identified and reported in accordance with company procedures.

Unit: 11790NS PREPARE ALUMINUM SUBSTRATES FOR MARINE SURFACE COATING

Objectives

People credited with this unit are able to check and clean aluminium substrates, and prepare aluminium substrates. This unit covers preparation activities to the point where the substrate can be filled and faired. It does not include filling and fairing, or the application of any surface coatings other than chemical etch priming.

Elements and Performance Criteria

1. Check and clean aluminium substrates.

    1.1 Substrate is checked for soundness and corrosion in accordance with job specifications and manufacturer's specifications.

    1.2 Actions are taken in accordance with company and customer's requirements in the event that unsound or deteriorated areas are found.

    1.3 Use of degreasing agents ensures that the substrate is free of contamination in accordance with manufacturer's specifications and recommendations.

2. Prepare aluminium substrates.

    2.1 Prepared surface achieves coating manufacturer's requirements for profile and cleanliness.

    2.2 Work area is left free of possible surface contaminants.

    2.3 Protection for areas not to be coated is provided in accordance with company and/or customer's requirements.

Unit: 9949NS IDENTIFY THE CHARACTERISTICS OF STEELS RELEVANT TO BOATBUILDING

Objectives

People credited with this unit are able to identify the chemical composition of steel, and identify the engineering characteristics of steels.

Elements and Performance Criteria

1. Identify the chemical composition of steel.

    1.1 Characteristics of the components of steel are identified in terms of their physical properties.

    1.2 The chemical compatibility of different steels is explained in terms of their compositions.

2. Identify the engineering characteristics of steel.

    2.1 Characteristics of steels are identified and explained in terms of their applications.

    2.2 Manufacturing processing effects are identified and related to the characteristics of steels.

Unit: 11789NS PREPARE STEEL SUBSTRATES FOR MARINE SURFACE COATING

Objectives

People credited with this unit are able to check and clean steel substrates, and prepare steel substrates.This unit covers preparation activities to the point where the substrate can be filled and faired. It does not include filling and fairing, or the application of any surface coatings.

Elements and Performance Criteria

1. Check and clean steel substrates.

    1.1 Substrate is checked for soundness and corrosion in accordance with job specifications and manufacturer's specifications.

    1.2 Actions are taken in accordance with company and customer's requirements in the event that unsound or deteriorated areas are found.

    1.3 Use of degreasing agents ensures that the substrate is free of contamination in accordance with manufacturer's specifications and recommendations.

2. Prepare steel substrates.

    2.1 Prepared surface achieves coating manufacturer's requirements for profile and cleanliness.

    2.2 Work area is left free of possible surface contaminants.

    2.3 Protection for areas not to be coated is provided in accordance with company and/or customer's requirements.

Detailed Unit Descriptions

Elective Units

Unit: 3166NS PRODUCE AN ITEM USING RESIN PRE-IMPREGNATED REINFORCEMENT FOR COMPOSITES

Objectives

People credited with this unit are able to produce an item using resin pre-impregnated reinforcement by preparing for production, producing the item to a process specification, and carrying out specified safety precautions.

Elements and Performance Criteria

1. Prepare for the production of an item using resin pre-impregnated reinforcement.

    1.1 Equipment is confirmed as being in working condition.

    1.2 Equipment matches the requirements of the product and process specifications.

    1.3 Safety equipment is complete, in working order, matches the requirements of the task, and is used in accordance with code of practice.

    1.4 Materials match the requirements of the product specification.

    1.5 Materials are prepared in accordance with the manufacturer's specification.

2. Produce an item using resin pre-impregnated reinforcement.

    2.1 Process specifications are met in accordance with worksite procedures.

    2.2 Remedial action ensures that product meets product specifications.

3. Carry out specified safety precautions while producing an item using resin pre-impregnated reinforcement.

    3.1 Materials are handled according to the safety data sheet recommendations and the code of practice.

    3.2 Safety equipment is used according to worksite procedures.

Unit: 3167NS DEPOSIT COMPOSITE MATRIX WITH DEPOSITOR OR CHOPPER GUN

Objectives

People credited with this unit are able to deposit composite matrix with a depositor or chopper gun by taking the required safety precautions, calibrating equipment, loading and cleaning the machine, and depositing to the laminate specification.

Elements and Performance Criteria

1. Carry out specified safety precautions.

    1.1 Materials are handled according to safety data sheet recommendations.

    1.2 Safety equipment is used according to worksite practice.

    1.3 Safety precautions are carried out according to the equipment manufacturer's recommendations.

2. Calibrate depositor or chopper gun and test matrix.

    2.1 Test result matches laminate specification.

    2.2 Controls are adjusted to calibration requirements of equipment.

    2.3 Controls are adjusted according to equipment manufacturer's recommendations and process specification recommendations.

3. Describe computer aided manufacturing processes used in the boating industry.

    3.1 Materials meet laminate specification.

    3.2 Materials are loaded into machine according to manufacturer's recommendations.

    3.3 Machine is cleaned according to manufacturer's recommendations.

4. Deposit laminate.

    4.1 Laminate meets specification requirements

    4.2 Materials are stored according to worksite practice.

Unit: 3179NS PRODUCE A LAMINATE USING A PRE-WET MACHINE FOR COMPOSITES

Objectives

People credited with this unit are able to produce an item using a pre-wet machine by taking the required safety precautions, calibrating equipment, loading and cleaning the machine, and depositing to the laminate specification.

Elements and Performance Criteria

1. Carry out specified safety precautions while producing an item using a pre-wet machine.

    1.1 Materials are handled according to safety data sheet recommendations and the code of practice.

    1.2 Safety equipment is used according to worksite procedures.

    1.3 Safety precautions are carried out according to the equipment manufacturer's recommendations.

2. Calibrate equipment used to produce an item using a pre-wet machine.

    2.1 Test results matches laminate specification.

    2.2 Controls are adjusted according to calibration requirements of equipment.

    2.3 Controls are adjusted according to equipment manufacturer's recommendations and process specification recommendations.

3. Load and clean a pre-wet machine.

    3.1 Materials meet laminate specification.

    3.2 Materials are loaded into a pre-wet machine according to manufacturer's specifications.

    3.3 Machine is cleaned according to manufacturer's specifications.

4. Deposit laminate using a pre-wet machine.

    4.1 Laminate meets specification requirements.

    4.2 Remedial action ensures product meets product specifications.

Unit: 9940NS SHEATH A BOAT FRAMEWORK USING WOOD & FIBRE-REINFORCED COMPOSITES (FRC)

Objectives

People credited with this unit are able to select sheathing materials, prepare wood for fitting and fixing, fit and fix wood to a framework and apply an FRC sheath.

Elements and Performance Criteria

1. Select sheathing materials.

    1.1 Wood is selected to meet job requirements.

    1.2 FRC materials are selected to meet job requirements.

    1.3 Fastenings are selected to meet job requirements.

2. Prepare wood for fitting and fixing.

    2.1 Wood is cut to size so that it can be fit to frames in accordance with job requirements, and fair lines can be achieved to design requirements.

    2.2 Wood pieces are pre-shaped in accordance with job requirements for jointing to adjacent pieces.

    2.3 Wood is pre-coated to job requirements.

3. Fit and fix wood to a framework.

    3.1 Framework is faired to job specifications and tolerance for fair lines.

    3.2 Wood is fitted and fixed in accordance with job requirements for fastening type and location.

    3.3 All joint surfaces are in contact with each other.

    3.4 Wood is fitted and fixed to relieve all stress that could potentially open up the joints.

4. Apply an FRC sheath.

    4.1 Substrate is prepared to job requirements, and in accordance with FRC manufacturer's specifications and instructions.

    4.2 FRC materials are mixed in accordance with manufacturer's specifications and instructions.

4.3 Materials are applied to job requirements and in accordance with manufacturer's specifications and instructions.

Unit: 2686NS WELD ALUMINUM WITH THE GAS METAL ARC WELDING PROCESS IN ALL POSITIONS

Objectives

People credited with this unit are able to safely use gas metal arc welding (GMAW) to join aluminium in all positions to meet the standards required by industries such as marine and transport. They are able to take individual responsibility for a range of quality related tasks including equipment specification and preparation, the optimisation of welding parameters and working to codes and standards.

Elements and Performance Criteria

1. Create a safe worksite.

    1.1 Welding hazards are identified prior to welding.

    1.2 Work is undertaken in accordance with worksite and/or approved codes of practice under general supervision.

2. Prepare equipment for the positional welding of aluminium.

    2.1 The features of GMAW-Pulsed are compared to GMAW for the welding of aluminium.

    2.2 Equipment is setup and maintained to weld aluminium to worksite requirements and/or manufacturer's instructions.

3. Demonstrate an understanding of materials used.

    3.1 Joints are prepared and assembled for welding to AS 1665 (or equivalent).

    3.2 Parent metal and welding consumables are handled and stored to prevent contamination or damage.

    3.3 Filler metals are selected to AS 1665 Table 2.3 (or equivalent).

    3.4 The aluminium alloys are recognised as having a range of properties.

4. Join aluminium with the GMAW and GMAW-Pulsed processes.

    4.1 Welding parameters are established to approved welding procedure specifications.

    4.2 Welds are deposited to industry standard AS 1665 Category B (or equivalent) in the horizontal, vertical and overhead positions.

5. Control the quality of the completed weld.

5.1 Weld imperfections are identified by visual examination and workshop tests.

5.2 Potential causes of weld imperfections are identified prior to welding and action taken meets WPS.

5.3 Weld defects are repaired to industry standard.

5.4 Control measures are planned to minimise distortion.

5.5 Quality Assurance procedures as applied to welded fabrication are identified as the use of Welding Procedure Specifications (WPS), welder performance qualifications and weld inspection.

Unit: 2688NS WELD STAINLESS STEEL TUBES IN POSITION WITH THE GAS TUNGSTEN PROCESS

Objectives

People credited with this unit are able to: create a safe worksite; prepare the equipment to weld stainless steel; demonstrate an understanding of the materials used; join stainless steel sheet and tube with the gas tungsten arc welding (GTAW) process; and control the quality of the completed weld.

Elements and Performance Criteria

1. Create a safe worksite.

    1.1 Hazards are identified prior to welding.

    1.2 Welding activity undertaken is in accordance with worksite safety practices.

2. Prepare the equipment to weld stainless steel.

    2.1 The features of GTAW are prepared to weld stainless steel tube in accordance with worksite procedure.

    2.2 Equipment is selected and set up to weld stainless steel in accordance with worksite procedure.

    2.3 Maintenance is performed on the welding equipment in accordance with manufacturers and/or worksite procedure.

3. Demonstrate an understanding of the materials used.

    3.1 The physical properties and alloying elements of austenitic stainless steels are described in terms of the effect on their weld-ability.

    3.2 The composition of the recommended grades of filler wire is described in comparison to that of AISI grade 304L and 316L parent metal.

    3.3 The joining practice undertaken assures the properties of stainless steel are retained.

4. Join stainless steel sheet and tube with the gas tungsten arc welding (GTAW) process.

    4.1 Joint is back purged in accordance with welding procedure specifications.

    4.2 Welding parameters are established in accordance with approved welding procedure specifications.

    4.3 Welds are deposited in accordance with industry standard.

5. Control the quality of the completed weld.

5.1 Weld imperfections are identified by visual examination and workshop tests in accordance with worksite procedure.

5.2 Incorrect welding parameters are identified as potential causes of imperfections, and actions are taken to welding procedure specification (WPS).

5.3 Weld defects are repaired in accordance with industry standard.

5.4 Control measures are performed to minimise distortion in accordance with worksite procedure.

5.5 Quality assurance procedures specific to welded fabrication, are identified.

Unit: 2671NS WELD STRUCTURAL STEEL WORK WITH THE MANUAL METAL ARC WELDING PROCESS IN DOWN-HAND POSITION

Objectives

People credited with this unit are able to safely use the manual metal arc welding (MMAW) process to join steel to meet stringent industry structural standards. They are able to prepare the equipment and materials, and work to codes and standards.

Elements and Performance Criteria

1. Create a safe worksite.

    1.1 Potential hazards are identified prior to welding.

    1.2 Work is undertaken in accordance with worksite and/or approved codes of practice under general supervision.

2. Prepare MMAW equipment to weld steel.

    2.1 Power source is selected to weld steel.

    2.2 Equipment is assembled for welding and maintenance performed on welding cables, electrode holder, and work clamp to worksite and/or manufacturers instructions.

    2.3 Electrodes are identified by brand, classification and specification.

3. Demonstrate an understanding of materials used.

    3.1 Steel is prepared and assembled to welding procedure specification.

    3.2 The three common types of electrode coating are identified as rutile, cellulosic and basic.

    3.3 Electrodes are stored and handled to manufacturers specifications.

    3.4 The mechanical properties and composition of structural sections are recognised as conforming to standard grades.

    3.5 The mechanical properties of the welded joint are identified as being dependent upon the steel composition and the cooling rate following welding.

4. Join steel with MMAW.

    4.1 Welding parameters are established to an approved welding procedure specification (WPS).

4.2 Welds are deposited to industry standard AS 1554.1 Category SP (or equivalent) in the AWS positions 1G, 1F and 2F positions.

5. Control the quality of the completed weld.

5.1 Weld imperfections are identified by visual examination and workshop tests.

5.2 Incorrect welding parameters are identified as potential causes of imperfections.

5.3 Weld defects are repaired to industry standard AS 1554.1 Category SP (or equivalent).

5.4 Distortion control measures are followed under supervision.

5.5 Quality Assurance procedures as applied to welded fabrication are identified as the use of WPS, welder performance qualifications and weld inspection.

Unit: 2684NS WELD STRUCTURAL STEEL WORK WITH THE GAS METAL ARC WELDING PROCESES IN ALL POSITIONS

Objectives

People credited with this unit are able to safely use the gas metal arc welding (GMAW) and flux cored arc welding (FCAW) processes to join steel to meet stringent industry structural standards. They are able to take individual responsibility for a range of quality related tasks including equipment specification and preparation, the optimisation of welding parameters and working to codes and standards.

Elements and Performance Criteria

1. Create a safe worksite.

    1.1 Potential hazards are identified prior to welding.

    1.2 Procedures are implemented to eliminate, isolate or minimise welding hazards in accordance with approved codes of practice.

    1.3 Work is undertaken in accordance with worksite and/or approved codes of practice.

2. Prepare GMAW equipment for welding steel in all positions.

    2.1 The features of GMAW and FCAW are identified for welding in all positions.

    2.2 Equipment is selected and assembled to weld steel.

    2.3 Consumables are identified by composition and specification.

    2.4 Maintenance is performed on the welding gun, wire drive system and work connection to manufacturers' instructions.

3. Demonstrate an understanding of materials.

    3.1 Methods of preparing and assembling parent metal are co-ordinated to meet code requirements.

    3.2 Electrodes are handled and stored to prevent damage or contamination.

    3.3 The grades, section thickness and required mechanical properties of a steel are recognised as influencing the welding parameters specified.

4. Join carbon steels with GMAW and FCAW.

    4.1 Welding parameters are established to an approved welding procedure specification (WPS).

    4.2 Welds are deposited in the horizontal, vertical and overhead positions to industry standard AS 1554.1 Category SP (or equivalent).

5. Control the quality of the completed weld.

    5.1 Weld requirements are identified from weld symbols to AS 1101.3.

    5.2 Weld imperfections are identified by visual examination and workshop tests.

    5.3 Incorrect welding parameters are identified as potential causes of imperfections and actions taken meet WPS.

    5.4 Weld defects are repaired to industry standard AS 1554.1 Category SP (or equivalent).

    5.5 Control measures are planned to minimise distortion.

    5.6 Quality Assurance procedures as applied to welded fabrication are identified as the use of WPS, welder performance qualifications and weld inspection.

Unit: 2685NS WELD STRUCTURAL STEEL WORK WITH THE MANUAL METAL ARC WELDING PROCESS IN ALL POSITIONS

Objectives

People credited with this unit are able to safely use the manual metal arc welding (MMAW) process to join steel in all positions to meet stringent industry structural standards. They are able to take individual responsibility for a range of quality related tasks including equipment specification and preparation, the optimisation of welding parameters and working to codes and standards.

Elements and Performance Criteria

1. Create a safe worksite.

    1.1 Potential hazards are identified prior to welding.

    1.2 Procedures are implemented to eliminate, isolate or minimise welding hazards in accordance with approved codes of practice.

    1.3 Work is undertaken in accordance with worksite and/or approved codes of practice.

2. Prepare MMAW equipment to weld steel in position.

    2.1 Power source is selected for welding in position.

    2.2 Equipment is assembled and maintained for both shop and site work to manufacturers specification or worksite requirements.

    2.3 Electrodes are identified by brand, classification and specification.

3. Demonstrate an understanding of materials used.

    3.1 Steel is prepared and assembled to welding procedure specification.

    3.2 Rutile, cellulosic and basic electrodes are used to advantage for positional welding.

    3.3 Electrodes are stored and handled to manufacturer's specifications.

    3.4 The grades, section thickness and required mechanical properties of a steel are recognised as influencing the welding parameters specified.

4. Join steels with MMAW.

    4.1 Welding parameters are established to an approved welding procedure specification (WPS).

4. Welds are deposited in the horizontal, vertical, and overhead positions to industry standard AS 1554.1 Category SP (or equivalent).

5. Control the quality of the completed weld.

5.1 Weld requirements are identified from weld symbols to AS 1101.3.

5.2 Weld imperfections are identified by visual examination and workshop tests.

5.3 Incorrect welding parameters are identified as potential causes of imperfections and actions taken meet WPS.

5.4 Weld defects are repaired to industry standard AS 1554.1 Category SP (or equivalent).

5.5 Control measures are planned to minimise distortion.

5.6 Quality Assurance procedures as applied to welded fabrication are identified as the use of WPS, welder performance qualifications and weld inspection.

Unit: 2687NS WELD STAINLESS STEEL SHEET AND PLATE WITH THE GAS METAL ARC WELDING PROCESSES IN ALL POSITIONS

Objectives

People credited with this unit are able to safely use the gas metal arc welding (GMAW), GMAW-Pulsed (GMAW-P) and flux cored arc welding (FCAW) processes to join stainless steel to meet the standards required by industries such as food processing, petrochemical and pulp and paper. They are able to take individual responsibility for a range of quality related tasks including equipment specification and preparation, the optimisation of the welding parameters, and working to codes and standards.

Elements and Performance Criteria

1. Create a safe worksite.

    1.1 Potential hazards are identified prior to welding.

    1.2 Procedures are implemented to eliminate, isolate or minimise welding hazards in accordance with approved codes of practice.

    1.3 Work is undertaken in accordance with worksite and/or approved codes of practice.

2. Prepare the equipment to weld stainless steel.

    2.1 The distinguishing features of GMAW, GMAW-P and FCAW as used to weld stainless steel in position are identified.

    2.2 Equipment is selected and assembled to weld stainless steel.

    2.3 Maintenance is performed on the welding gun, and wire drive system, and work connection to worksite requirements and/or manufacturer's instructions.

    2.4 Consumables are identified by composition and specification.

3. Demonstrate an understanding of materials.

    3.1 The physical properties and alloying elements of austenitic stainless steels are recognised as affecting their weldability.

    3.2 The composition of the recommended grades of filler wire is compared to that of AISI grades 304L and 316L parent metal.

    3.3 Methods of preparing and assembling parent metal are co-ordinated to meet code requirements.

    3.4 Joining practice assures the properties of stainless steel.

4. Join stainless steel with GMAW, GMAW-P and FCAW.

    4.1 Welding parameters are established to an approved welding procedure specification (WPS).

    4.2 Welds are deposited in position to industry standard NZS/AS 1554.6 Category B (or equivalent).

5. Control the quality of the completed weld.

    5.1 Weld requirements are identified from weld symbols to AS 1101.3.

    5.2 Weld imperfections are identified by visual examination and workshop tests.

    5.3 Incorrect welding parameters are identified as potential causes of imperfections and actions taken meet WPS.

    5.4 Weld defects are repaired to industry standard AS 1554.6 Category SP (or equivalent).

    5.5 Control measures are planned to minimise distortion.

    5.6 Quality Assurance procedures as applied to welded fabrication are identified as the use of WPS, welder performance qualifications and weld inspection.

Unit: 11777NS INSTALL PRODUCTION BOAT ENGINE PACKAGES

Objectives

People credited with this unit are able to prepare for installation of production boat engine packages, install and align power plants and power trains, and complete the installation process.

Elements and Performance Criteria

1. Prepare for the installation of production boat engine packages.

    1.1 Components are identified to installation plan requirements.

    1.2 Installation methods are identified to ensure compliance with installation plan requirements.

    1.3 Tools and equipment for installation are identified to installation plan specifications.

    1.4 Potential hazards are identified and preventative action is taken in accordance with company procedures.

    1.5 Preparation for installation is confirmed in accordance with company procedures.

2. Install and align power plants and power trains.

    2.1 Components and engine frame are checked before installation for trueness in accordance with company procedures and requirements.

    2.2 Components are installed, aligned and secured in accordance with installation plan and / or manufacturers' and / or supplier's specifications, recommendations, and instructions.

    2.3 Installation and alignment are carried out without damage to the boat, components, or equipment, and without danger to people.

3. Complete the installation process.

    3.1 Checking establishes that the installation conforms to supplied installation specifications.

    3.2 Completion and / or non-conformance are reported in accordance with company procedures.

    3.3 Installation and work area are cleaned and tidied in accordance with company procedures and requirements.

Unit: 241NS DESCRIBE THE OPERATION OF A DIESEL FUEL SYSTEM & PERFORM MINOR SERVICING TASKS

Objectives

This unit is for people who wish to enter or are employed in the automotive repair industry. People credited with this unit are able to: demonstrate knowledge of diesel oil as an automotive fuel; demonstrate knowledge of a diesel fuel system; remove and replace diesel fuel injectors; remove and replace a fuel filter; and bleed air from a diesel fuel system.

Elements and Performance Criteria

1. Demonstrate knowledge of diesel oil as an automotive fuel.

    1.1 The properties of a diesel fuel are described according to oil company specifications.

    1.2 The different grades of diesel fuel are defined.

2. Demonstrate knowledge of a diesel fuel system.

    2.1 The major components of the fuel system, their location on the vehicle, and the fuel flow path are described according to vehicle manufacturer's workshop manual descriptions.

    2.2 The purposes of the lift pump, the injection pump, and the injectors are described according to manufacturer's manual descriptions.

    2.3 The major differences between an in-line injection pump and a rotary injection pump are described according to manufacturer's manual descriptions.

    2.4 Safety precautions when working on vehicles equipped with electronically controlled diesel fuel systems are described according to vehicle manufacturer's workshop manual instructions.

3. Remove and replace diesel fuel injectors.

    3.1 Safe working practices are observed throughout the task.

    3.2 Suitable tools are selected for removing and replacing injectors.

    3.3 The injectors are disconnected and removed without damage to the injectors, pipes, and connections.

    3.4 Replacement injectors are installed and connected to manufacturer's specifications.

4. Remove and replace a fuel filter.

    4.1 Safe working practices are observed throughout the task.

4.2 Suitable tools are selected for removing and replacing a fuel filter.

4.3 The fuel filter element is removed without damage to the fuel casing and the element, and any other componentry, and wasted fuel is disposed of in a manner that will not cause a hazard.

4.4 A new filter element and gasket are selected, fitted, and tightened to manufacturer's specifications, ensuring that dirt and moisture are kept out.

5. Bleed air from a diesel fuel system.

5.1 Safe working practices are observed throughout the task.

5.2 The need for bleeding air from a diesel fuel system is determined from the nature of work undertaken on the system.

5.3 The fuel tank is checked to ensure sufficient fuel is available to carry out the task successfully.

5.4 Air is bled from the system in accordance with manufacturer's instructions and specifications.

Unit: 15404NS DEMONSTRATE KNOWLEDGE OF DIESEL ENGINE AIR INTAKE & EXHAUST SYSTMES; INSPECT AND TEST THEM

Objectives

This unit is for people in the automotive repair industry. People credited with this unit are able to: demonstrate knowledge of an induction system on a diesel engine; demonstrate knowledge of an exhaust system on a diesel engine; demonstrate knowledge of the operating conditions for a vehicle and/or machine equipped with a turbocharged engine; inspect and test the induction system on a diesel engine for faults; and inspect and test the exhaust system on a diesel engine for faults.

Elements and Performance Criteria

1. Demonstrate knowledge of an induction system on a diesel engine.

    1.1 Air volumes required of an engine are compared.

    1.2 Main components of a turbocharger system are identified according to manufacturer's workshop manual illustrations.

    1.3 Principles of turbocharging are described according to engine manufacturer's specifications.

    1.4 Principles of a Rootes type blower are described according to engine manufacturer's specifications.

2. Demonstrate knowledge of an exhaust system on a diesel engine.

    2.1 Exhaust size and air flow rates of an exhaust system are compared.

    2.2 Requirements of an exhaust system to produce back pressure according to manufacturer's specifications are determined and calculated.

3. Demonstrate knowledge of the operating conditions for a vehicle and/or machine equipped with a turbocharged engine.

    3.1 Driver operational requirements for a turbocharged engined vehicle and / or machine are identified.

    3.2 Importance of specified clean oil delivery to the turbocharger is identified.

    3.3 Hazards of unfiltered air entering the turbocharger system are identified.

4. Inspect and test the induction system on a diesel engine for faults.

    4.1 Safe working practices are observed throughout the task.

4.2 Test equipment is mounted on the engine to enable inlet system restrictions to be identified.

4.3 Air pressure readings are measured according to manufacturer's instructions, and the results are recorded.

4.4 Induction system is inspected according to manufacturer's workshop manual instructions, and any faults found are reported to the supervisor.

5. Inspect and test the exhaust system on a diesel engine for faults.

5.1 Safe working practices are observed throughout the task.

5.2 Suitable tools and test equipment are selected according to manufacturer's specifications, and used to enable the system to be inspected and tested.

5.3 Test equipment is mounted on the engine to enable exhaust system restrictions to be identified.

5.4 Exhaust system is inspected according to manufacturer's workshop manual instructions, and any faults found are reported to the supervisor.

5.5 Exhaust system faults and their causes identified by the test gauge readings are noted.

5.6 Fuel lift tube, screens, and primary and secondary filters are inspected and cleaned and/or replaced according to manufacturer's recommendations.

5.7 Fuel hoses and connections are inspected and those found faulty are repaired and/or replaced according to manufacturer's specifications.

5.8 Fuel system is bled of air as prescribed by the engine manufacturer.

Unit: 9938NS INSTALL PIPE WORK IN BOATS

Objectives

People credited with this unit are able to describe pipe work and associated tools and accessories, and carry out pipe work installation. They are able to work under supervision.

Elements and Performance Criteria

1. Identify simple plumbing systems used in vessels.

    1.1 Systems that require plumbing and pipe work are identified.

    1.2 Pipe work systems / connections hose types are identified and described according to sustainability for the system purpose.

    1.3 Fittings are identified in terms of their purposes and installation methods.

2. Install plumbing system.

    2.1 Plumbing system is planned and components specified to suit job requirements.

    2.2 Plumbing installation and support is described in accordance with job requirements and component manufacturers' specifications.

    2.3 System testing process is described in accordance with system requirements.

Unit: 9937NS INSTALL EXTERIOR BOAT SYSTEMS

Objectives

People credited with this unit are able to fit exterior boat system components and associated power inputs, and confirm the operational integrity of installed exterior boat systems.

Elements and Performance Criteria

1. Fit exterior boat system components and associated power inputs.

    1.1 Alignment of installation positions meets job requirements and enables operational integrity to be achieved to manufacturers' and / or designer's requirements.

    1.2 Components are installed in accordance with job requirements and / or component manufacturers' specifications and instructions.

    1.3 Fitting provides a watertight contact between the hardware and substrate.

2. Confirm the operational integrity of installed exterior boat systems.

    2.1 System is operated in accordance with the manufacturers' recommendations and instructions.

    2.2 Tests are carried out in accordance with manufacturers' warranty requirements.

    2.3 Adjustments made enable components and systems to operate in accordance with manufacturers' and / or company requirements.

    2.4 Completed installation does not interfere with other boat systems or weaken the boats' structure.

Unit: 401NS NSBA ELECTRICAL CERTIFICATION

Objectives

People credited with this unit are required to have the knowledge and practical experience to design and install complete AC and DC electrical systems on yachts and small commerical vessels.

Elements and Performance Criteria

1. Demonstrate knowledge of the installation of marine electrical systems.

    1.1 The selection, positioning and mounting of electrical equipment.

    1.2 The selection, positioning and mounting of electrical panels and switch boards.

    1.3 The determination of correct rating for circuit breakers.

    1.4 The selection, sizing and installation of wires and cables.

    1.5 The connection of wires and cables to power sources, switch boards and equipment.

    1.6 The static testing of AC and DC systems and the documenting of test results

Unit: 5433NS DESCRIBE THE APPLICATION OF ELECTRICITY AND ELECTRONICS FOR MARINERS

Objectives

This theory based unit is for people in the power boat and automotive electrical repair industries. People credited with this unit are able to demonstrate knowledge of: marine electrical and electronic systems; battery and voltage supply requirements; marine accessory wiring systems; and lighting and navigation systems on power boats and yachts.

Elements and Performance Criteria

1. Demonstrate knowledge of marine electrical and electronic systems.

    1.1 The range of electrical and electronic systems fitted to power boats and yachts is identified.

    1.2 Earthing requirements for marine electrical and electronic components are described according to text book descriptions.

    1.3 The use of relays for high loading circuits is described according to text book descriptions.

    1.4 The use of parallel switching in marine wiring circuits is described according to text book descriptions.

    1.5 The uses of sealed and waterproofed components are described according to component manufacturer's specifications.

    1.6 Corrosion protection for electrical and electronic components is identified.

2. Demonstrate knowledge of battery and voltage supply requirements.

    2.1 Marine battery types are identified.

    2.2 Battery installation requirements are identified.

    2.3 Battery testing and charging methods and procedures are described according to battery manufacturer's instructions.

    2.4 240 volt supply systems for marine use are described according to supply system manufacturer's specifications.

3. Demonstrate knowledge of marine accessory wiring systems.

    3.1 Engine monitoring systems are described according to system manufacturer's specifications.

    3.2 On-board instrument functions and purposes are explained according to instrument manufacturer's specifications.

4. Demonstrate knowledge of lighting and navigation systems on power boats and yachts.

   4.1 Lighting requirements are described according to shipping regulations.

   4.2 Cabin and accessory light requirements are described according to manufacturer's specifications.

   4.3 Emergency lighting and warning lights are identified.

   4.4 Radio-telephone and transceiver types are identified.

   4.5 Navigation instruments are identified.

Unit: 10836NS PRODUCE SCALE DRAWINGS OF BOAT SURFACES FROM CORRECTED OFFSETS

Objectives

People credited with this unit are able to prepare for the scale drawings of boats in three dimensions, and make scale drawings of boats in three dimensions.

Elements and Performance Criteria

1. Prepare for the scale drawing of boats in three dimensions.

    1.1 Components of plans are identified from corrected offsets.

    1.2 Interpretation of tables of offsets establishes locations of baselines.

2. Make scale drawings of boats in three dimensions.

    2.1 Grid is square, and scaled to job specifications.

    2.2 Selection and splining of battens enable fair lines to be established.

    2.3 Faired lines cross grid lines in all three views at the same points

Unit: 10837NS PREPARE A LOFTING FLOOR FOR BOATBUILDING

Objectives

People credited with this unit are able to prepare for the scale drawings of boats in three dimensions, and make scale drawings of boats in three dimensions.

Elements and Performance Criteria

1. Prepare a lofting floor for boatbuilding.

    1.1 Selection of grid location meets production requirements and enables subsequent lofting activities to take place without the need for relocating the grid.

    1.2 Interpretation of provided offsets and computer-generated mylar establishes the required grid dimensions and datum lines.

    1.3 Selection of materials, tools, and equipment enables job specifications to be achieved.

    1.4 Selection of straight edges enables grid lines to be drawn to job requirements.

    1.5 Floor is confirmed as being clean and true before proceeding.

2. Lay out and check grid.

    2.1 Layout is progressively checked in accordance with organizational and job requirements.

    2.2 Grid is square, and dimensionally and proportionally accurate to job specifications.

    2.3 Datum lines are positioned according to job requirements.

Unit: 10838NS DRAW FULL SIZED HULLS FROM CORRECTED OFFSETS UNDER SUPERVISION

Objectives

People credited with this unit are able to prepare for drawing full sized hulls, and produce full sized drawings of hulls.

Elements and Performance Criteria

1. Prepare for drawing full sized hulls.

    1.1 Interpretation of offsets establishes datum lines in accordance with job requirements.

    1.2 Grid characteristics are checked for suitability according to job requirements.

    1.3 Selection of materials, tools, and equipment enables job specifications to be achieved.

    1.4 Selection, production, and splining of battens enable full lines to be established to job specifications.

2. Produce full sized drawings of hulls.

    2.1 Lofted lines are unbroken and meet job requirements for consistency of line thickness.

    2.2 Definitions of different views meet organizational and job requirements for legibility.

    2.3 Faired lines cross grid lines in all three views at the same points.

    2.4 Drawn lines correspond to supplied offsets in accordance with job specifications.

    2.5 Drawing is progressively checked in accordance with organizational and job requirements.

    2.6 Drawing is verified with supervisor in accordance with organizational procedures.

Unit: 10842NS DRAW FAIR LINES FOR BOATBUILDING

Objectives

People credited with this unit are able to identify anomalies in supplied offsets and modify drawn lines.

Elements and Performance Criteria

1. Identify anomalies in supplied offsets.

    1.1 Anomalies are identified in terms of designer's intentions regarding lines, performance, and aesthetics.

    1.2 Anomalies are identified within 1 millimetre of fair lines.

2. Modify drawn lines.

    2.1 Selected modification enables designer's intentions to be achieved.

    2.2 Selected modification is within the designer's allowance for boatbuilder modification.

    2.3 Faired lines cross grid lines in all three views at the same points.

    2.4 Modifications are documented and communicated in accordance with company's production requirements.

Unit: 9950NS FILL AND FAIR BOAT SURFACES

Objectives

People credited with this unit are able to identify the characteristics of boat surfaces requiring filling and fairing, mix and apply filler, and reduce filler to a faired surface.

Elements and Performance Criteria

1. Identify the characteristics of boat surfaces requiring filling and fairing.

    1.1 Surface preparation is verified in accordance with job specifications and manufacturers' specifications.

    1.2 Selection, production and joining of battens enable fair lines to be identified.

    1.3 Variance is identified in accordance with design specifications, using battens and patterns

    1.4 Variance is established across the entire surface to be faired.

2. Mix and apply filler.

    2.1 Materials are mixed in accordance with job requirements and manufacturers' instructions.

    2.2 Filler is applied in accordance with job requirements and manufacturers' instructions.

    2.3 Surface is filled to the extent that fair lines can be achieved across the entire surface at the required standard of finish.

    2.4 Materials usage is monitored to company requirements.

3. Reduce filler to a fair surface.

    3.1 Filler is reduced in accordance with job requirements and manufacturers' instructions.

    3.2 Finished surface is fair in accordance with job specifications.

    3.3 Faired surface meets company and / or clients' requirements and specifications for finish.

Unit: 97NS APPLY SURFACE COATINGS BY CONVENTIONAL SPRAY TECHNIQUES

Objectives

People credited with this unit are able to carry out the servicing requirements of compressor units, implement the servicing requirements of conventional spray guns, prepare, then apply surface coatings by conventional spray equipment, and recognize and remedy faults and defects.

Elements and Performance Criteria

1. Carry out the servicing requirements of compressor units.

    1.1 The function of the driving units is described, and maintenance is carried out to manufacturers' specifications.

    1.2 The function of the pump unit is described, and maintenance is carried out to manufacturers' specifications.

    1.3 The function of ancillary equipment is described and maintenance is carried out to manufacturers' specifications.

    1.4 Safe working practices appropriate to the task being undertaken are implemented in accordance with relevant legislation.

2. Implement the servicing requirements of conventional spray guns.

    2.1 The parts of conventional spray guns are identified and their function stated.

    2.2 Servicing requirements of conventional spray guns, as stipulated by manufacturers' specifications or company procedures, are carried out.

3. Prepare; then apply surface coatings by conventional spray equipment.

    3.1 The surface coating is selected and prepared for spraying.

    3.2 Spray equipment suitable to the task is selected and assembled.

    3.3 Surface coating is applied without fault.

    3.4 Safe working practices appropriate to the task being undertaken are implemented in accordance with relevant legislation.

    3.5 Spray equipment is dismantled, cleaned, and stored.

4. Recognize and remedy faults and defects.

    4.1 Spraying technique faults are identified and remedies applied.

    4.2 Spray equipment faults are identified and remedial action taken.

    4.3 Causes of air pressure drop are identified and eliminated.

Unit: 100NS APPLY LIQUID COATINGS BY AIRLESS SPRAY TECHNIQUES

Objectives

People credited with this unit are able to demonstrate understanding of airless spray, demonstrate the servicing requirements of an airless spray system, prepare, then apply liquid surface coatings by airless spray, and recognize and remedy faults and defects.

Elements and Performance Criteria

1. Demonstrate understanding of airless spray.

    1.1 The principles of airless spraying are stated.

    1.2 The advantages and disadvantages of airless spray compared to conventional spray are stated.

2. Demonstrate the servicing requirements of an airless spray system.

    2.1 The parts of an airless spray unit are identified and their function is stated.

    2.2 Maintenance of the airless spray unit, as laid down by the manufacturers and in-house requirements, is carried out.

    2.3 Safe working practices are carried out in accordance with relevant legislation.

3. Prepare then apply liquid surface coatings by airless spray.

    3.1 Liquid surface coating appropriate to the task is selected and prepared for spraying.

    3.2 Surface is prepared and masked to receive the coating.

    3.3 Airless spray equipment suitable to the task is selected and assembled.

    3.4 Liquid surface coating is applied without fault.

    3.5 Airless spray equipment is dismantled, cleaned, and stored.

    3.6 Safe working practices are implemented appropriate to the task being undertaken in accordance with relevant legislation.

4. Recognize and remedy faults and defects.

4.1 Application faults are identified and the appropriate remedies applied.

4.2 Equipment faults are identified and remedial action taken.

Unit: 5712NS USE AND MAINTAIN SPRAY GUNS; RECTIFY SPRAY GUN DEFECTS

Objectives

Those credited with this unit are able to, demonstrate knowledge or spray guns, use a spray gun, maintain a spray gun, and rectify spray gun defects.

Elements and Performance Criteria

1. Demonstrate knowledge of spray guns.

    1.1 Purpose of each kind of spray gun is identified according to spray gun manufacturers' specifications.

    1.2 Principle of how each spray gun works is identified according to spray gun manufacturers' specifications.

    1.3 Spray gun set ups for the kinds of paint are identified according to manufacturers' specifications.

    1.4 Spray gun parts are identified according to manufacturers' specifications.

2. Use a spray gun.

    2.1 Spray gun is identified and set up according to the manufacturers' recommendations.

    2.2 Material to be sprayed is identified, and used according to paint manufacturers' specifications.

    2.3 Spray gun is used according to the spray gun manufacturers' specifications and the industry acceptable standard, and there are no defects on the painted panel.

    2.4 Spray gun is cleaned according to manufacturers' specifications, and is put away in its place and is not damaged.

    2.5 Tools, materials, and equipment are clean and put away in their places, and the work area is clean.

    2.6 Safe working practices are carried out throughout the task.

3. Maintain a spray gun.

    3.1 Tools and materials are selected that will enable the gun to be maintained according to the spray gun manufacturers' specifications.

    3.2 Spray gun is maintained and operated according to spray gun manufacturers' specifications.

3.3 Tools, materials, and equipment are clean and put away in their places, and the work area is clean.

3.4 Safe working practices are carried out throughout the task.

4. Rectify spray gun defects.

4.1 Tools and materials that will enable the gun to be repaired are selected and used according to the spray gun manufacturers' specifications.

4.2 Spray gun faults are identified, and the gun is repaired and operates according to manufacturers' specifications.

4.3 Tools, materials, and equipment are clean and put away in their places, and the work area is clean.

4.4 Safe working practices are carried out throughout the task according to the manufacturers' instructions, legislation, and establishment policy.

4.5 Work is completed to the acceptable industry standard and in an acceptable industry time.

Unit: 1071NS DESCRIBE, SELECT, USE AND MAINTAIN PAINT ROLLERS

Objectives

Work is completed to the acceptable industry standard and in an acceptable industry time.

Elements and Performance Criteria

1. Identify and select paint rollers.

    1.1 The capabilities and limitation of paint rollers are described.

    1.2 The work operation is identified.

    1.3 The paint roller is selected to enable the work operation to be completed.

2. Use paint rollers.

    2.1 The coating is applied with minimum fault.

    2.2 Application technique faults are identified.

    2.3 Safe working practices are implemented appropriate to the task being undertaken and in accordance with relevant legislation.

3. Maintain paint rollers in good working order.

    3.1 Paint rollers are cleaned and stored in accordance with industry standards.

Unit: 1073NS DESCRIBE, SELECT, USE AND MAINTAIN PAINT BRUSHES

Objectives

People credited with this unit are able to describe and select paint brushes, use paint brushes, and maintain paint brushes in good working order.

Elements and Performance Criteria

1. Identify and select paint brushes.

    1.1 The capabilities and limitation of paint brushes are described.

    1.2 The work operation is identified.

    1.3 The paint brush is selected to enable the work operation to be completed.

2. Use paint brushes.

    2.1 The coating is applied with minimum fault.

    2.2 Application technique faults are identified and corrected.

    2.3 Safe working practices are implemented appropriate to the task being undertaken and in accordance with relevant legislation.

3. Maintain paint brushes in good working order.

    3.1 Paint rollers are cleaned and stored in accordance with industry standards.

Unit: 11791NS APPLY BUILD COATS AND FINISH COATS FOR MARINE PAINT SYSTEMS

Objectives

People credited with this unit are able to carry out preparation for painting, prepare the previous coat, and apply coatings.

Elements and Performance Criteria

1. Carry out preparation for painting.

    1.1 Job specifications are obtained and verified in accordance with company procedures.

    1.2 Protection is provided for existing equipment, fittings, furnishings and surfaces in accordance with job specifications.

    1.3 Planning of own work schedule enables required coating system to be applied to required standard and within agreed time-frames.

2. Prepare the previous coat.

    2.1 Previous coats are post-cured in accordance with company requirements.

    2.2 Sanding between coats is carried out in accordance with specifications for the sanding profile.

    2.3 Actions taken ensure that the work area is kept free of possible surface contaminants.

3. Apply coatings.

    3.1 Coatings are applied in accordance with manufacturers' specifications for method of application, thinning, re-coat windows, and use of additive.

    3.2 Surface conforms to manufacturers' specifications and / or customer's requirements and / or the requirements of the reference text, for standard of finish and level of gloss.

    3.3 The combination and number of coats applied conform to job requirements.

Unit: 11786NS ANTI-FOUL A BOAT

Objectives

People credited with this unit are able to remove fouling from underwater areas, select preparation and coating methods and product range, and apply anti-fouling system.

Elements and Performance Criteria

1. Remove fouling from underwater area.

    1.1 Selection of removal method is matched with substrate and anti-fouling in current use.

    1.2 Specified surface is completely clear of fouling.

    1.3 Surface is clear of imperfections and the substrate is unbroken.

2. Select preparation and coating methods and product range.

    2.1 Methods and product range are matched with intended use, customer's requirements, and regulatory requirements.

    2.2 Surface preparation and coating methods are matched with substrate, product range, and customer's requirements.

3. Apply anti-fouling system.

    3.1 Anti-fouling is applied in accordance with manufacturers' specifications and recommendations.

    3.2 Protection is provided for areas not required to be coated.

    3.3 Application techniques comply with manufacturers' specifications for dry film thickness.

Unit: 9931NS OVERLAY BOAT DECK WITH TEAK

Objectives

People credited with this unit are able to select teak decking method and materials, prepare teak for fitting and fixing, fit and fix teak to substrates, and make teak planking watertight.

Elements and Performance Criteria

1. Select teak decking method and materials.

    1.1 Selected method is matched with substrate, and with design requirements for wood thickness.

    1.2 Teak is selected to meet job requirements.

    1.3 Fastenings are selected to meet job requirements.

2. Prepare teak for fitting and fixing.

    2.1 Teak is cut to size so that it can be fixed to the substrate in accordance with job requirements, and fair lines can be achieved to design requirements.

    2.2 Teak pieces are pre-shaped in accordance with job requirements for jointing to adjacent pieces.

    2.3 Teak is pre-treated in accordance with adhesive manufacturers' recommendations, specifications, and instructions.

3. Fit and fix teak to substrates.

    3.1 Substrate is faired to job specifications and tolerances for fair lines.

    3.2 Teak is fitted and fixed in accordance with job requirements for fastening type and location of butt joints.

    3.3 All glued interfaces are in contact with each other.

    3.4 Pressure between teak and substrate is maintained for sufficient time to meet manufacturers' requirements for adhesive curing.

    3.5 Planks are spaced in accordance with job requirements for dimension and appearance.

4. Make teak planking watertight.

4.1 Materials are selected and prepared in accordance with job requirements and manufacturers' specifications and instructions.

4.2 Materials are applied to job requirements, and in accordance with manufacturers' specifications and instructions.

4.3 Water tightness is established using visual methods.

Unit: 18171NS DEMONSTRATE KNOWLEDGE OF SPARS AND RIGGING

Objectives

People credited with this unit are able to describe the history of spars and rigging, explain the principles and dynamics of spars and rigging, identify the materials used for spars and rigging, identify spars and rigging components, describe the relationship between rig and other yacht systems, and explain the reasons for inspection and maintenance of spars and rigging.

Elements and Performance Criteria

1. Describe the history of spars and rigging.

    1.1 The changes in spars and rigging are described in terms of development.

    1.2 The changes in materials used in spars and rigging are described in terms of development.

    1.3 Terminology used to describe spars and rigging is explained in terms of its definition.

2. Explain the principles and dynamics of spars and rigging.

    2.1 Principles and dynamics of spars and rigging are explained in terms of type.

    2.2 Principles of operation of spars and rigging are explained in terms of sailing loads in different conditions and aspects.

3. Identify the materials used for spars and rigging.

    3.1 Materials used for spars are identified by type.

    3.2 Materials used for rigging are identified by type.

4. Identify spar and rigging componentry.

    4.1 Spar and rigging componentry is identified in terms of its purpose.

    4.2 The location of spar and rigging componentry is identified in terms of its operational use.

5. Describe the relationship between rig and other yacht systems.

    5.1 The relationship between rig and other yacht systems is described in terms of how they interface.

    5.2 Uses of spars and booms are identified in terms of tenders, covers and recovering.

6. Explain the reason for inspection and maintenance of spars and rigging.

6.1 The reasons for inspection and maintenance of spars and rigging are explained in terms of consequences of failure.

6.2 Key points for inspection are identified in terms of industry requirements.

Additional Learning Resources

Recommended Reference Materials

American Boat and Yacht Council (ABYC): Standards and Technical Information Reports for Small Craft (available on disc or internet access)

American Boat and Yacht Council (ABYC): Fundamentals of Marine Service Technology

Transport Canada: TP 1332 - Construction Standards for Small Vessels (2010)

NSBA Marine Electrical Handbook

Suggested texts

Calder, Nigel: Boatowner's Mechanical and Electrical Manual

Calder, Nigel: Marine Diesel Engines: Maintenance, Troubleshooting, and Repair

Calder, Nigel: Boatowner's Mechanical & Electrical Manual: How to Maintain, Repair, and Improve Your Boat's Essential Systems

Calder, Nigel: Refrigeration for Pleasure Boats: Installation, Maintenance & Repair

Colvin, Thomas E.: Steel Boatbuilding

Collier, Everett: The Boatowner's Guide to Corrosion

Dashew, Steve & Dashew, Linda: Offshore Cruising Encyclopedia II

Gougeon, Meade: Gougeon Brothers on Boat Construction: Wood & West System Materials

Larsson, Lars & Eliasson, Rolf: Principles of Yacht Design

Payson, Harold H.: Keeping the Cutting Edge: Setting & Sharpening Hand & Power Saws

Pollard, Stephen F.: Boatbuilding with Aluminum

Skene, Norman L. & Kinney, Francis S.: Skene's Elements of Yacht Design

Vickers Industrial Hydraulics Manual

Professional Boatbuilder Magazine, Brooklin ME USA: Professional Boatbuilder