



Australian Government

Department of Education, Employment and Workplace Relations

MSL965001A Design and manufacture glass apparatus and glass systems

Revision Number: 1

MSL965001A Design and manufacture glass apparatus and glass systems

Modification History

Not applicable.

Unit Descriptor

Unit descriptor	This unit of competency covers the ability to design and manufacture glass apparatus and glass systems. It includes consulting with clients regarding design specifications and cost, as well as designing equipment and systems to improve efficiency, increase production capabilities and improve safety of equipment and processes.
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Application of the Unit

Application of the unit	This competency is applicable to skilled and experienced scientific glassblowers. They will apply specialised technical knowledge and precise technical skills and considerable planning and judgement in their work. Industry representatives have provided case studies to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. These can be found at the end of this unit of competency under the section 'This competency in practice'.
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Licensing/Regulatory Information

Not applicable.

Pre-Requisites

Prerequisite units		
	MSL963001A	Operate basic handblowing

Prerequisite units		
		<i>equipment</i>
	MSL963002A	<i>Repair glass apparatus using simple glassblowing equipment</i>

Employability Skills Information

Employability skills	This unit contains employability skills.
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Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.
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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Scope the design of glass apparatus and system	1.1. Clearly identify the function, operating procedures and requirements for apparatus and/or glass system 1.2. Confirm details of glass apparatus and glass systems required 1.3. Prepare specifications for new glass apparatus and glass system requirements 1.4. Prepare design proposal and timelines 1.5. Obtain client's approval for design proposal
2. Design glass apparatus and systems	2.1. Identify or prepare appropriate blueprints, drawings or designs 2.2. Consult with clients regarding design specifications and cost 2.3. Design the equipment 2.4. Obtain client's approval for manufacture
3. Manufacture glass apparatus and systems	3.1. Identify hazards and enterprise safety requirements 3.2. Select and prepare glass stock and materials 3.3. Select and prepare tools and equipment in accordance with job requirements 3.4. Construct apparatus or system 3.5. Perform annealing operations 3.6. Perform glass finishing operations 3.7. Trial and commission apparatus or system
4. Maintain a safe work environment	4.1. Use established safe work practices and personal protective equipment to ensure safety of self and other workers 4.2. Minimise the generation of wastes 4.3. Ensure the safe disposal of wastes 4.4. Clean, care for and maintain work area, equipment and tools 4.5. Report any hazards or incidents according to enterprise procedures
5. Maintain records	5.1. Record data into reporting system 5.2. Maintain glass apparatus and system equipment logs as per enterprise requirements 5.3. Ensure security and confidentiality of enterprise information

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

Required skills include:

- designing and manufacturing glass apparatus systems
- interpreting briefs, including design requirements and cost
- selecting appropriate grades of glass and components and preparing for use
- applying basic theoretical knowledge and making relevant design conclusions
- identifying atypical situations and taking appropriate action
- communicating problems to either the supervisor or outside service technician
- recording and reporting work results
- following correct occupational health and safety (OHS) and principles of good laboratory practice (GLP)

Required knowledge

Required knowledge includes:

- design principles for glass apparatus
- types of glass (including special formula glass), their properties and applications
- incompatible glass types
- glass to glass and glass to metal seals
- theoretical and practical knowledge of glassworking methods and procedures, including chemistry, physics, electrode sealing techniques and electrode placement in glass
- basic theory of equipment operation and use for which design and manufacture is required
- characteristics, capabilities and limitations of glassblowing techniques
- relevant health, safety and environment requirements

Evidence Guide

EVIDENCE GUIDE	
The Evidence Guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.	
Overview of assessment	
Critical aspects for assessment and evidence required to demonstrate competency in this unit	Assessors should ensure that candidates can: • design and manufacture glass apparatus systems • interpret a brief, including design requirements and cost • prepare apparatus and system designs • incorporate appropriate design factors relevant to use requirements of apparatus • select appropriate grades of glass and components and prepare for use • apply basic theoretical knowledge of chemistry and physics and make relevant design conclusions • identify atypical situations and take appropriate action • communicate problems to either supervisor or outside service technician • record and report work results • follow correct OHS and principles of GLP.
Context of and specific resources for assessment	This unit of competency is to be assessed in the workplace or simulated workplace environment. It is strongly recommended that assessment is conducted through observation over time. The timeframe must allow for adequate assessment of operation under all normal and a range of abnormal conditions. Where this is not practical additional assessment techniques must be used. This unit of competency may be assessed with: • <i>MSL965002A Perform glass coating, grinding and finishing operations</i> • <i>MSL965003A Construct, modify and maintain high vacuum systems.</i> Resources may include: • access to a scientific glassblowing facility, appropriate equipment, materials and procedures

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	access to more than one workplace or simulated learning environment if the primary workplace or learning environment is unable to provide a suitable range of equipment.
Method of assessment	The following assessment methods are suggested: - inspection of examples of glasswork and workplace documentation completed by the candidate - analysis of the candidate's work records over a period of time to ensure accurate and consistent work is obtained within required timelines - feedback from peers and supervisors - oral/written questioning. In all cases, practical assessment should be supported by questions to assess underpinning knowledge and those aspects of competency which are difficult to assess directly. Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability. Access must be provided to appropriate learning and/or assessment support when required. The language, literacy and numeracy demands of assessment should not be greater than those required to undertake the unit of competency in a work like environment.
This competency in practice	Industry representatives have provided the case study below to illustrate the practical application of this unit of competency and to show its relevance in a workplace setting. Manufacturing A scientific glassblower, who works for a town gas company, has been requested by the research laboratory to design and manufacture a complex gas extraction train. The equipment will be used to burn town gas under a range of conditions and analyse the exhaust gases by bubbling them through a number of gas extraction bottles. The apparatus will be used around the plant and therefore it must be portable, small and contained within a safety box in the event that there is an explosion in the apparatus. After scoping the general design with the

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research staff, the glassblower prepared a detailed design with particular emphasis on the size and the technical requirements associated with the need for metal electrodes in glass and metal to glass seals. They also analysed the risks of an explosive air/gas mixture developing in the apparatus and the use of hazardous chemicals in the gas bubbling/extraction bottles. The glassblower selected the glass, prepared the glassblowing tools and equipment and constructed the apparatus according to the detailed design. They carefully performed the annealing operation given the complexity of the apparatus. They then liaised with the workshop staff who were building the box to contain the apparatus. Finally, the whole system was checked under operational conditions and handed over to the research staff.

Range Statement

RANGE STATEMENT

The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

Codes of practice

Where reference is made to industry codes of practice, and/or Australian/international standards, it is expected the latest version will be used

Standards, codes, procedures and/or enterprise requirements

Standards, codes, procedures and/or enterprise requirements may include:

- calibration and maintenance schedules
- enterprise recording and reporting procedures
- equipment manuals
- equipment startup, operation and shutdown procedures
- industry codes of practice
- material safety data sheets (MSDSs)
- material, production and product specifications
- national environment protection measures
- OHS national standards and codes of practice
- production and laboratory schedules
- quality manuals
- standard operating procedures (SOPs)

Tools, materials and equipment

Tools, materials and equipment may include:

- bench burner, hand torch and ribbon burners, gas supplies and gas economisers
- glassworking lathes
- annealing ovens
- measuring and recording equipment
- hand tools, such as carbon paddles and mandrels, range of forceps, glass tubing gauges, angle setting jigs, calipers, glass support rollers, brass shapers, carbon rods, glass knife, stainless steel gauze, vernier calipers and other measuring tools, and strain viewer
- mechanical glass cutters and saws

RANGE STATEMENT	
	• mechanical glass grinding equipment • special formula glasses • glass to glass and glass to metal seals
Hazards	Hazards may include: • sharps and broken glassware • residues on used glassware, such as mercury • heat sources, such as burners and ovens • fluids under pressure (acetylene and oxygen) • glass dust • cuts associated with glass grinders and cutters • manual handling of heavy equipment and containers
Safety practices	Safety practices may include: • use of personal protective equipment, such as heat resistant gloves, safety glasses, goggles, face guards, coveralls, respirators and safety boots • correct labelling of reagents and hazardous materials • handling, and storing hazardous materials and equipment in accordance with labels, MSDS, manufacturer's instructions, and enterprise procedures and regulations • regular cleaning and/or decontamination of equipment and work areas
Occupational health and safety (OHS) and environmental management requirements	OHS and environmental management requirements: • all operations must comply with enterprise OHS and environmental management requirements, which may be imposed through state/territory or federal legislation - these requirements must not be compromised at any time • all operations assume the potentially hazardous nature of samples and require standard precautions to be applied • where relevant, users should access and apply current industry understanding of infection control issued by the National Health and Medical Research Council (NHMRC) and State and Territory Departments of Health

Unit Sector(s)

Unit sector	Scientific glassblowing
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Competency field

Competency field	
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Co-requisite units

Co-requisite units		