



National Competency Standards Level-5 for “Glass & Ceramics Technology”



National Vocational and Technical Training Commission (NAVTTTC),

Government of Pakistan



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NAVTTTC team under the leadership of Dr. Muqeem ul Islam initiated development of CBT & A based qualifications of diploma level-5 as a reform project of TVET sector in November 2018 and completed 27 NVQF diplomas of Level-5 in September, 2019. It seems worth highlighting that during this endeavor apart from developing competency standards/curricula in conventional trades new dimensions containing high-tech trades in TVET sector in the context of generation IR 4.0 trades have also been developed which inter alia includes Robotics, Mechatronics, artificial intelligence, industrial automation, instrumentation and process control. Moreover, trades like entrepreneurship, green/environmental skills and variety of soft/digital skill have also been developed to equip the Pakistani youth with skills set as per requirement of the global trends. These skills have been made integral part of all the 27 diplomas.

Nobody has been more important in the pursuit of this project than Dr. Nasir Khan, Executive Director, NAVTTTC, whose patronage and support remain there throughout the development process and lastly to thanks specially to Syed Javed Hassan, Chairman NAVTTTC and Raja Saad Khan, Deputy Team Lead TSSP-GIZ who made it happened in this challenging time.



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1. Introduction

This qualification reflects the role of glass and ceramic technology expert who combine specialised technical, creative and conceptual skills to develop their own Glass and ceramics practice. They are able to plan, design and realize a body of ceramic work using in-depth skills specific to ceramics technologies, materials and processes.

Glass & Ceramics technologist may work in their own practice, or in organisations that design and produce Glass & ceramic objects, such as specialist tile ,sanitary ware , table ware, insulators , window Glass container glass, float glass etc. manufacturers, The purpose of the work may be artistic or technical Glass & Ceramic technologist may teach in a range of community contexts.

Glass and Ceramics students learn to use mathematical ideas and techniques in judging proportions, sizes, measurements and spatial relationships. Work with glass, ceramic body, glaze technology and kiln work, in particular, require specific technical skills and knowledge.

Initially students are given opportunities to engage with materials and processes associated with Glass and Ceramics alongside related activities of print, drawing/image making and digital manufacture. Increasingly students are encouraged to adopt more personal, informed and responsive approaches that will allow for diverse practice across a wide spectrum of craft, design and technology context.

2. Purpose of the Qualification

The competency based NVQ has been developed to train the unskilled men and women of Pakistan on the technical and entrepreneurial skills to be employed / self-employed and inevitably set sustainable impact on their lives by increase in their livelihood income generation.

The purpose of these qualifications is to set professional standards for Glass & ceramics experts, who will serve as key elements enhancing quality of Pakistan’s Glass & Ceramic industry. The specific objectives of developing these qualifications are as under:

- Develop knowledge, skills and understanding through the making of ceramic work that leads to and demonstrates conceptual and technical accomplishment;
- Provide you with an exciting and diverse introduction to contemporary Glass and Ceramics practice.
- Support you to acquire specialist knowledge and practical experience of working in Glass and Ceramics industry.
- Encourage you to test and explore different approaches to practice and to critically evaluate the relationship between idea, media, method and outcome.
- Enable you to develop an individually negotiated practice informed by a relevant theoretical and contextual framework.



3. Packaging of Qualification

The national vocational qualifications are packaged as per following:

<p>National Vocational Certificate Level-2 Glass & Ceramics Junior Assistant</p>	<ul style="list-style-type: none">• Explore the basics of glass & Ceramics• Identify glass and ceramic raw materials• Prepare workstation for glass manufacturing• Prepare workstation for ceramics manufacturing• Apply basic ceramic surface techniques• Perform computer applications• Follow safety practices at workplace
<p>National Vocational Certificate Level3 Glass & Ceramics Assistant</p>	<ul style="list-style-type: none">• Perform computer-aided design• Explore the basics of batch preparation• Perform finishing and joining• Apply ceramic surface techniques• Prepare molds and models• Apply glazing on ceramic ware• Perform glass melting• Explore ceramic raw material• Manage kiln loading and unloading
<p>National Vocational Certificate Level4 Glass & Ceramics Expert</p>	<ul style="list-style-type: none">• Perform batch preparation for ceramics• Process glass raw materials• Perform batch preparation for glass• Plan different techniques of Kiln Firing• Perform stoichiometric calculations• Perform engineering drawing<ul style="list-style-type: none">• Perform tableware manufacturing• Perform workshop techniques• Apply OHSE practices at workplace
<p>National Vocational Certificate Level-5 Glass & Ceramics Technologist</p>	<ul style="list-style-type: none">• Perform tile manufacturing• Measure the properties of ceramic Products• Measure the properties of glass• Prepare advanced ceramic Products• Perform digital fabrication• Perform refractory manufacturing• Perform sanitary ware manufacturing• Perform glass manufacturing• Communicate effectively with others• Prepare advanced ceramic Products• Perform digital fabrication• Perform refractory manufacturing• Perform sanitary ware manufacturing



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4. Date of Validation

This National Vocational Qualification (NVQ) has been validated by the Qualifications Development Committee (QDC) on **25 May, 2019** and will remain valid for ten years i.e. **25 May, 2029**

5. Date of Review

This National Vocational Qualification (NVQ) has been validated by the Qualifications Development Committee (QDC) on **25 May, 2019** and shall be reviewed after three years i.e. **26 May, 2022**

6. Codes of Qualifications

The International Standard Classification of Education (ISCED) is a framework for assembling, compiling and analyzing cross-nationally comparable statistics on education and training. ISCED codes for these qualifications are assigned as follows:

ISCED Classification for Glass & Ceramics Technology level 5	
Code	Description
0722-M(1)	1 st Level D.A. E National Certificate of level-5, in “ Glass & Ceramics Technology”
0722-M(2)	2 nd Level D.A. E National Certificate of level-5, in “ Glass & Ceramics Technology”
0722-M(3)	3 rd Level D.A. E National Certificate of level-5, in “ Glass & Ceramics Technology”
0722-M(4)	4 th Level D.A. E National Certificate of level-5, in “ Glass & Ceramics Technology”
0722-M(5)	5 th Level D.A. E National Certificate of level-5, in “ Glass & Ceramics Technology”



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7. Members of Qualifications Development Committee

The following members participated in the qualification development of this qualification:

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8. Members of Qualification Validation Committee

The following members participated in the qualifications validation of this qualification:

9. Entry Requirements

The entry for D.A. E National Certificate level 5, in Glass & Ceramics Technology are

1. A person having **National Vocational Certificate level 4**, in Glass & Ceramics Technology.
2. A person having **Matric certificate with Science**



10. Packaging of qualifications

Glass and Ceramics Technology

LEVEL 2						
Code	Competency Standards	Level	Theory	Practical	Total	
			HR	HR	HR	C
1.	Explore the basics of glass & Ceramics	2	10	40	50	5
2.	Identify glass and ceramic raw materials	2	10	60	70	7
3.	Prepare workstation for glass manufacturing	2	30	100	130	13
4.	Prepare workstation for ceramics manufacturing	2	30	100	130	13
5.	Apply basic ceramic surface techniques	2	10	60	70	7
6.	Perform computer applications	2	10	80	90	9
7.	Follow safety practices at workplace	2	30	80	110	11
Total			130	520	650	65
LEVEL 3						
8.	Perform computer-aided design	3	10	80	90	9
9.	Explore the basics of batch preparation	3	20	60	80	8
10.	Perform finishing and joining	3	10	30	40	4
11.	Apply ceramic surface techniques	3	20	120	140	14
12.	Prepare molds and models	3	30	90	120	12
13.	Apply glazing on ceramic ware	3	10	60	70	7
14.	Perform stoichiometric calculations	4	10	0	10	1
15.	Perform engineering drawing	4	20	80	100	10
Total			130	520	650	65
Total hrs. per year			260	1040	1300	130



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LEVEL 4						
Code	Competency Standards	Level	Theory	Practical	Total	
			HR	HR	HR	C
16.	Perform glass melting	3	20	60	80	8
17.	Explore ceramic raw materials	3	20	60	80	8
18.	Manage kiln loading and unloading	3	20	80	100	10
19.	Perform batch preparation for ceramics	4	10	100	110	11
20.	Process glass raw material	4	10	60	70	7
21.	Perform batch preparation for glass	4	20	80	100	10
22.	Plan different techniques of Kiln Firing	4	30	80	110	11
Total			130	520	650	65
LEVEL 4						
23.	Apply health and safety practices at workplace	3	10	20	30	3
24.	Perform tableware manufacturing	4	30	140	170	17
25.	Perform workshop techniques	4	20	60	80	8
26.	Perform tile manufacturing	5	30	140	170	17
27.	Measure the properties of ceramic Products	5	20	90	110	11
28.	Measure the properties of glass	5	20	70	90	9
Total			130	520	650	65



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Total Hrs per year			260	1040	1300	130
LEVEL 5						
Code	Competency Standards	Level	Theory	Practical	Total	
			HR	HR	HR	C
29.	Apply OHSE practices at workplace	4	10	20	30	3
30.	Prepare advanced ceramic Products	5	30	80	110	11
31.	Perform digital fabrication	5	10	60	70	7
32.	Perform refractory manufacturing	5	10	120	140	14
33.	Perform sanitary ware manufacturing	5	25	120	150	15
34.	Perform glass manufacturing	5	25	110	150	15
35.	Communicate effectively with others	5	20	10	30	3
Total			130	520	650	65
LEVEL 5						
36.	Undertake small business planning	5	40	170	210	21
37.	Apply quality standards	5	40	100	140	14
38.	Present a final project	5	30	240	270	27
39.	Manage Human Resources	5	20	10	30	3
Total			130	520	650	65
Total Hrs per year			260	1040	1300	130
Grand Total			780	3120	3900	390



11. Detail of Competency Standards

0722-M-1: Explore the basics of glass and ceramics

Overview

This competency standard describes the skills and knowledge of ceramic and glass history and the terminology used. This helps to know about the research, vocabulary, Elements and principles of Design and hand building techniques of ceramics and glass.

Competency Units	Performance Criteria
CU1- Undertake research for ceramics and glass	<i>You must be able to:</i> P1. Research the history of ceramics and glass P2. Research the techniques of ceramics and glass P3. Research the raw material of ceramics and glass
CU2-Develop vocabulary of ceramic and glass term	<i>You must be able to:</i> P1. Gain practical knowledge of applied surface treatment such as coils, springing, burnishing, and wax resist, engobes, oxides and glaze. P2. Gain practical knowledge of subtract surface treatment such as incising, impressing, stamping, piercing and inlaying. P3. Gain practical knowledge of composition of different clay bodies, clay preparation, difference in firing temperatures, porosity, vitrification, thermal shock, shrinkage, warpage and specific uses. P4. Gain practical knowledge of composition and function of glazes under-glazes and on-glazes used for specific purpose P5. Gain practical knowledge of Kiln types and the different cycles and functions of a bisque and glaze firing. P6. Gain Practical knowledge of glass composition/material P7. Gain practical knowledge of glass melting temperature P8. Gain practical knowledge of glass fusing temperature P9. Gain practical knowledge of glass casting P10. Gain practical knowledge of glass annealing
A3-Produce a range of ceramic/glass forms	<i>You must be able to:</i> P1. Design functional and decorative forms P2. Design sculptural forms (round and relief) P3. Design jewellery
A4-Apply elements and principles of design to ceramics/glass	<i>You must be able to:</i> P1. Develop Structural, subjective, cultural and postmodern ceramics/glass according to the elements and principles of design
A5-Explore hand building techniques of Ceramics and Glass	<i>You must be able to:</i> P1. Practice Pinching (Open, close or sculptural forms) P2. Practice coiling (hand rolled or extruded coils to make a range of functional or sculptural forms P3. Practice slab construction (rolled, wire-cut or stretched slabs to



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make a range of forms including tiles)
P4. Practice throwing (cylinders, spheres, bowls and platter forms)
P5. Practice casting (hump moulds, press moulds and slip casting moulds to make a range of forms) or a combination of the above techniques
P6. Practice Glass Slumping
P7. Practice Glass Fusing
P8. Practice Glass Casting
P9. Practice Stain Glass
P10. Practice Glass Mosaic

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes:

- Knowledge of the history, techniques and raw material of ceramics and glass
- Knowledge of the vocabulary of ceramics and Glass
- Knowledge of sculptural forms (round and relief) of ceramics and glass
- Knowledge of elements and principles of design and its application in Ceramics and glass
- Knowledge of hand building techniques of Ceramics and Glass

Critical Evidences Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Write a research paper on history, techniques and raw material of ceramics and glass.
- Make functional and decorative sculptural forms in ceramics and glass
- Make structural, subjective, cultural and postmodern forms and objects in ceramics and glass

List of Tools & Equipment

Sr#	Description	Quantity
1.	cut-off wire	1 roll
2.	needle tool and fettling knife	5 sets
3.	modelling tools	5 sets
4.	rolling pin guides	5
5.	Wax	1 kg
6.	Glazes	Different types of Glazes
7.	Kilns	1
8.	potter wheel	5
9.	slab roller	5
10.	Extruder	1
11.	modelling wheel	2



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12.	glaze booth	2
13.	compressor with spray gun	1
14.	Glass furnace,	1
15.	electric kiln	1
16.	Annealer	1



0722-M-2: Assist basic test of glass and ceramics raw materials

Overview

This competency standard describes the skills and knowledge required to identify the different raw materials used for Glass & Ceramics Industry and assist the basic test used for the evaluation of raw Materials

Competency Units	Performance Criteria
<p>CU1. Identify the raw materials used in the glass industry</p>	<p>The trainee must be able to:</p> <p>P1. Identify different types of feldspar as a source of alumina and Alkali</p> <ul style="list-style-type: none"> • Potash feldspar • Soda feldspar • Nepheline syenite <p>P2. Identify different types of glass formers</p> <ul style="list-style-type: none"> • Quartz • Silica sand • Boric oxide • Germanium oxide <p>P3. Identify different types of glass fluxes</p> <ul style="list-style-type: none"> • Soda ash • Pearl ash • Lead oxide <p>P4. Identify different types of stabilizers</p> <ul style="list-style-type: none"> • Alumina • Dolomite • Magnesite • Limestone <p>P5. Identify miscellaneous glass raw materials</p> <ul style="list-style-type: none"> • Cryolite • Fluorspar • Calumet • Barium carbonate • Phosphate compounds <p>P6. Identify minor additives</p> <ul style="list-style-type: none"> • Colorants • Decolorizers • Oxidizing agents • Reducing agents • Refining agents <p>P1. Identify factory and foreign cullet</p>
<p>CU2. Identify the raw materials used in ceramics industry</p>	<p>The trainee must be able to:</p> <p>P7. Identify different types of clays</p> <ul style="list-style-type: none"> • Ball clay • China clay • Fire clay



	<ul style="list-style-type: none">• Bentonite• Fuller’s earth <p>P8. Identify different types of feldspar</p> <ul style="list-style-type: none">• Lime feldspar• Potash feldspar• Soda feldspar <p>P9. Identify different types of silica sources</p> <ul style="list-style-type: none">• Quartz• Quartzite• Sandstone• Ganister• Diatomaceous earth <p>P10. Identify different types of carbonate sources</p> <ul style="list-style-type: none">• Dolomite• Magnesite• Limestone <p>P11. Identify miscellaneous ceramic raw materials</p> <ul style="list-style-type: none">• Barium carbonate• Bauxite• Frit• Silimanite• Talc• Zinc oxide• Zirconium silicate <p>P12. Identify minor additives</p> <ul style="list-style-type: none">• Binders• Ceramic pigments• Deflocculates
<p>CU3. Identify the equipment used for testing of raw materials</p>	<p>The trainee must be able to:</p> <p>P. P1. Identify the physical appearance of the glass and ceramics raw materials</p> <p>P2. Identify the following equipment</p> <ul style="list-style-type: none">• Testing Kiln• Desiccator• Platinum Crucible• Platinum Tip Tongue• Sieve Sets• Spectrophotometer• Particle size analyzer• Moisture Analyzer etc <p>P3. Clean the equipment</p> <p>P4. Understand the risk involve</p>



CU4. Assist in performing basic testing of raw materials

The trainee must be able to:

- P1. Prepare samples for testing
- P2. Clean the equipment
- P3. Assist the supervisor
- P4. Help in record and analyse the result

Knowledge and Understanding

The trainee must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge and ability to:

- Name the raw materials used in glass industry
- Name the raw materials used in the ceramics industry
- Name the furnaces used in the Laboratory
- Describe the types of clay
- Describe Quartz
- Describe Feldspar
- Describe the silica sand
- Name the equipment used in the testing of glass and ceramics raw materials

Critical Evidences Required

The trainee needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Identify the equipment used for firing
- Measure the desired weight
- Identify the given basic materials

List of Tools & Equipment

Sr#	Description	No Quantity
1.	Platinum Crucible	2
2.	Platinum Dish	1
3.	Platinum Tip tongue	2
4.	Agate Pestle and mortar	3
5.	Sieves	8
6.	Oven	1
7.	Electric Kiln 1400 Deg C	1
8.	Flame Photometer	1
9.	UV Spectrophotometer	1



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10.	Desiccator	2
11.	Laboratory glass ware	3 no each



0722-M-3: Identify Workstations for Glass Manufacturing

Overview

This course is aimed at introducing the basic skills & knowledge of the complete glass industry section like batch house, Melting furnace, forming and annealing section. It will also enable learner to know the equipment used in Glass Manufacturing

Competency Units	Performance Criteria
C1. Identify the equipment used in the batch-house	The trainee must be able to: P2. Identify batch-house equipment <ul style="list-style-type: none">• Bin• Silo• Mixer• Conveyer belt• Weighing hopper P3. Clean and lubricate batch-house equipment P4. Check batch-house equipment functionality P5. Check batch-house environment
C2. Identify the equipment used in the melting section	The trainee must be able to: P1. Identify melting section equipment <ul style="list-style-type: none">• Tank furnace• Gob feeder P2. Record the temperature and pressure of furnace <ul style="list-style-type: none">• Thermocouple• Pressure gauge• Gas flow meter P3. Clean and lubricate melting section equipment P4. Check melting section equipment functionality P5. Check melting section environment
C3. Identify the equipment used in the forming section	The trainee must be able to: P1. Identify the equipment used in container glass manufacturing <ul style="list-style-type: none">• IS machine• Mould• Pyrometer P2. Identify the equipment used in float glass manufacturing <ul style="list-style-type: none">• Rollers• Molten-tin bath• Temperature measurement P3. Clean and lubricate forming section equipment P4. Check forming section equipment functionality P5. Check forming section environment
C4. Identify the equipment used in the annealing section	The trainee must be able to:



- P1. Identify annealing section equipment
 - Annealing Lehr
 - Temperature measurement
 - Gear motion
- P2. Clean and lubricate annealing section equipment
- P3. Check annealing section equipment functionality
- P4. Check annealing section environment

Knowledge and Understanding

The trainee must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge and ability to:

Knowledge of Prepare the batch-house workstation

- Batch House
- Infrastructural facilities
- Silo
- Bin Conveyor
- Mixer
- Charger

Knowledge of Prepare the melting section workstation

- Tank furnace for container glass
- Tank Furnace for Float glass
- Pot Furnace
- Temperature reading
- Pipe Lines color for utilities

Knowledge of Prepare the forming section workstation

- Amber and Flint Glass
- IS machine
- Molten Tin Bath
- Rollers
- Temperature reading

Knowledge of Prepare the annealing section workstation

- Differentiate between furnace and Lehr
- Temperature reading
- Conveyor belt

Critical Evidences Required

The trainee needs to produce following critical evidences in order to be competent in this competency standard:

- Name and identify the equipment used in batch house
- Name the parts of the tank furnace
- Name the equipment used for annealing
- Name and Identify the tools for glass forming



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List of Tools & Equipment

This competency standard involves the following equipment:

Sr#	Description	Quantity
	Mixing Silo	1
	Silo with Hoppers	4
	Additive Bins	6
	Conveyors	2
	Inclined conveyors	3
	Bucket Elevators	2
	Glass tank Furnace	1
	Machine	1
	Compressor	1
	Annealing Lehr	1
	Glass Cutters	3
	Tank Furnace for float glass	1
	Molten Tin Bath Assembly complete	1
	Annealing section with conveyors	1
	Pyrometer	1



0722-M-4: Identify Workstations for Ceramics Manufacturing

Overview

This course is aimed at introducing the basic skill & knowledge of slip house (body/glaze preparation section), Moulding section, finishing and joining section, glazing and firing section . The trainee is introduced in step by step manner to the various elements

Competency Units	Performance Criteria
<p>D1. Identify the equipment used in slip-house</p>	<p>You must be able to:</p> <p>P1. Identify slip-house equipment</p> <ul style="list-style-type: none"> • Weighing balance • Jaw crusher • Roller crusher • Ball mill • Magnetic separator • Blunger • Conveyer belt • Gear box • De-dusting plant • Filter press • Pug mill • Diaphragm pump • Vibrating sieve • High Pressure piston pump <p>P2. Clean and lubricate slip-house equipment P3. Check slip-house equipment functionality P4. Check slip-house environment for hazards</p>
<p>D2. Identify the equipment used in casting section</p>	<p>The trainee must be able to:</p> <p>P1 Identify casting section equipment</p> <ul style="list-style-type: none"> • Mixer/Blunger • Plaster moulds • Clamps • Scrappers • Vibrating sieve • Magnetic Separator • High Pressure Pump • Stop watch <p>P2 Clean and lubricate casting section equipment P3 Check casting section equipment functionality P4. Check casting section environment for Hazards</p>
<p>D3. . Identify the equipment used in pressing section n</p>	<p>The trainee must be able to:</p> <p>P1. identify pressing section equipment</p>



	<ul style="list-style-type: none">• IsostaticHydraulic press• Manual press• Conveyer belt• Sieves• Punches• Dies• Dryer <p>P2.Clean and lubricate pressing section equipment P3.Check pressing section equipment functionality P4.Check pressing section environment for Hazards</p>
D4. Identify the equipment used in moulding section	<p>The trainee must be able to:</p> <p>P5. Identify moulding section equipment</p> <ul style="list-style-type: none">• Modeling wheel• Vernier callipers• Rubber hammer• Cutter• Clamps• Dryer• Geometrical tools• Carving tools <p>P6. Clean and lubricate moulding section equipment P7. Check moulding section equipment functionality P8. Check moulding section environment for hazards</p>
D5. . Identify the equipment used in finishing and joining section	<p>The trainee must be able to:</p> <p>P1. Identify finishing and joining section equipment</p> <ul style="list-style-type: none">• Hand wheel• Carving tools• Cutter• Scrapper• Sand paper• Sponge <p>P2. Clean finishing and joining section equipment P3. Check finishing and joining section equipment functionality P4. Check finishing and joining section environment for Hazards</p>
D6. Identify the equipment used in drying section	<p>The trainee must be able to:</p> <p>P1. Identify drying section equipment</p> <ul style="list-style-type: none">• Dryer• Thermocouple• Hygrometer <p>P2. Clean and lubricate drying section equipment P3. Check drying section equipment functionality P4. Check drying section environment for Hazards</p>



D7. Identify the equipment used in glazing section

The trainee must be able to:

- P1. Identify glazing section equipment
- Spray booth
 - Spray gun
 - Brush
 - Sponge
 - Glazing disc
 - Pump
 - Air Compressor
 - Stirrer
- P2. Clean and lubricate glazing section equipment
- P3. Check glazing section equipment functionality
- P4. Check glazing section environment for Hazards

D8. Identify the equipment used in firing section

The trainee must be able to:

- P1. Identify firing section equipment
- Kiln
 - Kiln furniture
 - Burners
 - Thermocouple
 - Pressure gauge
 - Pushers
 - Gear motor Drives
- P2. Clean and lubricate firing section equipment
- P3. Check firing section equipment functionality
- P4. Check firing section environment for Hazards

Knowledge and Understanding

The trainee must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge and ability to:

Knowledge of identify the workstation for ceramics

- Differentiate between crusher and ball mill
- Equipment used in the slip house
- Equipment used in the finishing section
- Equipment used in the moulding section
- Equipment used in the glazing section
- Equipment used in the firing section
- Equipment used in the drying section

Critical Evidences Required

The trainee needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Name the equipment used in the slip house



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- Name the Equipment used in the casting section
- Name the equipment used in the finishing section
- Name the equipment used in the glazing section
- Name the parts of the kiln
- Name different types of kiln furniture
- Name different types of dryers for ceramics industry

List of Tools & Equipment

This competency standard involves the following equipment:

Sr#	Description	Quantity
1.	Jaw Crusher	1
2.	Ball Mill	1
3.	Blunger	1
4.	Modelling Wheel	1
5.	Pottery Wheel	1
6.	Plate and frame filter press	1
7.	Pug Mill	1
8.	Magnetic separator	1
9.	Diaphragm pump	2
10.	Ball Mill with media	1
11.	Dryer(Roller, Vertical,tunnel)	1
12.	Spray Dryer	1
13.	Jollying and jiggering machine	1
14.	Cutter(Wire ,Knife)	20
15.	Sponges	10
16.	Shuttle Kiln	1
17.	Plaster moulds of various shapes	20
18.	Weighing Balance	2
19.	Vibrating Sieve	1
20.	Air Compressor	1



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21.	High Pressure Piston Pump	1
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0722-M-5: Apply Basic Ceramic Surface Techniques

Overview

This competency standard covers the skills and knowledge required to perform the basic cleaning of ceramic surface and apply Decal on surface. Learners would also be able to identify the surface technique used in ceramics.

Competency Units	Performance Criteria
E1. Identify ceramics surface techniques	The trainee must be able to: P1. Identify the following techniques <ul style="list-style-type: none">• Over glaze Decoration• Embossing• Engraving• Underglaze decoration• Kashigari
E2. Perform cleaning of the surface for decoration	The trainee must be able to: P1. Identify the ware P2. Handle the ware properly P3. Remove the Dust P4. Use the compressor
E3. Paste Decal on ceramic articles	The trainee must be able to: P1. Identify tools for decal P2. Apply fixative on ware P3. Place proper decal on ware P4. De air the decal

Knowledge and Understanding

The trainee must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge of:

- Knowledge of the basic surface techniques
- Knowledge of air compressor
- Knowledge of decal and relevant tools

Critical Evidences Required

The trainee needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Clean the given surface
- Use the air compressor



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List of Tools & Equipment

Following Tools and equipment are required for completion of this competency standard.

Sr#	Description	Quantity
1.	Spray gun	5
2.	Cutters	20
3.	Sponges	15
4.	Decal	500
5.	Air compressor	2



0722-M-6: Follow Safety Practices at Workplace

Overview

The students will be able to Recognize Workplace hazards, Conduct work safety, Follow emergency response procedures in different ceramics industries.

Competency Units	Performance Criteria
F1- Recognize Workplace hazards	The trainee must be able to: <ol style="list-style-type: none">Identify Situations like:<ul style="list-style-type: none">• Accident• Injury• Near Miss• Dangerous OccurrenceIdentify different hazards like:<ul style="list-style-type: none">• Electrical• Mechanical• Chemical• Biological• Physical• Fire• Confined SpaceIdentify different safety signsIdentify use of different basic safety equipment.
F2- Conduct work safety	The trainee must be able to: <p>P1 Identify PPE's as per requirement. P2 Use PPE's Properly P3 Use of Fire Extinguisher Properly P4 Identify Fire Type.</p> <ul style="list-style-type: none">• A Class• B Class• C Class• E Class
F3- Follow emergency response procedures	The trainee must be able to: <p>P1 Identify Emergency Procedure in case of accidents like</p> <ul style="list-style-type: none">• Fire• Chemical Burn• Electric shock• Fall, Trip and Slip• Dog Bite• Snake Bite• Heart Attack



	<ul style="list-style-type: none">• Unconsciousness• Injury <p>P2 Maintain First aid Kit</p> <p>P3 Identify Emergency Steps</p> <ul style="list-style-type: none">• Switch on Emergency Alarm.• Call emergency services• Open emergency exit• Clear accidental area.
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Knowledge and Understanding

The candidate must be able to:

- Understand basic safety terminologies.
- Understand tool box talk.
- Understand classifications of Fire.
- Understand various types and their use of fire extinguisher.
- Understand ABC of First Aid.
- Understand various components of First Aid Kit and their use.
- Understand Emergency Procedures.
- Understand proper use of PPE's
- Understand Safety signs.

Critical Evidences Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Prepare first aid kit for Heart Attack.
- Prepare first aid kit for Injury.
- Prepare first aid kit for electric shock.
- Prepare first aid kit for burn.
- Extinguish fire with extinguisher.
- Prepare safety signs for production hall.
- Prepare safety signs for machine hall

List of Tools & Equipment

Sr#	Description	Quantity
1	First Aid Kit	25
2	Fire Extinguishers of different types	10
3	Different PPE's	25 sets
4	Emergency Alarm	5



0722-M-7: Explore the basics of batch preparation

Overview

This competency standard describes the skills and knowledge required to explore the different raw materials used in the glass and ceramics industry, assist the supervisor to operate the batch house and slip house equipment. Your underpinning knowledge regarding batch preparation skills will be sufficient to provide you the basis for your work.

Competency Units	Performance Criteria
G1 Perform weighing of glass raw materials in batch house	The trainee must be able to: P1. Identify the major and minor raw materials P2. Assist in operate mixing silo P3. Assist to operate panel control P4. Assist to operate additive bin P5. Know the risk factors involved in batch house
G2 Perform weighing of Ceramics raw materials in slip house	The trainee must be able to: P1. Identify the ceramics raw materials P2. Operate the weigh balance P3. Assist in adding minor ingredients P4. Know the risk factors involved in batch house
G3 Operate the ball mill	The trainee must be able to: . Load the ball mill . Operate the ball mill . Unload the ball mill
G4 Operate the blunger	The trainee must be able to: P1. Identify the damaged green ware and slip mixing P2. Operate the vibrating sieves Operate the pump

Knowledge and Understanding

The trainee must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge of:

- major raw materials for glass manufacturing
- minor raw materials for glass manufacturing
- importance of proper mixing
- equipment used batch house



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- raw materials for ceramics manufacturing
- Differentiate between body and glaze manufacturing
- deflocculated
- operation of ball mill types of grinding media
- wet and dry grinding
- operation of blunger
- slip and glaze

Critical Evidence(s) Required

The trainee needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Weight the of the soda lime glass batch using automatic control
- Name the equipment used in batch house
- Weight the batch of ceramics body
- Weight the batch of ceramics glazes
- Load and unload the ball mill for body and glaze batch
- Operate the ball mill
- Operate the blunger

List of Tools & Equipment

Sr#	Description	Quantity
1	Silos	04
2	Mixing Silo	01
3	Control panals for hoopers	02
4	Additive bin	03
5	Ball mill	10
6	Blunger with pump	01
7	Weight Balance	04
8	Conveyor belt	1



0722-M-8: Prepare Moulds and Models

Overview

This competency standard describes the skills and knowledge requires drafting the patterns of models and preparation of plaster or resin. It also covers the preparation and finishing of Mould and its defects rectification and storage.

Competency Units	Performance Criteria
H1. Prepare draft Pattern for Model	You must be able to: P1. Understand basic tools and mathematic calculation P2. Do Basic Drawing and Draft P3. Perform Tracing of Pattern
H2. Prepare Plaster / Resin Model	You must be able to: P1. Calculate Clay Body Shrinkage P2. Batching / Mixing of Plaster P3. Working on Modeling Wheel / Direct Carving / Lathe Machine / CNC Machine P4. Inspection of Final Model P5. Handle & store plaster properly P6. Calculate the setting time of plaster.
H3. Prepare Plaster Mould	You must be able to: P1. Identify the Types of Mould (Plaster/Resin) P2. Identify Parting Solution & Shellac P3. Prepare Master Mould P4. Prepare / Develop Father Mould P5. Develop / Prepare Work Mould P6. Develop / Jiggering Mould P7. Drying the Mould P8. Identify the faults in models.
H4. Perform Finishing of the Mould	You must be able to: P1- Repair defects occurring during the moulding process P2- Remove inserts or loose pieces and replace in mould P3- Prepare the surface of the mould for the application of any surface finishes P4- Cure or dry the mould in accordance with the specification P5- Return mould and or segments for re-use or storage.
H5. Rectify defects in moulds and models	You must be able to: P1- Identify the range of faults that can occur during the operation P2- Determine and rectify fault causes by /work instructions P3- Identify and rectify equipment failure causes in accordance with procedures/work instructions



	<p>P4- Make sure appropriate records and log books of equipment operations are maintained to meet procedures/work instructions</p> <p>P5- Identify non-routine problems and report to designated person.</p>
H6. Inspect and store Moulds / Models	<p><i>You must be able to:</i></p> <p>P1- Inspect moulds / model for defects</p> <p>P2- Store the Moulds and Model in accordance with specification and procedures/work instructions.</p>

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge of:

- Tools and instruments used for measuring.
- **Measuring Tools:** Steel foot rules; Steel Square, Vernier Caliper, Calipers (Internal & external), and Spirit level.
- **Marking Tools:** Indelible Pencil, Lead Pencil,
- Selecting the proper drawing tools.
- Basic freehand drawing technique
- Selecting proper measuring instruments for the jobs.
- Conversion of measuring units and drawing.
- Basic Principles & technique of drafting
- Drafting plan, side, top and bottom views.
- 2D Drafting
- Basics of drafting i.e Side elevation, top, bottom, front etc.



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- Scale drawings
- Basic Mathematical calculation of radius, circumference etc
- On scale drawing
- Basic Mapping technique
- Clay Body Types
- Clay Body Composition
- Shrinkage calculation formula
- Properties of Plaster
- Types of Plaster
- Water Plaster ratio Tables.
- Sifting the plaster into water & removing lumps of foreign matter
- Placing rubber sheet on modeling wheel & fixing it with rubber grips or Jute thread
- Speed adjustment of the machine
- Using modeling tools
- Placing and removing mode on the wheel
- Carving & cutting the plaster
- Transfer design/pattern on the plaster piece.
- Making a study model
- Finishing the model
- Vertical lathe .
- Selection of Plaster for mould making
- Materials used in making parting solution in the process
- Role of Shellac in reducing the absorption of plaster model
- The role of parting solution.
- Making of parting solution
- Drying mold
- Cleaning the work space
- Wooden boards , clamps, rings application & their removal
- Pouring
- Finishing exterior of mold
- Purpose of marking keys
- Drying mould
- Cleaning the work space
- Pouring
- Knowledge of different drawing sheets (Newspaper sheet, Scholar sheet, Canson Sheet, etc.)
- Knowledge of Shading and lighting

Critical Evidences Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Demonstrate how to use measuring tools by measuring simple and complicated shapes
- Explain drafting, basic concept & techniques
- Demonstrate drafting side, top & bottom view of basic forms.
- Do freehand drawing of an object.



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- Demonstrate mapping and tracing the existing pattern
- Demonstrate how to Calculate shrinkage of clay
- Explain the material plaster, its types, qualities & properties.
- Demonstrate how to assess the quality of plaster
- Demonstrate manual mixing
- Demonstrate mechanical mixing .
- Explain the tools and their use
- Demonstrate how to make model on modeling wheel
- Demonstrate the use of different carving tools
- Demonstrate Carving of a given pattern.
- Demonstrate the use of appropriate tools on lathe
- Demonstrate making model on lathe
- Demonstrate the maintenance of various tools & equipment used.
- Explain the role of parting solution & shellac in mold making
- Demonstrate how to apply shellac
- Demonstrate how to prepare & apply parting solution.
- Demonstrate manual mixing of plaster
- Develop a master mold of a basic form
- Demonstrate how to make father mold of a simple master mould
- Demonstrate how to make father mold of a complicated master mold
- Demonstrate how to make working mould from a simple father mold
- Demonstrate how to make working mould from a complicated father mold .
- Demonstrate the use of proper tools & equipment
- Demonstrate making one piece jiggering mold
- Demonstrate the proper use of dryer machine
- Demonstrate proper drying both manually & mechanically

List of Tools & Equipment

This competency includes equipment such as:

Sr#	Description	Quantity
1.	Plaster Modelling Wheel	02Nos
2.	Plaster Mixing Machine	02 Nos
3.	Vacuum Machine for Plaster	02 Nos
4.	Buckets, jugs	10 each
5.	Spoons & whisks	05 each
6.	Wooden Boards	25 Nos.
7.	Dry, Soft Bristle Brushes	10 Nos.
8.	Plaster's Turning Tools	25Sets
9.	Scrapers or Metal Kidneys	25 Nos.
10.	Carpenter's Saw	10 Nos



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11.	Hacksaw Blades	25 Nos
12.	Variety of Files, Knives, Gouges, chisels	25 Nos
13.	Indelible Pencil	25 Nos
14.	Weighing scale	2 Nos
15.	Drawing Board	25 Nos
16.	Vernier Caliper,	5 Nos
17.	Calipers (Internal & external)	5 Nos
18.	Spirit level.	5 Nos
19.	Paper	1 rim
20.	Sponge	25 Nos
21.	Tool Kit	5 set
22.	Knives/Blades	15 Nos.
23.	Hand Wheel	10 Nos.
24.	Plastic Tub	10 Nos.
25.	Sand Paper	25 Nos.
26.	Safety Gloves	25 Nos.
27.	Safety Goggles	25 Nos.
28.	Apron	25 Nos.



0722-M-9: Perform Finishing and Joining

Overview

This competency standard describes the skills and knowledge required to join the different green ware, their finish and cleaning for glaze purpose. It will enable learners to perform the finishing and joining of the green ware .

Competency Units	Performance Criteria
I-1. Inspect green ware	Candidate will be able to: P1- Check the shape & form of the ware P2- Check the green ware for cracks. P3- Check the surface for bubbles & pin holes. P4- Check the weight of the ware
I-2. Perform Peeling of green ware	Candidate will be able to: P1- Make the ware symmetrical P2- Make the base of the ware in level.
I3. Perform cutting and edging of green ware	Candidate will be able to: P1- Make the outline for cutting of the ware, P2- Cutting the ware as per requirement of the ware
I-4. Perform joining of the green ware.	Candidate will be able to: P1- Prepare the paste for joining the ware. P2- Clean the parts of the ware to be joined. P3- Apply the paste on the parts to be joined. P4- Perform the cleaning after joining.
I-5. Perform Refinishing and Quality Control of green ware	Candidate will be able to: P1- Perform the final finishing of the ware. P2- Perform the quality check of the ware.

Knowledge and Understanding

The trainee must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge of:

- Understand the shape of the ware to be finished along with precision & accuracy.
- Understand the defects e.g. pin holes, bubbles etc. in the green ware & the disadvantages of the defects.
- Describe the basic mould shape techniques of symmetry.
- Knowledge of moisture content
- Knowledge of tools used in cutting, finishing & design of the ware.
- Knowledge to use the cutting tools, make hole/ designing of the ware.
- Knowledge of material of mixture formulation of joining paste.
- Describe the importance of cleanliness & PPEs.



Critical Evidences Required

The trainee needs to produce following critical evidences in order to be competent in this competency standard:

- Illustrate green ware
- Explain defects found in green ware wares
- Demonstrate to identify the defects like crack in the given ware
- Demonstrate to check the given ware shape and form compare to the final product
- Explain the pin holes defects in green ware
- Explain the importance of Weight checking
- Perform the weight check of the ware
- Demonstrate to make corners of the given ware equals
- Demonstrate to levelling of the ware
- Explain the different cutting techniques used for green ware
- Demonstrate to make outline for the cutting of the given ware of the given pattern by any methods
- Demonstrate to perform the cutting and making hole of the given ware
- Define Joining of green ware and its different techniques
- Explain the joining of handles
- Define and explain the joining paste
- Perform the making of Handle by different techniques
- Explain the importance of cleaning of wares after joining
- Perform the test to the cleaning of wares after joining the paste on the wares to be joined
- Explain finishing with respect to quality control
- Write down the steps of finishing for different green wares
- Explain the finishing tools used for a given job
- Perform the finishing of the given ware
- Explain the importance of the soft finishing of the wares
- Explain the tools used for soft finishing
- Explain the quality control in the finished green ware
- Perform the quality control tests on the given wares

List of Tools and Equipment

This competency includes equipment such as:

Sr#	Description	Quantity
1.	Glass slab	5 Nos
2.	Cutting Blades	100Nos
3.	Finishing Blade	100 Nos
4.	Form Sheets	25 Nos
5.	Dry, Soft Bristle Brushes	10 Nos.



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6.	Indelible Pencil	25 Nos
7.	Weighing scale	2 Nos
8.	Drawing Board	25 Nos
9.	Spirit level.	5 Nos
10.	Plastic Tub (Small, Large)	15 Each
11.	Hand Wheel	10 Nos.
12.	Sand Paper	25 Nos.
13.	Safety Gloves	25 Nos.
14.	Safety Goggles	25 Nos.
15.	Apron	25 Nos.



0722-M-10: Apply Ceramic Surface Techniques

Overview

This competency standard covers the skills and knowledge required to perform the decoration, engraving and embossing on green ware. This also covers the on glaze decoration and decal on the ceramic ware. After completing this competency learner will be able to perform ceramics surface techniques.

Competency Units	Performance Criteria
J1. Perform under-glaze decoration on ceramic articles	The trainee must be able to: P1. Apply sketch on the article P2. Make outline as per sketch P3. Apply colour on the green ware with sponge P4. Apply the colour with brushes P5. Verify quality
J2. Perform on-glaze decoration on ceramic articles	The trainee must be able to: P1. Apply fixative on the surface. P2. Perform screen setting P3. Set parameter of printing paste P4. Set the pressure of squeegees rubber. P5. Clean and finish the ware.
J3. Perform engraving on ceramic articles	The trainee must be able to: P1. Identify tools for engraving <ul style="list-style-type: none">• Blades• Cutters P2. Make engraving patterns using tools
J4. Perform embossing on ceramic articles	The trainee must be able to: P1. Prepare the glaze for embossing. P2. Clean the ware. P3. Draw pattern as per design. P4. Apply the paste glaze on the ware.
J5. Perform kashigari on ceramic articles	The trainee must be able to: P1. Prepare the colors. P2. Prepare the brushes for kashigari. P3. Draw freehand pattern for kashigari. P4. Apply colors to fill pattern with brushes.

Knowledge and Understanding

- Explain the different decoration techniques used in ceramics industry.
- Describe on glaze decoration.
- Describe under glaze decoration.
- Describe the tools used in engraving.
- Describe the tools used in embossing.
- Describe the pattern in printing and engraving.
- Describe the brushes used in kashigari.
- Describe basic drawing.



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- Describe warm and cool colours.
- Describe the mixing of different colours.
- Explain difference between nakashi and kashigari.

Critical Evidences Required

The trainee needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Make the given/desired pattern on the tile.
- Perform the desired cutting on bowl.
- Make Gulab kashi Design in tea set.
- Make Traditional kashi design on vase.
- Perform engraving (Pattern to be given) on Green ware
- Make emboss patterns on Mugs/ Green ware
- Apply the colours with sponge on Green Ware

List of Tools & Equipment

Sr. No	Description	Quantity
1	Hand Wheel	05
2	Kashi Brushes	50
3	Carving tool Set	25 Set
4	Cutter	25
5	Foam Sheets	50
6	Cleaning Cloths	50
7	Butter Paper	100
8	Carbon Paper	100



0722-M-11: Apply Glazing on Ceramic Ware

Overview

This competency standard covers the skills and knowledge required by the learner to perform glazing of ceramics ware by using different techniques.

Competency Units	Performance Criteria
K1. Perform glazing of ceramic ware by spraying	The trainee must be able to: P1. Prepare spray unit P2. Apply spray of glaze P3. Verify quality of glaze application
K2. Perform glazing of ceramic ware by dipping/pouring	The trainee must be able to: P1. Plan handling of article P2. Apply glaze by dipping/pouring P3. Verify quality of glaze application
K3. Perform glazing of ceramic ware by brushing	The trainee must be able to: P1. Plan handling of article P2. Select appropriate brush <ul style="list-style-type: none">TypeSize P3. Perform brushing P4. Verify quality of glaze application
K4. Perform glazing of ceramic ware by bell-fall	The trainee must be able to: P1. Set steel bell equipment P2. Adjust glaze fall P3. Verify quality of glaze application
K5. Perform removal of undesirable glaze from ceramic ware	The trainee must be able to: P1. Select suitable tools for cleaning P2. Remove undesirable glaze from article
K6. Identify glaze defects	The trainee must be able to: P1. Observe defects in glaze <ul style="list-style-type: none">Pin-holeCrawlingCratersGlaze chippingThicknessFall problemBubblesDimples

Knowledge and Understanding

The trainee must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge of:



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- Explain the different types of glaze application
- Explain the equipment used for spraying glaze
- Explain the glazing by dipping method
- Explain the glazing by pouring method
- Explain the mixing of colors
- Explain different brushes used for glazing
- Describe different glaze defects
- Explain the glazing by bell method

Critical Evidences Required

The trainee needs to produce following critical evidences in order to be competent in this competency standard:

- Perform glazing on a large vase
- Perform glazing on a given tea set
- Perform color glazing on a given ceramic article
- Identify different glaze defects and suggest remedies

List of Tools & Equipment

Sr No.	List of Equipment	Quantity
1.	Spray booth	4
2.	Spray guns (different sizes) with compressor	10
3.	Plastic tubs (different sizes)	25
4.	Weighing scale	1
5.	Foam sheet	100
6.	Plastic bottle with nozzle lid	100
7.	Viscometer	1
8.	ASTM sieve set	1
9.	Bell equipment	3



0722-M-12: Manage Kiln Loading & Unloading

Overview

This competency standard identifies the competencies required to distinguish between different types of Kilns their furniture and recorders. You will be able to perform the loading of different wares in the kiln on the shelves and their unloading. Your underpinning knowledge regarding kiln loading and unloading skills will be sufficient to provide you the basis for your work.

Competency Units	Performance Criteria
L1. Identify different types of Kilns	The trainee will be able to: P1. Classify different types of Kilns Shuttle Kiln Tunnel Kiln Roller Kiln Gradient Kiln Muffle Kiln P2. Distinguish different types of Kilns based on fuels and products
L2. Identify different types of Kiln Furniture	The trainee will be able to: P1. Identify different Kiln furniture .e.g. Silicon carbide Mullite Cordierite Refractory Slabs Caps and splicers Ceramics wool Saggers Ceramics Rollers P2. Check the furniture to identify faults
L3. Perform Stacking in Kiln	The trainee will be able to: P1. Perform coating/kiln wash on the Kiln Furniture excluding Pillars etc. P2. Calculate the capacity for loading P3. Perform uniform loading of green wares on kiln cars P4. Perform adequate distance between the green wares P5. Perform the lubrication of the mechanical parts in Kiln P6. Perform unloading of Kiln P6. Evaluate the whole process of stacking in Kiln

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the



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knowledge of:

- Types of kilns
- Types of kiln furniture
- Understand the loading of the different green wares in the Kiln
- Apply the coating/Kiln wash on the kiln furniture
- Understand the Kiln Car
- Understand the different kiln Furniture to set the Green Wares
- Understand the unloading
- Prepare the coating/Kiln wash for Kiln furniture

Critical Evidences Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

Perform stacking of sanitary ware, table ware , refractory bricks etc.

Describe the material used for coating /kiln wash

Prepare the coating for kiln furniture

Apply the coating on furniture

Identify different Kiln furniture

Demonstrate the unloading of the fired material from the kiln

List of Tools & Equipment

#Sr. No.	Equipment	Quantity
1	Shuttle kiln with all accessories Furniture's Sic Slabs, Saggars, Pillar etc	1
2	Grinder	1
3	Brick and Slab cutter	1
4	Scraper	5
5	Coating /kiln wash(According to Requirement)	



0722-M-13: Perform Glass Melting

Overview

The Trainee will be able to understand different glass melting and able to control the different parameters like temp, pressure, flame, foaming and density in the tank furnace

Competency Units	Performance Criteria
M1-Perform melting of glass in tank furnace	You must be able to: P1. Identify different types of glass melting furnaces Tank Furnace for float glass Tank Furnace for container glass Pot Furnace P2. Control the operation of batch chargers P3. Use the electric boosting
M2-Monitor glass furnace operation.	You must be able to: P1. Control the reversal system of the regenerators P2. Check the density of glass at different zone P3. Check homogenization at various zone P4. Control the following parameters in furnace Temp/Viscosity Pressure Flame Condition Foaming etc.
M3-Perform Refining and conditioning of glass	You must be able to: P1. Control the parameters like Temp/Viscosity Pressure Flame Condition Foaming etc. P2. Control the gob feeder



Knowledge & Understanding

- Describe the different types of furnaces used for melting glass
- Compare the tank furnace for Flat and container glass
- Describe the different parts of tank furnace
- Explain the different bricks used for the different part of the tank furnace
- Describe the working of Refining section
- Explain the conditioning of the glass
- Describe electric boosting
- Explain different defects arising during the melting of glass
- Describe the role of the forehearth
- Explain different heat recovery devices used in the tank furnace
- Illustrate the working of the reversal system of regenerator
- Describe the effect of temperature and viscosity in the different zones of the furnace
- Explain the working of the pot furnace
- Describe cross firing in the furnace
- Explain the scum problems arises during the melting of glass

Critical Evidences Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

1. Melt the batches of the following glasses
 - Water Glass
 - Soda Lime Glass
 - Crystal Glass
 - Colored Glasses etc.
2. Melting of glass with or without refining agents
3. Perform the refining of glass
4. Maintain the homogenization in the furnace

List of Tools & Equipment

Sr. No	Equipment	Quantity
1	Glass Melting Pot Furnace 1400Deg C	01
2	Annealing Chamber	01
3	Glass Melting Tank Furnace	01
4	Pyrometer	02



0722-M-14: Apply Health and Safety Practices at Workplace

Overview

This competency standard describes the skills and knowledge required to understand workplace hazards and ensure safe work practices to improve health and safety culture. It will also enable learners to use PPEs and maintain health & safety culture in the workplace.

Competency Units	Performance Criteria
N1- Identify workplace hazards	<p>The trainee will be able to:</p> <p>P1 Perform hazard identification at work place like</p> <ul style="list-style-type: none"> • Electrical • Mechanical • Chemical • Biological • Physical • Fire • Slippery • Confined Space <p>P2 Manage work place hazards.</p> <p>P3 Suggest and use PPE's as per requirements.</p>
N2- Ensure use of PPEs and protective clothing in the workplace	<p>The trainee will be able to:</p> <p>P1 Identify PPE's for hazards involve in</p> <ul style="list-style-type: none"> • Electrical Work • Mechanical Works • Chemical Work • Biological Work • Physical Work • Fire • Confined Space • Noise • Vibration <p>P2 Select PPE's for the protection of:</p> <ul style="list-style-type: none"> • Eyes • Ear • Body • Lungs • Face • Head • Feet etc. <p>P3 Perform use of PPE's like</p> <ul style="list-style-type: none"> • Safety Cloths • Fire Resistance Cloths



	<ul style="list-style-type: none"> • Safety Gloves • Goggles • Ear plugs and muffs • Helmet • Safety Shoes • Face Mask • Fire Fighting Suit • Self contain breathing apparatus (SCBA)
N3- Maintain Health and safety culture in the workplace	<p>The trainee will be able to:</p> <p>P1 Perform tool box talk P2 Report hazards P3 Analyse accidents P4 Report accidents P5 Improve safety policies.</p>

Knowledge & Understanding

The candidate must be able to

- Describe workplace hazards
- Describe basic control to reduce hazards.
- Describe PPE's as per requirements
- Describe proper use of PPE's.
- Describe how to maintain PPE's.
- Describe basic components of tool box talk.
- Report accident.

Critical Evidences Required

You will need to produce following critical evidence(s) in order to be competent in this competency standard:

- Identify PPE's for hazards involve at slip house.
- Identify safety cloths for casting section.
- Report Hazards of Kiln firing.
- Report Accidents of Moulding.

List of Tools & Equipment

SR. NO.	EQUIPMENT	QUANTITY
1.	Safety Gloves	25 pairs
2.	Safety Goggles	25
3.	Safety Cloths	25
4.	Safety Shoes	25
5.	Fire Extinguisher	2
6.	Face Masks	25



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7.	Fire beaters	10
8.	Ear Muff/Ear plugs	25
9.	SCBA self contained breathing apparatus	10
10.	Fire resistance cloth	10



0722-M-15: Explore Ceramic Raw Materials

Overview

This competency standard describes the skills and knowledge required to research and explore a wide variety of ceramic raw materials, with emphasis on selection and grading for a particular application, size reduction, and safe handling and storage.

Competency Units	Performance Criteria
O1. Perform grading of ceramic raw materials	<p>The trainee must be able to:</p> <p>P1. Identify plastic raw materials for ceramic manufacturing</p> <ul style="list-style-type: none">• Clays <p>P2. Identify non-plastic raw materials for ceramic manufacturing</p> <ul style="list-style-type: none">• Limestone• Quartz• Talc• Fire Clay/Refractory clay• Dolomite <p>P3. Identify fluxing materials for ceramic manufacturing</p> <ul style="list-style-type: none">• Feldspar
O2. Test the quality of ceramic raw materials	<p>The trainee must be able to:</p> <p>P1. Check physical properties of ceramic raw materials as per applicable standard procedures</p> <ul style="list-style-type: none">• Color• Free silica• Moisture content• Particle size• Plasticity• Green strength of clays <p>P2. Check chemical properties of ceramic raw materials as per applicable standard procedures</p> <ul style="list-style-type: none">• Silica content• Alkali content• Alumina content• Iron content• Loss on ignition• Sodium Content• Potassium content• Calcium Content• Magnesium Content <p>P3. Perform housekeeping of the analytical lab</p> <p>P4. Maintain record of tests performed and testing reports generated</p>
O3. Reduce the particle size of ceramic raw materials	<p>The trainee must be able to:</p>



	<p>P1. Operate crushing equipment for size reduction of ceramic raw materials</p> <ul style="list-style-type: none">• Jaw crusher• Hammer mill• Roller mill <p>P2. Operate grinding equipment for size reduction of ceramic raw materials</p> <ul style="list-style-type: none">• Ball mill• Conical ball mill• Pebble mill <p>P3. Perform housekeeping of the crushing and grinding workstation</p> <p>P4. Evaluate the crushing and grinding process as per applicable standards</p>
O4. Store ceramic raw materials	<p>The trainee must be able to:</p> <p>P1. Recognize different types of storage facilities for storing ceramic raw materials</p> <p>P2. Transfer ceramic raw materials' stock into and out of storage</p> <p>P3. Perform housekeeping of the ceramic raw materials' storage workstation</p> <p>P4. Record the quality and quantity of bulk materials stored</p>

Knowledge and Understanding

The trainee must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge and ability to:

- Describe classification and grading of raw materials used in ceramic manufacturing
- Describe the standard procedures for determination of various physical properties and chemical composition of ceramic raw materials
- Explain the effects of various physical properties and chemical composition of ceramic raw materials on the final product
- Explain the mechanisms and principles of size reduction
- Discuss requirements for storage and safe handling of ceramic raw materials
- Describe the importance of using PPE and maintaining safe working conditions

Critical Evidences Required

The trainee needs to produce following critical evidences in order to be competent in this competency standard:

- Identify various ceramic raw materials
- Perform grinding of ceramic raw materials in ball mill
- Perform grading of ground material using standard sieves
- Determine physical properties and chemical composition of ceramic raw materials
- Demonstrate packing and storage of ceramic raw materials



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List of Tools & Equipment

This competency standard involves the following equipment:

S. No.	Equipment	Nos. Required
1.	Jaw crusher	1
2.	Ball mill	1
3.	Roller mill	1
4.	Pebble mill	1
5.	Dryer	1
6.	ASTM sieve set	2
7.	Weighing balance	2
8.	Moisture analyser	2
9.	Shovel	5
10.	Hammer	5



0722-M-16: Process Glass Raw Materials

Overview

This competency standard describes the skills and knowledge required to process raw materials. This involves testing, storing and beneficiation of glass raw materials.

Competency Units	Performance Criteria
P1. Test the quality of glass raw materials	The trainee must be able to: P1. Check physical properties of glass raw materials <ul style="list-style-type: none">• Colour of Hygroscopic Raw Material• Moisture content• Particle size P2. Check chemical properties of glass raw materials <ul style="list-style-type: none">• Silica content• Alkali content• Alumina content• Iron content• Loss on ignition
P2. Store glass raw materials	The trainee must be able to: P1. Recognize different types of storage facilities P2. Transfer stock into and out of storage P3. Record the quality and quantity of bulk materials stored
P3. Perform beneficiation of glass raw materials	The trainee must be able to: P1. Perform removal of impurities using <ul style="list-style-type: none">• Froth floatation• Gravity separation• Magnetic separation P2. Perform drying of silica sand

Knowledge and Understanding

The trainee must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge and ability to:

Knowledge of Test the quality of glass raw materials

- Explain the cumulative percentage of the silica sand
- Explain the Physical and chemical test of glass raw materials
- Explain the quality of silica sand required of different glass industries

Knowledge of Store glass raw materials

- Explain the common glass raw materials handling problems
- Explain the quick test involved in raw materials storage
- Describe the difference between bin and silo
- Describe hygroscopic materials used in glass batch

Knowledge of Perform beneficiation of glass raw materials



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- Explain the beneficiation process
- Describe the types of beneficiation
- Explain the washing process of silica sand
- Describe the beneficiation process of the lime stone
- Describe the removal of free and combined iron found in the silica sand
- Explain the working of the rotary dryer

Critical Evidences Required

The trainee needs to produce following critical evidences in order to be competent in this competency standard:

- Determine the %age of SiO₂ in the given sample of silica sand
- Determine the %age of Iron in the given sample
- Determine the cumulative %age of Silica sand
- Determine the %age LOI in the given sample
- Remove the Iron with the help of the magnetic separator
- Remove the undesired impurities of the given sample using froth floatation

List of Tools & Equipment

This competency standard involves the following equipment:

S. No.	Equipment	Nos. Required
1.	Platinum Crucible	2
2.	Platinum Dish	1
3.	Platinum Tip tongue	2
4.	Agate Pestle and mortar	3
5.	Sieves	8
6.	Oven dryer	1
7.	Electric Kiln 1400 Deg C	1
8.	Flame Photometer	1
9.	UV Spectrophotometer	1
10	Desiccator	2
11	Laboratory glass ware	3 no each



0722-M-17: Perform Batch Preparation for Ceramics

Overview

This competency standard describes the skills and knowledge required to prepare a batch of ceramic body or glaze, with emphasis on the composition of raw materials for a particular application and safe operation of associated size reduction, mixing, and property analysis equipment.

Competency Units	Performance Criteria
Q1. Perform body preparation	The trainee must be able to: P3. Identify different types of ceramic bodies <ul style="list-style-type: none">• Earthenware• Porcelain• Stoneware• Terracotta P4. Perform calculations for the batch of body P5. Operate the weighing balance P6. Operate the ball mill
Q2. Test the quality of slip	The trainee must be able to: P4. Test the slip <ul style="list-style-type: none">• Density• Residue• Viscosity• Particle size P5. Perform mixing by using stivver
Q3. Perform glaze preparation	The trainee must be able to: P3. Identify different types of glazes <ul style="list-style-type: none">• Matt glaze• Opaque glaze• Transparent glaze• Luster glaze P4. Perform calculations for the batch of glaze P5. Operate the weighing balance P6. Operate the ball mill
Q4. Test the quality of glaze	The trainee must be able to: P5. Test the glaze <ul style="list-style-type: none">• Density• Residue• Viscosity• Particle size P6. Perform sieving of glaze



P7. Store the glaze in proper tank

Knowledge and Understanding

The trainee must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge and ability to:

- Describe different types of ceramic bodies and glazes
- Explain the effects of various physical properties on the final product
- Calculate the composition of raw materials required for a particular application
- Explain the working principle of the ball mill
- Describe the working of blunger
- Explain the different types of glazes
- Explain the different properties of slip and glazes

Critical Evidences Required

The trainee needs to produce following critical evidences in order to be competent in this competency standard:

- Determine the density of the slip
- Determine the Residue test of the given slip
- Perform the PSA of the given sample
- Determine the viscosity of the given sample
- Prepare the desired body with glaze
- Determine the RPM for effective grinding for ball mill
- Determine the mixing time of blunger

List of Tools & Equipment

This competency standard involves the following equipment:

Equipment	Nos. Required
Gradient Kiln 6 Shelve 1400 deg C	1
Lab Kiln 1300 Deg C	1
Particle Size analyser 0.1 Microgram to 1000 ug	1
Moisture Analyser	1
Oven	1
Weighing Balance	2
Hydrometer	10
Torsion Viscometer	1
Sieve shakers with ASTM sieve sets	1



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Ball Mill	1
Blunger/	1



0722-M-18: Perform Batch Preparation for Glass

Overview

This competency standard describes that the Trainee will be able to distinguish different types of glasses and perform batches of different glass and operate the equipments used in batch house like silo, conveyors and mixer

Competency Units	Performance Criteria
R1. Perform batch calculations for glass	The trainee must be able to: P1. Identify different types of glass w.r.t composition Soda Lime Lead Glass Borosilicate glass P2. Perform batch calculations using charts P3. Perform batch calculations using Computer softwares
R2. Prepare glass batch	The trainee must be able to: P1. Operate the automatic control equipment for batch preparation • Silos/hoppers • Mixers • Additives' bins • Conveyors P2. Evaluate the glass batch for segregation
R3. Perform mixing of glass batch	The trainee must be able to: P1. Use the proper amount of the binding agent P2. Operate the mixer P3. Check for homogenization of glass batch

Knowledge and Understanding

The trainee must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge and ability to:

Knowledge of Perform batch calculations for glass

- Explain the function of glass making oxides
- Describe batch calculation from Oxides
- Describe oxide calculations from batch
- Describe the table of glass making oxides
- Perform batch calculations for glass

Knowledge of Prepare glass batch



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- Explain the general storage problems arising during batch handling
- Explain the equipment of the batch house
- Describe the method of the mixing of the minor ingredients
- Explain the pneumatic transport
- Describe segregation

Knowledge of Perform mixing of glass batch

- Describe different binding agents used for glass batch
- Explain the importance of batch homogenization
- Describe the advantageous and disadvantageous using wet sand
- Describe the problems involved during the segregation of glass batch

Critical Evidences Required

The trainee needs to produce following critical evidences in order to be competent in this competency standard:

- Prepare the batch of the soda lime glass
- Prepare the batch of the Crystal glass
- Prepare the batch of the borosilicate glass
- Prepare the mixed batch of soda lime glass
- Determine the percentage Oxide of the given mixed batch

List of Tools & Equipment

This competency standard involves the following equipment:

S. No	Equipment	Nos. Required
1	Mixer	01
2	Crucible	04
3	Hot plate with magnetic stirres	01
4	Oven	01
5	Analytical Weight Balance	02
6	Silo	03
7	Mixer	01
8	Conveyor	02

0722-M-19: Plan Different Techniques of Kiln Firing



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Overview

The students will be able to conduct biscuit, glost and Decal firing of ceramic article using different fuels

Competency Units	Performance Criteria
S1. Identify the different types of fuels	<p>The trainee will be able to:</p> <ul style="list-style-type: none"> P1 Check the properties of different types of fuel Solids fuels Liquid fuels Gases Fuels
S2. Loading of the Kiln	<p>The trainee will be able to:</p> <ul style="list-style-type: none"> P1 Perform inspection of the kiln furniture. P2 Make proper stacking of the wares. P3 Perform Loading for Biscuit Firing P4 Perform Loading for Glost Firing
S3. Maintenance of the Kiln	<p>The trainee will be able to:</p> <ul style="list-style-type: none"> P1 Perform maintenance of the kiln furniture P2 Perform the maintenance of burners. P3 Perform the lubrication of the mechanical parts in kiln P4 Replace the wear and tear of insulation P5 Ensure the availability of alternate power supply P6 Check and clean the air filter
S4. Control of the Kiln	<p>The trainee will be able to:</p> <ul style="list-style-type: none"> P1 Adjust air to fuel ratio for combustion P2 Control parameters for biscuit firing P3 Control parameters for glost firing P4 Control parameters for Decal firing P5 Check the burners for proper ignition P6 Check damper to adjust exhaust gases P7 Calculate soaking time
S5. Trouble shooting in kiln	<p>The trainee will be able to:</p> <ul style="list-style-type: none"> P1 Adjust the temperature in Under firing or over firing P2 Identify and control the leakage of gas P3 Perform quick action during utility failure P4 Adjust the speed of the tunnel/roller kiln P5 Replacement of damaged kiln furniture
S6. Quality Control and Sorting	<p>The trainee will be able to:</p> <ul style="list-style-type: none"> P1 Identify the glazing defects P2 Identify the defects in Ceramics body. P3 Make grading of the products.



S7. Perform Communications with colleagues	The trainee will be able to: P1 Communicate with senior / junior P2 Communicate with peers P3 Communicate with engineer/ Supervisor P4 Communicate with electrical department P5 Communicate with Mechanical department P6 Communicate with concerned office / stakeholder
S8. Safety at work	The trainee will be able to: P1 Identify the protective procedures P2 Ensure the cleaning of the working area P3 Use of Fire Extinguisher, and safety alarms

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge of:

- Types of fuels Solid fuels Liquid fuels Gaseous fuels
- Types of materials, Methods to manufacture Uses and properties
- Types of refractories e.g. Acid, Basic & Neutral Refractory Physical & Mechanical properties
- Softening Point
- Load bearing capacity
- Shrinkage and expansion Thermal shock resistance Spalling
- Identify the Problems arise during kiln firing
- Mercury thermometers Electrical resistances Thermometers Thermocouples Measuring instruments
- Radiations & Optical pyrometer
- Automatic control of firing pyrometers, cones, their kinds, uses, difficulties & disadvantages in the use of the cones.
- Explain the Setting in kilns
- Explain the Firing in kilns
- Describe the Thermocouples
- Describe the pressure measuring instruments
- Describe the Radiations & Optical pyrometer
- Describe the Automatic control of firing pyrometer cones, their kinds, uses, difficulties & disadvantages in the use of the cones.
- Describe types of Kiln slabs

Critical Evidences Required

The candidate needs to produce following critical evidences in order to be competent in this competency standard:

Make Models, Assignments and chart of the following

- Roller Hearth Kiln



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- Shuttle Kiln
 - Tunnel Kiln
 - Firing Curve
 - Log Sheet Importance
1. Measure the temperature and pressure of the different zones of the kiln
 2. Perform the setting of kiln for different articles
 3. Fire and maintain the kiln up to 1200 deg C
 4. Identify the kiln firing defects
 5. Perform the refractory coating on the kiln furniture

Tools and Equipment

Sr. No.	Equipment	Quantity
1	Shuttle kiln with all accessories	1
2	Optical pyrometer	1
3	Brick and Slab cutter	1
4	Tool kit (tub, gloves, masonry tools etc.)	3
5	Fire Extinguisher	2
6	Ceramic Insulation wool	4 Boxes
7	Silicon carbide slabs	100



0722-M-20: Perform Table ware manufacturing

Overview

This competency standard describes the skills and knowledge required to manufacture the tableware and decorative articles. You will be able to learn multiple steps of batching, moulding, casting, jiggering, finishing, drying and firing of table wares articles.

Competency Units	Performance Criteria
T1. Perform Batching of Table ware Body	<p>Candidate will be able to:</p> <ul style="list-style-type: none"> P1- Check the job card P2- Identify the raw materials P3- Check the moisture P4- operate the ball mills P5- Operate the de - dusting plant P6- Check residue, viscosity and Particle size analysis of the slip P7- Identify the body deflocculants. P8- Complete appropriate record and log
T2. Perform Batching of Table ware Glaze	<p>Candidate will be able to:</p> <ul style="list-style-type: none"> P1- Check the job card P2- Identify the raw materials P3- Check the moisture P4- operate the ball mills P5- Check residue, viscosity and Particle size analysis of the glaze. P6- Identify the glazedeflocculants. P7- Identify the glaze faults. P8- Identify the glaze stain. P9- Prepare the color glazes. P10- Complete appropriate record and log
T3. Perform Modelling & Mould making of Table ware	<p>Candidate will be able to:</p> <ul style="list-style-type: none"> P1-Check plaster quality for moulds P2- Identify the types of the material used e.g. Plaster of paris, resin. P3- Identify the tools for mould & model making. P4- Identify the material used as parting solution to seal the pores of mould. P5- Calculate the clay body shrinkage in respect of models
T4. Perform Casting of Table Ware	<p>Candidate will be able to:</p> <ul style="list-style-type: none"> P1- Handle the slip. P2- Check the density & viscosity of the slip. P3- Identify the tools and equipment required during casting. P4- Select the suitable moulds.



	<p>P5- Control the filling speed & position of the pored slip. P6- Check cast thickness. P7- Calculate the removing cast time. P8- Handle the cast getting stucked in the mould. P9- Identify the defects of the casting. P10- Operate battery casting, pressure casting machine</p>
T5. Perform Jigging of Table Ware	<p>Candidate will be able to: P1- Prepare the pug mill P2- Check the vacuum of the pug mill P3- Check the hardness of blank P4- Cut the blank as per requirement P5- Check the RPM of roller head and spindle P6- Check the Temperature of roller head and spindle P7- Adjust Roller head up and down level as per product specification P8- Adjust the Edge cutter. P9- Make the Machine ready to operate in accordance with work instructions P10- Check the Mould Condition as per specification P11- Prepare Mould as required P12- Fix Mould on the spindle as per procedure P13- Put Clay slice on the mould according to instruction P14- Check clay slice to be pressed and formed P15- Identify the Defects of the product P16- Remove the product with mould</p>
T6. Perform Finishing and Joining of Table Ware	<p>Candidate will be able to: P1- Identify the Green product as per specification P2- Identify the Defects as per specification. P3- check moisture content of green product P4- identify the different cutting tools as per job requirement P5- Cut the Scrap according to the mark P6- Finish the Product as per requirement. P7- Identify the Joining paste P8- Apply the Paste to the joining parts P9- Ensure Proper joining P10 - Remove extra clay from the article P11- Finish Full body by using sponge and water as required P12- Clean the Piece as per requirements P13- Finalize the product</p>
T7. Perform drying of Table ware	<p>Candidate will be able to: P1- Check the green product to ensure desired condition P2- Start the dryer as per operating procedure</p>



	<p>P3- Check the Temperature as per job requirement P4- Place the Product on the conveyer / round dryer as per specifications P5-Unload dried product from the dryer as per procedure. P6- Set the humidity & temperature of dryer if required. P7- Check the moisture of the dried ware. P8- Identify the drying defects. P9- Maintain Records and log books of equipment operations. P10- Identify the Non-routine problems and report to the designated person.</p>
.Perform Glazing of Table ware	<p>Candidate will be able to: P1-Adjust the viscosity & density of the glaze. P2- Identify the glazing technique. P3- Set up glaze application equipment for operation P4- Apply glaze to produce the specified thickness P5- Recover excess or spilt glaze for treatment or recycling P6- Identify the glazing defects. P7- Apply glaze repair techniques to produce a properly finished product P8- Ensure all glaze faults are removed P9- Identify the range of faults that can occur during the operation P10- Identify and rectify equipment failure causes in accordance with procedures/work instructions P11- Complete appropriate record and log P12- Identify non-routine problems and report to the designated person. P12- Use PPEs(Personal Protective Equipment)</p>
. Perform Firing of Table wares	<p>Candidate will be able to: P1- Identify the Kilns e.g. tunnel kiln, roller kiln, shuttle kiln etc. P2- Determine the firing requirements from the production program P3- Identify and set up the kiln cars or furniture P4- Determine kiln and kiln furniture e.g. slabs, pillars, kiln lining and burners etc are within specification. P5 - Determine the firing equipment is safe to operate P6- Check for fuel feed obstructions and clear burner pathways. P7- Ensure products are set or stacked to specification P8- Determine correct stacking pattern of green wares P9- Ensure adequate space is allowed around each item P10- Use kiln space effectively P11- Determine kiln firing cycle</p>



	<p>P12- Monitor and record kiln car movement, or kiln contents P13- Monitor and adjust kiln heating equipment (elements or burners) and record temperature gradient details P14- Complete appropriate record and log P15- Identify non-routine problems and report to designated person. P16- Use PPEs(Personal Protective Equipment)</p>
0. Perform Sorting & packing of Table wares	<p>Candidate will be able to: P1- identify the defects P2- understand the quality standards P3- understand the quality control tools. P4- Identify the suitable packing & stacking. P5- Use PPEs(Personal Protective Equipment)</p>

Knowledge and Understanding

The trainee must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge of:

- Understand the ball mill/ jar mill and their working principles.
- Understand the various types of grinding media i.e. flint stone, river stones & alumina balls.
- Describe the different types of moulds e.g. father mould, working mould etc
- Describe the quality of the moulds.
- Explain the slip quality and assessment test.
- Moisture contents of clay
- Heat requirement of roller head
- Requirement of storage environment
- Body plasticity
- Defects of the product
- Dry and humid issue
- Composition and nature of the products being manufactured
- Construction and limitations of the equipment
- Start up and shut down processes
- Adjustments required of the equipment
- Properties of raw Material.
- Equipment adjustment/set up
- Maintenance of tools & equipment
- Explain how to fill the mould to get a cast.
- Describe the assembly of all parts of moulds using wire or rubber grips
- Describe the composition & properties of the casting slip.
- Describe the process of casting and problems
- Describe the mechanisms and benefits of battery casting & high pressure casting.
- Describe the importance of cleanliness & PPEs.



Critical Evidences Required

The trainee needs to produce following critical evidences in order to be competent in this competency standard:

- Explain the different types of raw materials used in the table ware industries
- Demonstrate the Crushing of Sand stone in the Jaw Crusher
- Explain the sampling technique for the raw materials
- Demonstrate the sampling of the raw materials
- Demonstrate the physical testing like, moisture, % LOI, plasticity, particle size analysis, color after firing on the given raw materials
- Explain the types of the different clay bodies w.r.t composition
- Explain the Flux, binder and filler used in the slip body
- Describe the preparation of slip
- Describe the use of Deflocculants in the slip
- Describe Glaze and its types
- Explain the different colors used in making colored glazes
- Demonstrate the batch calculations of the stone ware, Porcelain and terra cotta bodies
- Demonstrate to make batch for different types of glazes
- Explain the working principle and operation of different grinding mills
- Explain the types of grinding and the selection criteria of the grinding media.
- Demonstrate to do the complete grinding of raw materials in the ball mill
- Explain the different parameters affecting quality of slip and glazes
- Demonstrate the density measurement of the given slip
- Demonstrate to perform the residue test
- Demonstrate the viscosity measurement test of the slip and glaze
- Define and explain the filtration
- Explain the operating principal of the filter press
- Explain the working principal of blunger
- Perform filter pressing of the slip
- Perform the mixing in the blunger
- Explain the different defects on bodies
- Describe the reasons of these defects
- Identify the different defects on surface
- Explain the Vacuum Kneading process
- Describe the working operation and principal of the pug mill
- Explain the role of the vacuum pump, dies, cutter in the mill
- Demonstrate to operate the pug mill and make the blank
- Demonstrate the Model making of the given pattern
- Demonstrate the making of the Case, Master and working mould
- Demonstrate the making of the multi-piecesmould
- Explain the different forming techniques used in the table ware industries.
- Explain the filling of the mould with slip
- Demonstrate the filling of the given mould
- Explain the factors for controlling casting thickness
- Explain casting time



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- Demonstrate to cast the slip for the controlled thickness
- Describe the Jiggering & Jollying Process
- Demonstrate to make cup and plate from the machine
- Define drying and explain the different drying equipment used in the table ware industries
- Perform the drying in dryer
- Explain defects in the green ware piece
- Demonstrate to identify the different defects in the pieces
- Define green ware items and explain the need of finishing
- Explain the use of Wheel
- Demonstrate the finishing of the given piece
- Explain the under glaze decoration
- Describe the related tools and the properties of color solution
- Demonstrate to make the pattern for the under glaze decoration in the given piece
- Explain the types of Over glaze decoration
- Explain the glazing by spray gun and its applications.
- Explain the working principle and use of the spray gun.
- Explain the role of Wheel and Spray booth on spray glazing
- Demonstrate the glazing on the given item with the help of spray gun
- Explain the application of glazing by brushing technique
- Explain the application of glazing by dipping techniques and the factors of controlling glaze consistency
- Demonstrate the glazing on the different pieces with dipping technique
- Describe the application of glazes by pouring
- Explain the parameters that affect the application of glazing
- Demonstrate to apply the given glaze on the ware by adjusting the related parameters
- Explain the different defects on the surface of glazes
- Describe the reasons of these defects
- Identify the different defects on glazed surface
- Define kiln, explain the kiln furniture and its types
- Describe staking
- Perform the loading of the given different types of wares on the kiln furniture
- Describe the maintenance of the kiln furniture
- Describe the maintenance of the burners
- Describe the importance of the insulation and mechanical parts of the kiln
- Demonstrate to perform the maintenance of the kiln
- Describe the different parameters for affecting the control of the kiln Combustion ratio, Temperature, pressure, Flow
- Demonstrate the control of the running kiln by adjusting these above parameters
- Describe the importance of kiln reading
- Describe Log book and its application
- Explain the firing curve
- Describe trouble shooting data
- Describe the trouble shooting data in kiln
- Explain Over firing and under firing
- Demonstrate to identify and remove the smoke from the kiln zone



- Explain the importance of grading and the quality control
- Demonstrate the grading of the given materials

List of Tools & Equipment

Equipment	Quantity
ball mills with grinding media	02 Nos.
Plaster Modelling Wheel	02 Nos.
Plaster Mixing Machine	02 Nos.
Buckets, jugs	15 Nos.
Spoons & whisks	25 Nos.
Wooden Boards	25 Nos.
Dry, Soft Bristle Brushes	25 Nos.
Plaster’s Turning Tools	25 Nos.
Scrapers or Metal Kidneys	15 Nos.
Carpenter’s Saw	15 Nos.
Hacksaw Blades	25 Nos.
Variety of Files, Knives, Gauges, chisels	15 Nos.
Indelible Pencil	25 Nos.
Weighing scale	02 Nos.
Pug mill	01 Nos.
Jar Mill	02 Nos.
Jigging machine	01 Nos.
Battery Casting machine	01 Nos.
High Pressure Casting machine	01 Nos.
Extruder including dies, wire trims or blades	01 Nos.
Spray guns	05 Nos.
Glazing booths	05 Nos.
Wire cutting machines	01 Nos.
Transfer machines/ Manual transfer cars	01 Nos.
Dryer i.e. Conveyor, Round table	01 Nos.
Air Compressor	01 Nos.
Kiln (shuttle / Tunnel/Roller)	01 Nos.
Sand papers	25 Nos.
Safety Gloves	25 Nos.
Safety goggles	25 Nos.
Apron	25 Nos.
Paper	01 rim



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0722-M-21: Perform Glass Manufacturing

Overview

The trainee would be able to apply the knowledge in order to prepare different types of industrial glasses while testing various properties thereof.

Competency Units	Performance Criteria
U1. Perform Blowing	<p>You must be able to:</p> <ul style="list-style-type: none">P1. Perform free hand blowingP2. Operate the IS Machine<ul style="list-style-type: none">Air PressureMoulds LubricationDrive ControlControl the drive for gob feederP3. Operate the Corning Ribbon Machine<ul style="list-style-type: none">Air PressureFlow RateP4. Make rods and tube by blowing process<ul style="list-style-type: none">Flow rate of airMandrel RPM
U2. Perform Pressing	<p>You must be able to:</p> <ul style="list-style-type: none">P1. Operate gob feederP2. Control the operation of pressing machineP3. Lubricate the moulds
U3. Perform Casting	<p>You must be able to:</p> <ul style="list-style-type: none">P1. Identify the mould for castingP2. Check the condition of mouldP3. Add Gob to the MouldP4. Remove the glass article from the mould
U4. Make Float Glass	<p>You must be able to:</p> <ul style="list-style-type: none">P1. Control the atmosphere of molten tin bathP2. Nitrogen/ Hydrogen levelP3. Speed of top rollersP4. Control thickness and flow rate in Molten Tin Bath
U5. Perform Drawing & Rolling	<p>You must be able to:</p> <ul style="list-style-type: none">P1. Operate the water cooled RollersP2. Control the flow rate and temperature of glass
U6. Perform Centrifuging	<p>You must be able to:</p> <ul style="list-style-type: none">P1. Control the operation of the centrifuge process<ul style="list-style-type: none">RPMTemperature



	Cooling
U7. Perform Annealing of Glass	You must be able to: P1. to control the temperature of annealing chamber P2. Perform Cold End Coating P3. Perform Hot End Coating
U8. Perform Value Addition	You must be able to: P1. Control the process during the tempering of glass P2. Control the process of CVD coating during manufacturing P3. Control the process of the designing of glass Sand Blasting Pattern glass Mirrors Application Etching Decorative glasses Screen Printing
U9. Perform Strengthening of glass	You must be able to: P1. Control The parameters for thermal treatment Temperature Flow rate P2. Prepare the safety glass by lamination

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the :

Knowledge of U1-Perform the blowing

- Explain the different types of blowing process used for glass.
- Explain the working of I.S. machines;
- Explain the working of press and blow machines;
- Explain the working of ribbon machine;
- Classify the forming defects
- Explain the relationship of viscosity and working
- Describe bottle shape and design parameters
- Explain relationship of bottle weight and size.
- Explain the Danner process for the manufacture of tube & rod

Knowledge of U2-Perform pressing

- Describe the pressing process for manufacturing of different glass articles
- Understand the different pressing techniques used for shaping of glass
- Describe the formation of gob
- Explain the role of different ingredients affecting the properties of glass plate.



Knowledge of U3-Perform casting

- Describe the different articles formed for the casting process
- Describe the mould materials used for the casting of glass
- Explain the different machinery used for the casting process
- Identify the different defects arising during the casting of glass

Knowledge of U4-Make Float glass

- Explain the development of float process
- Describe the float bath and equilibrium mode of operation
- Explain the theory of float effect and equilibrium thickness
- Explain the float ribbon formation
- Describe the metal oxides used for tinted glass
- Define super tints

Knowledge of U5-Perform Drawing & Rolling

- Explain the basic science of flat glass process
- Describe the stress and stretch in an updrawn process as well as in a horizontal ribbon process
- Describe typical glass composition of sheet glass
- Explain the intermittent double roll process
- Describe the use of intermittent double roll glass
- Describe the continuous double roll process
- Describe the equipment and operation of Foucault process
- Explain the equipment and operation of the colburnupdraw process and glaverbel modification

Knowledge of U6-Perform Centrifuging

- Explain the centrifuging process of glass
- Describe the different types of fiber glass produced from the centrifuge process
- Explain the quality parameters for the glass wool
- Describe typical glass composition of fiber glass

Knowledge of U7-Perform Value Addition

- Defined laminated safety glass
- Explain the process of Sand blasting
- Explain the making OF Glass mirror
- Describe the screen printing of glass
- Explain artistic decoration on glass

Knowledge of U8-Perform Annealing of Glass

- Explain the annealing process of glass
- Describe the operation and working principle of the annealing chamber
- Explain the annealing temperature and annealing curve
- Explain the working of the polariscope

Critical Evidences Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

1. Cast the Soda lime glass in given mould
2. Cast the Crystal glass in the given mould
3. Quizes, Assignments on the following topics



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Working and Operation of the following

- IS Machine
- Corning Ribbon Machine
- Westlake Paste Mould Machine
- Annealing of glass
- 4. Identify the strain in the glass with the help of Polariscope
- 5. Model, Charts on the following topics
 - Danners Process
 - Float Process
 - Fourcault Process
 - Coulborn Process
 - DownDraw Process
 - Centrifuging Process
 - Thermal Tempering
 - Chemical Strengthening
 - Laminated Safety Glass etc.
- 6. Perform the free hand blowing
- 7. Apply inbound decoration of glass

List of Tools & Equipment

Sr. No	Equipment	Quantity
1	Glass Melting Pot Furnace 1400Deg C	01
2	Annealing Chamber	01
3	Iron Casting Mould	04
4	Weight Balance	03
5	Free Hand glass blowing tools	10
6	Mixer	01
7	Glory Hole Kiln	01
8	Optical Pyrometer	02
9	Autoclave	01
10	IS Machine	01



0722-M-22: Perform Stoichiometric Calculations

Overview

This competency standard describes the skills and knowledge required to perform unit conversions for important physical quantities, read and interpret process flow diagrams, and perform stoichiometric calculations for the combustion process.

Competency Units	Performance Criteria
V1. Perform unit conversions	The trainee must be able to: P1. Identify primary and secondary quantities P2. Identify dimensional and dimensionless quantities and equations P3. Perform unit conversion for the following quantities <ul style="list-style-type: none">• Mass• Length• Area• Volume• Density• Pressure• Energy• Viscosity• Humidity
V2. Interpret process flow diagrams (PFD)	The trainee must be able to: P1. Identify standard symbols for process equipment P2. Identify standard symbols for valves and fittings P3. Identify standard representation for process conditions
V3. Perform combustion calculations	The trainee must be able to: P1. Write balanced chemical reaction for the combustion of a fuel P2. Calculate theoretical and excess air required for combustion P3. Calculate composition of exhaust gases P4. Calculate theoretical and actual flame temperature

Knowledge and Understanding

The trainee must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge and ability to:

- Describe commonly encountered physical quantities in the glass and ceramic industry and perform unit conversion between different systems of units
- Read and interpret symbolic representation of process equipment, valves and fittings, and process conditions from process flow diagrams
- Understand principles of stoichiometric calculations with special emphasis on calculations related to the combustion process



Critical Evidences Required

The trainee needs to produce following critical evidences in order to be competent in this competency standard:

- Calculate the air required for the given volume of gas
- Conversion of basic unit conversion
- Label the PnI Diagram
- Calculate humidity using stoichiometric chart

List of Tools & Equipment

Sr No	Equipment	Quantity
1	Scientific calculator	20
2	Wet Bulb Thermometer	20
3	Dry Bulb Thermometer	20
4	Unit conversion Charts	10



0722-M-23: Apply OSHE Practices at workplace

Overview

This competency standard covers the skills and knowledge required to identify and apply OHSE practices in the workplace, with special emphasis on identifying, controlling and reporting OHSE hazards, conducting work in a safe manner, following emergency response procedures, and maintaining and improving health and safety culture in the workplace.

Competency Units	Performance Criteria
W1. Understand work permit system	The trainee must be able to: P1. Identify need for work permit P2. Ensure job site is prepared for authorised work. P3. Check permit condition and report to officials.
W2. Control and report OHSE Hazards	The trainee must be able to: P1. Perform risk assessment including all five steps. <ul style="list-style-type: none">• Identify the hazards• Identify who may might be harmed• Evaluate risk and identify precautions• Record findings• Review assessments P2. Perform Tool Box Talk. P3. Identify safety signs and symbols. P4. Take preventive/corrective action within the level of responsibility P5. Report OHSE hazards and incidents to appropriate personnel according to workplace procedures
W3. Maintain and improve health and safety culture in the workplace	The trainee must be able to: P1. Identify risks and hazards in the workplace and implement appropriate control measures P2. Identify opportunities for improving OHSE practices P3. Maintain safety records as per company policy P4. Identify Safety Procedures to maintain environmental conditions.



Knowledge & Understanding

The trainee must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge and ability to:

- General OSH Principles
- Occupational hazards/risks recognition
- Systematic gathering of OSH issues and concerns
- Appropriate prevention and control measures for specific hazards
- Major causes of workplace accidents relevant to the work environment.
- Techniques to handle emergency situations in different forms and contexts.
- Shop safety signs, symbols and alarms
- Safety precautionary measures of the building and equipment used
- Housekeeping
- Machine risks
- First aid
- Workplace hazards and their precautions and reduction

Critical Evidences Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Prepare Risk Assessment on slip house.
- Identify and control hazard on slip house.
- Prepare and identify hot work permit.
- Plan emergency exit.
- Prepare accident report.

List of Tools & Equipment

Sr. No.	Equipment	Quantity
1	First Aid Kit	25
2	Fire Extinguishers of different types	10
3	Different PPE's	25 sets
4	Emergency Alarm	5
5	Printer	01



0722-M-24: Perform Computer Application

Overview

This competency standard will enable the student to be familiar with the operation of MS office. He will also learn DOS, BASIC language and MS office to elementary level.

Competency Units	Performance Criteria
X1. Operate Microsoft windows	You must be able to: P1. Identify computer system components P2. Identify safety precautions associated with computer use P3. Maintain workstation, equipment and supplies P4. Navigate operating systems and software programs P5. Troubleshoot computer problems P6. Troubleshoot printer malfunction P7. Manipulate data/software/operating system P8. Use file management techniques
X2. Operate Microsoft office processing	You must be able to: P1. Perform word processing P2. Perform excel processing P3. Perform power point processing P4. Perform database management system P5. Perform outlook processing
X3. Use Internet & Email	You must be able to: P1. Use internet explorer P2. Use search engine P3. Compose & Send Email P4. Attach file in Email P5. Open an email P6. Find an email P7. Arrange address book
X4. Explore careers	You must be able to: P1. Identify digital opportunities for careers P2. Develop a resume P3. Participate in a mock interview



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Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge of:

- Knowledge of computer system components
- Knowledge of operating system & software programs
- Knowledge of Microsoft office processing
- Knowledge of computer graphics
- Knowledge of Internet & Email
- Define copyright standards, computer ethics netiquette

Critical Evidences Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

Develop Power point presentation

Create a resume

Compose a business document on Microsoft word

Compose a result of ceramic students on Microsoft excel

Research a job on portals

Troubleshoot computer problems

Draw a picture using circle and rectangle tools

Compose email with attachment and send

List of Tools & Equipment

- Computer Systems
- Printer
- Internet
- Software
- Window X
- Microsoft office 2016

Sr. No	Equipment	Quantity
1	Computer Systems	25
2	Printer	1
3	Internet	1 connection
4	Software	25
5	Window X	25
6	Multimedia	1



0722-M-25: Perform Workshop Techniques

Overview

This competency standard enables the students to have a hands-on experience with basic workshop operations, including electric wiring, welding, drilling, lathe machine, and general hand-tools.

Competency Units	Performance Criteria
Y1. Make Physical measurements	The trainee must be able to: P1. Select measuring instrument according to the job requirement P2. Make measurements of dimensions using <ul style="list-style-type: none"> • Meter rule • Measuring tape • Outside/inside caliper • Vernier caliper • Micrometer screw gauge • Protractor P3. Perform unit conversion for <ul style="list-style-type: none"> • Mass • Length • Volume
Y2. Perform unit conversion calculations	The trainee must be able to: P1. Perform calculations according to the job requirement <ul style="list-style-type: none"> • Mass • Length • Volume • Circumference • Radius • Inside/outside diameter • Thickness • Taper measurement
Y3. Perform simple tasks using tools	The trainee must be able to: P1. Perform mechanical tasks using <ul style="list-style-type: none"> • Screw driver • Allen key • Pliers • Hand cutter • Spanners • Wrench • Hammer • Scissors • Drill • Saw • Coping saw



<p>Y4. Perform electric wiring and circuits</p>	<ul style="list-style-type: none"> • General toolkit <p>The trainee must be able to:</p> <p>P1. Make circuits using different combinations of</p> <ul style="list-style-type: none"> • Series circuit • Parallel circuit • Star circuit • Delta circuit <p>P2. Perform numerical calculations for</p> <ul style="list-style-type: none"> • Series circuit • Parallel circuit • Star circuit • Delta circuit <p>P3. Perform electric wiring</p> <ul style="list-style-type: none"> • Single-phase • Three-phase
<p>Y5. Perform lathe operations</p>	<p>The trainee must be able to:</p> <p>P1. Perform basic checks</p> <ul style="list-style-type: none"> • Conduct bed alignment • Check lathe centers • Adjust speed • Adjust handling parameter • Prepare cutting tool • Check chuck <p>P2. Perform operations using lathe machine</p> <ul style="list-style-type: none"> • Cutting • Facing • Turning • Threading • Boring • Knurling • Internal grooving • Profiling
<p>Y6. Operate drill machine</p>	<p>The trainee must be able to:</p> <p>P1. Perform drilling operation using</p> <ul style="list-style-type: none"> • Hand drill • Drilling machine • Lathe machine
<p>Y7. Operate welding plant</p>	<p>The trainee must be able to:</p> <p>P1. Perform surface preparation</p> <ul style="list-style-type: none"> • Analyze metal type • Analyze cracks • Analyze metal surface • Identify welding technique • Identify required tools <p>P2. Operate electric welding plant</p>



	<ul style="list-style-type: none"> • Perform basic electrical connections • Select core wire • Adjust welding current/arc • Select welding rod • Adjust welding torch • Identify welding joint • Identify welding position • Identify soldering accessories • Identify brazing accessories <p>P3. Operate gas welding plant</p> <ul style="list-style-type: none"> • Perform basic connections • Check welding torch • Adjust gas pressure • Adjust flame • Identify flux • Identify soldering accessories • Identify operational problems
<p>Y8. Perform welding operation</p>	<p>The trainee must be able to:</p> <p>P1. Perform electric welding</p> <ul style="list-style-type: none"> • Electric arc welding • MIG welding • TIG welding <p>P2. Perform gas welding</p> <ul style="list-style-type: none"> • Oxy-acetylene welding • Oxy-gasoline welding • Hydrogen welding • Propane/butane welding • Methyl-acetylene-propadiene-petroleum (MAPPE) welding <p>P3. Perform laser-beam welding</p> <p>P4. Perform oxy-acetylene cutting</p>
<p>Y9. Identify welding defects</p>	<p>The trainee must be able to:</p> <p>P1. Investigate welding joint</p> <ul style="list-style-type: none"> • Visual inspection • Non-destructive testing • Destructive testing <p>P2. Identify external defects</p> <ul style="list-style-type: none"> • Weld crack • Crater • Overlap • Porosity • Spatter • Undercut <p>P3. Identify internal defects</p> <ul style="list-style-type: none"> • Cracking



	<ul style="list-style-type: none">• Slag inclusion• Incomplete fusion• Incomplete penetration
Y10. Apply safe workplace practices	The trainee must be able to: P1. Generate work permit P2. Perform risk assessment P3. Perform toolbox talk P4. Identify fire hazards and control P5. USE PPE (Personal Protective Equipment)

Knowledge and Understanding

The trainee must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge and ability to:

- Explain different wires and their gauges
- Explain different Circuits and their types
- Explain different electric circuits and their formation.
- Explain the working of lathe machine and tools
- Describe Lathe Machine and its parts
- Describe the Structure and functions of Lathe Machine.
- Describe the drilling by using Machine.
- Describe the making of holes 2.5 inch
- Describe the Drill chuck keys
- Describe the Operation of lathe machines
- Describe the Miscellaneous tools and utilities
- Explain the welding process
- Explain Fuel medium for welding
- Explain the welding apparatus
- Explain the welding operations
- Explain the Utility of Welding in ceramics industry
- General tools kits and it applications
- Describe the Plain tool kit
- Describe the L & N keys
- Describe the Utility of tools

Critical Evidences Required

The trainee needs to produce following critical evidences in order to be competent in this competency standard:

- To make a hole of 3 Cm in a shaft.
- To make a screw shaft
- To make a metal die for pressing
- To demonstrate the lightening of one bulb with one switch.
- To demonstrate the lightening of one bulb with two switches.



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- To demonstrate the lightening of two bulbs with one switch.
- To demonstrate the working of a fuse.
- Joining of two cylinders by welding.
- Make a cylindrical shape of a steel sheet by using welding.
- Utility of different tool kits in ceramics industry
- To make hole on metal sheet using different bits

List of Tools & Equipment

Sr #	Name of Tools / Equipment	Quantity
1	Star set 7 pieces changeable screw driver	5
2	Mig plier 8 inch	10
3	Anvil 60kg	3
4	Hammers 1kg to 5kg set	10
5	Screw drivers set 7pcs 4", 6", 8", 10"	5
6	Adjustable Wrench 8", 10", 12" max power	10
7	Combination Pliers 8" Auto	10
8	Socket Set 52 pieces	5
9	Allen key set 9 pieces 0.5mm to 12mm cromvendiam	10
10	Open and ring spanner 12 pes, 8mm to 24mm cromvendiam	5 Sets
11	Digital Multi-meter Taiwan 500volt Ac Dc 1000, 20 mega oham	5
12	Blower Gif-2 335watt 13000RPM 1.6Amp	5
13	Dusters Stander size Pakistan	24
14	Liquid Cleaner	10
15	Luster Drummond Metal Luster Weight 18-0 Itom DL 6220K12 Brand Drummond	10
16	Tip Cleaner different wire size China	10
17	Anti spatter spray 400ml Banzan German	10
18	GTAW Welding Machine, TIG welding machine + argon cylinder 6.80cu/meter gas filled + argon regulator gauge + TIG Torch Heavy Pressure, 300 - 400 amp+rubber hose pipe 8.5mm with length 25ft + inventor type + single phase / three phase complete installation, air cool system	3
19	Grinder 4.7 inch	10



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20	Chipping hammer 10"*4"	10
21	Wire Brush 6 Inch	10
22	Electrode drying oven 10kg rad	4
23	Desiccators weight capacity 70kg	3
24	Work station jigs and fixtures Model 60S* Fully loaded Sturdy 1/8-in-thick steel frame construction consists of 1 1/2 in square tubing weight capacity 454kg	3



0722-M-26: Perform Engineering Drawing

Overview

The Trainee will be able to understand the fundamentals of engineering drawing used in the various fields of industry especially in the Mechanical Technology. The student will be familiarized with the use of conventional drawing instruments as well as the modern technology used for this subject.

Competency Units	Performance Criteria
Z1. Identify drawing tools	<p>The trainee must be able to:</p> <p>P1. Conduct use of drawing tools</p> <ul style="list-style-type: none"> • Pencils • Drawing tables • T-square • Set-square • Ruler • Compass • Protractor • Drawing pens • French curves • Templates (pre-dimensioned holes, shapes, and symbols) <p>P2. Ensure proper use of drawing tools</p>
Z2. Conduct drawing of basic shapes	<p>The trainee must be able to:</p> <p>P1. Draw basic types of lines</p> <p>P2. Draw alphabets</p> <p>P3. Draw basic geometrical shapes</p> <ul style="list-style-type: none"> • Circle • Triangle • Square • Rectangle • Parallelogram • Rhombus • Kite • Ellipse • Star • Polygons <p>P4. Draw involutes</p> <ul style="list-style-type: none"> • Arc • Tangent to circle • Spiral <p>P5. Draw simple objects in 2-D</p>
Z3. Conduct drawing of views	<p>The trainee must be able to:</p> <p>P1. Draw different views</p> <ul style="list-style-type: none"> • Top view



	<ul style="list-style-type: none">• Front view• Bottom view• Rear view• Right view• Left view• Cross-sectional view
Z4. Conduct drawing projections	The trainee must be able to: P1. Draw different types of projections <ul style="list-style-type: none">• Isometric projections• Oblique projections• Perspective projections• Orthographic projections P2. Draw 1 st angle and 3 rd angle projections
Z5. Conduct drawing of pictorial views	The trainee must be able to: P1. Draw 3 types of pictorial drawings P2. Draw oblique sketching of rectangular block P3. Draw 1-point perspective view of rectangular block P4. Draw 2-point perspective view of rectangular block
Z6. Conduct sectional views	The trainee must be able to: P1. Draw sectional view lines P2. Draw cutting planes P3. Draw sectional views
Z7. Conduct dimensioning and labelling	The trainee must be able to: P1. Draw basic dimension lines P2. Draw basic dimensioning types P3. Draw dimensions on different drawings

Knowledge and Understanding

The trainee must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge and ability to:

- Identify the uses of different pencils for technical drawing
- Identify different paper sizes for drawing
- Describe different types of papers suitable for drawing
- Explain different types of erasers and their uses Maintain a well sharpened pencil for drawing
- Explain different geometrical shapes. Surface of objects
- Knows principles planes of projections Knows the orthographic method of projection
- Explain the 1st and 3rd angle projections State six principle views Practice multi view projection

Critical Evidences Required

The trainee needs to produce following critical evidences in order to be competent in this competency standard:

- Draw horizontal, vertical and inclined lines
- Draw alone line with correct weight ages
- Draw circular an arc using circular line method



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- Draw a circular arc using square method
- Draw an ellipse using rectangular method Draw views of simple objects
- Draw basic geometrical construction
- Draw properties of lines, plane and solids

List of Tools and Equipment

Sr. No.	Equipment	Quantity
1	Drawing Boards	25
2	Drawing Sheets	25
3	Set square	25
4	T-scale	25
5	Pencils(2B,3B,HB)	25
6	Ruler	25
7	Eraser	25
8	Sharpener	25



0722-M-27: Perform computer Aided Design

Overview

This competency standard deal with learning the competencies needed to perform Digital Fabrication. Your underpinning knowledge will be sufficient to provide you the basis for your work.

Competency Units	Performance Criteria
AA1. Perform basics of CAD	You must be able to: P1. Develop Expertise on CAD software P2. Explore Software Commands & tools used for designing P3. Develop Geometrical Designs for Ceramic/Glass printing P4. Develop Floral Designs for Ceramic/Glass Printing P5. Source Pictures & Manipulate them to create design compositions for Ceramic/Glass printing purposes P6. Develop technical drawings to create ready to print files o Ceramic/Glass P7. Create Basic Dimensions for technical drawings.
AA2. Create 3D Designs for printing	You must be able to: P1. Create 3D Designs for Ceramic/Glass structural designs P2. Develop 3D textures for Ceramic surface designs P3. Create 3D Rendered output for analysing the Ceramic/Glass design outcome
AA3. Create Designs for CNC Modelling	You must be able to: P1. Create Designs for CNC Modelling. P2. Create Technical Drawings of the design for On-scale CNC modelling

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge of:

- CAD Software used for Glass & Ceramic Design Industry
- Design Compositions
- Technical Drawings & Dimensions
- Basics of 3D Designing
- 3D Drawings & Designs
- CNC Design Technicalities



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Critical Evidences Required

The candidate needs to produce following critical evidence(s) in order to be competent in this competency standard:

- Assignment 1: Create Theme Based design for digital/screen printing on Ceramic/Glass Tile
- Assignment 2: Design a functional kettle with texture. Finalise the design through sketching, drafting and technical drawings and produce a finalised 3D Render.
- Assignment 3: Create the model of a cup focusing on CNC modelling.

List of Tools & Equipment

- Soft wares
 - Auto Cad 2018 or above
 - Auto desk 3Ds Max 2018 or above
 - Adobe Illustrator CS6 or above
 - Adobe Photoshop CS6 or above
 - Corel Draw X7 or above



0722-M-28: Apply Quality Standards

Overview

This competency standard describes the skills and knowledge required to assess own work, assess and measure quality of green fired articles and investigate the causes of quality deviations from applicable standards.

Competency Units	Performance Criteria
BB1 .Assess own work	The trainee must be able to: P4. Check completed work continuously as per workplace standards P5. Identify and isolate faulty components, parts and materials P6. Record and report faults as per workplace practices
BB2. Assess quality of received components, parts and materials	The trainee must be able to: P2. Check received components, parts and materials for quality parameters • Visual inspection • Physical measurements P3. Perform quality checks to identify faults • Durability • Finish • Size P4. Record and report faults as per workplace practices
BB3. Measure components, parts and materials	The trainee must be able to: P2. Select appropriate measuring instruments P3. Make measurements following applicable SOPs P4. Identify and isolate faulty components, parts and materials P5. Record and report faults as per workplace practices
BB4. Investigate causes of quality deviations	The trainee must be able to: P4. Investigate causes of deviations from specified quality standards P5. Identify causes of deviations from specified quality standards P6. Recommend suitable preventive action to maintain quality standards

Knowledge and Understanding

The trainee must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge and ability to:

- Understand relevant quality standards, policies and procedures
- Understand relevant production processes, materials and products
- Understand relevant workplace practices for recording and reporting of events
- Relevant quality standards, policies and procedures



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- Knowledge of Characteristics of materials used
- Understand Safety environment aspects of production processes
- Comprehend Workplace procedures

Critical Evidences Required

The trainee needs to produce following critical evidences in order to be competent in this competency standard:

- Direct observation/demonstration of candidate’s application of tasks and questioning related to underpinning knowledge may include
 - Visual inspection for the defect
 - Physical measurements
 - Check against patterns
 - Check against size & fit
 - Communicating product description
 - Record data and report
- Assessment shall be observed while task are being undertaken

List of Tools & Equipment

Sr No	Equipment	Quantity
1	Rapid ball mill with media	1
2	Gradient kiln 1330	1
3	PSA	1
4	Lab Kiln 1400 deg c	1
5	Orton Cone	1
6	Tile flatness Test Apparatus	1
7	Abrasion resistance meter	1
8	Vacuum Porosity tester	1
9	XRD	1
10	XRF	1
11	Autoclave	1
12	PH meter	1
13	Whitnness meter for ceramics	1
14	Vernier Calliper	1



0722-M-29: Perform Sanitary Ware Manufacturing

Overview

This competency standard describes the skills and knowledge required to manufacture the sanitary ware.

Competency Units	Performance Criteria
CC1. Perform Batching of Sanitary Ware body	Candidate will be able to: P1- Identify the raw materials P2- Check the moisture P3- operate the ball mills P4- Operate the de - dusting plant P5- Check residue, viscosity and Particle size analysis of the slip P6- Identify the body deflocculants.
CC2. Perform Batching of sanitary ware Glaze	Candidate will be able to: P1- Identify the raw materials P2- Check the moisture P3- operate the ball mills P4- Check residue, viscosity and Particle size analysis of the glaze. P5- Identify the glazed deflocculants. P6- Identify the glaze faults. P7- Identify the glaze stain. P8- Prepare the color glazes.
CC3. Perform Modelling & Mould making for sanitary ware	Candidate will be able to: P1- Check plaster quality for moulds P2- Identify the types of the material used e.g. Plaster of paris, resin. P3- Identify the tools for mould & model making. P4- Identify the material used as parting solution to seal the pores of mould. P5- Calculate the clay body shrinkage in respect of models
CC4. Perform Casting for Sanitary Ware	Candidate will be able to: P1- Handle the slip. P2- Check the density & viscosity of the slip. P3- Identify the tools and equipment required during casting. P4- Select the suitable moulds. P5- Control the filling speed & position of the pored slip. P6- Check cast thickness. P7- Calculate the removing cast time. P8- Handle the cast that get stuck in the mould. P9- Identify the defects of the casting. P10- Operate battery casting, pressure casting machine, robot machine



CC5. Perform drying of sanitary ware	Candidate will be able to: P1- Operate the dryer. P2- Set the humidity & temperature of dryer. P3- Check the moisture of the dried ware. P4- Identify the drying defects.
CC6. Perform Glazing of sanitary ware	Candidate will be able to: P1- Adjust the viscosity & density of the glaze. P2- Set the spray gun. P3- Set the air pressure. P4- Identify the glazing technique. P5- Check the weight of the glaze P6- Identify the glazing defects. P7- Use PPEs(Personal Protective Equipment) P8. Perform glazing using robots
CC7. Perform Firing of sanitary wares	Candidate will be able to: P1- Identify the Kilns e.g. tunnel kiln, roller kiln, shuttle kiln etc. P2- Load the kiln. P3- Identify the kiln furniture. P4- Identify the fuel for the kiln e.g natural gas, LPG etc . P5- Adjust the firing curve. P6- Identify the firing defects. P7- Unloading of the kiln. P8- Use PPEs(Personal Protective Equipment)
CC8. Perform Sorting & packing of sanitary wares	Candidate will be able to: e P1- identify the defects P2- understand the quality standards P3- understand the quality control tools. P4- Identify the suitable packing & stacking. P5- Use PPEs(Personal Protective Equipment)

Knowledge and Understanding

The trainee must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge of:

- Understand the ball mill/ jar mill and their working principles.
- Understand the various types of grinding media i.e. flint stone, river stones & alumina balls.
- Describe the different types of moulds e.g. father mould, working mould etc
- Describe the quality of the moulds.
- Explain the slip quality and assessment test.
- Explain how to fill the mould to get a cast.
- Describe the assembly of all parts of moulds using wire or rubber grips
- Describe the composition & properties of the casting slip.
- Describe the process of casting and problems
- Describe the mechanisms and benefits of battery casting & high pressure casting.
- Describe the importance of cleanliness & PPEs.



Critical Evidences Required

The trainee needs to produce following critical evidences in order to be competent in this competency standard:

- Explain the different types of raw materials used in the Sanitary ware industry.
- Demonstrate the Crushing of Sand stone in the Jaw Crusher
- Explain the sampling technique for the raw materials
- Explain the physical tests used for the raw materials
- Demonstrate the physical testing like, moisture, % LOI, plasticity, Particle size analysis, residue,color after firing on the given raw materials
- Explain the types of the different clay bodies w.r.t composition
- Explain the Flux, binder and filler used in the slip body
- Describe the preparation of slip
- Describe the use of Deflocculants in the slip
- Describe Glaze and its types
- Explain the different colors used in making colored glazes
- Demonstrate the batch calculations of the sanitary ware body
- Demonstrate to make batch for different types of glazes for sanitary wares
- Explain the working principle and operation of different grinding mills
- Explain the types of grinding and the selection criteria of the grinding media.
- Demonstrate to do the complete grinding of raw materials in the ball mill
- Explain the different parameters affecting quality of slip and glazes
- Demonstrate the density measurement of the given slip
- Demonstrate to perform the residue test
- Demonstrate the viscosity measurement test of the slip and glaze
- Define and explain the filtration
- Perform the mixing in the blunger
- Explain the different defects on the surface of glazes
- Describe the reasons of these defects
- Identify the different defects on glazed surface
- Explain the different defects on bodies
- Describe the reasons of these defects
- Identify the different defects on surface
- Explain different Units of Length, Area and Volume
- Perform the Conversion of data from one unit to the other
- Explain scale drawings
- Demonstrate the tracing of the given pattern
- Demonstrate the use of the Vernier Calipers, Scale etc.
- Demonstrate the free hand and scale drawing
- Describe different materials used for the model making
- Explain the different tools used for Model making



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- Demonstrate the Model making of the given pattern
- Explain the different types of Moulds
- Demonstrate the making of the Case, Master and working mould
- Demonstrate the making of the multi-piecesmould
- Explain the different forming techniques used in the sanitary ware industries.
- Explain the filling of the mould with slip
- Demonstrate the filling of the given mould
- Explain the factors for controlling casting thickness
- Explain casting time
- Demonstrate to cast the slip for the controlled thickness
- Define drying and explain the different drying equipment used in the Sanitary ware industries
- Perform the drying in dryer
- Explain defects in the green ware piece
- Demonstrate to identify the different defects in the pieces
- Define green ware items and explain the need of finishing
- Demonstrate the finishing of the given piece
- Explain the glazing by spray gun and its applications.
- Explain the working principal and use of the spray gun.
- Demonstrate the glazing on the given item with the help of spray gun
- Explain the application of glazing by dipping techniques and the factors of controlling glaze consistency
- Demonstrate the glazing on the different pieces with dipping technique
- Explain the parameters that affect the application of glazing
- Define kiln, explain the kiln furniture and its types
- Describe staking
- Perform the loading of the given different types of wares on the kiln furniture
- Describe the maintenance of the kiln furniture
- Describe the maintenance of the burners
- Describe the importance of the insulation and mechanical parts of the kiln
- Describe the different parameters for affecting the control of the kiln Combustion ratio, Temperature, pressure, Flow
- Demonstrate the control of the running kiln by adjusting these above parameters
- Describe Log book and its application
- Explain the firing curve
- Describe trouble shooting data
- Describe the trouble shooting data in kiln
- Explain Over firing and under firing
- Demonstrate to identify and remove the smoke from the kiln zone
- Explain the importance of grading and the quality control
- Demonstrate the grading of the given materials

List of Tools & Equipment

Equipment	Quantity
ball mills with grinding media	02 Nos.



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Plaster Modelling Wheel	02 Nos.
Plaster Mixing Machine	02 Nos.
Different Moulds	10 Nos.
Buckets, jugs	15 Nos.
Spoons & whisks	15 Nos.
Wooden Boards	25 Nos.
Dry, Soft Bristle Brushes	15 Nos.
Plaster's Turning Tools	5 sets
Scrapers or Metal Kidneys	15 Nos.
Carpenter's Saw	15 Nos.
Hacksaw Blades	25 Nos.
Variety of Files, Knives, Gauges, chisels	15 Nos.
Indelible Pencil	25 Nos.
Weighing scale	2 Nos.
Jar Mill	2 Nos.
Battery Casting machine	1 Nos.
High Pressure Casting machine	1 Nos.
Spray gun for glaze application	05 Nos.
Air Compressor	01 Nos.
Dryer i.e. Conveyor, Round table	01 Nos.
Glazing booth	05 Nos.
Kiln (shuttle / Tunnel/ Roller Kiln)	01 Nos.
Sand papers	25 Nos.
Safety Gloves	25 nos.
Safety Goggles	25 Nos.
Apron	25 Nos.
Paper Rim	4 Nos
Robotic Machine	1 Nos



0722-M-30: Perform Tile Manufacturing

Overview

This competency standard describes the skills and knowledge required to manufacture different types of tiles, with emphasis on specific skills required to perform batching of tile body and glaze, spray drying of slip, pressing of granules to make tiles, and glazing, firing, sizing, grading, and packing of tiles as per applicable standards.

Competency Units	Performance Criteria
DD1. Perform batching of tile body	<p>The trainee must be able to:</p> <ul style="list-style-type: none">P1. weigh raw materials for batching of tile bodyP2. Transport raw materials batch of tile body to the ball millP3. Operate the ball mill to prepare batch of tile bodyP4. Discharge batch of tile body from the ball millP5. Transfer slip to mixing tanksP6. Perform housekeeping of the batching workstationP7. Evaluate the batching process as per applicable standardsP8. Maintain the level of grinding media in ball mill
DD2. Perform batching of tile glaze	<p>The trainee must be able to:</p> <ul style="list-style-type: none">P1. weigh raw materials for batching of tile glazeP2. Transport raw materials for batch of tile glaze to the ball millP3. Operate the ball mill to prepare batch of tile glazeP4. Discharge batch of tile glaze from the ball millP5. Transfer glaze to mixing tanksP6. Perform housekeeping of the batching workstationP7. Evaluate the batching process as per applicable standardsP8. Maintain the level of grinding media in ball mill
DD3. Perform spray drying of slip	<p>The trainee must be able to:</p> <ul style="list-style-type: none">P1. Conduct sieving of slip for tile manufacturingP2. Perform drying of slip in spray dryerP3. Maintain process parameters for drying of slip<ul style="list-style-type: none">• Temperature• Grain size• Moisture contentP4. Discharge and transfer granulate to silosP5. Perform housekeeping of the spray drying workstationP6. Evaluate the spray drying process as per applicable standards
DD4. Perform pressing of granules	<p>The trainee must be able to:</p> <ul style="list-style-type: none">P1. Perform moisture analysis of granules for tile manufacturingP2. Operate hydraulic press to make tiles from granulesP3. Maintain process parameters for pressing of granules<ul style="list-style-type: none">• Thickness



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	<ul style="list-style-type: none"> • Penetration • Size • Weight • Speed/cycle • Green strength <p>P4. Inspect quality parameters of pressed tiles</p> <ul style="list-style-type: none"> • Visual inspection • Surface • Dry powder • Bulge • Chipping <p>P5. Perform drying of pressed tiles</p> <p>P6. Maintain process parameters for drying of pressed tiles</p> <ul style="list-style-type: none"> • Temperature • Visual inspection • Dry strength <p>P7. Perform housekeeping of the pressing workstation</p> <p>P8. Evaluate the pressing process as per applicable standards</p>
<p>DD5. Perform glazing of tiles</p>	<p>The trainee must be able to:</p> <p>P1. Perform cleaning of the tile surface for glazing</p> <p>P2. Perform grinding of the tile edges for glazing</p> <p>P3. Apply engobe and glaze on tiles</p> <p>P4. Perform cleaning of the tile edges after application of glaze</p> <p>P5. Apply fixative on tiles</p> <p>P6. Perform printing on tiles</p> <ul style="list-style-type: none"> • Screen printing • Digital • Soluble salt <p>P7. Apply under-tile coating on tiles</p> <p>P8. Perform housekeeping of the glazing workstation</p> <p>P9. Evaluate the glazing process as per applicable standards</p>
<p>DD6. Perform firing of tiles in kiln</p>	<p>The trainee must be able to:</p> <p>P1. Apply under-tile coating on tiles</p> <p>P2. Perform stacking of tiles in kiln</p> <p>P3. Operate kiln for firing of tiles</p> <ul style="list-style-type: none"> • Pre-heating zone • Firing zone • Cooling zone <p>P4. Perform unloading of tiles from kiln</p> <p>P5. Perform housekeeping of the kiln workstation</p> <p>P6. Evaluate the firing process as per applicable standards</p>
<p>DD7. Perform sizing of tiles</p>	<p>The trainee must be able to:</p> <p>P1. Operate disc cutting machine for sizing of tiles</p> <ul style="list-style-type: none"> • X-axis



DD8. Perform grading and packing of tiles	<ul style="list-style-type: none"> • Y-axis P2. Perform housekeeping of the tile cutting workstation P3. Evaluate the tile cutting process as per applicable standards <p>The trainee must be able to:</p> <ul style="list-style-type: none"> P1. Grade finished tiles as per applicable standards P2. Pack finished tiles as per applicable standards P3. Perform housekeeping of the grading and packing workstation
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Knowledge and Understanding

The trainee must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge and ability to:

- Describe the mechanisms and principles of size reduction
- Describe the operation and working principle of ball mill
- Describe various types of grinding media (flint stone, river stone, alumina balls, alubit)
- Describe the standards and procedures of slip quality assessment
- Describe the operation and working principle of spray dryer
- Describe the methods of glazing and printing of tiles
- Describe the operation and working principle of kiln
- Describe the standards and procedures for sizing and sorting of tiles
- Describe the importance of using PPE and maintaining safe working conditions

Critical Evidences Required

The trainee needs to produce following critical evidences in order to be competent in this competency standard:

- Prepare the body of tile in ball mill
- Perform granulation using spray dryer
- Perform pressing of granules to make tiles
- Determine the density, viscosity, and residue of a given sample of slip
- Prepare engobe and glaze for tiles in ball mill
- Determine the density and viscosity of engobe and glaze
- Check the application of engobe and glaze on tiles
- Determine penetration, lamination, green strength, and drying strength of the pressed tiles
- Check printing quality of the tile
- Determine strength of the biscuit
- Check contamination on the ceramic roller of the kiln
- Check temperature of the kiln
- Determine fired strength of the fired tiles
- Check dimensions and surface quality of the tiles

List of Tools and Equipment

This competency standard involves the following equipment:

S. No.	Equipment	Nos. Required
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1	Weighing balance	1
2	Ball mill	1
3	Spray dryer	1
4	Hydraulic press	1
5	ASTM sieve set	1
6	Jaw crusher	1
7	Blunger	1
8	Roller kiln	1
9	Dryer	1
10	Disc-spray unit	1
11	Spray booth	1
12	Spray gun with compressor	5
13	Digital Printer	1
14	Sizing Machine	1
15	Polishing Machine	1
16	Sorting Machine	1



0722-M-32: Measure the Properties of Ceramics Product

Overview

The competency standard describe the skill and knowledge required to measure and understand the mechanical, thermal and chemical properties of different ceramics product.

Competency Units	Performance Criteria
EE1. Measure the mechanical properties of Ceramics product	The trainee must be able to: P1. Measure the Scratch Hardness P2. Perform the Abrasion Resistance P3. Find the Modulus of Rupture etc.
EE2. Measure the thermal properties of Ceramics product	The trainee must be able to: P1. Measure Thermal shock resistance P2. Measure the Thermal Expansion P3. Measure the Thermal Conductivityetc
EE3. Measure the Chemical properties of Ceramics product	The trainee must be able to: P1. Measure the Acid Resistance P2. Measure the Resistance to molten glass etc P3 Measure properties of ceramics materials Water Absorption Crazing resistance etc

Knowledge and Understanding

The trainee must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge of:

Knowledge of EE1 Measure the mechanical properties of Ceramics articles

- Describe Elastic Deformation
- Define Stress and strain
- Explain Tensile and compressive deformations
- Describe Sheer stress strain Discuss Poison’s Ratio
- Describe Hardness and Abrasion
- Explain the Relationship with other properties
- Describe Elastic modules
- Discuss Creep Explain Flow strength and phase assemblage Describe Abrasions

Knowledge of EE2 Measure the thermal properties of Ceramics articles

- Describe the specific capacity of common ceramic material
- Elaborate the Effect of temperature on different ceramics materials
- Define Latent heat of fusion
- Explain the thermal expansion curve and its significance.
- Explain Thermal expansion, composition and structure of different Polycrystalline materials
- Draw the Relationship with composition and micro structure
- Explain Thermal Conductivity
- Describe the thermal conductivity in Simple oxides: Relationship with other properties



- Describe the effect of Polycrystalline materials:
- Describe the Effect of micro structure porosity and Insulation
- **Knowledge of EE3 Measure the Chemical properties of Ceramics articles**
- Explain the Chemical Attack on Refractories
- Describe the effect of Slags and glasses
- Describe the effect of Molten Metals and Glasses
- Describe different types of porosity and their measurement methods
- Define crazing and the measurement techniques

Critical Evidences Required

- Determine the thermal expansion of the given sample of refractory brick
- Measure the thermal shock resistance of the given sample of ceramics material.
- Determine the Abrasion resistance of the given sample of glaze
- Determine the Modulus of Rupture of the given ceramics material
- Determine the scratch resistance of the given sample
- Determine the specific gravity of the given sample
- Measure the Apparent porosity of the given sample of insulating bricks
- Determine the crazing resistance of the given sample of ceramic article
- Determine the acid resistance of the given sample of refractory brick
- Measure the slag resistance of the given refractory sample

List of Tools & Equipment

Thermal Shock Tester	01
Bending Strength	01
Oven	01
Dilatometer	01
Abrasion Tester	01
Porosity Tester	01
Autoclave	01
Moh scale Hardness tester	01
Thermal Conductivity Furnace	01
Weight Balance	01
Gradient Kiln	01
Lab kiln	01



0722-M-33: Measure the Properties of Glass

Overview

This competency standard describes the skills and knowledge required to measure the most important thermal, optical, and physical properties of glass as per applicable standard procedures and to use this information for troubleshooting the production process.

Competency Units	Performance Criteria
FF1. Measure thermal properties of glass	<p>The trainee must be able to:</p> <p>P1. Measure the following thermal properties of glass as per applicable standard procedures</p> <ul style="list-style-type: none">• Thermal expansion• Thermal endurance• Softening point• Annealing point• Strain point <p>P2. Perform housekeeping of the analytical lab</p> <p>P3. Maintain record of tests performed and testing reports generated</p>
FF2. Measure optical properties of glass	<p>The trainee must be able to:</p> <p>P1. Measure the following optical properties of glass as per applicable standard procedures</p> <ul style="list-style-type: none">• Refractive index• Strain in glass <p>P2. Perform housekeeping of the analytical lab</p> <p>P3. Maintain record of tests performed and testing reports generated</p>
FF3. Measure physical properties of glass	<p>The trainee must be able to:</p> <p>P1. Measure the following physical properties of glass as per applicable standard procedures</p> <ul style="list-style-type: none">• Density• Viscosity• Tensile strength <p>P2. Perform housekeeping of the analytical lab</p> <p>P3. Maintain record of tests performed and testing reports generated</p>

Knowledge and Understanding

The trainee must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge and ability to:

- Describe the significance of various thermal, optical, and physical properties of glass
- Describe the standard procedures for determination of various thermal, optical, and physical properties of glass
- Explain the effect of glass composition on its thermal, optical, and physical properties



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- Explain the effect of production process conditions on the thermal, optical, and physical properties of glass

Critical Evidences Required

The trainee needs to produce following critical evidences in order to be competent in this competency standard:

- Determine thermal properties of a given sample of glass (thermal expansion, thermal endurance, softening point, annealing point, strain point)
- Determine optical properties of a given sample of glass (refractive index)
- Determine optical properties of a given sample of glass (density, tensile strength)

List of Tools & Equipment

This competency standard involves the following equipment:

S. No	Equipment	Nos. Required
1	Weighing balance	2
2	Standard strain disc set	4
3	Refractometer	4
4	Polariscope	4
5	Dilatometer	1
6	Parallel plate viscometer	1



0722-M-34: Prepare Advanced Ceramics Products

Overview

The objective of this course is to make the students aware of latest techniques and materials that are being brought in to use for numerous practical importance, especially the medical and industrial equipment e.g. Bio – Ceramics, heat exchangers for chemical industry, etc

Competency Units	Performance Criteria
GG1. Identify different types of Advance ceramic products	<p>The trainee must be able to:</p> <p>P1. Identify different types of Advanced Ceramics used in different Industries</p> <ul style="list-style-type: none"> • Chemical Industries • Electrical Industries • Textile Industries • Bio Ceramics <p>P2. Identify different types of Synthetic Raw Material used</p> <ul style="list-style-type: none"> • Alumina • Zirconia • Silicon Carbide • Barium Titanate • Carbon • Tricalcium Phosphate • Aluminium Nitrate • Aluminium Carbide etc
GG2. Prepare articles used in the chemical Industries	<p>The trainee must be able to:</p> <p>P1. Fabricate the following products by extrusion techniques</p> <ul style="list-style-type: none"> • Rashing Rings • Thermocouple sheets • Tubes • Insulators <p>P2. Identify the properties of the Heat Exchangers used in the Chemical Industry</p>
GG3. Prepare articles used in the ceramics industry	<p>The trainee must be able to:</p> <p>P1. Check physical properties of Rutile Porcelain</p> <p>P2. Prepare the body of the thread guides</p> <p>P3. Prepare thermocouple sheets</p> <p>P4. Prepare high alumina bricks</p>
GG4. Identify the ceramic articles used in medical industry	<p>The trainee must be able to:</p> <p>P1. Check the properties of the following</p> <ul style="list-style-type: none"> • Bio inert • Bio active • Bio resorbabale
GG5. Identify the electro-ceramics materials	<p>The trainee must be able to:</p> <p>P1. Recognize different properties of electro-ceramics materia</p>



- Piezoelectricity
- Pyroelectricity
- Ferroelectric
- Ceramics dielectric
- High voltage Insulators

Knowledge and Understanding

The trainee must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge of:

Knowledge of 1

- Compare Advanced and traditional ceramics
- Describe the types of the Advanced Ceramics
- Describe the manufacturing of the different raw materials used in advanced ceramics

Knowledge of Q2 Prepare articles used in the chemical Industries

- Describe the role of Advanced Ceramics in Chemical Industry
- Describe the manufacturing of the ceramics Heat exchangers
- Describe the manufacturing of high alumina products
- Describe the manufacturing process of Chemical Porcelain
- Describe the manufacturing of Thermocouple sheets
- Explain Laboratory Porcelain as high temperature Ceramics
- Explain Mullite Porcelains as high temperature Ceramics
- Explain Alumina bodies for spark plugs as high temperature Ceramics

Knowledge of Prepare articles used in the ceramics industry

- Describe the properties of Rutile porcelain
- Describe high alumina bodies
- Describe the role of Advanced Ceramics in Textile Industries – Thread guides
- Describe the role of Advanced Ceramics in Paper Industries – Nose & Cones

Knowledge of Identify the bio ceramics articles used in medical industry

- Describe the types and application of bio ceramics
- Explain the Bio inert ceramics and the materials used for the manufacturing of different body parts
- Describe dental porcelain
- Describe glass ceramics
- Describe bio compatibility
- Describe the application of bioresorbable

Knowledge of Q5 Identify the electro-ceramics materials

- Describe the types of different ceramics materials used in the electronic industry
- Describe the properties of electro-ceramics materials
- Describe high voltage and low voltage insulator

Critical Evidences Required

The trainee needs to produce following critical evidences in order to be competent in this competency standard:

- Assignments and charts on the following topics
- Bio-Ceramics



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- Electro-ceramic
- Preparation of bodies Chemical Porcelain and Rutile Porcelain by grinding & pulverizing.
- Pressing of materials / extrusion / Casting, of high alumina bodies
- Prepare Dental Porcelain Bodies
- Prepare self-glazed bodies

List of Tools & Equipment

Sr No	Item	Quantity
1	Electric Kiln Temp 1700 deg C	1
2	Alumina Lined Ball mill	1
3	Extruder with Heating system	1
4	Mixer	1
5	Balance	1
6	Dies	4
7	Pyrometer	2



0722-M-35: Perform Digital fabrication

Overview

This competency standard deal with learning the competencies needed to perform Digital Fabrication. Your underpinning knowledge will be sufficient to provide you the basis for your work..

Competency Units	Performance Criteria
HH1. Perform Digital Printing for Ceramics	You must be able to: knowledge P1. Perform Screen Printing on Ceramics P2. Create Sticker Making for heat transfer print for ceramics P3. Execute Inkjet printing technology on Ceramics
HH2. Perform Laser cutting / Etching for Glass	You must be able to: P1. Perform Surface treatment / decoration on glass P2. Perform laser cutting and/or Etching on glass
HH3. Execute CNC Modelling	You must be able to: P1. Perform CNC router modelling for design outcomes P2. Perform CNC Programming for modelling P3. Perform 2 axis to 5 axis milling programme techniques to achieve various depths P4. Assure hands on training on CNC Controller

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge of:

- 3D Drawings & Designs
- Screen Printing
- Digital Printing
- Heat Transfer Prints
- Inkjet Printing
- Laser Cutting & Etching
- CNC Modelling and machine controlling
- Health & safety

Critical Evidences Required

The candidate needs to produce following critical evidences in order to be competent in this competency standard:

- Assignment 1: Create a design and use it for multipurpose printing i.e. screen, digital, heat transfer and inkjet focusing on the technicalities of each printing procedure and ensure health and safety precautions.
- Assignment 2: Create a design for Glass etching and use Laser cutting and etching technique focusing on health and safety precautions.



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- Assignment 3: Create the model of a cup using CNC modelling machine.

List of Tools & Equipment

- Soft wares
 - Auto Cad 2019
 - Auto desk 3Ds Max 2019
 - Adobe Illustrator CC 2019

List of Tools & Equipment

Soft wares

- Auto Cad 2018 or above
- Auto desk 3Ds Max 2018 or above
- Adobe Illustrator CS6 or above
- Adobe Photoshop CS6 or above
- Corel Draw X7 or above
- Laser cutting machine
- CNC Router machine
- Digital printer
- Screen Printing Setup
- Heat Transfer Printing unit



0722-M-36: Present a Final Project

Overview

This competency standard describes the skills and knowledge required to undertake a final project or a section of a larger project. It covers developing a project plan, administering and monitoring the project, finalizing the project and reviewing the project to identify lessons learned for application to future projects. This unit applies to individuals who play a significant role in ensuring a project meets timelines, quality standards, budgetary limits and other requirements set for the project.

Competency Units	Performance Criteria
II1. Initiate project	The trainee must be able to: P1. Form a group P2. Identify problem and opportunity for modification P3. Figure out scope and objectives P4. Check feasibility P5. Identify major deliverables
II2. Plan project	The trainee must be able to: P1. Create project plan clearly identifying • Timeline • Phases of project • Tasks to be performed • Possible constraints P2. Create workflow documents • Gather resources to complete tasks • Anticipate risks • Estimate budget
II3. Execute project	The trainee must be able to: P1. Assign tasks to team members P2. Brief team members on tasks P3. Communicate with team members P4. Monitor quality of work P5. Manage budget
II4. Close project	The trainee must be able to: P1. Analyze project performance P2. Analyze team performance P3. Analyze team results P4. Prepare project report P5. Conduct final analysis P6. Prepare statement of used and unused budget

Knowledge and Understanding

The trainee must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes:

- The knowledge to Ceramics Industry



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- The knowledge ability to Glass Industry

Critical Evidences Required

The trainee needs to produce following critical evidences in order to be competent in this competency standard:

- Project on Glass Industry
- Project on Ceramics Industry



0722-M-37: Perform Refractory Manufacturing

Overview

This competency standard describes the skills and knowledge required to manufacture different types of refractory products, with emphasis on specific skills required to perform batching, forming/pressing, firing, grading, and quality inspection of refractories as per applicable standards.

Competency Units	Performance Criteria
JJ1. Identify different refractory raw materials	<p>The trainee must be able to:</p> <p>P1. Identify the following raw materials for refractory manufacturing</p> <ul style="list-style-type: none">• Fire clay• Bauxite• Kyanite• Quartzite• Magnesite• Chromite• Zirconia
JJ2. Prepare different refractories	<p>The trainee must be able to:</p> <p>P1. Identify different types of refractories</p> <ul style="list-style-type: none">• Acidic refractories• Basic refractories• Neutral refractories• Insulating bricks <p>P2. Perform batching of raw materials for refractory manufacturing</p> <p>P3. Perform forming of refractory products by hydraulic pressing</p> <p>P4. Perform firing of pressed refractory products in kiln</p> <p>P5. Perform grading of refractory products</p> <p>P6. Perform housekeeping of the batching, forming, firing, and grading workstations</p> <p>P7. Evaluate the refractory manufacturing process as per applicable standards</p>
JJ3. Measure the properties of refractory bricks	<p>The trainee must be able to:</p> <p>P1. Measure the following properties of finished refractory products</p> <ul style="list-style-type: none">• Modulus of rupture• Cold crushing strength• Acid resistance• Slag resistance• Porosity



	<ul style="list-style-type: none">• Specific gravity• Chemical composition <p>P2. Perform housekeeping of the analytical lab P3. Maintain record of tests performed and testing reports generated</p>
JJ4. Classify refractories for different industries	<p>The trainee must be able to:</p> <p>P1. Identify the refractories used in the following industries</p> <ul style="list-style-type: none">• Steel and metallurgical industries• Cement industry• Glass industry• Chemical industry• Ceramics industry

Knowledge and Understanding

The trainee must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge and ability to:

- Describe the sources, grades, and properties of different raw materials used for refractory manufacturing
- Describe the properties of different types of refractories for industrial applications
- Explain the manufacturing process for different types of refractories (fire bricks, high-alumina fire bricks, insulating bricks)
- Describe the standard procedures for determination of various mechanical properties and chemical composition of refractories

Critical Evidences Required

The trainee needs to produce following critical evidences in order to be competent in this competency standard:

- Determine physical properties of a given sample of refractory brick (specific gravity, porosity)
- Determine mechanical properties of a given sample of refractory brick (modulus of rupture, cold crushing strength)
- Determine chemical properties of a given sample of refractory brick (acid resistance, slag resistance, chemical composition)
- Manufacture refractory bricks for a particular application (batching, forming/pressing and firing)

List of Tools & Equipment

This competency standard involves the following equipment:

S. No.	Equipment	Nos. Required
1	Thermal shock tester	1
2	Cold crushing strength equipment	1
3	Electric kiln	1
4	Weighing balance	1



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5	Platinum crucible with tip tongue	1
6	Hydraulic Press	1
7	Different Moulds for different sizes	10
8	Dryer	1
9	Tunnel Kiln	1
10	Ball Mill	1
11	Sieves of different sizes	15
12	Pin Mill	1



0722-M-38: Communicate Effectively with Others

Overview

This unit is concerned with the competencies required to carry out a range of communication functions to enable effective transfer of information. It describes the skills and knowledge required to use advanced and specialized communication skills in the client-counselor relationship. This unit applies to individuals whose job role involves working with others on personal and organizational level within established policies, procedures and guidelines.

Competency Units	Performance Criteria
KK1. Communicate effectively in workgroup	You must be able to: P1. Assess and interpret the issues to provide relevant advice to group members P2. Negotiate, mediate and resolve the issues, problems and conflicts within the group P3. Conduct meetings, briefings and group working sessions to increase the level of participation in the group processes P4. Communicate messages to group members clearly and inform to ensure interpretation is valid P5. Communicate style and manner to reflect professional standards and awareness of appropriate cultural practices
KK2. Communicate in writing	You must be able to: P1. Draft, edit, revise and correct all written communication to ensure compliance with organisational guidelines and define time frames prior to submission or presentation P2. Apply computer technology to produce high quality written material P3. Take account of written material to cultural differences and requirements
KK3. Coordinate teamwork	You must be able to: P1. Seek and encourage the work contributions and suggestions from work group P2. Acknowledge the contributions to workgroup operations and deal the suggestions constructively P3. Use and develop the workgroup skills according to work requirements P4. Consult the workgroup about implementing new work practices P5. Address the conflict between team members in accordance with current personnel practices P6. Inform the team about the objectives and standards required



	<p>P7. Provided regular constructive feedback on all aspects of work performance to individuals and team</p> <p>P8. Encourage and support the team in applying skills and knowledge in the workplace</p>
<p>KK4. Provide leadership direction and guidance to the workgroup</p>	<p><i>You must be able to:</i></p> <p>P1. Endorse and communicate the link between the function of the group and the goals of the organisation</p> <p>P2• Obtain the participative decision making routinely to develop, implement and review work of the group and to allocate responsibilities where appropriate</p> <p>P3• Develop new and innovative work practices and strategies by giving opportunities and encouragement to others</p> <p>P4• Identify and resolve the conflict with minimum disruption to work group function</p> <p>P5• Provide the workgroup with the support and supervision necessary to perform work safely and without risk to health</p>

Knowledge & Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes;

- The knowledge of effective communication in workgroup
- The knowledge of communication through writing
- The knowledge of the importance of teamwork

Critical Evidences Required

The candidate needs to produce following critical evidences in order to be competent in this competency standard through:

Class presentations

Roll play

Group Projects

Quizzes

List of Tools & Equipment

- Paper
- Pen



0722-M-39: Undertake small business planning

Overview

This competency standard describes the skills and knowledge required to research and explore a wide variety of glass raw materials, their influence on the quality of glass, composition of different types of glasses, batch calculations and preparation, and equipment for size reduction, mixing, and safe handling and storage.

Competency Units	Performance Criteria
<p>LL1. Identify elements of the business plan</p>	<p>The trainee must be able to:</p> <p>P1. Identify purpose of the business plan</p> <p>P2. Identify and review essential components of the business plan</p> <p>P3. Identify and document business goals and objectives as a basis for measuring business performance</p> <ul style="list-style-type: none"> • Oxidizing agents • Reducing agents • Refining agents <p>P4. Identify factory and foreign cullet</p>
<p>LL2. Develop a business plan</p>	<p>The trainee must be able to:</p> <p>P1 Conduct a market survey to collect following information</p> <ul style="list-style-type: none"> ✓ Customer /demand ✓ Tools, equipment, machinery and furniture with rates ✓ Raw material ✓ Supplier ✓ Credit / funding sources ✓ Marketing strategy ✓ Market trends ✓ Overall expenses ✓ Profit margin <p>P2 Select the best option in terms of cost, service, quality, sales, profit margin, overall expenses</p> <p>P3 Compile the information collected through the market survey, in the business plan format</p>
<p>LL3. Develop strategies for minimizing risks</p>	<p>The trainee must be able to:</p> <p>P1. Identify specific interests and objectives of relevant people and seek and confirm their support of planned business direction</p> <p>P2. Identify and develop risk management strategies according to business goals and objectives, and relevant legal requirements</p> <p>P3. Develop a contingency plan to address possible areas of non-conformance with the plan</p>



LL4 Plan & Organise Work	P1 Set objectives and plan work activities P2 Plan and schedule work activities P3 Implement work plans P4 Monitor work activities P5 Review and evaluate P6 work plans and activities
LL5 Collect information regarding funding sources	P1 Identify the available funding sources based on their terms and conditions, maximum loan limit, payback time, interest rate P2 Choose the best available option according to investment requirement P3 Prepare documents according to the loan agreement requirement P4 Include the information of funding sources in the business plan
LL6 Develop a marketing plan	P1. Make a marketing plan for the business including product, price, placement, promotion, people, packaging and positioning P2. Include the information of marketing plan in the business plan

Knowledge and Understanding

The trainee must be able to demonstrate underpinning knowledge and understanding required to carry out the tasks covered in this competency standard. This includes the knowledge and ability to:

- Discuss all government legislative requirements relating to business operation, especially in regard to WHS and environmental issues, equal employment opportunity, industrial relations and anti-discrimination
- explain methods of evaluation
- Summarise WHS responsibilities and procedures for identifying hazards relevant to the business
- outline planning processes
- describe preparation of a business plan
- identify principles of risk management relevant to small business planning
- outline common risks particular to the small business type or industry
- explain reasons for, and benefits of, business planning
- clarify relevant industry codes of practice
- outline setting goals and objectives
- Explain types of business planning feasibility studies; strategic, operational, financial and marketing planning.
- : Explain the 7ps of marketing including product, price, placement, promotion, people, packaging and positioning



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- Define different modes of communication and their application in the industry
- K1: Explain Communication skills:
 - sharing information,
 - listening and understanding,
 - negotiation,
 - facilitation and team collaboration
- K2: Explain the ways of conducting team meetings
- K3: List down motivation skills
- K4: Outline the organization’s strategic plan, policies rules and regulations, laws and objectives for work unit activities and priorities
- K5: Outline organizations policies, strategic plans, guidelines related to the role of the work unit
- K6: Explain team dynamics and facilitation processes
- K7: Describe the following
 - Organizing
 - Planning
 - Presentation skills
 - Team work and consultation strategies
 -
- Enlist specific business terms used in the industry
- Enlist the available funding sources
- Explain how to get loan to start a new business
- Explain market survey and its tools e.g: questionnaire, interview, observation etc
- Describe the market trends for specific product offering
- State the main elements of business plan
- Explain how to fill the business plan format

Critical Evidences Required

The trainee needs to produce following critical evidences in order to be competent in this competency standard:

Evidence gathered demonstrates consistent performance of typical activities experienced in the Management and Leadership Small and Micro Business field of work and include access to:

- business equipment and resources
- relevant legislation, regulations, standards and codes
- relevant workplace documentation and resources
- case studies or where possible, real situations
- Interaction with others.



0722-M-40: Manage Human Resources

Overview

This unit describes the skills and knowledge required to plan, manage and evaluate delivery of human resource services, integrating business ethics. It applies to individuals with responsibility for coordinating a range of human resource services across an organization. They may have staff reporting to them.

Unit of Competency	Performance Criteria
MM1 Determine strategies for delivery of human resource services	<p>P1 Analyze business strategy and operational plans to determine human resource requirements</p> <p>P2 Review external business environment and likely impact on organization’s human resource requirements</p> <p>P3 Consult line and senior managers to identify human resource needs in their areas</p> <p>P4 Review organization’s requirements for diversity in the workforce</p> <p>P5 Develop options for delivery of human resource services that comply with legislative requirements, organizational policies and business goals</p> <p>P6 Develop and agree on strategies and action plans for delivery of human resource services</p>
MM2 Manage the delivery of human resource services	<p>P1 Develop and communicate information about human resource strategies and services to internal and external stakeholders.</p> <p>P2 Develop and negotiate service agreements between the human resource team, service providers and client groups</p> <p>P3 Document and communicate service specifications, performance standards and timeframes</p> <p>P5 Agree on, and arrange monitoring of quality assurance processes</p> <p>P6 Ensure that services are delivered by appropriate providers, according to service agreements and operational plans</p> <p>P8 Identify appropriate return on investment of providing human resource services</p>
MM3 Evaluate human resource service delivery	<p>P1 Establish systems for gathering and storing information needed to provide human resource services</p> <p>P2 Survey clients to determine level of satisfaction</p> <p>P3 Analyze feedback and surveys and recommend changes to service delivery</p> <p>P4 Evaluate and rectify underperformance of human resource team or service providers</p>



	P5 Obtain approvals to variations in service delivery from appropriate managers P6. Support agreed change processes across the organization
MM4 Manage integration of business ethics in human resource practices	P1 Ensure personal behavior is consistently ethical and reflects values of the organization P2 Ensure code of conduct is observed across the organization, and its expectations are incorporated in human resource policies and practices P3 Observe confidentiality requirements in dealing with all human resource information P4 Deal promptly with unethical behavior P5 Ensure all persons responsible for human resource functions understand requirements regarding their ethical behavior

Knowledge and Understanding

The candidate must be able to demonstrate underpinning knowledge and understanding required to carry out tasks covered in this competency standard. This includes the knowledge of:

K1: identify the key provisions of legal and compliance requirements that apply to managing human resources

K2: summarize the organization’s code of conduct

K3: explain human resource strategies and planning processes and their relationship to business and operational plans

K4: describe performance and contract management

K5: explain how feedback is used to modify the delivery of human resources.

Critical Evidence(s) Required

The candidate needs to produce following critical evidence(s) to be competent in this competency standard:

A person who demonstrates competency in this unit must be able to provide evidence of the ability to manage human resource services. The evidence should integrate employability skills with workplace tasks and job roles and verify competency is able to be transferred to other circumstances and environments.

Performance requirements

This competency is to be assessed using standard and authorized work practices, safety requirements and environmental constraints. Demonstrated evidence is required of the ability to:

plan and manage human resource delivery within legislative, organizational and business ethics frameworks

communicate effectively with a range of senior personnel

identify and arrange training support where appropriate

Calculate human resource return on investment within the organization.

K1: Explain Communication skills:

sharing information,



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listening and understanding,
negotiation,
facilitation and team collaboration
K2: Explain the ways of conducting team meetings
K3: List down motivation skills
K4: Outline the organization's strategic plan, policies rules and regulations, laws and objectives for work unit activities and priorities
K5: Outline organizations policies, strategic plans, guidelines related to the role of the work unit
K6: Explain team dynamics and facilitation processes
K7: Describe the following
Organizing
Planning
Presentation skills
Team work and consultation strategies

Critical Evidence(s) Required

- The candidate needs to produce following critical evidence(s) to be competent in this competency standard:
- A person who demonstrates competency in this unit must be able to provide evidence of the ability to plan and organize work. The evidence should integrate employability skills with workplace tasks and job roles and verify competency is able to be transferred to other circumstances and environments.

Performance requirements

- This competency is to be assessed using standard and authorized work practices, safety requirements and environmental constraints. Evidence of the following is essential:
 - implemented work plans;
 - monitored work activities;
 - planned and scheduled work activities;
 - reviewed and evaluated work plans and activities; and
 - Set objectives.
-



National Competency Standards Level-5 for “Glass & Ceramics Technology”



Islamabad 31st May, 2019

NOTIFICATION

No. F. 5(13)/2018-DD (TE): In pursuance of sub-section (d) of section-6" Functions of the Commission" National Vocational & Technical Training Commission (NAVTTTC) Act-2011, NAVTTTC is pleased to approve and notify following qualifications in twenty (20) trades for Level 1-5 under National Vocational Qualification Framework (NVQF), which have been developed in compatibility with latest global trends in the fields and fulfilling requirements of competency based training and assessment (CBT&A) system. The qualifications have been developed and validated in collaboration with TEVTAs, QABs, industry and other relevant stakeholders: -

S#	National Vocational Qualifications
1.	National Qualification Level-5 diploma in Automobile Technology
2.	National Qualification Level-5 diploma in Civil Technology
3.	National Qualification Level-5 diploma in Construction Technology
4.	National Qualification Level-5 diploma in Information & Commutation Technology (ICT)
5.	National Qualification Level-5 diploma in Garment Manufacturing Technology
6.	National Qualification Level-5 diploma in Glass & Ceramics Technology
7.	National Qualification Level-5 diploma in Electronics Technology
8.	National Qualification Level-5 diploma in Instrumentation Technology
9.	National Qualification Level-5 diploma in Computer Aided Design & Manufacturing (CAD /CAM)
10.	National Qualification Level-5 diploma in Mechanical Technology
11.	National Qualification Level-5 diploma in Graphics Designing
12.	National Qualification Level-5 diploma in Heating, Ventilation, Air-conditioning & Refrigeration (HVACR) Technology
13.	National Qualification Level-5 diploma in Media Production
14.	National Qualification Level-5 diploma in Hotel Management
15.	National Qualification Level-5 diploma in Professional Chef
16.	National Qualification Level-5 diploma in Tourism Management



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17.	National Qualification Level-5 diploma in Hair & Beauty Services
18.	National Qualification Level-5 diploma in Fashion Designing
19.	National Qualification Level-5 diploma in Ceramics Technology
20.	National Qualification Level-5 diploma in Telecom Technology

2. All the TVET related institutions / organizations are required to implement aforementioned qualifications so that a uniform and standardized TVET qualification system is established in Pakistan and efforts are made for international equivalence / recognition of these qualifications.

3. Competency Standards of the above enlisted qualifications can be accessed at NAVTTC's website (www.navttc.org).

(Muqem Islam)

Director General (Skill Standards & Curricula)

Phone: 051-9215385

Distribution:

1. Federal Secretary, Ministry of Federal Education & Professional Training, Govt of Pakistan
2. Federal Secretary, Ministry of Overseas Pakistanis and Human Resource Development, Govt of Pakistan, Islamabad
3. Federal Secretary, Ministry of Industry and Production, Govt of Pakistan, Islamabad
4. Federal Secretary, Ministry of Textile Industry, Govt of Pakistan, Islamabad
5. Federal Secretary, Ministry of Commerce, Govt of Pakistan, Islamabad
6. Federal Secretary, Ministry of Railway, Govt of Pakistan, Islamabad
7. Federal Secretary, Ministry of Climate Change, Govt of Pakistan, Islamabad
8. Federal Secretary, Ministry of Religious Affairs, Govt of Pakistan, Islamabad
9. Federal Secretary, Ministry of Communication, Govt of Pakistan, Islamabad
10. Federal Secretary, Ministry of Aviation Division, Govt of Pakistan, Islamabad



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11. Federal Secretary, Ministry of Science & Technology, Govt of Pakistan, Islamabad
12. Chairperson, Punjab Technical Education and Vocational Training Authority (P-TEVTA), Lahore
13. Managing Director, Khyber Pakhtunkhwa Technical Education and Vocational Training Authority (KP-TEVTA),
14. Managing Director, Sindh Technical Education and Vocational Training Authority (S-TEVTA), Karachi
15. Chairman, Azad Jammu & Kashmir, Technical Education and Vocational Training Authority (AJ&K TEVTA), Muzafarabad
16. Director TVET Cell, Gilgit Baltistan, Gilgit
17. Director General, Punjab Vocational Training Council (PVTC), Punjab
18. Managing Director, Technology Upgradation and Skill Development Company (TUSDEC) Lahore
19. Project Director, Punjab Skill Development Program (PSDP) Lahore
20. CEO, Punjab Skill Development Fund, Lahore
21. Rector, UNTECH University Islamabad
22. National Deputy Leader, GIZ Islamabad
23. PS to Minister of Federal Education & Professional Training, Govt of Pakistan
24. PS to Special Adviser to the Prime Minister on Youth Affairs, Prime Minister's Office, Islamabad
25. Chairperson, Federal of Pakistan Chamber of Commerce and Industry (FPCCI), Karachi
26. Conveyor, Sector Skills Council (Textile/ Construction/ Renewable Energy/ Hospitality and Tourism)
27. Director Technical Education and Vocational Training Authorities (TEVTA), Balochistan
28. Chairman, Pakistan Tourism Development Corporation, Lahore
29. Chairman, PCSIR Headquarters, Islamabad
30. Director General, Pakistan Forest Institute, Peshawar
31. Chairman, Wafaq ul Madaris, Multan
32. Director General, Staff Welfare, Islamabad
33. Director General, NISTE Capital Administration and Development Division, Islamabad
34. Director General, National Training Bureau, Islamabad
35. Chairmen, Provincial Technical Education Boards



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36. Chairmen, Provincial Trade Testing Boards

37. Secretary, IBCC, Islamabad: *with the request that National qualifications of Level 5 diploma in the aforementioned trades may be considered equivalent to Diploma of Associate Engineer/HSSC after inclusion of compulsory courses in the light of IBCC general requirement.*

Copy for information to: -

1. DG (P&D)/(A&F)/ (A&C) (S&C) NAVTTC
2. Director General(s), NAVTTC Regional Office(s).
3. Sr. Technical Advisor, TSSP-GIZ
4. Staff Officer to Chairman, NAVTTC
5. PS to Executive Director, NAVTTC Islamabad
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