



National Vocational Certificate level 2, in (Gems& Jewellery Sector) “GEMSTONE CARVING”



National Vocational and Technical Training Commission (NAVTTTC)
Government of Pakistan



TABLE OF CONTENTS

Contents

1. TITLE OF QUALIFICATION	3
2. INTRODUCTION.....	3
3. PURPOSE OF THE QUALIFICATION	5
4. MAIN OBJECTIVES OF THE QUALIFICATION.....	5
5. DATE OF VALIDATION	6
6. CODES OF QUALIFICATIONS.....	6
7. MEMBERS OF QUALIFICATIONS DEVELOPMENT COMMITTEE	7
8. ENTRY REQUIREMENTS	8
9. SUMMARY OF COMPETENCY STANDARDS	8
Competency Standard A: Prepare Cabochon Manually	9
Competency Standard B: Prepare Cabochon with Auto Cab Making Machine.....	12
Competency Standard C: Sanding and Polishing of Cabochon	14
Competency Standard D: Perform basic carving work	16
Competency Standard E: Perform advance carving work.....	18
Competency Standard F: Perform sanding and polishing of carving work.....	20



1. TITLE OF QUALIFICATION

National Vocational Certificate level 2, in (Gems and Jewellery Sector)
“Gemstone Carving”

2. INTRODUCTION

The National Competency Standards are written specifications of skill and knowledge competencies required in a particular trade. The competency standards are developed in collaboration with United Nations Industrial Development Organization (UNIDO), GIZ and National Vocational & Technical Training Commission (NAVTTTC).

Industry experts from the relevant industries from different geographical locations across Pakistan were consulted during the development process of these competency standards to ensure input and ownership of all the stakeholders. NAVTTTC approves these competency standards on the recommendation of Industry Advisory Group (IAG) for the Gems and Jewelry sector.

The National Competency Standards could be used as a referral document for the development of curricula to be used by training institutions.

Training in the course is based on defined competency standards, which are industry oriented, here the traditional role of a trainer changes and shifts towards the facilitation to trainees. A trainer encourages and assists trainees to learn for themselves. Trainees are likely to work in groups (pairs) and all doing something different. Some are doing practical tasks in the workshop, some writing, some not even in the classroom or workshop but in another part of the building using specialist equipment, working on computers doing research on the Internet or the library. As trainees learn at different pace they might well be at different stages in their learning, thus learning must be tailored to suit individual needs. The following facilitation methods (teaching strategies) are generally employed:



- **Direct Instruction Method:** This might be effective when introducing a new topic to a larger group of trainees in a relative short amount of time. In most cases this method relies on one-way communication, hence there are limited opportunities to get feedback on the trainee's understanding.
- **Discussion Method:** This allows trainees to actively participate in sharing knowledge and ideas. It will help the trainer to determine whether trainees understand the content of the topic. On the other hand, there is a possibility of straying off topic under discussion and some trainees dominating others on their views.
- **Small Group Method:** Pairing trainees to help and learn from each other often results in faster knowledge/skill transfer than with the whole class. The physical arrangement of the classroom/workshop and individual assessment may be challenging. Analogy method should be incorporated.
- **Problem Solving Method:** This is a very popular teaching strategy for the training. Trainees are challenged and are usually highly motivated when they gain new knowledge and skills by solving problems (Contingency skills). Trainees develop critical thinking skills and the ability to adapt to new learning situations (Transfer skills). It might be time consuming and because trainees sometimes work individually, they may not learn all the things that they are expected to learn.
- **Research Method:** This is used for workshops and laboratory tasks, field experiments, and case studies. It encourages trainees to investigate and find answers for themselves and to critically evaluate information. It however requires a lot of time and careful planning of research projects for the trainee.

Detail of the competency standards included in this qualification is given below:

National Vocational Certificate level 2, in Gems and Jewellery Sector “Gemstone Carving”



- A. Prepare cabochon manually
- B. Prepare with auto cab making machine
- C. Sanding and polishing of cabochon
- D. Basic carving work
- E. Advance carving work
- F. Sanding and polishing of carving work

3. PURPOSE OF THE QUALIFICATION

The purpose of the training is to provide skilled manpower for the value addition on gemstone of the existing Gems and Jewellery sector and related industry. This will improve the abilities and accreditation of a Gemstone Carving Expert in terms of national and international standards applicable in the field of Gemstone Carving. The availability of quality Gemstone Carving Experts in the local and international markets will ultimately bring economic benefits to the producers and processors.

The core purpose of this qualification is to produce employable Gemstone Carving Experts, who could provide advanced Services of using advanced techniques for Carving on gemstones. In addition this qualification will prepare youth to be employee in Gemstone industry or work as an entrepreneur. To prepare and train students through skill training and enabling them to earn their living either through employment in industry or to be self-employed as Gemstone Carving Expert.

4. MAIN OBJECTIVES OF THE QUALIFICATION

Gemstone carving qualification consists of theoretical and practical details required for the identification, carving and Polishing of precious, semi-precious, raw or polished gemstone. The main objectives of the qualification are as follows:

1. Prepare cabochon manually
2. Prepare cabochon with auto cab making machine
3. Sanding and polishing of cabochon
4. Basic carving work
5. Advanced carving work
6. Sanding and polishing of carving work



5. DATE OF VALIDATION

The level 2 of national vocational qualification on Gems and Jewellery Sector – Gemstone Carving, has been validated by the Qualifications Development Committee (QDC) members on May 2018 and will remain in currency until May 2021

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 Gemstone Carver	
Code	Description
0214G&J2	National Vocational Certificate level 2 in Gems and Jewelry Sector – Gemstone Carving”



7. MEMBERS OF QUALIFICATIONS DEVELOPMENT COMMITTEE

The following members participated in the qualifications development and validation of these qualifications:

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8. ENTRY REQUIREMENTS

The entry for National Vocational Certificate level 2, in (Gems and Jewellery Sector) “Gemstone Carving” is given below:

Entry for assessment for this qualification is open. However, entry into formal training institutes, based on this qualification may require skills and knowledge equivalent to middle (Grade 8).

9. SUMMARY OF COMPETENCY STANDARDS

Code	Competency Standards	Level	Credits	Category
0214G&J2 A	Prepare cabochon manually	2	12	Technical
0214G&J2 B	Prepare cabochon with auto cab making machine	3	8	Technical
0214G&J2 C	Perform sanding and polishing of cabochon	2	12	Technical
0214G&J2 D	Perform basic carving work	2	20	Technical
0214G&J2 E	Perform advanced carving work	3	20	Technical
0214G&J2 F	Perform sanding and polishing of carving work	3	8	Technical
	TOTAL	2	80	6 months



Competency Standard A: Prepare Cabochon Manually

Overview: This competency standard covers the skills and knowledge required to prepare cabochon manually, through marking and Sawing stone, Template marking, preparing stone for cab making and Doping and course grinding of stone.

Competency Units	Performance Criteria	Knowledge & Understanding
A1: Perform marking and Sawing stone	<i>Trainee will be able to:</i> P1. Judge stone for process P2. Remove unwanted areas with plier and trim saw machine as required P3. Perform marking as per requirements P4. Sawing of stone as per requirement.	Trainee will be able to know: K1. Introduction to gemstones K2. Basic terminology of relating with gemstone carving industry K3. Types and characteristics of different stone used in carving and their habit K4. Introduction to sawing machine and other related tools K5. Procedure and process of gemstone sawing K6. Safety measures of gemstone sawing
A2: Perform Template marking	<i>Trainee will be able to:</i> P1. Identify fair and appropriate surface of the stone for marking the shape P2. Mark stone with the help template for cabochon	Trainee will be able to know: K1. Introduction of Geometry shapes K2. Procedure of marking points K3. Understanding of templates marking techniques K4. Understanding of reflection, refraction, color, luster
A3: prepare stone for cab making	<i>Trainee will be able to:</i> P1. Select appropriate tools and machine for cab making P2. Ensure adequate water supply for cutting process P3. Adjust machine according to requirement	Trainee will be able to know: K1. Types of stone grinding machines and their operations K2. Types of stone grinding materials, Tools, and their uses K3. Uses of water during stone cutting process



	P4. Adopt safety precautions and measures during work to avoid accident	K4. Safe precaution during grinding of stones
A4: Perform Doping and course grinding of stone	<i>Trainee will be able to:</i> P1. Arrange material for doping process P2. Fix the stone on dope stick P3. Make Smooth surface of stone as per requirement P4. Verify doped stone according to requirement P5. Perform course grinding at grit #180/#220/#260/#320 wheel	<i>Trainee will be able to know:</i> K1. Accurate position of stone during doping K2. Color, luster, reflection of the gemstone from the surface K3. Course Gridding grit (#180, #220, #260, #320) K4. Fine grinding grit (600)

Critical Evidence(s) Required

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

- Marking and Sawing of stone
- Template marking
- Preparing stone for cab making
- Doping and course grinding of stone.

Tools and equipment required

- Light source
- Aluminum pencil or permanent Marker
- Plier diamond cutter.
- Trim saw Machine
- Trim saw Blade as per requirement
- Template with difference 6, 4 and 2 in oval shapes
- Faceting unite machine for smooth work



- leather lap, rubber lap with abrasive and water for soft stone
- Use hard buff with different diamond powder 0-2 mix with olive oil for hardness 7 and above
- Sprit, sprit lamp
- Doping wax, dipsticks
- Wheel and laps



Competency Standard B: Prepare Cabochon with Auto Cab Making Machine

Overview: This competency standard covers the skills and knowledge required to prepare cabochon with auto cab making machine, through marking and Sawing stone, preparing of stone for cab making, Performing of Doping and Preparing of cabochon on auto cab machine

Competency Units	Performance Criteria	Knowledge & Understanding
B1: Perform marking and Sawing stone	<i>Trainee will be able to:</i> P1. Judge stone for process P2. Remove unwanted areas with plier and trim saw machine as required P3. Perform marking as per requirements P4. Sawing of stone as per requirement	Trainee will be able to know: K1. Introduction to gemstones K2. Basic terminology of relating with gemstone carving industry K3. Types and characteristics of different stone used in carving and their habit K4. Introduction to sawing machine and other related tools K5. Procedure and process of gemstone sawing K6. Safety measures of gemstone sawing
B2: prepare stone for cab making	<i>Trainee will be able to:</i> P1. Select appropriate tools and machine for cab making P2. Ensure adequate water supply for cutting process P3. Adjust machine according to requirement P4. Adopt safety precautions and measures during work to avoid accident	Trainee will be able to know: K1. Types of stone grinding machines and their operations K2. Types of stone grinding materials, Tools, and their uses K3. Uses of water during stone cutting process K4. Safe precaution during grinding of stones
B3: Perform Doping	<i>Trainee will be able to:</i> P1. Arrange material for doping process P2. Fix the stone on dope stick P3. Fixing of doped stone in auto cab making machine	Trainee will be able to know: K1. Accurate position of stone during doping K2. Color, luster, reflection of the gemstone from the surface K3. Knowledge about fixing of doped stone in auto cab machine



		K4. Knowledge about templates and their alignments
B4: Prepare cabochon on auto cab machine	<i>Trainee will be able to:</i> P1. Select appropriate tools and machine P2. Ensure adequate water supply for cutting process P3. Adjust machine according to template P4. Fix stone as per template alignment P5. Execute the auto cab making process P6. Adopt to safety precautions and measures	Trainee will be able to know: K1. Cab making Machine operation K2. Cab making Machine templates as per requirement

Critical Evidence(s) Required

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

- Marking and Sawing stone
- Preparing of stone for Cab making
- Performing of Doping and
- Preparing of cabochon on auto cab machine

Tools and equipment required

- Trim saw machine with different types of blade as per requirement
- Abrasive wheel, grit 400 and 600 “cut off disc”
- Plier with diamond coated tips
- Aluminum pencil or permanent marker
- Doping wax and dop sticks
- sprit, sprit lamp



Competency Standard C: Sanding and Polishing of Cabochon

Overview: This competency standard covers the skills and knowledge required to Perform sanding on Cab stone, Perform sanding with tumbler machine and to Perform polishing with tumbler machine,

Competency Units	Performance Criteria	Knowledge & Understanding
C1: Perform sanding on Cab stone	Trainee will be able to: P1. Remove the stone from auto Cab machine P2. Perform sanding on the stone with 400 sanding paper according to requirement P3. Perform sanding on the stone with 600 sanding paper according to requirement P4. Perform sanding on the stone with 1000 sanding paper according to requirement	Trainee will be able to know: K1. Sanding process K2. Types of waterproof sanding papers (#320, #400, #600 and #1000) K3. Usage of sanding paper K4. Fix rubber lap on master lap and also fix sanding paper as per requirement
C2: Perform sanding with tumbler machine	Trainee will be able to: P1. Select appropriate sanding media and stone according to defined ratio P2. Fill the sanding abrasive according to defined ratio of material and media P3. Add media with 600 abrasive to remove scratch P4. Add media with 1000 abrasive to remove scratch P5. Adopt safety measures according to requirement	Trainee will be able to know: K1. Understand the tumbler machine as per its capacity K2. Usage of abrasive and media



C3: Perform polishing with tumbler machine	<i>Trainee will be able to:</i> P1. Select appropriate polishing media and stone according to defined ratio P2. Fill the polishing abrasive according to defined ratio of material and media P3. Add media with abrasive 600 (Aluminum oxide) for pre polish P4. Add media with abrasive 1000 (Aluminum oxide) for pre polish P5. Add media with abrasive chrome oxide P6. Adopt safety measures according to requirement	Trainee will be able to know: K1. Understand the tumbler machine for polishing as per its capacity K2. Usage of abrasive and media K3. Understand the time required for completion of the process
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Critical Evidence(s) Required

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

- Setting of tumbler machine for polishing
- Perform sanding on Cab stone
- Perform sanding with tumbler machine
- Perform polishing with tumbler machine

Tools and equipment required

- Diamond powder (0-2)
- Sanding paper waterproof (400, 600, 1000)
- Chrome oxide, cerium oxide and aluminum oxide
- Leather lap, rubber lap, buff



Competency Standard D: Perform basic carving work

Overview: This competency standard covers the skills and knowledge required to Extract required shape for basic carving from stone and to perform basic carving.

Competency Units	Performance Criteria	Knowledge & Understanding
D1: Extract required shape for basic carving from stone	<i>Trainee will be able to:</i> P1. Perform pre marking on stone P2. Perform removal of unwanted edge of stone as per marking P3. Finalize the basic shape on stone P4. Ensure adequate water supply for stone cutting process to remove unwanted stone P5. Adopt safety precautions and measures	Trainee will be able to know: K1. Stone carving tools, machine and their operations K2. Safety Measures. - During training used optics and goggles - Wears gloves and apron during work.
D2: perform basic carving	<i>Trainee will be able to:</i> P1. Select appropriate tools and machine for basic carving process P2. Install the carving tools in carving machine as per the requirement of the design P3. Perform course grinding with grinding wheels P4. Perform basic carving	Trainee will be able to know: K1. Use of stone grinding machine and its operations K2. Types of stone grinding materials, Tools, and their uses

Critical Evidence(s) Required

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



- Setting of Carving machines
- Extract required shape for basic carving from stone and
- Perform basic carving as per instructions/ assignment.

Tools and equipment required

- Carving Machine
- Flexible shaft Machine
- Trim saw machine 6"-8" blade
- Diamond coated carving tools kit
- Trim saw and blades



Competency Standard E: Perform advance carving work

Overview: This competency standard covers the skills and knowledge required to develop 3d design with china clay, Extract required shape for advance carving from stone and to Perform advance carving.

Competency Units	Performance Criteria	Knowledge & Understanding
E1: develop 3d design with china clay	<i>Trainee will be able to:</i> P1. Select appropriate tools and machine P2. Develop prototype model with china clay according to design	Trainee will be able to know: K1. 3D carving procedures K2. 3D stone carving tools, machine and their operations K3. Understand 3D designing
E2: Extract required shape for advance carving from stone	<i>Trainee will be able to:</i> P1. Perform pre marking on stone P2. Perform removal of unwanted edge of stone as per marking P3. Finalize the 3D shape on stone P4. Ensure adequate water supply P5. Adopt safety precautions and measures	Trainee will be able to know: K1. Stone carving tools, machine and their operations
E3: Perform advance carving	<i>Trainee will be able to:</i> P1. Select appropriate tools and machine P3. Mark points to stone according to model design P6. Hold the stone carefully to avoid damage P7. Perform shaping as per model design to stone according to requirement	Trainee will be able to know: K1. Knowledge about 3D designing K2. 3D stone carving tools, machine and their operations K3. 3D carving procedures



Critical Evidence(s) Required

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

- Setting of tools and equipment
- Develop 3d design with china clay
- Extract required shape for advance carving from stone and
- Perform advance carving as per requirements/ assignment

Tools and equipment required

- Carving Machine
- Flexible shaft Machine
- Trim saw machine 6"-8" blade
- Diamond coated carving tools kit
- Trim saw and blades
- China clay
- Plier with diamond coated tips
- Clamping device for holding stone



Competency Standard F: Perform sanding and polishing of carving work

Overview: This competency standard covers the skills and knowledge required to perform sanding on stone and to perform polishing on stone

Competency Units	Performance Criteria	Knowledge & Understanding
F1: Perform sanding on stone	<i>Trainee will be able to:</i> P1. Use the flexible shaft machine for sanding process P2. Use the small disk of silicone carbide for engraving carve lines P3. Perform sanding on the stone with 400 sanding wheel according to requirement P4. Perform sanding on the stone with 600 sanding wheel according to requirement P5. Perform sanding on the stone with 1000 sanding wheel according to requirement P5. Use the abrasive for sanding with rubber wheel if required	Trainee will be able to know: K1. Sanding process K2. Types of sanding wheel (#600 and #1000) K3. Usage of sanding wheel K4. Understand the types and use of buffs
F2: Perform polishing on stone	<i>Trainee will be able to:</i> P1. Use the flexible shaft machine for polishing process P2. Use the small disk of cotton, rubber, leather and wooden with polishing abrasive for engraving carve lines P3. Perform polishing on the stone with required laps and polishing abrasive (aluminum oxide 600 for pre polish) P3. Perform polishing on the stone with required laps and polishing abrasive (aluminum oxide 1000 for	Trainee will be able to know: K1. polishing process K2. Types and usage of polishing wheel K4. Understand the types and use of buffs



	pre polish) P4. Perform polishing of stone with cotton buff and diamond powder (0-2)	
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Critical Evidence(s) Required

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

- Perform sanding on stone
- Perform polishing on stone

Tools and equipment required

- Diamond powder (0-2)
- Sanding paper waterproof (400, 600, 1000)
- Chrome oxide, cerium oxide and aluminum oxide
- Leather lap, rubber lap, buff
- Flexible shaft machine
- Small disk of silicon carbide
- Sanding wheel, 400, 600 and 1000
- Aluminum oxide (600, 1000)
- Cotton and leather buff