

QUALIFICATIONS PACK - OCCUPATIONAL STANDARDS FOR GEMS & JEWELLERY INDUSTRY

What are Occupational Standards(OS)?

- OS describe what individuals need to do, know and understand in order to carry out a particular job role or function
- OS are performance standards that individuals must achieve when carrying out functions in the workplace, together with specifications of the underpinning knowledge and understanding

Contact Us:
GJSCI, Mumbai

E-mail: coo@gjsi.org



Contents

1. Introduction and Contacts.....P1
2. Qualifications PackP2
3. OS Units.....P3
4. Glossary of Key Terms.....P16
5. Nomenclature of QP & NOS.....P18

Introduction

Qualifications Pack – Gold Refiner

SECTOR: GEMS & JEWELLERY

SUB-SECTOR: Cast and Diamonds-Set Jewellery

OCCUPATION: Gold Refining

REFERENCE ID: G&J/Q3401

ALIGNED TO: NCO-2004/7313.18

Gold Refiner: Also known as 'Refiner', in the cast and diamond-set jewellery manufacturing, the Gold Refiner recovers gold from scrap using refining techniques.

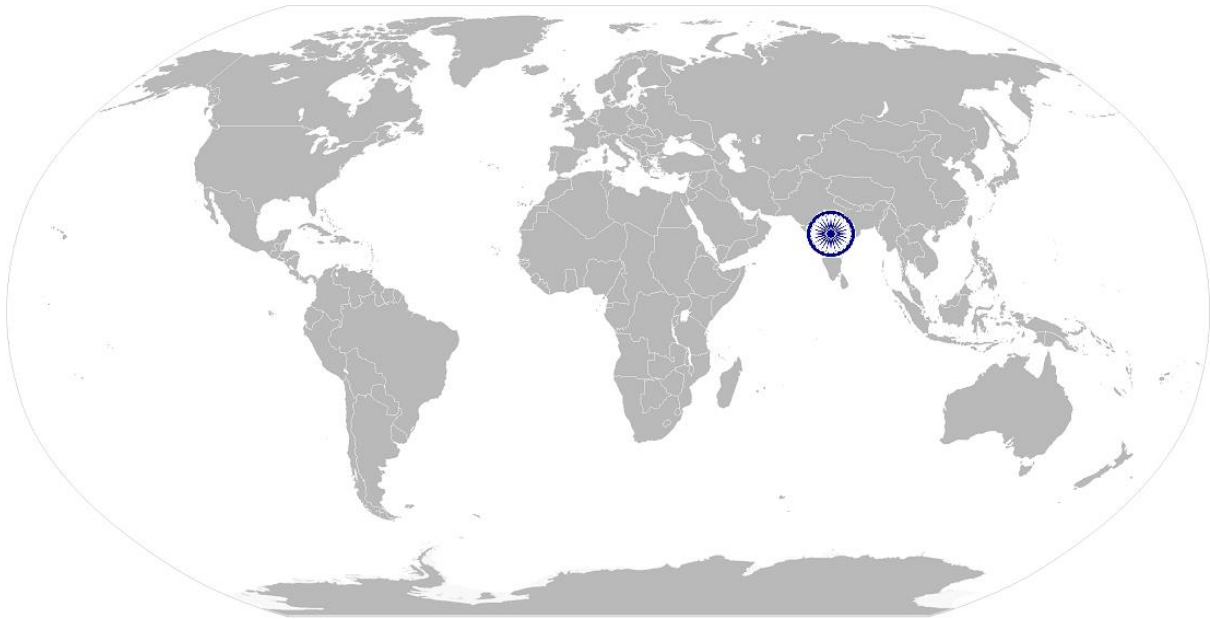
Brief Job Description: The individual at work recovers gold from jewellery pieces, gold scrap and dust collected at different stages of jewellery manufacturing. The individual operates furnaces and uses chemicals to recover gold in the pure form.

Personal Attributes: The job requires the individual to have: attention to details; ability to multi-task in a process driven team; ability to work in a high temperature environment for long hours and safely handle hazardous chemicals. The individual is expected to have the quality of integrity in dealing with precious metal.

Qualifications Pack Code	G&J/Q3401		
Job Role	Gold Refiner		
Credits(NVEQF/NVQF/NSQF)	TBD	Version number	1.0
Sector	Gems & Jewellery	Drafted on	29/05/13
Sub-sector	Cast and Diamond-set Jewellery	Last reviewed on	30/07/13
Occupation	Gold Refining	Next review date	15/07/15

Job Role	Gold Refiner
Role Description	Recovering gold from jewellery pieces, scrap and dust and refining into 24K gold, through various processes more often, the Aqua Regia process
NVEQF/NVQF level	6
Minimum Educational Qualifications	B.Sc. (Chemistry)
Maximum Educational Qualifications	
Training	Not applicable
Experience	Not applicable
Applicable National Occupational Standards (NOS)	<p>Compulsory:</p> <ol style="list-style-type: none"> G&J/N3401 Recover and refine gold G&J/N9902 Coordinate with others G&J/N9905 Maintain occupational health and safety <p>Optional: Not applicable</p>
Performance Criteria	As described in the relevant OS units

National Occupational Standard



Overview

This unit is about recovering and refining gold from jewellery pieces, scrap and dust collected at different stages of jewellery manufacturing. Gold refining is the critical step in the cast and diamond-set jewellery manufacturing.

G&J/N3401

Recover and refine gold

Unit Code	G&J/N3401
Unit Title (Task)	Recover and refine the gold
Description	This OS unit is about recovering gold from jewellery pieces, scrap and dust and refine into pure gold jewellery pieces
Scope	<p>This unit/task covers the following:</p> <p>Collect material and consumables from stores and other departments</p> <ul style="list-style-type: none"> collect old and rejected jewellery pieces from marketing collect scrap and dust from different stages of jewellery manufacturing calculate and weigh the correct amount of material collected <p>Identify the type of refining process to be used</p> <ul style="list-style-type: none"> read analysis reports to determine the gold content in refinable material assess the metals to be removed and purity of gold to be achieved after refining assess if a clean-up is adequate for reuse or full refining is needed for pure gold determine the extent to which a refining process is capable of achieving pure gold determine if a grain refiner is required, the metal to be used for it and quantity <p>Separate base metals from precious metals using Cupellation process</p> <ul style="list-style-type: none"> add Lead to unrefined gold in porous bone-ash crucibles or cupels for small-scale refining heat in air to melt the metals and dissolve in Lead allow base metal oxides to be absorbed in the cupels leaving behind metallic beads of precious metals such as Gold, Silver and Platinum send the precious metal alloy for further separation of Gold and other metals for large-scale Cupellation, smelt with flux of precious metal, iron-sulphide and lead oxide to form Lead bullion, slag and Matte of Copper allow base metal oxides to be absorbed in the cupels leaving behind metallic beads of precious metals such as Gold, Silver and Platinum send the precious metal alloy for further separation of Gold and other metals <p>Remove base metals and silver using Iquartation and Parting method for large scale refining</p> <ul style="list-style-type: none"> melt non-Platinum Group Metals (PGM)-gold with silver or copper to reduce the gold content to less than 25 percent granulate the melt and treat with Nitric acid filter to remove the pure Gold left behind after silver and other base metals are dissolved in Nitric acid <p>Use Miller process to remove base metals and silver for large scale refining</p> <ul style="list-style-type: none"> add gold scrap to crucible for melting

G&J/N3401

Recover and refine gold

- pass bubble chlorine gas through molten metal
- take extra care in handling chlorine gas
- bail out gradually forming chloride slag of base metals and silver
- stop the process when purple fumes emanate
- send for further electrolytic refining if purity content needed is higher than 99.5 per cent and to remove PGMs
- treat slag with sodium carbonate to recover any Gold trapped in Silver

Remove PGMs using Wohlwill Electrolytic process for large scale refining

- use refined gold obtained from Miller process and cast into anodes
- electrolyse in gold chloride and hydrochloric acid
- wash, dry, melt and granulate pure gold of 99.99 per cent deposited on the cathode
- treat spent electrolyte to recover Platinum and Palladium

- filter anode slimes formed at bottom of cell and treat to recover gold

Recover and refine gold using Aqua Regia Process

- melt dust at specific temperature for time period as per operating standards
- granulate (make fine powder of the dust) and screen the metal
- remove ferrous metal by using magnetic plate
- prepare Aqua Regia solution (of hydrochloric acid and nitric acid) as per proportion required
- boil granules in Aqua Regia solution as specified to dissolve the molten gold
- add urea to remove nitric acid fumes
- pass solution through filter and collect molten gold at the bottom of filtration unit
- add ferrous sulphate in the beaker containing gold
- leave the solution until it changes colour from green to black, the bottom of the solution containing heavy metal including gold
- decant top solution containing dust and other light metals
- boil heavy metal in hydrochloric acid to clean the impurities and blackness on gold
- wash metal in plain water until the solution neutralises
- dry recovered gold on hot plate
- melt again in furnace crucible and pour in metal mould to form 24K gold rod/ bar
- for diamond studded jewellery, after dissolving metal into Aqua Regia solution, collect the diamond at the bottom of container

Remove base metals except Copper using Pyro-metallurgical process

- smelt scrap gold under a flux
- pass bubble air or oxygen through molten metal
- remove slag containing combined impurities
- send recovered gold alloy for analysis of copper or any remaining base metal

G&J/N3401

Recover and refine gold

	<p>content</p> <p>Maintain the refining plant</p> <ul style="list-style-type: none"> • clean the plant regularly • schedule the annual maintenance <p>Maintain records of the refining plant</p> <ul style="list-style-type: none"> • record weight of dust and powder collected from different sources • record recovery percentage and weight of pure gold bar
Performance Criteria(PC) w.r.t. the Scope	
Element	Performance Criteria
Recovering gold	<p>To be competent, the user/individual on the job must be able to:</p> <p>PC1. accurately compute quantity of different solutions required for the amount of scrap and dust collected</p> <p>PC2. proportionately mix chemicals required for the refining process</p> <p>PC3. apply operating procedure as required for different alloys</p> <p>PC4. optimise recovery of gold and precious metals</p> <p>PC5. ensure zero accidents while handling chemicals and molten metal</p>
Productivity	<p>To be competent, the user/individual on the job must be able to:</p> <p>PC6. plan and optimum use of the refining plant</p> <p>PC7. process quantity of scrap and dust in the refining plant as per target deliverable</p> <p>PC8. recover higher percentage of gold as per the company standards</p>
Quality of output	<p>To be competent, the user/individual on the job must be able to:</p> <p>PC9. ensure purity of the recovered gold as per industry specified limits</p> <p>PC10. minimise cracking, porosity and contamination of refined gold</p> <p>PC11. refine gold as per quality standards of the company and industry</p> <p>PC12. remove impurities in the refined gold to ensure no casting defects due to impurities</p>
Knowledge and Understanding (K)	
A. Organizational Context	<p>The user/individual on the job needs to know and understand:</p> <p>KA1. company's policies on: acceptable limits of gold and other precious metal loss, quality, incentives, delivery standards, safety and hazards, integrity and IPR, personnel management and dress code</p> <p>KA2. importance of the individual's role in the workflow</p> <p>KA3. reporting structure</p>
B. Technical Knowledge	<p>The user/individual on the job needs to know and understand:</p> <p>KB1. metallurgy (gold alloy properties) and purity measurement</p> <p>KB2. methods of calculating required quantities of alloys</p> <p>KB3. malleability of the metal</p> <p>KB4. the chemical compositions, structure, and properties of substances used in the refining process</p>

G&J/N3401

Recover and refine gold

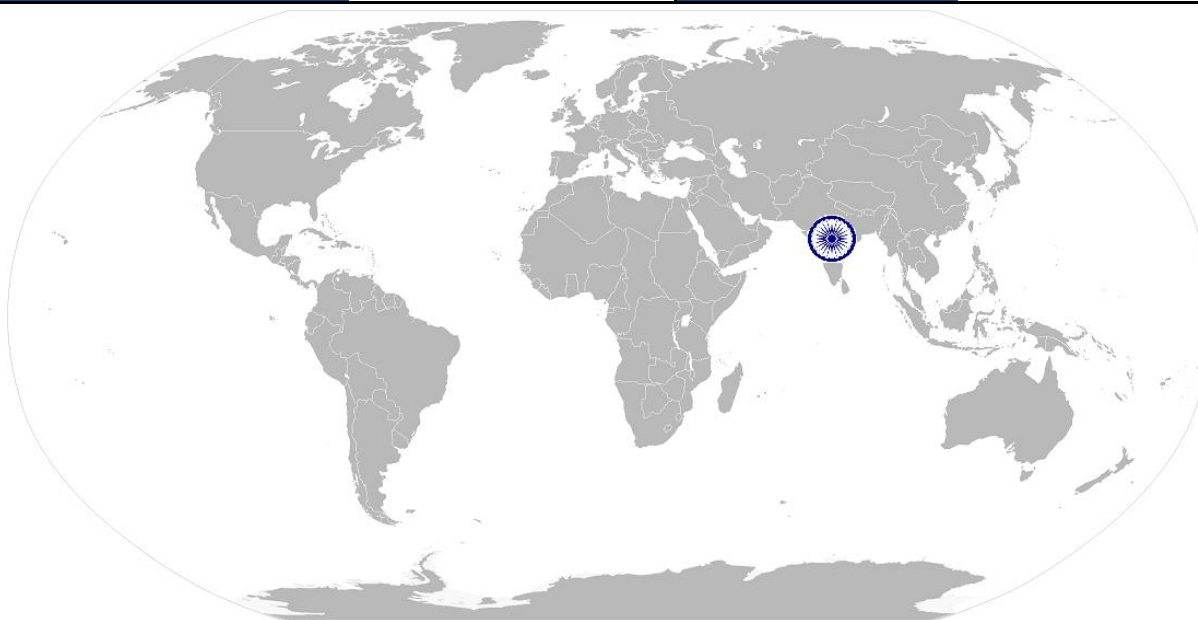
	<p>KB5. the chemical processes and transformations that they undergo in the refining process</p> <p>KB6. refining process planning</p> <p>KB7. uses of different processes for different purposes and end results</p> <p>KB8. potential work hazards while handling molten metal and chemicals</p>
Skills (S) [Optional]	
A. Core Skills/ Generic Skills	Basic reading and writing skills
	The user/ individual on the job needs to know and understand how to:
	SA1. read notes and operating manual of machine
	SA2. read company rules and compliance documents required to complete the work
	Calculation skills
	The user/individual on the job needs to know and understand how to:
B. Professional Skills	SA3. weigh the dust collected
	SA4. calculate and weigh the correct amount of alloy requirement
	Teamwork and multi-tasking
	The user/individual on the job needs to know and understand how:
	SA5. to share work load as required
	SA6. to deliver refined gold to the stores
	SA7. to receive feedback from co-workers and casting department
	SA8. to share knowledge with co-workers
	Refining plant management
	The user/individual on the job needs to know and understand how to:
B. Professional Skills	SB1. manage the refining process
	SB2. present records and recovery of the refining plant
	Use of tools and machines
	The user/individual on the job needs to know and understand how:
	SB3. to use the right equipment in the recovery and refining process
	SB4. to understand safety and hazards involved
	SB5. to understand tools and machine operations and its usage to be able to maintain and repair
	Reflective thinking
	The user/individual on the job needs to know and understand how:
	SB6. to improve work processes
B. Professional Skills	SB7. to improve recovery and purity of gold through repeated refining or borrowing from other refining methodologies
	Critical thinking
	The user/individual on the job needs to know and understand how to:
B. Professional Skills	SB8. anticipate process disruption and reasons for delay

G&J/N3401

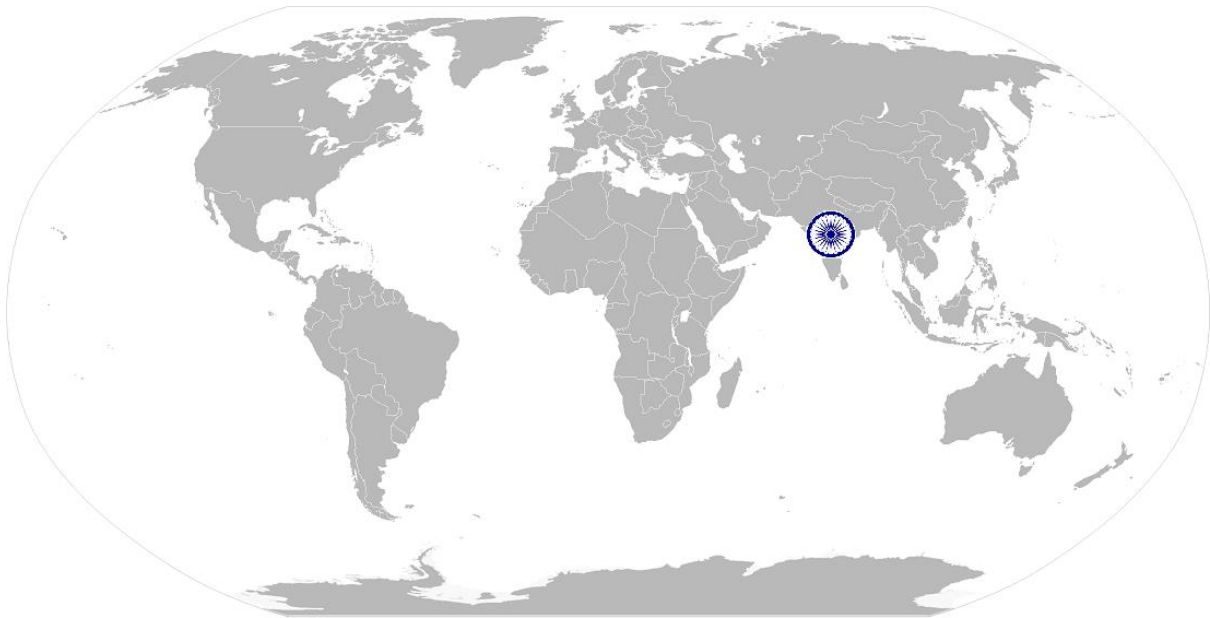
Recover and refine gold

NOS Version Control

NOS Code	G&J/N3401		
Credits(NVEQF/NVQF/NSQF)	TBD	Version number	1.0
Industry	Gems & Jewellery	Drafted on	29/05/13
Industry Sub-sector	Cast and Diamond-set Jewellery	Last reviewed on	30/07/13
Occupation	Gold Refining	Next review date	15/06/15



National Occupational Standard



Overview

This unit is about team work and level of communication with colleagues or clients. It determines the ability to work as a team member, share work and multi-task in order to achieve the deliverables on schedule.

G&J/N9902

Coordinate with others

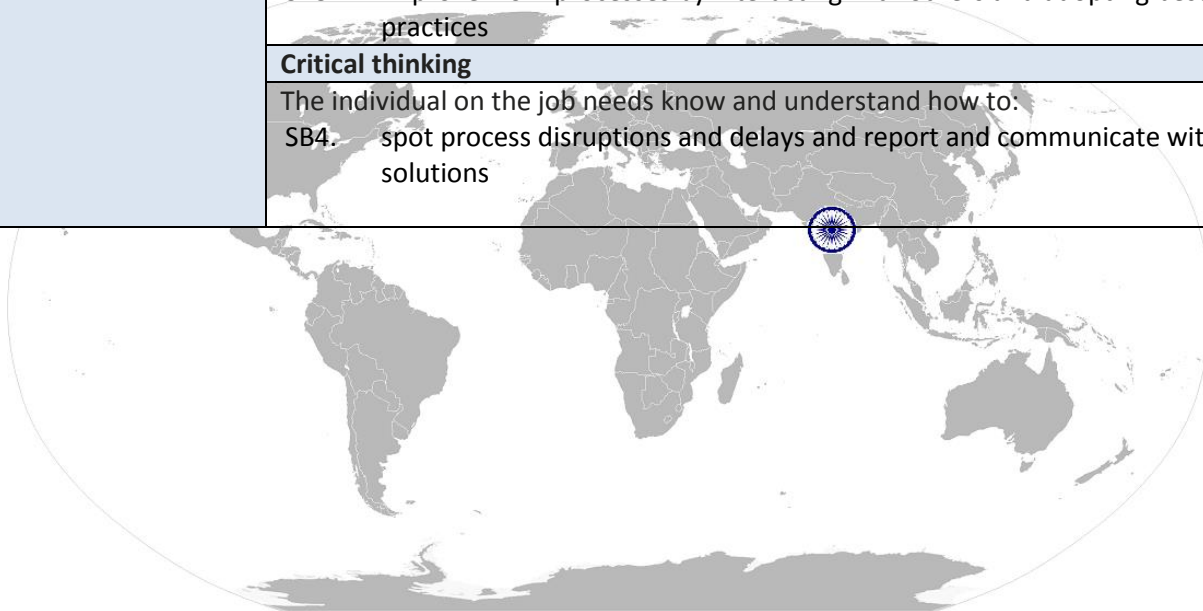
National Occupational Standard

Unit Code	G&J/N9902
Unit Title (Task)	Interact with colleagues and seniors
Description	This OS unit is about communicating with colleagues and seniors in order to achieve smooth and hazard-free work flow
Scope	<p>This unit/task covers the following:</p> <p>Interact with supervisor</p> <ul style="list-style-type: none"> • receive work instructions and raw materials from reporting supervisor • communicate to reporting supervisor about process-flow improvements, product defects received from previous process, repairs and maintenance of tools and machinery as required • communicate any potential hazards or expected process disruptions • handover completed work to supervisor <p>Interact with colleagues within and outside the department</p> <ul style="list-style-type: none"> • work as a team with colleagues and share work as per their or own work load and skills • work with colleagues of other departments • communicate and discuss work flow related difficulties in order to find solutions with mutual agreement • receive feedback from qc and rework in order to complete work on time
Performance Criteria(PC) w.r.t. the Scope	
Element	Performance Criteria
Interaction with supervisor	<p>To be competent, the user/individual on the job must be able to:</p> <p>PC1. understand the work output requirements</p> <p>PC2. comply with company policy and rule</p> <p>PC3. deliver quality work on time as required by reporting any anticipated reasons for delays</p>
Interactions with colleagues and other departments	<p>To be competent, the user/individual on the job must be able to:</p> <p>PC4. put team over individual goals</p> <p>PC5. be able to resolve conflicts</p> <p>PC6. learn how to multi-task relevant activities</p>
Knowledge and Understanding (K)	
A. Organizational Context	<p>The user/individual on the job needs to know and understand:</p> <p>KA1. company's policies on: preferred language of communication, reporting and escalation policy, quality delivery standards, and personnel management</p> <p>KA2. reporting structure</p>
B. Technical Knowledge	<p>The user/individual on the job needs to know and understand how to:</p> <p>KB1. communicate effectively</p> <p>KB2. build team coordination</p>

G&J/N9902

Coordinate with others

Skills (S) [Optional]	
A. Core Skills/ Generic Skills	Communication skills
	<p>The individual on the job needs to know and understand how to:</p> <p>SA1. read and write preferred language of communication as prescribed by the company</p> <p>SA2. read job sheets and interpret technical details mentioned in the job sheet</p>
B. Professional Skills	Decision making
	<p>The individual on the job needs to know and understand:</p> <p>SB1. how to spot and communicate potential areas of disruptions to work process and report the same</p> <p>SB2. when to report to supervisor and when to deal with a colleague individually, depending on the type of concern</p>
	Reflective thinking
	<p>The individual on the job needs to know and understand how to:</p> <p>SB3. improve work processes by interacting with others and adopting best practices</p>
	Critical thinking
	<p>The individual on the job needs know and understand how to:</p> <p>SB4. spot process disruptions and delays and report and communicate with solutions</p>

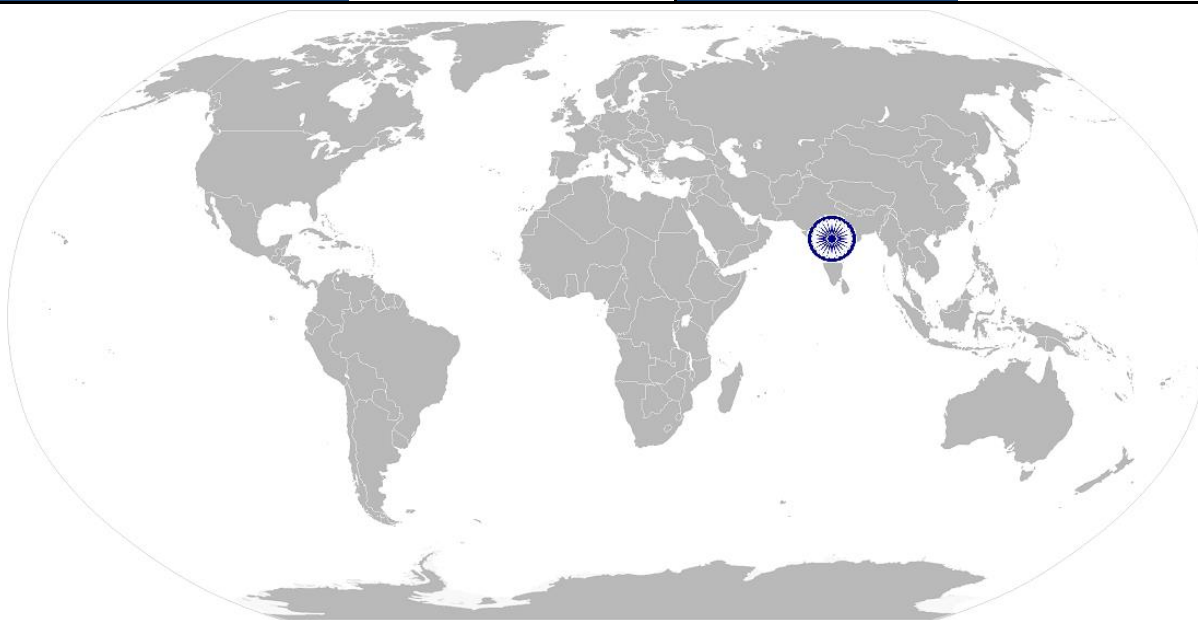


G&J/N9902

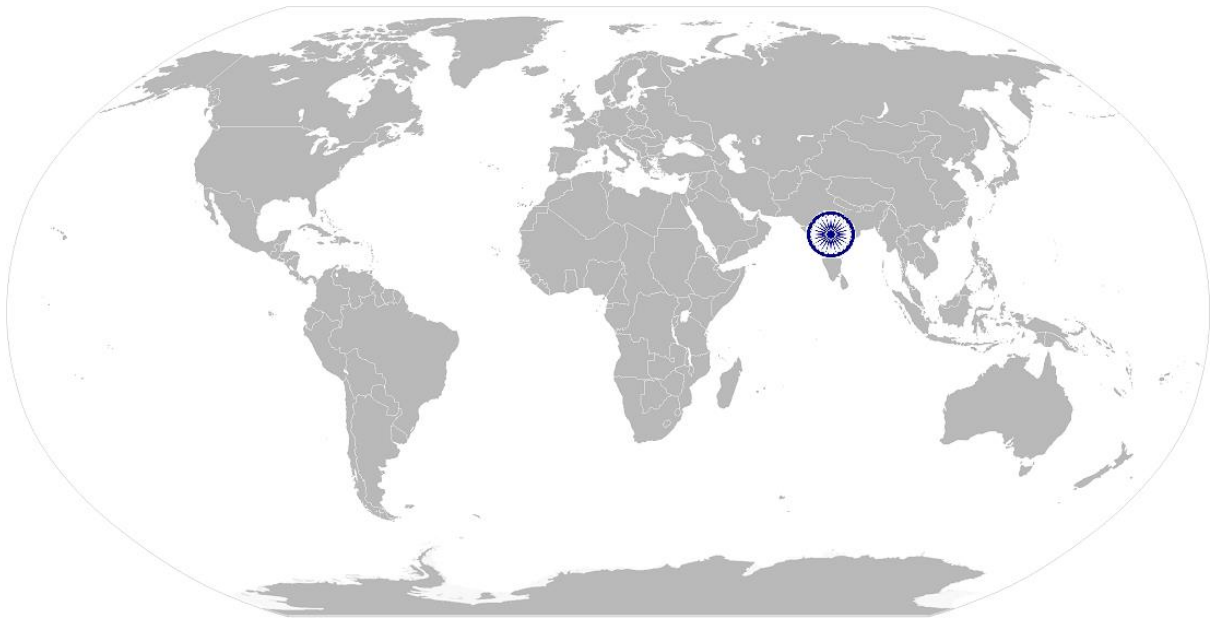
Coordinate with others

NOS Version Control

NOS Code	G&J/N9902		
Credits(NVEQF/NVQF/NSQF)	TBD	Version number	1.0
Industry	Gems & Jewellery	Drafted on	29/05/13
Industry Sub-sector	Cast and diamond-set jewellery	Last reviewed on	30/07/13
		Next review date	15/06/15



National Occupational Standard



Overview

This unit is about commitment towards reporting potential hazards, taking preventive measures to contain accidents in order to make the work environment safe for self and colleagues and maintaining occupational health and safety.

G&J/N9905

Maintain occupational health and safety

National Occupational Standard

Unit Code	G&J/N9905
Unit Title (Task)	Maintain occupational health and safety
Description	This OS unit is about being aware of, communicating and taking steps towards minimizing potential hazards and dangers of accidents on the job and maintaining occupational health and safety
Scope	<p>This unit/task covers the following:</p> <p>Understand potential sources of accidents</p> <ul style="list-style-type: none"> to avoid accidents related to use of potentially dangerous chemicals, sharp tools and machines <p>Use safety gear to avoid accidents</p> <ul style="list-style-type: none"> wear safety gear such as goggles, mask, gloves, ear plugs <p>Actively participate in the health and safety awareness campaigns</p> <ul style="list-style-type: none"> attend fire drills organised by the company or industrial zone learn first aid procedure be alert about designated assembly area in the event of an emergency read and understand the evacuation and emergency procedures <p>Communicate to reporting supervisor about:</p> <ul style="list-style-type: none"> process flow improvements that can reduce anticipated or repetitive hazards mishandling of tools, machines or hazardous materials electrical problems that could result in accident
Performance Criteria(PC) w.r.t. the Scope	
Element	Performance Criteria
Communicating potential accident points	<p>To be competent, the user/individual on the job must be able to:</p> <p>PC1. spot and report potential hazards on time</p> <p>PC2. follow company policy and rules regarding use of hazardous materials</p> <p>PC3. attend and actively participate in the health and safety campaigns organised by the company</p>
Using safety gear	<p>To be competent, the user/individual on the job must be able to:</p> <p>PC4. use or wear safety gear as per the rules of the company</p>
Knowledge and Understanding (K)	
A. Organizational Context	<p>The user/individual on the job needs to know and understand:</p> <p>KA1. company's policies on: safety and hazards and personnel management</p> <p>KA2. reporting structure</p>
B. Technical Knowledge	<p>The user/individual on the job needs to know and understand:</p> <p>KB1. how different chemicals react and what could be the danger from them</p> <p>KB2. how to use machines and tools without suffering bodily harm</p>

G&J/N9905

Maintain occupational health and safety

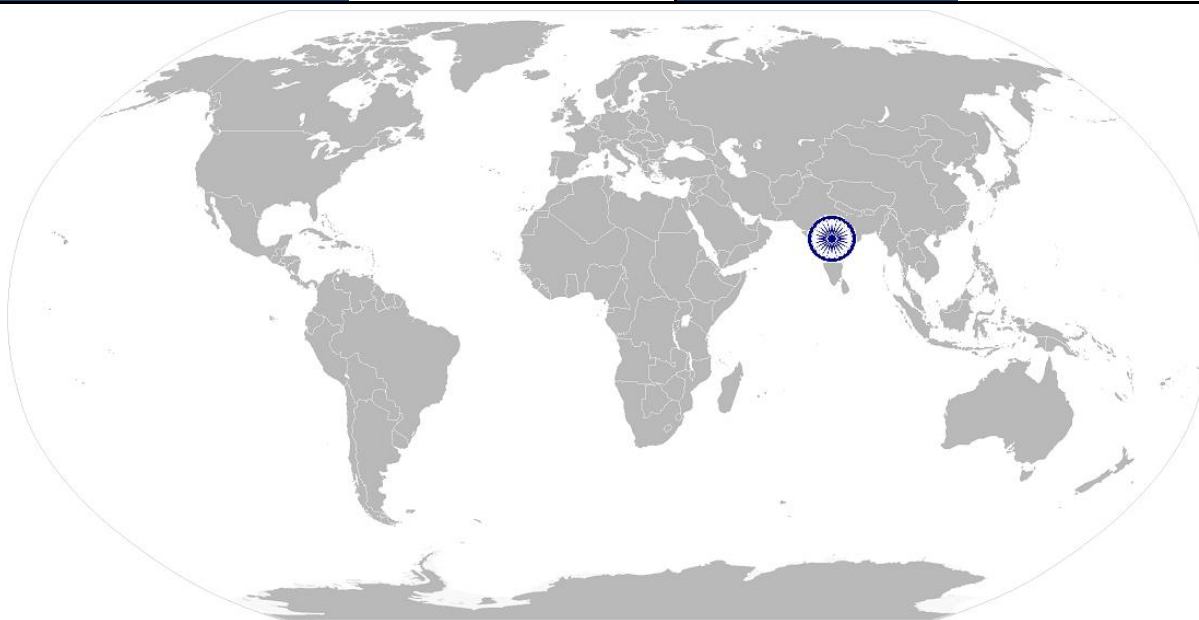
Skills (S) [Optional]	
A. Core Skills/ Generic Skills	Communication skills
	The individual on the job needs to know and understand how to: SA1. effectively communicate the danger
	Organising skills
	The individual on the job needs to know and understand how to: SA2. keep all the tools in an organised manner so as to avoid accidents SA3. keep the work environment safe and clean
B. Professional Skills	Decision making
	The individual on the job needs to know and understand how to: SB1. report potential sources of danger SB2. follow prescribed procedure in the event of an accident SB3. wear appropriate safety gear to avoid an accident
	Reflective thinking
	The individual on the job needs to know and understand to: SB4. learn from past mistakes regarding use of hazardous machines or chemicals
	Critical thinking
	The individual on the job needs to know and understand how to: SB5. spot danger
	Decision making
	The individual on the job needs to know and understand how to: SB6. report potential sources of danger SB7. follow prescribed procedure in the event of an accident SB8. wear appropriate safety gear to avoid an accident

G&J/N9905

Maintain occupational health and safety

NOS Version Control

NOS Code	G&J/N9905		
Credits(NVEQF/NVQF/NSQF)	TBD	Version number	1.0
Industry	Gems & Jewellery	Drafted on	29/05/13
Industry Sub-sector	Cast and diamond-set jewellery	Last reviewed on	30/07/13
		Next review date	15/06/15



Definitions

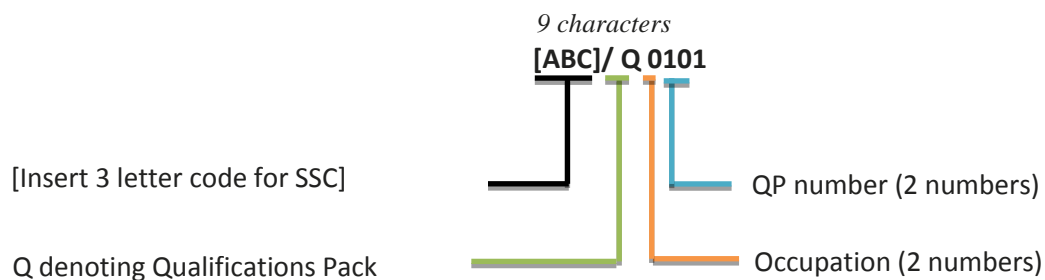
Keywords /Terms	Description
Sector	Sector is a conglomeration of different business operations having similar business and interests. It may also be defined as a distinct subset of the economy whose components share similar characteristics and interests.
Sub-sector	Sub-sector is derived from a further breakdown based on the characteristics and interests of its components.
Occupation	Occupation is a set of job roles, which perform similar/ related set of functions in an industry.
Function	Function is an activity necessary for achieving the key purpose of the sector, occupation, or an area of work, which can be carried out by a person or a group of persons. Functions are identified through functional analysis and form the basis of OS.
Sub-function	Sub-functions are sub-activities essential to fulfil the achieving the objectives of the function.
Job role	Job role defines a unique set of functions that together form a unique employment opportunity in an organisation.
Occupational Standards (OS)	OS specify the standards of performance an individual must achieve when carrying out a function in the workplace, together with the knowledge and understanding they need to meet that standard consistently. Occupational Standards are applicable both in the Indian and global contexts.
Performance Criteria	Performance criteria are statements that together specify the standard of performance required when carrying out a task.
National Occupational Standards (OS)	NOS are occupational standards which apply uniquely in the Indian context.
Qualifications Pack (QP)	QP comprises the set of OS, together with the educational, training and other criteria required to perform a job role. A QP is assigned a unique qualifications pack code.
Unit Code	Unit code is a unique identifier for an Occupational Standard, which is denoted by an 'N'
Unit Title	Unit title gives a clear overall statement about what the incumbent should be able to do.
Description	Description gives a short summary of the unit content. This would be helpful to anyone searching on a database to verify that this is the appropriate OS they are looking for.
Scope	Scope is a set of statements specifying the range of variables that an individual may have to deal with in carrying out the function which have a critical impact on quality of performance required.
Knowledge and Understanding	Knowledge and understanding are statements which together specify the technical, generic, professional and organisational specific knowledge that an individual needs in order to perform to the required standard.
Organisational Context	Organisational context includes the way the organisation is structured and how it operates, including the extent of operative knowledge managers have of their relevant areas of responsibility.
Technical Knowledge	Technical knowledge is the specific knowledge needed to accomplish

	specific designated responsibilities.
Core Skills/ Generic Skills	Core skills or generic skills are a group of skills that are the key to learning and working in today's world. These skills are typically needed in any work environment in today's world. These skills are typically needed in any work environment. In the context of the OS, these include communication related skills that are applicable to most job roles.
Keywords /Terms	Description
CAD	Computer Aided Design
CAM	Computer Aided Manufacturing
IPR	Intellectual Property Rights
NOS	National Occupational Standard(s)
NVQF	National Vocational Qualifications Framework
NSQF	National Qualifications Framework
NVEQF	National Vocational Education Qualifications Framework
QP	Qualifications Pack

Annexure

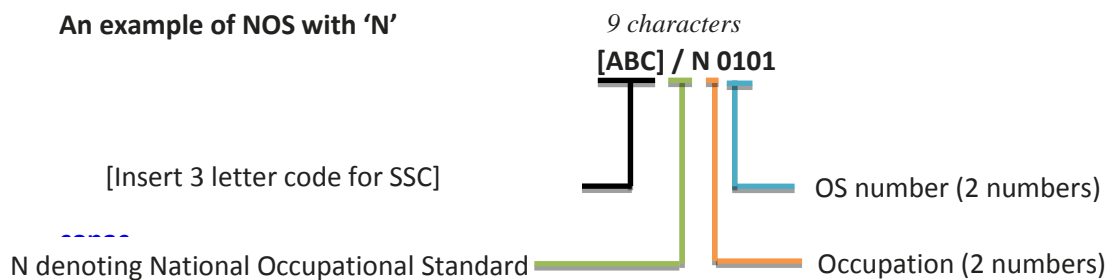
Nomenclature for QP and NOS

Qualifications Pack



Occupational Standard

An example of NOS with 'N'



[Back to top...](#)

The following acronyms/codes have been used in the nomenclature above:

Sub-sector	Range of Occupation numbers
Handmade gold and gems-set jewellery	01-20
Cast and diamond-set jewellery	21-40
Diamond processing	41-60
Gemstone processing	61-80
Jewellery retailing	81-98

Sequence	Description	Example
Three letters	Industry name	G&J
Slash	/	/
Next letter	Whether QP or NOS	N
Next two numbers	Occupation code	01
Next two numbers	OS number	01

CRITERIA FOR ASSESSMENT OF TRAINEES

Job Role	Qualifications Pack- Refiner			
Qualification Pack	Qualifications Pack- Refiner			
Sector Skill Council	GEMS & JEWELLERY			
Assessment Strategy				Marks Allocation
NOS	Elements	Performance Criteria	Theory	Practical
1. G&J/N3401 Recover and refine gold	Recovering gold	PC1. accurately compute quantity of different solutions required for the amount of scrap and dust collected	2	7
		PC2. proportionately mix chemicals required for the refining process	2	7
		PC3. apply operating procedure as required for different alloys	2	7
		PC4. optimise recovery of gold and precious metals	1	7
		PC5. ensure zero accidents while handling chemicals and molten metal	1	7
	Productivity	PC6. plan and optimum use of the refining plant	1	5
		PC7. process quantity of scrap and dust in the refining plant as per target deliverable	1	5
		PC8. recover higher percentage of gold as per the company standards	0	5
		PC9. ensure purity of the recovered gold as per industry specified limits	0	5
	Quality of output	PC10. minimise cracking, porosity and contamination of refined gold	0	5
		PC11. refine gold as per quality standards of the company and industry	0	5
		PC12. remove impurities in the refined gold to ensure no casting defects due to impurities	0	5
			10	70
2. G&J/N9902 Coordinate with others	Interaction with supervisor	PC1. understand the work output requirements	1	2
		PC2. comply with company policy and rule	1	2
		PC3. deliver quality work on time as required by reporting any anticipated reasons for delays	1	2
	Interactions with colleagues and other departments	PC4. put team over individual goals	1	0
		PC5. be able to resolve conflicts	1	0
		PC6. learn how to multi-task relevant activities	1	0
			6	6
3. G&J/N9905 Maintain occupational health and safety	Communicating potential accident points	PC1. spot and report potential hazards on time	1	0
		PC2. follow company policy and rules regarding use of hazardous materials	1	2
		PC3. attend and actively participate in the health and safety campaigns organised by the	1	0

		company		
	Using safety gear	PC4. use or wear safety gear as per the rules of the company	1	2
			4	4
			20	80
			100	