UNITED ARAB EMIRATES
MINISTRY OF EDUCATION

NQC UAE NATIONAL QUALIFICATION/AWARD

For use by developers of UAE national qualifications based on national occupational standards (Q+NOS)

1. General Profile of Qualification							
1.1	Title	Level 4 Award for Radiation Occupationally Exposed Workers - Tier 3					
1.2	Code	EGY04004NQ23					
1.3	Type	☐ Principal Qualification		☑ Award			
1.4	Credit and duration	Credit value	1 credits	Duration	15 hours		
1.5	QF*Emirates* Level	Level 4					
1.6	Aim	This award aims to provide Learners with the knowledge, skills and competencies to safely perform work activities in facilities characterized by highest radiological risks (or during transport of highly irradiating radioactive materials), which may also include risks from neutron sources, ensuring that best Radiation Protection practices are maintained.					
1.7	Qualification outcomes	Upon successful completion of this award, learners will be able to:					
		QO01	Demonstrate relevant knowledge and application of work policies, procedures and instructions related to Radiation Protection in facilities characterized by highest radiological risks which may also include neutron sources				
		QO02	Demonstrate knowledge of ionizing radiation risk identification and control in facilities characterized by highest radiological risks which may also include neutron sources				
		QO03	Demonstrate ability to select and use personal protective equipment against ionizing radiation, in facilities characterized by highest radiological risks which may also include neutron sources				
1.8	Functions	☐ Policy and strategy	QF 9-10	☐ Controlling	QF 6		
		☐ Managing	QF 7-8	☑ Maintaining capability	QF 4-6		
		☐ Specifying	QF 6-7	☐ Performing/carry out	QF 1-4		
1.9	Pathways/progression into other qualifications (if any)	Successful Candidates may progress and obtain the Level 5 Award "Radiation Protection Officer - Tier 1"					
1.10	Licensing/regulatory requirements (if any)	Not applicable					
2. Occupation and industry sector							
2.1	ISCO title and code	Occupation title		Protective services workers not elsewhere classified			
		4-digit ISCO code		5419			

2.2	Industry sector	Sector	Energy resources - oil, natural gas, petrochemical, chemical and mining/quarrying
		Sub-sector	Other (Energy)
3. Entry requirements for this qualification			
3.1	Minimum requirements (if any)	Qualification(s) required for entry	Level 4 Award for Radiation Occupationally Exposed Workers - Tier 2 "Tier 2 Stream A" is required in order to access to "Tier 3 Stream A" "Tier 2 Stream B" is required in order to access to "Tier 3 Stream B" or "Tier 3 Stream C"
		Other minimum requirements e.g. competence, experience	Candidates should already be employed in a sector in which work activity in the course of radiation emergencies is likely, or be students or trainees in nuclear or radiological sciences. Basic English language literacy. Basic computational abilities.
3.2	Advisory requirements (if any)	Recommended requirements	It is recommended that medical fitness to work in a radiation emergency environment be obtained prior to work assignment. Grade 12 education.

4. Rules of combination

4.1 The learner must successfully complete the following minimum number of credits

Unit type	Min. Credits	Guidance on the rules of combination (if any)
Stream	1	Choose "Stream A" for medical facilities, "Stream C" for nuclear facilities, and choose "Stream B" for all other facilities

4.2 Core unit standards

Title	Code (NQC to enter)	QF level	Credit value
Total number of credits from core unit standards to be completed			

4.3	Stream unit standards		
Title	Code (NQC to enter)	QF level	Credit value
Execute work activities in the presence of ionizing radiation sources, medical facilities, highest radiological risks, neutron sources – Exposed Worker Tier 3 Stream A	EGY04003NU23	Level 4	1
Execute work activities in the presence of ionizing radiation sources, industrial facilities, highest radiological risks, neutron sources – Exposed Worker Tier 3 Stream B	EGY04004NU23	Level 4	1
Execute work activities in the presence of ionizing radiation sources in nuclear facilities – Exposed Worker Tier 3 Stream C	EGY04006NU23	Level 4	1
			3

4.4	Optional unit standards		
Title	Code (NQC to enter)	QF level	Credit value

5. Assessment advice

The assessment advice for the qualification to guide learners, assessors and verifiers must consider evidence requirements in NOS unit standards and summarise the main assessment approach and methods for the qualification that will ensure learners meet the qualification learning outcomes. (Note: Trainers, assessors, internal verifiers and external verifiers for this qualification must be occupationally competent in the occupational field of the qualification).

Assessment must be conducted in an environment where evidence gathered demonstrates consistent performance.
Learners must demonstrate consistent performance in conditions that are safe and replicate a potential workplace.

Assessment methods can include:
• Scenario setting
• Presentations
• Virtual simulations (or role plays) and modelling
• Written material and reports, including authenticated evidence from workplace and/or training courses
• Checklists and comparative charts
• Statements
• Evidence of written reports summarising results of candidate skills assessment
• Oral or written questioning

Evidence:
• Verbal or written questioning to assess candidate's knowledge
• Summative assessment to ensure consistency of performance in a range of contexts
• Formative evidence for this unit can be written, oral or diagrammatic
• Formative evidence ought to assist learners to learn and increase performance
• Summative assessment is based on real live work situations or simulated situations

Assessors and verifiers must satisfy NQC/VETAC requirements with subject matter expert related to radiation protection assessments.

All evidence submitted by the learner must be verified and documented by the assessor for future evaluation purpose.
Summative assessment is based on real live work situations or simulated situations.

Assessment judgements are based on evidence that is documented valid, authentic, current, and sufficient, and are consistent with previous judgements made on similar evidence.

Re-submissions are permissible

6. Glossary

Term	Definition
Occupationally Exposed Worker - Tier 1	Workers exposed to ionizing radiation during the course of their work (and whose potential doses may exceed that of the general population), in facilities characterized by lowest radiological risks (or during transport of radioactive materials), across all Sectors (industrial, research, medical, etc.). They should be trained in general radiation protection and have a basic, broad understanding of radiological risks and radiation detection.
Occupationally Exposed Worker - Tier 2 Stream A (medical)	Workers exposed to ionizing radiation during the course of their work in medical facilities characterized by intermediate radiological risks (or during transport of radioactive materials), which may also include risks from radioactive contamination. Facilities may include CT scanner, PET, SPECT, nuclear medicine departments, etc. Workers should be trained in general radiation protection topics, including risks of contamination and its prevention, and have an intermediate, broad understanding of radiological risks and radiation detection in medical facilities.
Occupationally Exposed Worker - Tier 2 Stream B (non-medical)	Workers exposed to ionizing radiation during the course of their work in non-medical facilities characterized by intermediate radiological risks (or during transport of radioactive materials), which may also include risks from radioactive contamination. Workers should be trained in general radiation protection topics, including risks of contamination and its prevention, and have an intermediate, broad understanding of radiological risks and radiation detection in non-medical facilities.
Occupationally Exposed Worker - Tier 3 - Stream A (medical)	Workers exposed to ionizing radiation during the course of their work in medical facilities characterized by highest radiological risks (or during transport of highly irradiating radioactive materials), which may also include risks from neutron sources. Facilities include radiotherapy departments, BNCP, alpha-immunotherapy, etc. Workers should be trained in most radiation protection topics, including risks arising from neutron sources, and have an advanced, broad understanding of radiological risks and radiation detection in most complex medical facilities.
Occupationally Exposed Worker - Tier 3 - Stream B (industrial)	Workers exposed to ionizing radiation during the course of their work in industrial facilities (non-medical and non-nuclear), characterized by highest radiological risks (or during transport of highly irradiating radioactive materials), which may also include risks from neutron sources. Facilities include food and commodities irradiation centres, NDA services, accelerators, neutron sources and gauges, etc. Workers should be trained in most radiation protection topics, including risks arising from neutron sources, and have an advanced, broad understanding of radiological risks and radiation detection in most complex non-medical, non-nuclear facilities.

Occupationally Exposed Worker - Tier 3 - Stream C (nuclear)	Workers exposed to ionizing radiation during the course of their work in nuclear facilities (or during transport of nuclear materials), including risks from neutron sources. Facilities include fuel fabrication facilities, nuclear reactors, high activity fuel storage, etc. Workers should be trained in most radiation protection topics, including risks arising from neutron sources, and have a more advanced, broad understanding of radiological risks and radiation detection in nuclear facilities.
FANR Safety, Security, and Safeguards Glossary	FANR Safety, Security, and Safeguards Glossary aims to provide with a comprehensive compilation of all the terms included in the Federal Law by Decree No.6 of 2009 Concerning the Peaceful Uses of Nuclear Energy (the Nuclear Law) , the Federal Law by Decree No.4 of 2012 Concerning Civil Liability for Nuclear Damage, FANR regulations and FANR regulatory guides and their respective definitions. The 2021 Edition of the FANR Glossary is an updated version of the initial Glossary issued in 2011 and reflects the updates in the legislative and regulatory framework of FANR. This document is developed for information purposes only, the official and authentic definitions being the ones contained in the laws, FANR regulations and regulatory guides as available on the FANR website. https://www.fanr.gov.ae/en/open-data/fnar-glossary (in English) https://www.fanr.gov.ae/ar/open-data/fnar-glossary (in Arabic)

7. Developer details

7.1	Organisation(s)	Radiation Protection RNDC

8. Key dates

8.1	Endorsement date	01/06/2023
8.2	Review date	31/05/2028

EGYN23

UNITED ARAB EMIRATES
MINISTRY OF EDUCATION

NQC UAE-NOS TEMPLATE

For use by developers of UAE national occupational standards (UAE-NOS) packaged as unit standards

1.	Title	Execute work activities in the presence of ionizing radiation sources, medical facilities, highest radiological risks, neutron sources – Exposed Worker Tier 3 Stream A			
2.	Code	EGY04003NU23			
3.	Credit and duration	3a) Credit value	1	3b) Duration	15
4.	Aim	This unit aims to provide Exposed Workers with advanced knowledge of radiation physics and radiation protection, and skills to operate effectively with ionizing radiation sources in medical facilities characterized by highest radiological risks (or during transport of radioactive materials) which may also include neutron radiation sources			
5.	Learning outcomes	At the end of this unit, learners will be able to:			
		LO01	Demonstrate relevant knowledge and application of work policies, procedures and instructions related to Radiation Protection in medical facilities characterized by highest radiological risks which may also include neutron sources		
		LO02	Demonstrate knowledge of ionizing radiation risk identification and control in facilities characterized by highest radiological risks which may also include neutron sources		
		LO03	Demonstrate ability to select and use personal protective equipment against ionizing radiation, in facilities characterized by highest radiological risks which may also include neutron sources		
6.	QF*Emirates* Level	Level 4			
7.	Outcomes, performance criteria, and evidence requirements				

Outcome 1	LO01
Performance criteria	
PC01	Demonstrate knowledge and understanding of radiation physics, including neutrons and their generation
PC02	Demonstrate knowledge and understanding of radiation sources used in a Radiotherapy Medical Department
PC03	State typical dose rates originated by radiation sources in use in Radiotherapy Departments
PC04	Explain the difference between shielding electrons, gamma photons or neutrons
PC05	Explain the difference between radiation sources, radioactive sources and radiation generators
PC06	Describe quantities and units used in expressing absorbed, equivalent and effective dose and dose rate
PC07	Describe safety precautions when operating radiation sources in a Radiotherapy Department
PC08	State good practices to be applied in handling, use, storage and transportation of radioactive sources in a Radiotherapy Department

PC09	Explain the concepts of radiation emergency response in a Radiotherapy Department, and Workers' role during an emergency
PC10	Explain the concept of neutron activation in a medical facility
Specific evidence requirements	

Candidates must demonstrate understanding and application of Radiation Protection precautions when operating or working in close proximity with most complex medical equipment used for radiotherapy, or high-activity radioactive sources; and explain their role in a radiation emergency.

The following information is provided to aid the training provider in developing the course work:
PC1.01: including neutrons generated by radioactive sources (Am-Be, Pu-Be, etc.) and by accelerators (d-d, d-t, etc.)
PC1.04: including materials used for shielding, and an order of magnitude of their thickness
PC1.06: includes understanding that patient doses in Radiotherapy are expressed in gray, while doses to workers are expressed in equivalent and effective dose in sievert, and stating the difference between absorbed dose and effective dose
PC1.09: Describe potential risks related to malfunctions and incidents involving radiation sources in a Radiotherapy Department

Outcome 2	LO02
Performance criteria	
PC01	Explain the difference between diagnostic X-ray machines, CT scanners and scintigrams
PC02	State typical dose rates emerging from X-ray machines, CT scanners, and other radioactive sources used in Nuclear Medicine Departments
PC03	Describe radioactive sources used in a Nuclear Medicine Department and their associated radiological risks
PC04	State contamination levels due to radioactive sources used in Nuclear Medicine Departments
PC05	Describe appropriate techniques to mitigate risks related to radioactive contamination
PC06	Explain effects of contamination to workers (skin and internal contamination)
PC07	Explain basic skin decontamination procedures
PC08	Describe methods for measuring radiation dose rate
PC09	Describe methods for measuring radiation surface contamination
PC10	Describe methods for measuring radiation airborne contamination
PC11	Explain biological effects of the exposure to ionizing radiation
PC12	State applicable FANR Regulations and annual dose limits for workers and the population, including dose limits on extremities, lens of the eye and the skin
PC13	Demonstrate the ISO symbols for neutron emission, high-activity sealed sources, radioactive contamination, general radiation risk
Specific evidence requirements	

Candidate must demonstrate knowledge and understanding of basic principles of radiation risk identification and control, the concept of ALARA, and the potential sources/effects of exposure to ionizing radiation, including radioactive contamination.
Candidates must have knowledge of the applicable Radiation Protection Regulations in the UAE, and must be familiar with annual dose limits to Workers and to the population, including organs and tissues.

The following information is provided to aid the training provider in developing the course work
PC2.03: it includes indicating name and radiation emissions (type and approximate energy) of the most used radionuclides in a Nuclear Medicine Department, and their typical shielding materials and thicknesses
PC2.05: includes measuring surface contamination levels, simple decontamination of contaminated surfaces, controls at the border of a Department with appropriate contamination detectors)
PC2.11: including the distinction between tissue reactions and stochastic risks, typical dose thresholds for tissues reactions and their consequences, and a clear explanation of the LNT theory as practical working tool in occupational radiation protection
PC2.12: state dose limits for workers and the general public, and reference levels to be applied in emergency situations, for the whole body and organs, including the skin

Outcome 3	LO03
Performance criteria	
PC01	Describe various personal protective equipment used in work activities in presence of ionizing radiation, including radioactive contamination, in medical facilities
PC02	Demonstrate the ability to correctly don, use and doff personal protective equipment in normal operating and emergency situations
PC03	Explain basic protocols to prevent the spread of radioactive contamination in the workplace
PC04	Explain the function, types, and use of various personal dosimeters, including electronic dosimeters
PC05	Describe precautions in radioactive waste management in a medical facility
PC06	Explain the difference between perceived risks and actual risks, with specific reference and examples related to ionizing radiation
Specific evidence requirements	
Candidate must demonstrate knowledge and understanding of selecting personal protective equipment against ionizing radiation according to the situations, and wearing it appropriately.	

8.	Range statement	This Unit may be assessed in a simulated environment under conditions that safely replicate relevant workplace situations

9.	Assessment advice	Assessment must be conducted in an environment where evidence gathered by Learners demonstrates consistent performance in conditions that are safe and replicate a potential workplace environment. Assessment methods can include: • Scenario setting • Presentations • Virtual simulations and modelling • Written material and report • Checklists and comparative charts • Statements • Topologies • Evidence of written reports summarising results of candidate skills assessment • Oral or written questioning Evidence: • Verbal or written questioning to assess candidate's knowledge • Summative assessment to ensure consistency of performance in a range of contexts • Formative evidence for this unit can be written, oral or diagrammatic • Formative evidence ought to assist learners to learn and increase performance • Summative assessment is based on real live work situations or simulated situations Assessors and verifiers must satisfy NQC/VETAC requirements with subject matter expert related to radiation emergency assessment. All evidence submitted by the learner must be verified and documented by the assessor for future evaluation purpose. Summative assessment is based on real work situations or simulated situations. Assessment judgements are based on evidence that is documented as valid, authentic, current, and sufficient, and are consistent with previous judgements made on similar evidence. Re-submissions are permissible	
10.	Entry requirements	10a) Mandatory	Level 4 Award for Radiation Occupationally Exposed Workers - Tier 2 Stream A
		10b) Advisory	None
11.	Grading	Percentile 100%: _____%	
		80% pass mark	

12.	Resources required	Reference materials related to this unit, for consideration, and which correlate with international nuclear industry acceptance, for working in a workplace environment include: • relevant and contemporary reference documents, manuals, instructions, procedures, standards; • relevant industry policies and organizational procedures • Other reference documents, including: A. Basic Safety Standards for Facilities and Activities involving Ionizing Radiation other than in Nuclear Facilities (FANR-REG-24) B. IAEA Safety Standards Series, Building Competence in Radiation Protection and the Safe Use of Radiation Sources, No. RS-G-1.4 C. American National Standards Institute, Inc. ANSI/HPS N13.36-2001, American National Standard: "Ionizing Radiation Safety Training for Workers", July 19, 2011, Published by Health Physics Society, 1313 Dolley Madison Blvd., Suite 402, McLean, VA 22101	
13.	Relevant CoreLife Skills	☑ Collecting, analysing, organising and applying information in a given context ☑ Communicating information, concepts and ideas ☑ Initiating and organising self and activities incl. motivation, exploration and creativity ☑ Working with others in teams incl. leadership ☑ Solving problems incl. using mathematical ideas and techniques ☐ Applying information and communication technology (ICT) ☐ Participating in social and civic life incl. ethical practice	
14.	Industry sector	14a) Sector	Energy resources - oil, natural gas, petrochemical, chemical and mining/quarrying
		14b) Sub-sector	Other (Energy)
15.	Developing organisation	Federal Authority for Nuclear Regulation (and Counterpart Organizations) in the "RNDC for Radiation Protection"	
16.	Approval date	01/06/2023	
17.	Review date	31/05/2028	

EGYN23

UNITED ARAB EMIRATES
MINISTRY OF EDUCATION

NQC UAE-NOS TEMPLATE

For use by developers of UAE national occupational standards (UAE-NOS) packaged as unit standards

1.	Title	Execute work activities in the presence of ionizing radiation sources, industrial facilities, highest radiological risks, neutron sources – Exposed Worker Tier 3 Stream B			
2.	Code	EGY04004NU23			
3.	Credit and duration	3a) Credit value	1	3b) Duration	15
4.	Aim	This unit aims to provide Exposed Workers with advanced knowledge of radiation physics and radiation protection, and skills to operate effectively with ionizing radiation sources in industrial and research facilities characterized by highest radiological risks (or during transport of radioactive materials) which may also include neutron radiation sources			
5.	Learning outcomes	At the end of this unit, learners will be able to:			
		LO01	Demonstrate relevant knowledge and application of work policies, procedures and instructions related to Radiation Protection in industrial and research facilities characterized by highest radiological risks which may also include neutron sources		
		LO02	Demonstrate knowledge of ionizing radiation risk identification and control in industrial and research facilities characterized by highest radiological risks which may also include neutron sources		
		LO03	Demonstrate ability to select and use personal protective equipment against ionizing radiation, in industrial and research facilities characterized by highest radiological risks which may also include neutron sources		
6.	QF*Emirates* Level	Level 4			
7.	Outcomes, performance criteria, and evidence requirements				

Outcome 1	LO01
Performance criteria	
PC01	Demonstrate knowledge and understanding of radiation physics, including neutrons and their generation
PC02	Demonstrate knowledge and understanding of radiation sources used in industrial and research facilities
PC03	State typical dose rates originated by radiation sources in use in industrial and research facilities
PC04	Explain the difference between shielding electrons, gamma photons or neutrons in industrial and research facilities
PC05	Explain the difference between radiation sources, radioactive sources and radiation generators
PC06	Describe quantities and units used in expressing absorbed, equivalent and effective dose and dose rate
PC07	Describe safety precautions when operating radiation sources in industrial and research facilities

PC08	State good practices to be applied in handling, use, storage and transportation of radioactive sources in industrial and research facilities
PC09	Explain the concepts of radiation emergency response in industrial and research facilities, and Workers' role during an emergency
PC10	Explain the concept of neutron activation in an industrial and research facility
Specific evidence requirements	
Candidates must demonstrate understanding and application of Radiation Protection precautions when operating or working in close proximity with most complex industrial and research equipment or high-activity radioactive sources; and explain their role in a radiation emergency. The following information is provided to aid the training provider in developing the course work: PC1.01: including neutrons generated by radioactive sources (Am-Be, Pu-Be, etc.) and by accelerators (d-d, d-t, etc.) PC1.04: including materials used for shielding, and an order of magnitude of their thickness PC1.06: includes stating the difference between absorbed dose and effective dose, and their units PC1.09: Describe potential risks related to malfunctions and incidents involving radiation sources in industrial and research facilities	

Outcome 2	LO02
Performance criteria	
PC01	Explain the difference between high-activity radioactive sources and particle accelerators
PC02	State typical dose rates emerging from various radiation sources used in industrial and research facilities
PC03	Describe appropriate techniques to mitigate risks related to radioactive contamination in industrial and research facilities
PC04	Describe methods for measuring neutron dose and dose rate in industrial and research facilities
PC05	Explain biological effects of the exposure to ionizing radiation, and specifically effects of high doses of radiation
PC06	State applicable FANR Regulations and annual dose limits for workers and the population, including dose limits on extremities, lens of the eye and the skin
PC07	Demonstrate the ISO symbols for neutron emission, high-activity sealed sources, radioactive contamination, general radiation risk
Specific evidence requirements	

Candidate must demonstrate knowledge and understanding of basic principles of radiation risk identification and control, the concept of ALARA, and the potential sources/effects of exposure to ionizing radiation, including neutron sources.
Candidates must have knowledge of the applicable Radiation Protection Regulations in the UAE, and must be familiar with annual dose limits to Workers and to the population, including organs and tissues.

The following information is provided to aid the training provider in developing the course work
PC2.02: it includes indicating name and radiation emissions (type and approximate energy) of the most used radiation sources in industrial and research facilities, and their typical shielding materials and thicknesses
PC2.05: including the distinction between tissue reactions and stochastic risks, typical dose thresholds for tissue reactions and their consequences, and a clear explanation of the LNT theory as practical working tool in occupational radiation protection
PC2.06: state dose limits for workers and the general public, and reference levels to be applied in emergency situations, for the whole body and organs, including the skin

Outcome 3	LO03
Performance criteria	
PC01	Describe various personal protective equipment used in work activities in presence of ionizing radiation in industrial and research facilities
PC02	Demonstrate the ability to correctly don, use and doff personal protective equipment in normal operating and emergency situations
PC03	Explain basic protocols to prevent the spread of radioactive contamination in industrial and research facilities
PC04	Explain the function, types, and use of various personal dosimeters, including electronic dosimeters, and including passive and active neutron dosimeters
PC05	Describe precautions in radioactive waste management in industrial and research facilities
Specific evidence requirements	

Candidate must demonstrate knowledge and understanding of selecting personal protective equipment against ionizing radiation according to the situations, and wearing it appropriately.

8.	Range statement	This Unit may be assessed in a simulated environment under conditions that safely replicate relevant workplace situations

9.	Assessment advice	Assessment must be conducted in an environment where evidence gathered by Learners demonstrates consistent performance in conditions that are safe and replicate a potential workplace environment. Assessment methods can include: • Scenario setting • Presentations • Virtual simulations and modelling • Written material and report • Checklists and comparative charts • Statements • Topologies • Evidence of written reports summarising results of candidate skills assessment • Oral or written questioning Evidence: • Verbal or written questioning to assess candidate's knowledge • Summative assessment to ensure consistency of performance in a range of contexts • Formative evidence for this unit can be written, oral or diagrammatic • Formative evidence ought to assist learners to learn and increase performance • Summative assessment is based on real live work situations or simulated situations Assessors and verifiers must satisfy NQC/VETAC requirements with subject matter expert related to radiation emergency assessment. All evidence submitted by the learner must be verified and documented by the assessor for future evaluation purpose. Summative assessment is based on real work situations or simulated situations. Assessment judgements are based on evidence that is documented as valid, authentic, current, and sufficient, and are consistent with previous judgements made on similar evidence. Re-submissions are permissible	
10.	Entry requirements	10a) Mandatory	Level 4 Award for Radiation Occupationally Exposed Workers - Tier 2 Stream B
		10b) Advisory	None
11.	Grading	Percentile 100%: _____%	
		80% pass mark	

12.	Resources required	Reference materials related to this unit, for consideration, and which correlate with international nuclear industry acceptance, for working in a workplace environment include: • relevant and contemporary reference documents, manuals, instructions, procedures, standards; • relevant industry policies and organizational procedures • Other reference documents, including: A. Basic Safety Standards for Facilities and Activities involving Ionizing Radiation other than in Nuclear Facilities (FANR-REG-24) B. IAEA Safety Standards Series, Building Competence in Radiation Protection and the Safe Use of Radiation Sources, No. RS-G-1.4 C. American National Standards Institute, Inc. ANSI/HPS N13.36-2001, American National Standard: "Ionizing Radiation Safety Training for Workers", July 19, 2011, Published by Health Physics Society, 1313 Dolley Madison Blvd., Suite 402, McLean, VA 22101	
13.	Relevant CoreLife Skills	☑ Collecting, analysing, organising and applying information in a given context ☑ Communicating information, concepts and ideas ☑ Initiating and organising self and activities incl. motivation, exploration and creativity ☑ Working with others in teams incl. leadership ☑ Solving problems incl. using mathematical ideas and techniques ☐ Applying information and communication technology (ICT) ☐ Participating in social and civic life incl. ethical practice	
14.	Industry sector	14a) Sector	Energy resources - oil, natural gas, petrochemical, chemical and mining/quarrying
		14b) Sub-sector	Other (Energy)
15.	Developing organisation	Federal Authority for Nuclear Regulation (and Counterpart Organizations) in the "RNDC for Radiation Protection"	
16.	Approval date	01/06/2023	
17.	Review date	31/05/2028	

EGYN23

UNITED ARAB EMIRATES
MINISTRY OF EDUCATION

NQC UAE-NOS TEMPLATE

For use by developers of UAE national occupational standards (UAE-NOS) packaged as unit standards

1.	Title	Execute work activities in the presence of ionizing radiation sources in nuclear facilities – Exposed Worker Tier 3 Stream C			
2.	Code	EGY04006NU23			
3.	Credit and duration	3a) Credit value	1	3b) Duration	15
4.	Aim	This unit aims to provide Exposed Workers with advanced knowledge of radiation physics and radiation protection, and skills to operate effectively with ionizing radiation sources in nuclear facilities			
5.	Learning outcomes	At the end of this unit, learners will be able to:			
		LO01	Demonstrate relevant knowledge and application of work policies, procedures and instructions related to Radiation Protection in nuclear facilities		
		LO02	Demonstrate knowledge of ionizing radiation risk identification and control in nuclear facilities		
		LO03	Demonstrate ability to select and use personal protective equipment against ionizing radiation in nuclear facilities		
6.	QF*Emirates* Level	Level 4			
7.	Outcomes, performance criteria, and evidence requirements				

Outcome 1	LO01
Performance criteria	
PC01	Demonstrate knowledge and understanding of radiation physics, including neutrons and their generation in nuclear facilities
PC02	Demonstrate knowledge and understanding of radiation sources used in nuclear facilities
PC03	State typical dose rates originated by radiation sources in use in nuclear facilities
PC04	Explain the difference between shielding radiation present in nuclear facilities
PC05	Explain the difference between radiation sources, radioactive sources and radiation generators
PC06	Describe quantities and units used in expressing absorbed, equivalent and effective dose and dose rate
PC07	Describe safety precautions when operating radiation sources in nuclear facilities
PC08	State good practices to be applied in handling, use, storage and transportation of radioactive sources and radioactive waste in nuclear facilities
PC09	Explain the concepts of radiation emergency response in nuclear facilities, and Workers' role during an emergency
PC10	Explain the concept of neutron activation in a nuclear facility
Specific evidence requirements	

Candidates must demonstrate understanding and application of Radiation Protection precautions when operating in nuclear facilities; and explain their role during a radiation emergency.

The following information is provided to aid the training provider in developing the course work:
PC1.01: including neutrons generated by radioactive sources (Am-Be, Pu-Be, etc.), by nuclear reactors and by accelerators (d-d, d-t, etc.)
PC1.04: including materials used for shielding, and an order of magnitude of their thickness
PC1.06: includes stating the difference between absorbed dose and effective dose, and their units
PC1.09: Describe potential risks related to malfunctions and incidents involving radiation sources in nuclear facilities

Outcome 2	LO02
Performance criteria	
PC01	Explain the difference between high-activity radioactive sources, particle accelerators, neutron generators and nuclear reactors
PC02	State typical dose rates emerging from various radiation sources used in nuclear facilities
PC03	Describe appropriate techniques to mitigate risks related to radioactive contamination in nuclear facilities
PC04	Describe methods for measuring neutron dose and dose rate in nuclear facilities
PC05	Explain biological effects of the exposure to ionizing radiation
PC06	State applicable FANR Regulations and annual dose limits for workers and the population, including dose limits on extremities, lens of the eye and the skin
PC07	Demonstrate the ISO symbols for neutron emission, high-activity sealed sources, radioactive contamination, general radiation risk
Specific evidence requirements	

Candidate must demonstrate knowledge and understanding of basic principles of radiation risk identification and control, the concept of ALARA, and the potential sources/effects of exposure to ionizing radiation, including neutron sources.
Candidates must have knowledge of the applicable Radiation Protection Regulations in the UAE, and must be familiar with annual dose limits to Workers and to the population, including organs and tissues.

The following information is provided to aid the training provider in developing the course work:
PC2.02: it includes indicating name and radiation emissions (type and approximate energy) of radiation sources in nuclear facilities, and their typical shielding materials and thicknesses
PC2.05: including the distinction between tissue reactions and stochastic risks, typical dose thresholds for tissue reactions and their consequences, and a clear explanation of the LNT theory as practical working tool in occupational radiation protection
PC2.06: state dose limits for workers and the general public, and reference levels to be applied in emergency situations, for the whole body and organs, including the skin

Outcome 3	LO03
Performance criteria	
PC01	Describe various personal protective equipment used in work activities in presence of ionizing radiation in nuclear facilities
PC02	Demonstrate the ability to correctly don, use and doff personal protective equipment in normal operating and emergency situations in nuclear facilities
PC03	Explain basic protocols to prevent the spread of radioactive contamination in nuclear facilities
PC04	Explain the function, types, and use of various personal dosimeters, including electronic dosimeters, and including passive and active neutron dosimeters
PC05	Describe precautions in radioactive waste management in nuclear facilities
Specific evidence requirements	
Candidate must demonstrate knowledge and understanding of selecting personal protective equipment against ionizing radiation according to the situations, and wearing it appropriately.	

8.	Range statement	This Unit may be assessed in a simulated environment under conditions that safely replicate relevant workplace situations

9.	Assessment advice	Assessment must be conducted in an environment where evidence gathered by Learners demonstrates consistent performance in conditions that are safe and replicate a potential workplace environment. Assessment methods can include: • Scenario setting • Presentations • Virtual simulations and modelling • Written material and report • Checklists and comparative charts • Statements • Topologies • Evidence of written reports summarising results of candidate skills assessment • Oral or written questioning Evidence: • Verbal or written questioning to assess candidate's knowledge • Summative assessment to ensure consistency of performance in a range of contexts • Formative evidence for this unit can be written, oral or diagrammatic • Formative evidence ought to assist learners to learn and increase performance • Summative assessment is based on real live work situations or simulated situations Assessors and verifiers must satisfy NQC/VETAC requirements with subject matter expert related to radiation emergency assessment. All evidence submitted by the learner must be verified and documented by the assessor for future evaluation purpose. Summative assessment is based on real work situations or simulated situations. Assessment judgements are based on evidence that is documented as valid, authentic, current, and sufficient, and are consistent with previous judgements made on similar evidence. Re-submissions are permissible	
10.	Entry requirements	10a) Mandatory	Level 4 Award for Radiation Occupationally Exposed Workers - Tier 2 Stream B
		10b) Advisory	None
11.	Grading	Percentile 100%: _____%	
		80% pass mark	

12.	Resources required	Reference materials related to this unit, for consideration, and which correlate with international nuclear industry acceptance, for working in a workplace environment include: relevant and contemporary reference documents, manuals, instructions, procedures, standards; relevant industry policies and organizational procedures Other reference documents, including: Basic Safety Standards for Facilities and Activities involving Ionizing Radiation other than in Nuclear Facilities (FANR-REG-24) IAEA Safety Standards Series, Building Competence in Radiation Protection and the Safe Use of Radiation Sources, No. RS-G-1.4 American National Standards Institute, Inc. ANSI/HPS N13.36-2001, American National Standard: "Ionizing Radiation Safety Training for Workers", July 19, 2011, Published by Health Physics Society, 1313 Dolley Madison Blvd., Suite 402, McLean, VA 22101	
13.	Relevant CoreLife Skills	☑ Collecting, analysing, organising and applying information in a given context ☑ Communicating information, concepts and ideas ☑ Initiating and organising self and activities incl. motivation, exploration and creativity ☑ Working with others in teams incl. leadership ☑ Solving problems incl. using mathematical ideas and techniques ☐ Applying information and communication technology (ICT) ☐ Participating in social and civic life incl. ethical practice	
14.	Industry sector	14a) Sector	Energy resources - oil, natural gas, petrochemical, chemical and mining/quarrying
		14b) Sub-sector	Other (Energy)
15.	Developing organisation	RNDC in Radiation Protection	
16.	Approval date	01/06/2023	
17.	Review date	31/05/2028	

EGYN23