Structural Steel NDT Tester

Electives: Ultrasonic Testing (UT)/ Magnetic Particle Test (MPT)/ Dye Penetration Test (DPT)

QP Code: CON/Q3503

Version: 4.0

NSQF Level: 3.5

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CON/Q3503: Structural Steel NDT Tester

Brief Job Description

A structural steel NDT tester is responsible for performing non-destructive tests (NDT) on structural steel components and welded sections by conducting dye penetration test, magnetic particle test, and ultrasonic test.

Personal Attributes

This individual should be physically and mentally strong to oversee the quality control work at a construction site. The person should have appropriate organizational, interpersonal and communication skills.

Applicable National Occupational Standards (NOS)

Compulsory NOS:

1. CON/N0417: Prepare for the testing of structural steel components
2. CON/N9001: Work according to personal health, safety and environment protocols at construction site
3. DGT/VSQ/N0101: Employability Skills (30 Hours)

Electives*(mandatory to select at least one):*

Elective 1: Ultrasonic Testing (UT)

This occupational standards unit is about performing ultrasonic testing on structural steel components and welded sections.

1. CON/N0411: Perform ultrasonic testing on structural steel components and welded sections

Elective 2: Magnetic Particle Test (MPT)

This occupational standards unit is about performing magnetic particle test on structural steel welded joints.

1. CON/N0412: Perform magnetic particle test on structural steel welded joints

Elective 3: Dye Penetration Test (DPT)

This occupational standards unit is about performing liquid/ dye penetration test on structural steel welded joints.

1. CON/N0413: Perform liquid /dye penetration test on structural steel welded joints

Qualification Pack (QP) Parameters

Sector	Construction
Sub-Sector	Real Estate and Infrastructure construction
Occupation	Quality Assurance & Quality Control
Country	India
NSQF Level	3.5
Credits	16
Aligned to NCO/ISCO/ISIC Code	NCO-2015/3111.0100
Minimum Educational Qualification & Experience	11th Class OR Completed 1st year of 3-year diploma (after 10th) and pursuing regular diploma OR 10th grade pass (pursuing continuous schooling) OR 8th grade pass with 3 Years of experience relevant experience OR Previous relevant Qualification of NSQF Level (2.5) with 3 Years of experience relevant experience OR Previous relevant Qualification of NSQF Level (3)
Minimum Level of Education for Training in School	10th Class
Pre-Requisite License or Training	Recommended training in basic computer literacy
Minimum Job Entry Age	18 Years
Last Reviewed On	NA
Next Review Date	29/02/2024
Deactivation Date	29/02/2024
NSQC Approval Date	31/08/2023
Version	4.0

Reference code on NQR	QG-3.5-CO-00815-2023-V2-CSDCI
NQR Version	1

CON/N0417: Prepare for the testing of structural steel components

Description

This occupational standards unit is about preparing for the testing of structural steel components

Scope

The scope covers the following :

- Determine the testing requirements
- Select and prepare the sample
- Calibrate the testing equipment

Elements and Performance Criteria

Determine the testing requirements

To be competent, the user/individual on the job must be able to:

PC1. interpret the quality plan, Welding Procedure Specification (WPS), fabrication shop drawings etc., to understand the technical specifications, locations of testing and method to be adopted

PC2. identify the location of joint or section for conducting the test as per the specification

PC3. estimate the quantity of materials and time required for the completion of test

Select and prepare the sample

To be competent, the user/individual on the job must be able to:

PC4. select representative samples of structural steel components for testing based on applicable policies and specifications

PC5. prepare the steel samples according to the specific testing requirements, e.g. cutting, machining, or shaping the samples to the desired dimensions

PC6. carry out pre-test cleaning of the structural steel components using the appropriate solvents, brushes, scrubs etc., to remove any paint, dust, oil, grease or scale

PC7. maintain appropriate documentation for each sample, including its origin, specifications, and any relevant material certifications

PC8. label each sample appropriately for identification

Calibrate the testing equipment

To be competent, the user/individual on the job must be able to:

PC9. check the availability of the testing equipment, such as tensile testing machines, impact testers, and hardness testers

PC10. check for the calibration of the testing equipment and calibrate them, as required

PC11. ensure the testing environment meets the testing standards, such as the recommended temperature and humidity

PC12. select the appropriate Personal Protective Equipment (PPE), such as helmets, gloves, safety glasses, for testing of structural steel

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. the importance of testing structural steel components to ensure their quality, safety, and compliance with industry standards and regulations
KU2. the relevant industry standards and codes applicable to structural steel testing
KU3. the importance of prioritizing safety in structural steel testing and the use of relevant PPE
KU4. how to interpret the quality plan, WPS, and fabrication shop drawings
KU5. the selection and preparation of structural steel components for testing, including cutting, machining, cleaning, etc
KU6. the appropriate testing environment required for ultrasonic/ magnetic particle/ liquid or dye penetration testing
KU7. how to calibrate different testing equipment to conduct ultrasonic/ magnetic particle/ liquid or dye penetration testing
KU8. the applicable sample labelling, and documentation requirements

Generic Skills (GS)

User/individual on the job needs to know how to:

GS1. maintain the appropriate data and records
GS2. read the appropriate reports and literature concerning the field of work
GS3. communicate professionally with all the stakeholders
GS4. listen attentively to understand the information/ instructions being shared and take appropriate action
GS5. coordinate with the co-workers to achieve the work objectives
GS6. plan and execute tasks based on priority
GS7. identify possible disruptions to work and take appropriate mitigation measures
GS8. take prompt action to deal with workplace emergencies and accidents
GS9. evaluate all possible solutions to work-related problems and select the best one
GS10. follow the recommended practices for the timely completion of work and achievement of organizational objectives

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Determine the testing requirements	**5**	**15**	**-**	**2**
PC1. interpret the quality plan, Welding Procedure Specification (WPS), fabrication shop drawings etc., to understand the technical specifications, locations of testing and method to be adopted	-	-	-	-
PC2. identify the location of joint or section for conducting the test as per the specification	-	-	-	-
PC3. estimate the quantity of materials and time required for the completion of test	-	-	-	-
Select and prepare the sample	**20**	**30**	**-**	**6**
PC4. select representative samples of structural steel components for testing based on applicable policies and specifications	-	-	-	-
PC5. prepare the steel samples according to the specific testing requirements, e.g. cutting, machining, or shaping the samples to the desired dimensions	-	-	-	-
PC6. carry out pre-test cleaning of the structural steel components using the appropriate solvents, brushes, scrubs etc., to remove any paint, dust, oil, grease or scale	-	-	-	-
PC7. maintain appropriate documentation for each sample, including its origin, specifications, and any relevant material certifications	-	-	-	-
PC8. label each sample appropriately for identification	-	-	-	-
Calibrate the testing equipment	**5**	**15**	**-**	**2**
PC9. check the availability of the testing equipment, such as tensile testing machines, impact testers, and hardness testers	-	-	-	-
PC10. check for the calibration of the testing equipment and calibrate them, as required	-	-	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC11. ensure the testing environment meets the testing standards, such as the recommended temperature and humidity	-	-	-	-
PC12. select the appropriate Personal Protective Equipment (PPE), such as helmets, gloves, safety glasses, for testing of structural steel	-	-	-	-
NOS Total	**30**	**60**	**-**	**10**

National Occupational Standards (NOS) Parameters

NOS Code	CON/N0417
NOS Name	Prepare for the testing of structural steel components
Sector	Construction
Sub-Sector	Real Estate and Infrastructure construction
Occupation	Quality Assurance and Quality Control, Quality Assurance and Quality Control
NSQF Level	3.5
Credits	8
Version	1.0
Last Reviewed Date	31/08/2023
Next Review Date	29/02/2024
NSQC Clearance Date	31/08/2023

DGT/VSQ/N0101: Employability Skills (30 Hours)

Description

This unit is about employability skills, Constitutional values, becoming a professional in the 21st Century, digital, financial, and legal literacy, diversity and Inclusion, English and communication skills, customer service, entrepreneurship, and apprenticeship, getting ready for jobs and career development.

Scope

The scope covers the following :

- Introduction to Employability Skills
- Constitutional values - Citizenship
- Becoming a Professional in the 21st Century
- Basic English Skills
- Communication Skills
- Diversity & Inclusion
- Financial and Legal Literacy
- Essential Digital Skills
- Entrepreneurship
- Customer Service
- Getting ready for Apprenticeship & Jobs

Elements and Performance Criteria

Introduction to Employability Skills

To be competent, the user/individual on the job must be able to:

PC1. understand the significance of employability skills in meeting the job requirements

Constitutional values – Citizenship

To be competent, the user/individual on the job must be able to:

PC2. identify constitutional values, civic rights, duties, personal values and ethics and environmentally sustainable practices

Becoming a Professional in the 21st Century

To be competent, the user/individual on the job must be able to:

PC3. explain 21st Century Skills such as Self-Awareness, Behavior Skills, Positive attitude, self-motivation, problem-solving, creative thinking, time management, social and cultural awareness, emotional awareness, continuous learning mindset etc.

Basic English Skills

To be competent, the user/individual on the job must be able to:

PC4. speak with others using some basic English phrases or sentences

Communication Skills

To be competent, the user/individual on the job must be able to:

PC5. follow good manners while communicating with others

PC6. work with others in a team

Diversity & Inclusion

To be competent, the user/individual on the job must be able to:

PC7. communicate and behave appropriately with all genders and PwD

PC8. report any issues related to sexual harassment

Financial and Legal Literacy

To be competent, the user/individual on the job must be able to:

PC9. use various financial products and services safely and securely

PC10. calculate income, expenses, savings etc.

PC11. approach the concerned authorities for any exploitation as per legal rights and laws

Essential Digital Skills

To be competent, the user/individual on the job must be able to:

PC12. operate digital devices and use its features and applications securely and safely

PC13. use internet and social media platforms securely and safely

Entrepreneurship

To be competent, the user/individual on the job must be able to:

PC14. identify and assess opportunities for potential business

PC15. identify sources for arranging money and associated financial and legal challenges

Customer Service

To be competent, the user/individual on the job must be able to:

PC16. identify different types of customers

PC17. identify customer needs and address them appropriately

PC18. follow appropriate hygiene and grooming standards

Getting ready for apprenticeship & Jobs

To be competent, the user/individual on the job must be able to:

PC19. create a basic biodata

PC20. search for suitable jobs and apply

PC21. identify and register apprenticeship opportunities as per requirement

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. need for employability skills

KU2. various constitutional and personal values

KU3. different environmentally sustainable practices and their importance

KU4. Twenty first (21st) century skills and their importance

KU5. how to use basic spoken English language

KU6. Do and dont of effective communication

KU7. inclusivity and its importance

KU8. different types of disabilities and appropriate communication and behaviour towards PwD

KU9. different types of financial products and services

KU10. how to compute income and expenses

KU11. importance of maintaining safety and security in financial transactions

KU12. different legal rights and laws
KU13. how to operate digital devices and applications safely and securely
KU14. ways to identify business opportunities
KU15. types of customers and their needs
KU16. how to apply for a job and prepare for an interview
KU17. apprenticeship scheme and the process of registering on apprenticeship portal

Generic Skills (GS)

User/individual on the job needs to know how to:

GS1. communicate effectively using appropriate language
GS2. behave politely and appropriately with all
GS3. perform basic calculations
GS4. solve problems effectively
GS5. be careful and attentive at work
GS6. use time effectively
GS7. maintain hygiene and sanitisation to avoid infection

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Introduction to Employability Skills	**1**	**1**	**-**	**-**
PC1. understand the significance of employability skills in meeting the job requirements	-	-	-	-
Constitutional values – Citizenship	**1**	**1**	**-**	**-**
PC2. identify constitutional values, civic rights, duties, personal values and ethics and environmentally sustainable practices	-	-	-	-
Becoming a Professional in the 21st Century	**1**	**3**	**-**	**-**
PC3. explain 21st Century Skills such as Self-Awareness, Behavior Skills, Positive attitude, self-motivation, problem-solving, creative thinking, time management, social and cultural awareness, emotional awareness, continuous learning mindset etc.	-	-	-	-
Basic English Skills	**2**	**3**	**-**	**-**
PC4. speak with others using some basic English phrases or sentences	-	-	-	-
Communication Skills	**1**	**1**	**-**	**-**
PC5. follow good manners while communicating with others	-	-	-	-
PC6. work with others in a team	-	-	-	-
Diversity & Inclusion	**1**	**1**	**-**	**-**
PC7. communicate and behave appropriately with all genders and PwD	-	-	-	-
PC8. report any issues related to sexual harassment	-	-	-	-
Financial and Legal Literacy	**3**	**4**	**-**	**-**
PC9. use various financial products and services safely and securely	-	-	-	-
PC10. calculate income, expenses, savings etc.	-	-	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC11. approach the concerned authorities for any exploitation as per legal rights and laws	-	-	-	-
Essential Digital Skills	**4**	**6**	**-**	**-**
PC12. operate digital devices and use its features and applications securely and safely	-	-	-	-
PC13. use internet and social media platforms securely and safely	-	-	-	-
Entrepreneurship	**3**	**5**	**-**	**-**
PC14. identify and assess opportunities for potential business	-	-	-	-
PC15. identify sources for arranging money and associated financial and legal challenges	-	-	-	-
Customer Service	**2**	**2**	**-**	**-**
PC16. identify different types of customers	-	-	-	-
PC17. identify customer needs and address them appropriately	-	-	-	-
PC18. follow appropriate hygiene and grooming standards	-	-	-	-
Getting ready for apprenticeship & Jobs	**1**	**3**	**-**	**-**
PC19. create a basic biodata	-	-	-	-
PC20. search for suitable jobs and apply	-	-	-	-
PC21. identify and register apprenticeship opportunities as per requirement	-	-	-	-
NOS Total	**20**	**30**	**-**	**-**

National Occupational Standards (NOS) Parameters

NOS Code	DGT/VSQ/N0101
NOS Name	Employability Skills (30 Hours)
Sector	Cross Sectoral
Sub-Sector	Professional Skills
Occupation	Employability
NSQF Level	2
Credits	1
Version	1.0
Last Reviewed Date	08/05/2025
Next Review Date	08/05/2028
NSQC Clearance Date	08/05/2025

CON/N0411: Perform ultrasonic testing on structural steel components and welded sections

Description

This occupational standards unit is about performing ultrasonic testing on structural steel components and welded sections

Scope

The scope covers the following :

- Perform ultrasonic testing

Elements and Performance Criteria

Perform ultrasonic testing

To be competent, the user/individual on the job must be able to:

PC1. determine the transducers, instruments and calibration standards to be used based upon the testing conditions, location and accessibility of testing and purpose of test

PC2. interpret the standard specifications and perform the test in accordance to the same

PC3. run diagnostic checks following the calibration standards to ensure that readings obtained are accurate

PC4. apply coating of gel, water or solvent on the surface to be tested appropriately as per manufacturer's guidelines or standard practices

PC5. ensure the test specimen is appropriately immersed in solvent for immersed type of ultrasonic test

PC6. ensure the transducers are appropriately coated and ready for use

PC7. choose normal or angle beam as per the test requirement and instructions

PC8. set the frequency of ultrasound as per the test specifications and requirements

PC9. ensure the position and movement of both pieces is correct and simultaneous in case of dual element transducers

PC10. ensure the single piece transducer moves appropriately and the required test area is covered

PC11. check the graphs and other details mentioned on the display to compute the size and type of defect

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. the standard practices for quality control

KU2. the safety measures concerning the handling and storage of required tools, equipment and materials

KU3. the importance of personal protection and the use of relevant safety gear and equipment

KU4. the statutory compliance requirements related to working at heights

KU5. the different types of testing carried out on fabricated materials
KU6. the pros and cons and difference between destructive and non-destructive testing
KU7. the properties of sound how it is transmitted
KU8. wave and related parameters
KU9. the principle, application and limitations of ultrasonic testing
KU10. the different methods and procedures of performing ultrasonic testing
KU11. the process of performing ultrasonic test on structural steel components and sections to detect deformities present inside the weld, between weld and parent material, rolling defects under the surface of base material
KU12. the range, area of application, classification and principles of operation of different equipment used in ultrasonic testing
KU13. how to operate various settings on the ultrasonic testing equipment and their implication on testing
KU14. the types of defects inspected by ultrasonic testing
KU15. the precautions to be taken while conducting ultrasonic testing
KU16. the importance of cleaning the surface before and after conducting ultrasonic testing
KU17. the different methods of cleaning metal surface
KU18. how to interpret the readings and graphs shown on the display of ultrasonic testing equipment
KU19. how to classify a sample based upon the test report
KU20. how to calibrate the ultrasonic testing equipment

Generic Skills (GS)

User/individual on the job needs to know how to:

GS1. maintain the appropriate data and records
GS2. read the appropriate reports and literature concerning the field of work
GS3. communicate professionally with all the stakeholders
GS4. listen attentively to understand the information/ instructions being shared and take appropriate action
GS5. coordinate with the co-workers to achieve the work objectives
GS6. plan and execute tasks based on priority
GS7. identify possible disruptions to work and take appropriate mitigation measures
GS8. take prompt action to deal with workplace emergencies and accidents
GS9. evaluate all possible solutions to work-related problems and select the best one
GS10. follow the recommended practices for the timely completion of work and achievement of organizational objectives

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Perform ultrasonic testing	**30**	**60**	**-**	**10**
PC1. determine the transducers, instruments and calibration standards to be used based upon the testing conditions, location and accessibility of testing and purpose of test	-	-	-	-
PC2. interpret the standard specifications and perform the test in accordance to the same	-	-	-	-
PC3. run diagnostic checks following the calibration standards to ensure that readings obtained are accurate	-	-	-	-
PC4. apply coating of gel, water or solvent on the surface to be tested appropriately as per manufacturer's guidelines or standard practices	-	-	-	-
PC5. ensure the test specimen is appropriately immersed in solvent for immersed type of ultrasonic test	-	-	-	-
PC6. ensure the transducers are appropriately coated and ready for use	-	-	-	-
PC7. choose normal or angle beam as per the test requirement and instructions	-	-	-	-
PC8. set the frequency of ultrasound as per the test specifications and requirements	-	-	-	-
PC9. ensure the position and movement of both pieces is correct and simultaneous in case of dual element transducers	-	-	-	-
PC10. ensure the single piece transducer moves appropriately and the required test area is covered	-	-	-	-
PC11. check the graphs and other details mentioned on the display to compute the size and type of defect	-	-	-	-
NOS Total	**30**	**60**	**-**	**10**

National Occupational Standards (NOS) Parameters

NOS Code	CON/N0411
NOS Name	Perform ultrasonic testing on structural steel components and welded sections
Sector	Construction
Sub-Sector	Real Estate and Infrastructure construction
Occupation	Quality Assurance & Quality Control
NSQF Level	3.5
Credits	2
Version	3.0
Last Reviewed Date	31/08/2023
Next Review Date	29/02/2024
NSQC Clearance Date	31/08/2023

CON/N0412: Perform magnetic particle test on structural steel welded joints

Description

This occupational standards unit is about performing magnetic particle test on structural steel welded joints

Scope

The scope covers the following :

- Perform magnetic particle test

Elements and Performance Criteria

Perform magnetic particle test

To be competent, the user/individual on the job must be able to:

PC1. interpret the quality plan, WPS, fabrication shop drawings etc., to determine the technical specifications, locations of testing and method to be adopted

PC2. identify the location of joint or section for conducting the test as per the specification

PC3. estimate the quantity of materials and time required for the completion of test

PC4. interpret the standard specifications and perform the test in accordance to the same

PC5. check the surface to be tested can be magnetized

PC6. carry out pre-test cleaning activities using solvents, brushes, scrubs etc., to remove any paint, dust, oil, grease or scale etc., from the test surface

PC7. ensure the temperature of the test specimen is within the applicable limits prescribed in the test procedure

PC8. ensure appropriate storage of consumables to avoid contamination

PC9. ensure the lighting arrangements are appropriate and compatible to the type of indicator used

PC10. apply suspended magnetic particles to the test surface using appropriate method

PC11. apply dry powder indicators to the surface of the test specimen

PC12. select a suitable method for the application of magnetic field to the test specimen

PC13. apply the magnetic fields in two directions perpendicular to each other of the required magnitude

PC14. check for the appropriate application of magnetic field

PC15. clean the particulate matter under supervision

PC16. set up reverse magnetic field to demagnetize the component or structure under inspection

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. the fundamentals and concepts of magnetic field

KU2. the principle and process of conducting magnetic particle test
KU3. the concept of flux leakage
KU4. the areas of application, and limitations and advantages of different equipment and methods used for creating a magnetic field
KU5. the methods of measuring magnetic field
KU6. the range, principle of operation, area of operation, and limitations of different tools used to measure magnetic field
KU7. the limitations of magnetic particle method
KU8. the type of defects inspected by magnetic particle test
KU9. the precautions to be taken while conducting magnetic particle test
KU10. the importance of cleaning the surface before and after conducting magnetic particle test
KU11. different methods of cleaning metal surface
KU12. different types of indicators, their application and auxiliary items required by them
KU13. the definition, properties and effects of carrier in relation to magnetic particle test
KU14. the interpretation of magnetic patterns developed by particles on the surface of test specimen

Generic Skills (GS)

User/individual on the job needs to know how to:

GS1. maintain the appropriate data and records
GS2. read the appropriate reports and literature concerning the field of work
GS3. communicate professionally with all the stakeholders
GS4. listen attentively to understand the information/ instructions being shared and take appropriate action
GS5. coordinate with the co-workers to achieve the work objectives
GS6. plan and execute tasks based on priority
GS7. identify possible disruptions to work and take appropriate mitigation measures
GS8. take prompt action to deal with workplace emergencies and accidents
GS9. evaluate all possible solutions to work-related problems and select the best one
GS10. follow the recommended practices for the timely completion of work and achievement of organizational objectives

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Perform magnetic particle test	**30**	**60**	**-**	**10**
PC1. interpret the quality plan, WPS, fabrication shop drawings etc., to determine the technical specifications, locations of testing and method to be adopted	-	-	-	-
PC2. identify the location of joint or section for conducting the test as per the specification	-	-	-	-
PC3. estimate the quantity of materials and time required for the completion of test	-	-	-	-
PC4. interpret the standard specifications and perform the test in accordance to the same	-	-	-	-
PC5. check the surface to be tested can be magnetized	-	-	-	-
PC6. carry out pre-test cleaning activities using solvents, brushes, scrubs etc., to remove any paint, dust, oil, grease or scale etc., from the test surface	-	-	-	-
PC7. ensure the temperature of the test specimen is within the applicable limits prescribed in the test procedure	-	-	-	-
PC8. ensure appropriate storage of consumables to avoid contamination	-	-	-	-
PC9. ensure the lighting arrangements are appropriate and compatible to the type of indicator used	-	-	-	-
PC10. apply suspended magnetic particles to the test surface using appropriate method	-	-	-	-
PC11. apply dry powder indicators to the surface of the test specimen	-	-	-	-
PC12. select a suitable method for the application of magnetic field to the test specimen	-	-	-	-
PC13. apply the magnetic fields in two directions perpendicular to each other of the required magnitude	-	-	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC14. check for the appropriate application of magnetic field	-	-	-	-
PC15. clean the particulate matter under supervision	-	-	-	-
PC16. set up reverse magnetic field to demagnetize the component or structure under inspection	-	-	-	-
NOS Total	**30**	**60**	**-**	**10**

National Occupational Standards (NOS) Parameters

NOS Code	CON/N0412
NOS Name	Perform magnetic particle test on structural steel welded joints
Sector	Construction
Sub-Sector	Real Estate and Infrastructure construction
Occupation	Quality Assurance & Quality Control
NSQF Level	3.5
Credits	2
Version	3.0
Last Reviewed Date	31/08/2023
Next Review Date	29/02/2024
NSQC Clearance Date	31/08/2023

CON/N0413: Perform liquid /dye penetration test on structural steel welded joints

Description

This occupational standards unit is about performing liquid/ dye penetration test on structural steel welded joints

Scope

The scope covers the following :

- Perform liquid/ dye penetration test

Elements and Performance Criteria

Perform liquid/dye penetration test

To be competent, the user/individual on the job must be able to:

PC1. interpret the quality plan, WPS, fabrication shop drawings etc., to determine the technical specifications, locations of testing and method to be adopted

PC2. identify the location of joint or section for conducting the test as per the specification

PC3. estimate the quantity of penetrants and developers and time required for the completion of test

PC4. interpret the standard specifications and perform the test in accordance to the same

PC5. check the compatibility of penetrants and developers with each other, the base metal and conditions of testing

PC6. carry out pre-test cleaning activities using solvents, brushes, scrubs etc., to remove any paint, dust, oil, grease or scale etc., from the test surface

PC7. ensure the area surrounding the test surface is appropriately cleaned and free from impurities

PC8. identify and use suitable means to apply penetrant on the test surface

PC9. apply the penetrant uniformly across the test specimen and allow it to soak into the flaw for the recommended duration, and avoid the direct application of removers/solvents to the test surface

PC10. remove excess penetrant from the surface of test specimen using suitable means as per the type of penetrant used and manufacturer’s guidelines

PC11. select and use appropriate developers based on the type of penetrant and inspection condition

PC12. apply the developer uniformly across the test specimen as per the manufacturer’s guidelines or standard procedure

PC13. ensure the developer is not disturbed for the specified duration as per instructions for blotting to take place correctly

PC14. check the completion of blotting period and development of penetrant on the test surface

PC15. clean the developer and penetrant appropriately after inspection

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. the principle, advantages and limitations of dye penetration test
KU2. different types of materials on which dye penetration test can be carried out
KU3. how to select materials used in dye penetration test for various conditions of testing
KU4. the types of defects inspected by dye penetration test
KU5. the precautions to be taken while conducting dye penetration test
KU6. the importance of cleaning the surface before and after conducting dye penetration test
KU7. different methods of cleaning metal surface
KU8. the use of different types of penetrants and developers
KU9. different methods of applying penetrants and developers
KU10. the guidelines for the application, and development time of various penetrants and developers
KU11. the appropriate safety measures to be taken while conducting the dye penetration test

Generic Skills (GS)

User/individual on the job needs to know how to:

GS1. maintain the appropriate data and records
GS2. read the appropriate reports and literature concerning the field of work
GS3. communicate professionally with all the stakeholders
GS4. listen attentively to understand the information/ instructions being shared and take appropriate action
GS5. coordinate with the co-workers to achieve the work objectives
GS6. plan and execute tasks based on priority
GS7. identify possible disruptions to work and take appropriate mitigation measures
GS8. take prompt action to deal with workplace emergencies and accidents
GS9. evaluate all possible solutions to work-related problems and select the best one
GS10. follow the recommended practices for the timely completion of work and achievement of organizational objectives

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Perform liquid/dye penetration test	**30**	**60**	**-**	**10**
PC1. interpret the quality plan, WPS, fabrication shop drawings etc., to determine the technical specifications, locations of testing and method to be adopted	-	-	-	-
PC2. identify the location of joint or section for conducting the test as per the specification	-	-	-	-
PC3. estimate the quantity of penetrants and developers and time required for the completion of test	-	-	-	-
PC4. interpret the standard specifications and perform the test in accordance to the same	-	-	-	-
PC5. check the compatibility of penetrants and developers with each other, the base metal and conditions of testing	-	-	-	-
PC6. carry out pre-test cleaning activities using solvents, brushes, scrubs etc., to remove any paint, dust, oil, grease or scale etc., from the test surface	-	-	-	-
PC7. ensure the area surrounding the test surface is appropriately cleaned and free from impurities	-	-	-	-
PC8. identify and use suitable means to apply penetrant on the test surface	-	-	-	-
PC9. apply the penetrant uniformly across the test specimen and allow it to soak into the flaw for the recommended duration, and avoid the direct application of removers/solvents to the test surface	-	-	-	-
PC10. remove excess penetrant from the surface of test specimen using suitable means as per the type of penetrant used and manufacturer’s guidelines	-	-	-	-
PC11. select and use appropriate developers based on the type of penetrant and inspection condition	-	-	-	-
PC12. apply the developer uniformly across the test specimen as per the manufacturer’s guidelines or standard procedure	-	-	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC13. ensure the developer is not disturbed for the specified duration as per instructions for blotting to take place correctly	-	-	-	-
PC14. check the completion of blotting period and development of penetrant on the test surface	-	-	-	-
PC15. clean the developer and penetrant appropriately after inspection	-	-	-	-
NOS Total	**30**	**60**	**-**	**10**

National Occupational Standards (NOS) Parameters

NOS Code	CON/N0413
NOS Name	Perform liquid /dye penetration test on structural steel welded joints
Sector	Construction
Sub-Sector	Real Estate and Infrastructure construction
Occupation	Quality Assurance and Quality Control
NSQF Level	3.5
Credits	2
Version	3.0
Last Reviewed Date	31/08/2023
Next Review Date	29/02/2024
NSQC Clearance Date	31/08/2023

Assessment Guidelines and Assessment Weightage

Assessment Guidelines

1. Criteria for assessment for each Qualification Pack will be created by the Sector Skill Council. Each Performance Criteria (PC) will be assigned marks proportional to its importance in NOS. SSC will also lay down proportion of marks for Theory and Skills Practical for each PC.

2. The assessment for the knowledge part will be based on knowledge bank of questions created by Assessment Bodies subject to approval by SSC.

3. Individual assessment agencies will create unique question papers for knowledge/theory part for assessment of candidates as per assessment criteria given below.

4. Individual assessment agencies will create unique evaluations for skill practical for every student at each examination/training center based on assessment criteria.

5. The passing percentage for each QP will be 70%. To pass the Qualification Pack, every trainee should score a minimum of 70% individually in each NOS.

6. The Assessor shall check the final outcome of the practices while evaluating the steps performed to achieve the final outcome.

7. The trainee shall be provided with a chance to repeat the test to correct his procedures in case of improper performance, with a deduction of marks for each iteration.

8. After the certain number of iteration as decided by SSC the trainee is marked as fail, scoring zero marks for the procedure for the practical activity.

9. In case of successfully passing only certain number of NOSs, the trainee is eligible to take subsequent assessment on the balance NOSs to pass the Qualification Pack within the specified time frame set by SSC.

10. Minimum duration of Assessment of each QP shall be of 4hrs/trainee.

Minimum Aggregate Passing % at QP Level : 70

(**Please note**: Every Trainee should score a minimum aggregate passing percentage as specified above, to successfully clear the Qualification Pack assessment.)

Assessment Weightage

Compulsory NOS

National Occupational Standards	Theory Marks	Practical Marks	Project Marks	Viva Marks	Total Marks	Weightage
CON/N0417.Prepare for the testing of structural steel components	30	60	0	10	100	50
CON/N9001.Work according to personal health, safety and environment protocols at construction site	30	70	0	0	100	10

National Occupational Standards	Theory Marks	Practical Marks	Project Marks	Viva Marks	Total Marks	Weightage
DGT/VSQ/N0101.Employability Skills (30 Hours)	20	30	-	-	50	10
Total	**80**	**160**	**0**	**10**	**250**	**70**

Elective: 1 Ultrasonic Testing (UT)

National Occupational Standards	Theory Marks	Practical Marks	Project Marks	Viva Marks	Total Marks	Weightage
CON/N0411.Perform ultrasonic testing on structural steel components and welded sections	30	60	0	10	100	30
Total	**30**	**60**	**-**	**10**	**100**	**30**

Elective: 2 Magnetic Particle Test (MPT)

National Occupational Standards	Theory Marks	Practical Marks	Project Marks	Viva Marks	Total Marks	Weightage
CON/N0412.Perform magnetic particle test on structural steel welded joints	30	60	0	10	100	30
Total	**30**	**60**	**-**	**10**	**100**	**30**

Elective: 3 Dye Penetration Test (DPT)

National Occupational Standards	Theory Marks	Practical Marks	Project Marks	Viva Marks	Total Marks	Weightage
CON/N0413.Perform liquid /dye penetration test on structural steel welded joints	30	60	0	10	100	30
Total	**30**	**60**	**-**	**10**	**100**	**30**

Acronyms

NOS	National Occupational Standard(s)
NSQF	National Skills Qualifications Framework
QP	Qualifications Pack
TVET	Technical and Vocational Education and Training

Glossary

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.
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 (KU) they need to meet that standard consistently. Occupational Standards are applicable both in the Indian and global contexts.
Performance Criteria (PC)	Performance Criteria (PC) are statements that together specify the standard of performance required when carrying out a task.
National Occupational Standards (NOS)	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 (KU)	Knowledge and Understanding (KU) 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 (GS)	Core skills or Generic Skills (GS) 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.
Electives	Electives are NOS/set of NOS that are identified by the sector as contributive to specialization in a job role. There may be multiple electives within a QP for each specialized job role. Trainees must select at least one elective for the successful completion of a QP with Electives.
Options	Options are NOS/set of NOS that are identified by the sector as additional skills. There may be multiple options within a QP. It is not mandatory to select any of the options to complete a QP with Options.