Applications of AI in Construction Safety

Unit Code: ICE/CON/N1201

Version: 1.0

NSQF Level: 3

INTEGRATED COUNCIL FOR ENTREPRENEURSHIP AND SKILLING || 533-R
Model Town Ludhiana || email:cmswami@ice.net.in

Description

This NOS specifies the skills and competencies required to apply artificial intelligence (AI) technologies to support safety management in construction environments. The individual is responsible for monitoring AI-enabled systems, interpreting risk predictions, validating alerts, reporting anomalies and ensuring coordinated communication on potential hazards. Application responsibilities include the safe use of AI-driven sensors, surveillance platforms, predictive maintenance tools, VR/AR workplace simulations and automated audit dashboards. Emphasis is on accurate risk interpretation, compliance support, emergency preparedness, structured incident reporting and contributing to decision-making alongside safety engineers and supervisors.

Scope

The scope covers the following :

- Operate AI-Based Hazard Detection Systems
- Manage Smart Wearables and Worker Monitoring
- Support Structural and Equipment Monitoring Using AI
- Use AI-Based Surveillance and Incident Reporting Systems
- Apply Immersive AI Technologies for Safety Training and Emergency Drills
- Assist in AI-Supported Safety Communication, Audits and Emergency Coordination

Elements and Performance Criteria

Operate AI-Based Hazard Detection Systems

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

PC1.   operate AI-enabled cameras and sensors to detect unsafe conditions, including slips, trips, falls, equipment proximity and barricade violations

PC2.   interpret hazard alerts generated from computer vision modules and confirm validity based on onsite conditions

PC3.   identify false positives and escalate suspected misclassifications to supervisors for validation

PC4.   record and communicate repeated scene-based alerts to prevent recurring risks

PC5.   verify environmental hazard warnings such as dust, noise or heat anomalies reported by AI units

Manage Smart Wearables and Worker Monitoring

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

PC6.   configure AI-enabled wearables for fatigue, posture recording, fall prediction, health vitals and proximity alerts

PC7.   track alerts generated from wearables and correlate readings with worker behaviour or high-strain tasks.

PC8.   inform workers of unsafe fatigue signals and recommend temporary withdrawal or rest

PC9.   identify incorrect device readings or sensor disconnection issues and escalate for rectification

PC10.   maintain device logs covering alert frequency, worker ID and resolution status.

PC11.   communicate with supervisors on repeated fatigue alerts or abnormal health readings

Support Structural and Equipment Monitoring Using AI

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

PC12. monitor AI-enabled structural health dashboards for unusual strain, settlement or vibration patterns

PC13. interpret predictive maintenance alerts related to cranes, hoists, scaffolds, drilling equipment or pumps

PC14. inspect flagged areas physically to verify predicted risks and confirm severity

PC15. support data acquisition by placing sensors at designated points as directed by supervisors

PC16. report deviations such as loose scaffolding, anchor failure patterns or instability signals detected by AI

PC17. coordinate with equipment technicians for maintenance actions triggered via AI prediction

Use AI-Based Surveillance and Incident Reporting Systems

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

PC18. review AI-based surveillance analytics for unsafe acts such as improper PPE, manual lifting, unsafe welding or crowding

PC19. tag unsafe events recorded by smart cameras and log them for periodic safety review

PC20. classify events by severity and category (behavioural, PPE, equipment, environmental) as per AI system outputs

PC21. upload near-miss images or clips for digital documentation and traceability

PC22. assist supervisors to validate automated incident reports before closure

PC23. maintain traceability registers for alerts and event resolution timelines

Apply Immersive AI Technologies for Safety Training and Emergency Drills

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

PC24. operate VR/AR training modules replicating common site hazards and accident sequences

PC25. support workers to navigate simulated emergency escape routes and rescue operations

PC26. record participant performance data from AI-enabled simulation dashboards

PC27. identify skill gaps observed during simulations and recommend focused re-training

PC28. collaborate with trainers to modify simulation scenarios based on actual site hazards

PC29. track improvements in successive simulation sessions through auto-generated analytics

Assist in AI-Supported Safety Communication, Audits and Emergency Coordination

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

PC30. use AI chatbots for dissemination of critical alerts and procedural safety instructions

PC31. support the integration of AI platform alerts into the site-wide unified communication system

PC32. assist supervisors in AI-driven safety audit documentation and compliance benchmarking

PC33. provide data inputs for evacuation pathway planning based on AI crowd-density outputs

PC34. maintain digital records of audit findings, corrective recommendations and timelines

PC35. support real-time emergency response coordination using AI-generated situational maps

PC36. escalate emergency alerts from AI dashboards to designated safety officials immediately

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

KU1. construction safety regulations, risk reporting requirements and hazard classification

KU2. procedures for incident escalation and compliance documentation

KU3. standard emergency response protocol and first-response guidelines

KU4.   site communication channels and supervisor coordination structure

KU5.   functioning of AI-based detection modules using image analytics and sensor data

KU6.   operating architecture of IoT-enabled safety monitoring systems

KU7.   parameters monitored by smart wearables such as vitals, posture and proximity

KU8.   fundamentals of predictive maintenance outputs such as vibration, strain or anomaly trends

KU9.   features of VR/AR simulation platforms for safety orientation

KU10. principles of automated digital reporting and AI-assisted audit dashboards

KU11. data privacy, traceability, tagging and secure storage requirements for AI logs

KU12. procedures for troubleshooting device connectivity, sensor failure and false alerts

Generic Skills (GS)

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

GS1. record readings, alerts, near-miss data and audit logs clearly and accurately

GS2. interpret digital dashboards, instruction manuals and AI-generated notifications

GS3. communicate alerts, risk interpretations and emergency instructions clearly

GS4. apply reasoning to distinguish valid alerts from false positives

GS5. prioritize hazards and escalate issues immediately where worker safety is involved

GS6. work collaboratively with supervisors, technicians and training personnel

GS7. follow time-bound tasks during audits, inspections and emergency drills

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
Operate AI-Based Hazard Detection Systems	**5**	**10**	**-**	**1**
PC1. operate AI-enabled cameras and sensors to detect unsafe conditions, including slips, trips, falls, equipment proximity and barricade violations	-	-	-	-
PC2. interpret hazard alerts generated from computer vision modules and confirm validity based on onsite conditions	-	-	-	-
PC3. identify false positives and escalate suspected misclassifications to supervisors for validation	-	-	-	-
PC4. record and communicate repeated scene-based alerts to prevent recurring risks	-	-	-	-
PC5. verify environmental hazard warnings such as dust, noise or heat anomalies reported by AI units	-	-	-	-
Manage Smart Wearables and Worker Monitoring	**5**	**10**	**-**	**1**
PC6. configure AI-enabled wearables for fatigue, posture recording, fall prediction, health vitals and proximity alerts	-	-	-	-
PC7. track alerts generated from wearables and correlate readings with worker behaviour or high-strain tasks.	-	-	-	-
PC8. inform workers of unsafe fatigue signals and recommend temporary withdrawal or rest	-	-	-	-
PC9. identify incorrect device readings or sensor disconnection issues and escalate for rectification	-	-	-	-
PC10. maintain device logs covering alert frequency, worker ID and resolution status.	-	-	-	-
PC11. communicate with supervisors on repeated fatigue alerts or abnormal health readings	-	-	-	-
Support Structural and Equipment Monitoring Using AI	**5**	**10**	**-**	**2**
PC12. monitor AI-enabled structural health dashboards for unusual strain, settlement or vibration patterns	-	-	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC13. interpret predictive maintenance alerts related to cranes, hoists, scaffolds, drilling equipment or pumps	-	-	-	-
PC14. inspect flagged areas physically to verify predicted risks and confirm severity	-	-	-	-
PC15. support data acquisition by placing sensors at designated points as directed by supervisors	-	-	-	-
PC16. report deviations such as loose scaffolding, anchor failure patterns or instability signals detected by AI	-	-	-	-
PC17. coordinate with equipment technicians for maintenance actions triggered via AI prediction	-	-	-	-
Use AI-Based Surveillance and Incident Reporting Systems	5	10	-	2
PC18. review AI-based surveillance analytics for unsafe acts such as improper PPE, manual lifting, unsafe welding or crowding	-	-	-	-
PC19. tag unsafe events recorded by smart cameras and log them for periodic safety review	-	-	-	-
PC20. classify events by severity and category (behavioural, PPE, equipment, environmental) as per AI system outputs	-	-	-	-
PC21. upload near-miss images or clips for digital documentation and traceability	-	-	-	-
PC22. assist supervisors to validate automated incident reports before closure	-	-	-	-
PC23. maintain traceability registers for alerts and event resolution timelines	-	-	-	-
Apply Immersive AI Technologies for Safety Training and Emergency Drills	5	10	-	2
PC24. operate VR/AR training modules replicating common site hazards and accident sequences	-	-	-	-
PC25. support workers to navigate simulated emergency escape routes and rescue operations	-	-	-	-

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC26. record participant performance data from AI-enabled simulation dashboards	-	-	-	-
PC27. identify skill gaps observed during simulations and recommend focused re-training	-	-	-	-
PC28. collaborate with trainers to modify simulation scenarios based on actual site hazards	-	-	-	-
PC29. track improvements in successive simulation sessions through auto-generated analytics	-	-	-	-
Assist in AI-Supported Safety Communication, Audits and Emergency Coordination	5	10	-	2
PC30. use AI chatbots for dissemination of critical alerts and procedural safety instructions	-	-	-	-
PC31. support the integration of AI platform alerts into the site-wide unified communication system	-	-	-	-
PC32. assist supervisors in AI-driven safety audit documentation and compliance benchmarking	-	-	-	-
PC33. provide data inputs for evacuation pathway planning based on AI crowd-density outputs	-	-	-	-
PC34. maintain digital records of audit findings, corrective recommendations and timelines	-	-	-	-
PC35. support real-time emergency response coordination using AI-generated situational maps	-	-	-	-
PC36. escalate emergency alerts from AI dashboards to designated safety officials immediately	-	-	-	-
NOS Total	30	60	-	10

National Occupational Standards (NOS) Parameters

NOS Code	ICE/CON/N1201
NOS Name	Applications of AI in Construction Safety
Sector	Construction
Sub-Sector	
Occupation	Safety Works, Future Skills
NSQF Level	3
Credits	2
Minimum Job Entry Age	18
Minimum Educational Qualification & Experience	10th grade pass OR 8th grade pass with 3 Years of experience Relevant Industry OR Previous relevant Qualification of NSQF Level 2 with 3 Years of experience Relevant Industry OR Previous relevant Qualification of NSQF Level 2.5 with 1.5 years of experience Relevant Industry
Version	1.0
Last Reviewed Date	07/10/2025
Next Review Date	07/10/2028
NSQC Clearance Date	07/10/2025
Reference code on NQR	NG-03-CO-046452025-V1-ICES
NQR Version	1.0
CCN Category	1