









Model Curriculum

NOS Name: Applications of AI in Construction Safety

NOS Code: ICE/CON/N1201

Version: 1.0

NSQF Level: 3

Model Curriculum Version: 1.0

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Training Parameters

Sector	Const	truction		
Sub-Sector	Futur	Future Skills		
Occupation	Safet	Safety Works, Future Skills		
Country	India			
NSQF Level	3			
Aligned to NCO/ISCO/ISIC Code	NCO	-2015/2263.9900		
	S. No.	Academic/Skill Qualification (with Specialization - if applicable)	Required Experience (with Specialization - if applicable)	
	1	10 th Grade Pass	,	
		OR		
Minimum Educational Qualification	2	8 th Grade Pass	3-years of Relevant Industry Experience	
and Experience	OR			
	3	Previous relevant Qualification of NSQF Level 2	3 years of Relevant Industry Experience	
	OR			
	4	Previous relevant Qualification of NSQF Level 2.5	1.5 years of Relevant Industry Experience	
Pre-Requisite License or Training	Not Applicable			
Minimum Job Entry Age	As per Govt. Norms			
Last Reviewed On	07-10-2025			
Next Review Date	07-10-2028			
NSQC Approval Date	07-10-2025			
QP Version	1.0			
Model Curriculum Creation Date	07-10-2025			
Model Curriculum Valid Up to Date	07-10-2028			
Model Curriculum Version	1.0			
Minimum Duration of the Course	60 Hours			
Maximum Duration of the Course	60 Hours			









Program Overview

This section summarises the end objectives of the program along with its duration.

Training Outcomes:

At the end of the program, the learner should have acquired the listed knowledge and skills to:

- Operate AI-enabled hazard detection systems for identifying unsafe conditions, validating alerts and preventing recurring risks.
- Use AI-enabled smart wearables to monitor worker vitals, fatigue, posture and proximity alerts and escalate anomalies.
- Support structural and equipment health monitoring using AI dashboards, predictive maintenance analytics and sensor-based reporting.
- Use AI-based surveillance tools and digital incident-reporting systems for classifying, documenting and reviewing unsafe events.
- Apply immersive AI technologies (VR/AR) for safety simulations, emergency drills and worker performance assessment.
- Assist in AI-driven safety communication, audit documentation, emergency coordination and AI-based evacuation planning.
- Maintain digital records, ensure traceability of alerts/events and comply with data privacy and safety reporting protocols.









Modules:

The table lists the modules and their duration corresponding to the Standalone NOS.

NOS	NOS and Module Details		Practical Duration (in Hours)	On-the-Job Training Duration (Mandatory) (in Hours)	On-the-Job Training Duration (Recommended) (in Hours)	Total Duration (in Hours)
		40:00	20:00	00:00	00:00	60:00
Module 1:	Introduction to AI in Construction Safety	04:00	00:00	00:00	00:00	04:00
Module 2:	Operation of AI-Based Hazard Detection Systems	06:00	02:00	00:00	00:00	08:00
Module 3:	Smart Wearables and Worker Monitoring	06:00	04:00	00:00	00:00	10:00
Module 4:	AI in Structural and Equipment Monitoring	06:00	04:00	00:00	00:00	10:00
Module 5:	AI-Based Surveillance and Digital Incident Reporting	06:00	04:00	00:00	00:00	10:00
Module 6:	AR/VR-Based Safety Training and Emergency Drills	06:00	02:00	00:00	00:00	08:00
Module 7:	AI-Supported Safety Communication, Audits and Emergency Response	06:00	04:00	00:00	00:00	10:00
,	Total Duration	40:00	20:00	00:00	00:00	60:00









Module Details

Module 1: Introduction to AI in Construction Safety

Mapped to ICE/CON/N1201, v1.0

Terminal Outcomes:

- Explain the role and scope of AI in construction safety.
- Identify different AI technologies used in safety applications.
- Understand the functioning of sensors, IoT devices, cameras and wearables.
- Interpret basic AI-generated alerts and notifications.
- Explain regulatory requirements and risk-reporting norms relevant to AI-based safety.
- Recognize data privacy protocols, traceability norms and secure storage requirements.

Duration: 04:00	Duration: 00:00
Theory – Key Learning Outcomes	Practical – Key Learning Outcomes
 Define AI, computer vision, IoT, predictive analytics, VR/AR. Explain the safety risks in construction requiring AI intervention. Describe the types of AI-enabled systems (cameras, sensors, wearables, dashboards). Interpret basic dashboards, heat maps, PPE-detection indicators and alert categories. Explain hazard classification systems (equipment, behavioral, environmental). Understand data tagging, log maintenance and documentation norms. List emergency escalation procedures linked to AI alerts. 	

Training Kit - Trainer Guide, Presentations, Whiteboard, Marker, Projector, Laptop, Video

Tools, Equipment and Other Requirements









Module 2: Operation of AI-Based Hazard Detection Systems Mapped to ICE/CON/N1201, v1.0

Terminal Outcomes:

- Operate AI-enabled cameras, sensors and CV-based hazard detection systems.
- Validate AI-generated hazard alerts against actual site conditions.
- Identify false positives and misclassifications.
- Record recurring scene-based alerts and forward them to supervisors.
- Verify environmental hazard readings (heat, dust, noise) from AI modules.
- Escalate critical alerts as per standard procedures.

Practical – Key Learning Outcomes			
 Operate a demo AI camera interface (PPE detection, proximity alerts). Validate system alerts using sample video feeds. Identify and tag misclassified events. Simulate environmental hazard readings and log them. Practice recording repeat alerts in a digital logbook. Execute an alert escalation simulation. Compare manual observation vs. AI observation for sample hazards. 			
Classroom Aids			

Films

Tools, Equipment and Other Requirements









Module 3: Smart Wearables and Worker Monitoring Mapped to ICE/CON/N1201, v1.0

Terminal Outcomes:

- Configure AI-enabled wearables (fatigue, vitals, posture, fall prediction).
- Track and interpret alerts from wearables.
- Correlate wearable data with worker behaviour and high-strain activity.
- Identify device malfunctions, disconnection and inaccurate readings.
- Maintain detailed logs of alerts, worker ID and resolution actions.
- Communicate abnormal readings to supervisors promptly

Practical – Key Learning Outcomes		
 Configure a sample wearable device. Read real-time data from demo wearables. Identify fatigue alerts and recommend rest intervals. Detect posture warnings from sample data. Simulate connectivity failure and log actions. Prepare worker-wise alert logs. Communicate alert trends to a supervisor in a mock scenario. 		
Classroom Aids		

Films

Tools, Equipment and Other Requirements









Module 4: AI in Structural and Equipment Monitoring Mapped to ICE/CON/N1201, v1.0

Terminal Outcomes:

- Monitor structural health dashboards for strain, vibration and settlement patterns.
- Interpret predictive maintenance alerts for cranes, hoists, scaffolds and equipment.
- Physically inspect flagged risk zones and validate AI alerts.
- Support sensor placement and data acquisition activities.
- Identify deviations such as loose scaffolding or anchor failures detected by AI.
- Report and coordinate maintenance actions with technicians.

Duration: 06:00	Duration: 04:00	
Theory – Key Learning Outcomes	Practical – Key Learning Outcomes	
 Explain structural health monitoring (SHM) and sensor technologies. Understand vibration, strain, displacement and anomaly data. Interpret predictive maintenance indicators (cycles, load history, thresholds). Describe failure patterns commonly flagged by AI. Learn sensor placement protocols. Understand technician coordination workflows. Study safety regulations for equipment maintenance. 	 Navigate a structural monitoring dashboard simulation. Analyze vibration/strain datasets and classify anomalies. Inspect a mock flagged area and validate alerts. Assist in placing sensors at designated points. Record deviations in a digital tool. Simulate maintenance requests from AI-triggered alerts. Collaborate with technicians in a role-play scenario. 	
Classroom Aids		

Films

Tools, Equipment and Other Requirements









Module 5: AI-Based Surveillance and Digital Incident Reporting Mapped to ICE/CON/N1201, v1.0

Terminal Outcomes:

- Review AI-generated surveillance analytics for unsafe acts.
- Tag unsafe events and classify severity and category.
- Upload images/videos for near-miss documentation.
- Assist in validating AI-generated incident reports.
- Maintain traceability of alert logs and resolution timelines.
- Support supervisors during periodic safety reviews.

Duration: 06:00	Duration: 04:00		
Theory – Key Learning Outcomes	Practical – Key Learning Outcomes		
 Explain how AI classifies unsafe acts (PPE, welding, crowding, manual lifting). Understand severity classification methods (high, medium, low). Learn digital documentation and traceability protocols. Understand incident validation workflows. Review automated event categorization logic. Understand periodic review cycles in safety management. Learn video analytic interpretation. 	 Review sample surveillance analytics data. Tag unsafe events in a mock system. Classify events using AI-generated categories. Upload and store near-miss images. Validate an automated incident report. Maintain a traceability register. Prepare a digital incident summary. 		
Classroom Aids			
Training Kit - Trainer Guide, Presentations, Whiteboard, Marker, Projector, Laptop, Video			

Films

Tools, Equipment and Other Requirements









Module 6: AR/VR-Based Safety Training and Emergency Drills *Mapped to ICE/CON/N1201, v1.0*

Terminal Outcomes:

- Operate VR/AR training modules simulating common hazards.
- Guide workers through simulated emergency escape routes.
- Record participant performance on simulation dashboards.
- Identify skill gaps based on training data.
- Recommend re-training and improvements.
- Assist trainers in adjusting simulation scenarios.
- Track performance improvement trends

Duration: 06:00	Duration: 02:00
Theory – Key Learning Outcomes	Practical – Key Learning Outcomes
 Explain VR/AR applications in safety training. Understand hazard simulation logic. Learn emergency escape and rescue protocols. Interpret performance metrics from simulation analytics. Understand scenario modification methods. Learn skill gap identification patterns. Recognize simulation-based assessment parameters. 	 Run a VR/AR safety simulation module. Assist participants during VR training. Record performance data from dashboards. Identify weak performance areas. Recommend corrective training steps. Modify a basic simulation scenario (with trainer support). Track improvement over successive sessions.
Classroom Aids	

Training Kit - Trainer Guide, Presentations, Whiteboard, Marker, Projector, Laptop, Video Films

Tools, Equipment and Other Requirements









Module 7: AI-Supported Safety Communication, Audits & Emergency Response

Mapped to ICE/CON/N1201, v1.0

Terminal Outcomes:

- Use AI chatbots to disseminate critical safety alerts.
- Support integration of platform alerts into unified communication systems.
- Assist in AI-driven safety audit documentation.
- Provide data inputs for evacuation planning based on crowd-density analytics.
- Maintain digital records of audit findings and recommendations.
- Coordinate during emergency response using AI-generated situational maps.
- Escalate emergency alerts as per protocol.

Duration: 06:00	Duration: 04:00
Theory – Key Learning Outcomes	Practical – Key Learning Outcomes
 Understand chatbot workflows and alert dissemination. Learn unified communication systems on construction sites. Study audit documentation and compliance formats. Explain crowd-density mapping and evacuation planning. Understand emergency classification and response hierarchy. Learn data traceability and secure storage protocols. Identify critical KPIs in safety audits. 	 Use a sample AI chatbot to send alerts. Review integrated alert dashboards. Prepare an audit document using sample data. Generate basic evacuation inputs from crowd analytics. Manage digital audit logs. Operate a situational map simulation for emergency response. Escalate emergency alerts in a role-play scenario.
Classroom Aids	

Training Kit - Trainer Guide, Presentations, Whiteboard, Marker, Projector, Laptop, Video Films

Tools, Equipment and Other Requirements









Annexure

Trainer Requirements

Minimum Educational	Specialization		Relevant Industry Experience		Preferable Training Experience	
Qualification	Specialization	Years	Specialization	Years	Specialization	
Post Graduation	Civil / CSE & IT Engineering	1		1		
	OR					
Graduation	Civil / CSE & IT Engineering	3		1		
OR						
Diploma	Civil / CSE & IT Engineering	5		1		

Trainer Certification		
Domain Certification	Platform Certification	
Recommended that the Trainer is certified for the Standalone NOS: "Applications of AI in Construction Safety", mapped to the Standalone NOS: "ICE/CON/N1201, v1.0". The minimum accepted score is 80%.	Recommended that the Trainer is certified for the Job Role: "Trainer (VET and skills)", mapped to the Qualification Pack: "MEP/Q2601, v3.0". The minimum accepted score is 80%.	









Assessor Requirements

Minimum Educational Qualification	Specialization	Relevant Industry Experience		Preferable Training / Assessment Experience	
		Years	Specialization	Years	Specialization
Post Graduation	Civil / CS & IT Engineering	1		1	
	OR				
Graduation	Civil / CSE & IT Engineering	3		1	
OR					
Diploma	Civil / CSE & IT Engineering	5		1	

Assessor Certification				
Domain Certification	Platform Certification			
Recommended that the Assessor is certified for the Standalone NOS: "Applications of AI in Construction Safety", mapped to the Standalone NOS: "ICE/CON/N1201, v1.0". The minimum accepted score is 80%.	Recommended that the Assessor is certified for the Job Role: "Assessor (VET and skills)", mapped to the Qualification Pack: "MEP/Q2701, v3.0". The minimum accepted score is 80%.			









Assessment Strategy

This section includes the processes involved in identifying, gathering and interpreting information to evaluate the Candidate on the required competencies of the program.

1. Assessment System Overview:

Assessment is done through ICES affiliated Assessment Agencies. Assessors are trained & certified by ICES after Training of Assessor (ToA) program. Assessments are conducted to gauge and assess the trainee's skill and knowledge competency in the specified areas.

The assessment will have both theory, practical and viva components as per ratio specified in the Standalone NOS **Applications of AI in Construction Safety.**

During the practical task, trainees are assessed on their workmanship, quality of finished product and time management. They will be graded for all their assessments based on the approved assessment strategy which is signed off by ICES. The Assessor submits an assessment plan to ICES prior to assessments.

The assessment plan contains the following information:

- What will be assessed, i.e. the competency based on each NOS based on theory, practical and viva questions
- How assessment will occur i.e. methods of assessment
- When the assessment will occur
- Duration of assessment
- Where the assessment will take place i.e. context of the assessment (workplace/simulation)
- The criteria for decision making i.e. those aspects that will guide judgments
- Where appropriate, any supplementary criteria are used to make a judgment on the level of performance.

ICES will be monitoring thoroughly the complete Assessment process.

2. Testing Environment:

- Training partner shares the batch start date and end date, number of trainees and the job role.
- Assessment will be fixed for a day after the end date of training. It could be next day or later. Assessment will be conducted at the training venue/test center only.
- The knowledge/theory assessments are conducted with proper seating arrangements with enough space between the candidates to prevent mal practicing.
- Question set for Theory and Practical will be distributed to each candidate by the Assessor.
 - ➤ Theory testing will include MCQ type questions, pictorial questions etc. which will test the trainee on his theoretical knowledge of the subject.
 - ➤ Practical assessments will be conducted in the approved test centers. The training provider will ensure adequate tools and materials are available to conduct the practical test.
 - ➤ Viva Testing will be conducted during or post to the practical assessment by the assessor concerned. This Viva Assessment is applicable to understand the outcomes from OJT attended by the candidate concerned.









- One (1) Assessor is eligible to conduct assessments of a batch of maximum 30 candidates.
- The assessment must comprise of two components, namely:
 - ➤ Knowledge and Viva assessment (Theory assessment)
 - > Skill assessment (Practical / Hands-on Skill assessment)

3. Mode of assessment

- Demonstration/Practical Performance /Skill Assessment
- Synoptic multiple-choice question test for Theory Assessment

4. Performance/skill assessment:

- The performance/skill assessment will be conducted through demonstration/practical
- For the practical test trainees are assessed through a given task, which they have to complete correctly for them to be marked as passed.
- The assessment is conducted in a simulated working environment. Due to this fact, the assessors must note that the naturally occurring evidence of competence is unavailable or infrequent. Simulation must be undertaken in a Realistic Working Environment which provides an environment that replicates the key characteristics of the workplace in which the skill to be assessed is normally employed.

5. Knowledge Assessment:

- The knowledge assessments are conducted through Theory (written) Test and Viva Test
- Synoptic test is used for this. It is an MCQ (Multiple Choice Question) test which is
 prepared externally and externally marked, meaning by agency having no link with
 training partners.
- The Viva test will be conducted by the assessor in the oral mode considering the communication and domain understanding of skills of trainees.
- The assessment strategy, weightage and duration of assessment for Applications of AI in Construction Safety is summarized below

Assessment Type	Formative or Summative	Strategies	Weightage	Duration (hours)
Knowledge	Summative	MCQ	30	2 hours
Knowledge	Summative	Viva	10	1 hour
Skill	Summative	Structured practical Task	60	2 hours

6. Assessment Quality Assurance levels/Framework

- ICES has developed assessment criteria framework for each Qualification pack as per National Occupational Standards. The criteria framework includes weightages/marks for each criterion under knowledge and skill. The criteria ensure quality assurance as they ensure valid, consistent and fair assessments at all locations. Issued to the affiliated Assessment body. The Assessment Body develops questions based on ICES's approved assessment criteria.
- The training partner will intimate the time of arrival of the assessor and time of leaving the venue. Random spot checks/audit may conducted by ICES to monitor assessment.
- Continuous Monitoring through virtual and In-person mode are conducted to ensure the assessment is conducted as per stipulated process
- Process and Technical audit of assessment batches by quality team are conducted to avoid errors in assessment process









- A well -defined comprehensive framework of NON-COMPLIANCE MATRIX is defined and implemented to identify the non-compliance made by assessor and AA and punitive actions are taken correspondingly.
- The capacity building sessions are conducted regularly for assessors and assessment agencies to update them about best practices in assessment

7. Types of evidence or evidence-gathering protocol:

- Evidence in the form of answer sheets in case of knowledge assessments (Theory only) is collected.
- For Practical and Viva assessments videos and photographs are prepared as evidence.
 These are submitted by the assessor to the assessment agency. ICES does random checks
 of the same with the participant/ trainee's ID and ascertains authenticity and validity of
 assessments.
- Post Assessment, the evidence are uploaded by Assessor to assessment agency and further assessment agency to ICES as per stipulated TAT
- Evidence are broadly photographic and video graphics in nature (Geo-Tagged)
- Results along with evidence to be submitted to ICES by the concerning Assessment Agency in the prescribed format and on Digital Format and Physical Format (As required)
- Results to be uploaded on SIDH and other relevant portals for collective data management.

8. Method of verification or validation:

- The process and technical audit of assessment batches are done by Awarding Body
- Attendance of each candidate is verified and it is ensured that only those candidates are assessed by assessors who are meeting the stipulated minimum percentage of attendance
- The result of each candidate is verified; it is verified that that result on SIP is matched with respect to summary sheet submitted by AAs
- Under detailed technical audit for sample batches, the knowledge and skill assessment results for each candidate are checked in technical aspect.
- All the evidence of batches are preserved on server of Awarding Body digital platform

9. On the Job:

• OJT is Not Applicable for this Standalone NOS.









References

Glossary

Glossary Term	Description
1 (1 111	Sector is a conglomeration of different business operations having similar business and
Sector	interests. It may also be defined as a distinct subset of the economy whose components
	share similar characteristics and interests.
	Sub-sector is derived from a further breakdown based on the characteristics and interests
Sub-sector	of its components.
	Occupation is a set of job roles, which perform similar/ related set of functions in an
Occupation	
	industry.
Job role	Job role defines a unique set of functions that together form a unique employment
	opportunity in an organisation.
Occupational	OS specify the standards of performance an individual must achieve when carrying out a
Standards	function in the workplace, together with the Knowledge and Understanding (KU) they
(OS)	need to meet that standard consistently. Occupational Standards are applicable both in
` ,	the Indian and global contexts.
Performance	Performance Criteria (PC) are statements that together specify the standard of
Criteria (PC)	performance required when carrying out a task.
National	
Occupational	NOS are occupational standards which apply uniquely in the Indian context
Standards (NOS)	
Qualifications	QP comprises the set of OS, together with the educational, training and other criteria
Pack (QP)	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.
Onit Title	Description gives a short summary of the unit content. This would be helpful to anyone
Description	searching on a database to verify that this is the appropriate OS they are looking for.
	Scope is a set of statements specifying the range of variables that an individual may have
Caama	to deal with in carrying out the function which have a critical impact on quality of
Scope	performance required.
Knowledge	•
and	Knowledge and Understanding (KU) are statements which together specify the technical,
Understanding	generic, professional and organisational specific knowledge that an individual needs in
(KU)	order to perform to the required standard.
,	Organisational context includes the way the organisation is structured and how it
Organisational Contact	operates, including the extent of operative knowledge managers have of their relevant
Context	areas of responsibility.
Technical	Technical knowledge is the specific knowledge needed to accomplish specific designated
Knowledge	responsibilities.
J	Core skills or Generic Skills (GS) are a group of skills that are the key to learning and
Core Skills/	working in today's world. These skills are typically needed in any work environment in
Generic Skills (GS)	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.	









Acronyms and Abbreviations

Acronym	Description		
NOS	National Occupational Standard(s)		
NSQF	National Skills Qualification Framework		
QP	Qualification Pack		
TVET	Technical and Vocational Education and Training		
MSDE	Ministry of Skill Development and Entrepreneurship		
NCVET	National Council for Vocational Education and Training		
NSDC	National Skill Development Corporation		
ICES	Integrated Council for Entrepreneurship and Skilling (erstwhile Integrated Council for		
ICES	Entrepreneurship and Skilling)		
AB	Awarding Body		
AA	Assessment Agency		
TP	Training Partner		
TC	Training Centre		
ITI	Industrial Training Institute		
ISCO	International Standard Classification of Occupations		
NCO	National Classification of Occupations		
NCrF	National Credit Framework		
NEP	New Education Policy		
Q-File	Qualification File		
MC	Model Curriculum		
PC	Performance Criteria		
KU	Knowledge and Understanding		
GS	Generic Skills		
PMKVY	Pradhan Mantri Kaushal Vikas Yojana		
DDUGKY	Deen Dayal Upadhyaya Grameen Kaushalya Yojana		
STT	Short Term Training		
RPL	Recognition of Prior Learning		
NAPS	National Apprenticeship Promotion Scheme		
NQR	National Qualification Register		
OJT	On the Job Training		
NSQC	National Skill Qualification Committee		
IS	Indian Standard		
AI	Artificial Intelligence		
AR	Augmented Reality		
VR	Virtual Reality		