QUALIFICATION FILE – Micro Credentials

Introduction to Textile Reinforced Concrete (TRC)

☒ Public ☐ Private

☒ Upskilling ☐ Dual/Flexi Qualification ☒ For ToT ☒ For ToA

☐General ☐ Multi-skill (MS) ☐ Cross Sectoral (CS) ☒ Future Skills ☐ OEM

NCrF/NSQF Level: 3.0

Submitted By:

The Institution of Civil Engineers

309-310, Suncity Trade Tower Sector 21

Gurugram Haryana-122016

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Section 1: Basic Details

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<tr><td>2.</td><td>Sector/s</td><td colspan="3">Construction/ Real Estate and Infrastructure Construction</td></tr>
<tr><td>3.</td><td>National Qualification Register (NQR) Code & Version (Will be issued after NSQC approval.)</td><td>NM-03-CO-03845-2025-V1-TICE - TRC</td><td>4. NCrF/NSQF Level: 3.0</td></tr>
<tr><td>5.</td><td>Brief Description of the Micro Credential</td><td colspan="2">This course on Textile Reinforced Concrete (TRC) equips participants with essential skills to prepare TRC elements using lightweight, durable, and versatile textile materials. It covers the fundamentals of textile types, concrete compatibility, and reinforcement techniques. Participants will gain hands-on experience in handling textiles, applying layers, and ensuring quality control. The course also explores advancements in TRC technology and its applications in modern construction, enabling participants to fabricate and apply TRC effectively in construction scenarios.</td></tr>
<tr><td>6.</td><td>Eligibility Criteria for Entry for Students/Trainee/Learner/Employee</td><td colspan="2">a. Entry Qualification & Relevant Experience
<table>
<tr><th>S. No.</th><th>Academic/Skill Qualification (with specialization- if applicable)</th><th>Relevant Experience (with specialization- if applicable)</th></tr>
<tr><td>1</td><td>Grade 10th Pass</td><td></td></tr>
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<tr><td>3.</td><td>Previous relevant Qualification of NSQF Level 2</td><td>3-year relevant experience</td></tr>
<tr><td>4.</td><td>Previous relevant qualification of NSQF Level 2.5</td><td>1.5 relevant experience</td></tr>
</table>
b. Age: 16 years</td></tr>
<tr><td>7.</td><td>Credits Assigned to this Qualification, Subject to Assessment (as per National Credit Framework (NCrF))</td><td>1</td><td>8. Common Cost Norm Category (I/II/III) (wherever applicable): I</td></tr>
</table>

9.	**Any Licensing Requirements/ Pre-requisites for Undertaking Training** *(wherever applicable)*	NA
10.	**Expected Outcomes of the Micro Credential**	**Terminal learning outcomes are:** • Demonstrate a thorough understanding of the fundamental concepts of TRC, including the properties and roles of its key components, i.e. textiles and concrete • Discuss the advantages and potential drawbacks of TRC compared to traditional concrete in various construction applications • Identify and evaluate different types of textile reinforcements used in TRC • Select the appropriate types of textiles based on specific project requirements and applicable criteria • Discuss the factors that influence the performance and longevity of TRC elements, including environmental conditions and material quality • Discuss the diverse applications of TRC in construction, emphasizing its versatility and effectiveness in various scenarios • Cultivate comprehensive knowledge and skills in the process of preparing and forming TRC elements, from material preparation to final construction • Apply quality assessment techniques for TRC elements, including visual inspections and testing methods, to ensure compliance with required standards • Demonstrate how TRC contributes to reducing the carbon footprint compared to traditional construction materials. • Follow the relevant safety protocols and best practices for handling TRC materials and mixtures to maintain a safe working environment • Commit to developing sustainable TRC materials by applying principles that consider environmental footprint and recycling potential • Demonstrate how to implement safety measures and quality control processes in the application of TRC to ensure compliance with regulatory standards. • Acquire a comprehensive knowledge of emerging trends, research and advancements in TRC applications

<table>
<tr><td></td><td></td><td>• Follow cost-effective and durable TRC solutions</td></tr>
<tr><td>11.</td><td>Training Duration by Modes of Training Delivery (Specify Total Duration as per selected training delivery modes and as per requirement of the qualification)</td><td>☒ Offline Only ☐ Online Only ☐ Blended
<table><tr><th>Training Delivery Mode</th><th>Theory (Hours)</th><th>Practical (Hours)</th><th>Total (Hours)</th></tr><tr><td>Classroom (offline)</td><td>10</td><td>20</td><td>30</td></tr><tr><td>Online</td><td></td><td></td><td></td></tr></table>(Refer Blended Learning Annexure for Details)</td></tr>
<tr><td>12.</td><td>Assessment Criteria</td><td><table><tr><th>Theory (Marks)</th><th>Practical (Marks)</th><th>Project (Marks)</th><th>Viva (Marks)</th><th>Total (Marks)</th><th>Passing %age</th></tr><tr><td>30</td><td>50</td><td></td><td>20</td><td>100</td><td>50</td></tr></table></td></tr>
<tr><td>13.</td><td>Is the Qualification Amenable to Persons with Disability</td><td>☒ Yes ☐ No If "Yes", specify applicable type of Disability: Deaf, Hard of Hearing, Speech and Language disability</td></tr>
<tr><td>14.</td><td>How participation of women will be encouraged?</td><td>Career Awareness Programs: Conduct workshops and seminars in schools and colleges to inform young women about career opportunities in construction and specifically in roles like concrete masons.

Targeted Training Programs: Establish training programs specifically for women to learn masonry skills. These programs can be provided by vocational schools, community colleges, and construction companies.

Mentorship Programs: Pair new female employees with experienced mentors who can provide guidance and support.</td></tr>
</table>

		Industry Partnerships: Collaborate with construction companies, industry associations, universities, Centers of Excellence (CoE), skill development centers and labor unions to create initiatives aimed at increasing female participation. **Facilities:** Provide adequate facilities, such as restrooms and changing areas for female workers at construction sites.	
15.	**Other Indian Languages in which the Micro Credential will be implemented.**	**Hindi**	
16.	**Is similar Micro Credential Qualification(s) available on NQR-if yes, justification for this qualification**	☐ **Yes** ☒ **No** **URLs of similar Qualifications:**	
17.	**Name and Contact Details Submitting / Awarding Body SPOC**	**Name:** Maya Thakur **Email:** dg@ice.net.in **Contact No.:** +91 9717900050 **Website:** www.ice.net.in	
18.	**NSQC Approval Date:**	**19. Validity Duration: 3 years**	**20. Next Review Date:**

Section 2: Training Related

1.	**Trainer's Qualification and experience in relevant sector (in years)** *(as per requirement and NCVET guidelines)*	M.Sc./M.Tech/M.E. in Civil Engineering with 2 Year of experience in the Textile-reinforced concrete field or Construction field B. Tech in Civil Engineering or Material Science Degree with 4 years of experience in the Textile-reinforced concrete field or Construction field Diploma in Civil Engineering with 5 Years of experience in the Textile-reinforced concrete field or Construction field.
2.	**Master Trainer's Qualification and experience in relevant sector (in years)** *(as per requirement and NCVET guidelines)*	M.Sc./M.Tech/M.E. in Civil Engineering with 4 years of experience in the Textile-reinforced concrete field or Construction field

		B. Tech in Civil Engineering or Material Science Degree with 6 years of experience in the Textile-reinforced concrete field or Construction field Diploma in Civil Engineering with 7 years of experience in the Textile-reinforced concrete field or Construction field
3.	**Tools and Equipment Required for Training**	☒ **Yes** ☐ **No** *(If "Yes", details to be provided in Annexure)*

Section 3: Assessment Related

1.	**Assessor's Qualification and experience in relevant sector (in years)** *(as per requirement and NCVET guidelines)*	M.Sc./M.Tech/M.E. in Civil Engineering with 2 years of experience in the Textile-reinforced concrete field or Construction field. B. Tech in Civil or Mechanical Engineering or Material Science Degree with 4 years of experience in the Textile-reinforced concrete field or Construction field. Diploma in Civil or Mechanical Engineering with 5 Years of experience in the Textile-reinforced concrete field or Construction field.
2.	**Proctor's Qualification and experience in relevant sector (in years)** *(as per requirement and NCVET guidelines)*	M.Sc./M.Tech/M.E. in Civil Engineering with 1 Year of experience in the Textile-reinforced concrete field or Construction field. B. Tech in Civil or Mechanical Engineering or Material Science Degree with 2 Year of experience in the Textile-reinforced concrete field or Construction field. Diploma in Civil or Mechanical Engineering with 3 Years of experience in the Textile-reinforced concrete field or Construction field.
3.	**Lead Assessor's/Proctor's Qualification and experience in relevant sector (in years)** *(as per requirement and NCVET guidelines)*	M.Sc./M.Tech/M.E. in Civil Engineering with 4 Year of experience in the Textile-reinforced concrete field or Construction field. B. Tech in Civil or Mechanical Engineering or Material Science Degree with 6 Year of experience in the Textile-reinforced concrete field or Construction field.

		Diploma in Civil or Mechanical Engineering with 7 Year of experience in the Textile-reinforced concrete field or Construction field.
4.	**Assessment Mode** *(Specify the assessment mode)*	**Mode: ☐ Online Only ☐ Offline Only ☒ Blended**
5.	**Tools and Equipment Required for Assessment**	**☒ Same as for training ☐ Yes ☒ No** *(details to be provided in Annexure-if it is different for Assessment)*

Section 4: Evidence of Need of the Micro Credential

As per the NCVET Guidelines for evidence of need, provide the required Annexure/Supporting documents.

1.	Government /Industry initiatives/ requirement (Yes/No): Yes
2.	Number of Industry validation provided: *5*
3.	Estimated number of people to be trained: *2,000 Nos.*

Section 5: Annexure Check List

Specify Annexure Number and Name.

1.	**Annexure:** NCrF/NSQF level justification based on NCrF Level/NSQF descriptors *(Mandatory)*	Annexure 1, Evidence of Level
2.	**Annexure:** Learning Outcomes and Assessment Criteria *(Mandatory)*	Annexure 2, Learning Outcomes
3.	**Annexure:** Assessment Strategy *(Mandatory)*	Annexure 3, Assessment Strategy

4.	**Annexure:** List of tools and equipment relevant for qualification *(Mandatory – Except in case of online course)*	Annexure 4, Tools and Equipment
5.	**Annexure:** Blended Learning *(Mandatory in case selected mode of delivery is "Blended Learning")*	Annexure 7, Blended Learning
6.	**Annexure:** Acronym and Glossary *(Optional)*	Annexure 8, Acronym and Glossary

Annexure 1: Evidence of Level

NCrF/NSQF Level Descriptors	Key requirements of the job role/ outcome of the qualification	How the job role/ outcomes relate to the NCrF/NSQF level descriptor	NCrF/NSQF Level

Professional Theoretical Knowledge/Process	• Process of selecting appropriate textile material to prepare TRC elements • Process of preparing a concrete mix according to the textile material • Process of coating the textile with a protective layer to enhance bonding with concrete • Process of selecting a suitable type of binder • Process of creating appropriate formwork to shape the concrete while accommodating the placement of the textile reinforcement • Process of placing an appropriate number of textile layers in the formwork and casting concrete • Process of removing air bubbles from concrete during casting and curing it under appropriate conditions • Process of performing the necessary quality checks to ensure the Textile-Reinforced Concrete (TRC) element meets the applicable design specifications and safety standards • Process of installing TRC elements	The individual in this job role should have practical skills for selecting appropriate textile materials and using them to create TRC elements. The listed competencies are suitable for an NSQF level 3 job role.	3.0
Professional and Technical Skills/ Expertise/ Professional Knowledge	• Properties of concrete, including mix design, strength development, curing behaviour, and shrinkage characteristics • Properties of different types of materials used for textile reinforcements, such as glass, carbon, Basalt, Polyphenylene Benzobisoxazole (PBO), etc. • Types and properties of binders	The individual is required to have a variety of knowledge for the manufacturing and application of TRC elements in construction activities. The listed knowledge requirements are appropriate to an NSQF level 3 job role.	3.0

	• How textiles behave under stress, including understanding fabric geometry, weave patterns, and their influence on mechanical performance • Mechanisms of adhesion between the concrete matrix and the textile reinforcement • How the combination of concrete and textile reinforcement creates a composite material with unique properties • How to analyze TRC elements under various loading conditions (tension, compression, bending, shear) • Factors affecting the long-term performance of TRC, including moisture exposure, chemical attack, and fatigue loading • How textile properties like fiber type, yarn structure, and fabric architecture influence the overall performance of TRC • Methods for testing the mechanical properties of textiles, such as tensile strength, modulus, and tear resistance • How to build formwork that can accommodate the specific requirements of TRC placement, including considerations for textile integration • Different concrete casting methods (laminating, spraying, casting) and their suitability for different TRC applications • Proper curing procedures for TRC to ensure optimal strength development and minimize cracking		

	• Relevant codes and standards for TRC applications, including material selection and construction practices • Fire resistance characteristics of TRC and appropriate fireproofing methods • Environmental impact of materials and processes used in TRC construction • Lifecycle costing		
Employment Readiness & Entrepreneurship Skills & Mind-set/Professional Skill	• Basic project management • Teamwork • Problem-solving • Attention-to-detail • Adaptability	The listed skills are required for individuals in this job role to effectively work in different construction settings.	3.0
Broad Learning Outcomes/Core Skill	• Select appropriate textile materials with high tensile strength and durability • Prepare a concrete mix according to the textile material • Coat the textile with a protective layer to enhance bonding with the concrete and protect against environmental factors • Create the formwork to shape the concrete and accommodate the placement of the textile reinforcement • Create an appropriate number of textile layers in the formwork, depending on the design requirements • Carry out concrete casting, ensuring the concrete mix fully encapsulates the textile layers	The listed learning outcomes for suitable for an NSQF level 3 job role.	3.0

	• Cure the concrete at the recommended temperature and humidity for an appropriate duration, to achieve the desired strength and durability • Perform the necessary quality checks to ensure the TRC elements meet the applicable design specifications and safety standards • Install the TRC elements into the desired structures		
Responsibility	The individual is responsible for selecting appropriate textile materials and creating TRC elements that meet the applicable quality standards.	The responsibilities are appropriate to an NSQF level 3 job role.	3.0

Annexure 2: Learning Outcomes and Assessment Criteria

Detailed learning outcomes and assessment criteria for the qualification are as follows:

S. No.	Learning Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC1.	select textile materials with high tensile strength and durability, and ensure their design is appropriate for TRC applications	2	3	-	1
PC2.	prepare a concrete mix tailored to the selected textile materials, ensuring compatibility and performance	2	3	-	1
PC3.	ensure the concrete mix is fine-grained to achieve effective bonding with the textile reinforcement	3	4	-	1
PC4.	apply a protective coating to the textile to enhance adhesion to the concrete and protect against environmental factors	1	3	-	1
PC5.	create formwork that accurately shapes the concrete and accommodates the placement of textile reinforcement	3	5	-	2
PC6.	place the appropriate number of textile layers in the formwork, based on design specifications and structural requirements	1	4	-	2

PC7.	apply necessary tension to the textiles to improve structural performance and stability	2	3	-	1
PC8.	carry out concrete casting to ensure the mix fully encapsulates and bonds with the textile layers	3	4	-	2
PC9.	remove air bubbles and achieve proper compaction around the textiles through vibration or other methods	2	3	-	1
PC10.	cure the concrete under recommended temperature and humidity conditions to achieve optimal strength and durability	2	4	-	1
PC11.	remove the formwork carefully to prevent damage to the textile-reinforced concrete	2	4	-	1
PC12.	perform thorough quality checks to ensure the TRC element meets design specifications and safety standards	2	4	-	1
PC13.	reduce Carbon Footprint by Using Textile-Reinforced Concrete (TRC)	1	1	-	1
PC14.	install the textile-reinforced concrete elements into the desired structures, following standard installation procedures	1	2	-	1
PC15.	utilize new reinforcement methods, materials, and design methodologies to enhance TRC performance.	1	1	-	1
PC16.	implement eco-friendly practices in TRC production, such as reducing carbon footprint and using recyclable materials	1	1	-	1
PC17.	implement safety measures and quality control processes in the application of TRC to ensure compliance with regulatory standards	1	1	-	1
Total Marks		**30**	**50**		**20**

Annexure 3: 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:

- Batches assigned to the assessment agencies for conducting the assessment on SIDH
- The batch allocation Matrix prepared for each month based on previous months' performance of AAs, which determines the quantum of Assessment which can be allocated to each AA for a month
- Post allocation of assessment, Assessment agencies send the assessment confirmation to AB

- Assessment agency deploys the ToA certified Assessor for executing the assessment
- AB monitors the assessment process.

2. Testing Environment:

- A combination of Theory and practical/demonstration test is deployed to assess knowledge and Skill respectively of Learners.
- Assessment is conducted at Training center in in-person/offline mode
- For Skill assessment, environment is simulated to create a realistic Working Environment that should replicate the key features of the workplace. In job roles, where it is difficult to replicate the same, the OJT assessment is implemented.
- During the practical task, trainees are assessed on their workmanship, quality of finished product, time management, etc., based on the performance criteria (PC), knowledge and understanding and their professional and soft skills as specified in the qualification pack.
- Knowledge assessment is done through closed ended questions up to level 4 and from level 5 onwards, it is mixture of open ended and closed ended questions

3. Assessment Quality Assurance levels/Framework

- Assessment criteria are developed for each QP which acts as a guide for developing question set /banks
- Sample questions aligned with Assessment criteria for each QP are developed by AB and validated by industry
- Taking reference of Assessment criteria and Sample Questions, AAs create the question bank which is further validated by AB
- Questions are mapped to the specified assessment criteria
- It is mandatory that Assessor and Trainer must be ToA certified & ToT Certified respectively
- 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 the 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

4. Types of evidence or evidence-gathering protocol:

- Post Assessment, the evidences are uploaded by Assessor to assessment agency and further assessment agency to AB as per stipulated TAT
- Evidences are broadly the photographic and video graphic in nature

- Assessment agencies upload the evidence on SIDH and detailed evidence on AB digital platform
- Evidences are; NOS wise-Geotagged photographs and videos of Theory Test &Practical Tasks, Attendance sheet, result summary sheet, group photographs.

5. Method of verification or validation:

- The process and technical audit of assessment batches are done by AB
- 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 SIDH are matching with respect to summary sheet submitted by AAs
- Under detailed technical audit for sample of batches, the knowledge and skill assessment results for each candidate is checked in technical aspect.
- All the evidences of batches are preserved on server of AB digital platform

Annexure 4: Tools and Equipment

List of Tools and Equipment

Batch Size: 30

S. No.	Tool / Equipment Name	Specification	Quantity for specified Batch size
1.	Scissors/ Rotary cutters/ Fabric Shears	Pair	5
2.	Rulers/ Tape Measure	Number	30
3.	Hammer	Number	5
4.	Saw	Number	5
5.	Drilling Machine	Number	5
6.	Screwdrivers	Number	30
7.	Plywood/ Metal Forms	Number	5
8.	Mold Release Agent	Pcs.	30
9.	Level/ Plumb Bobs	Number	30
10.	Concrete mixer	Number	5
11.	Wheelbarrow	Number	5
12.	Sand Blasting Equipment	Number	3

13.	Measuring Jars	Number	30
14.	Digital Weighing Machine	Number	3
15.	Shovel	Number	5
16.	Bucket	Number	30
17.	Trowels	Number	30
18.	Concrete Vibrator	Number	3
19.	Plastic sheeting/ Burlap Sacks	Number	30
20.	Gloves	Pair	30
21.	Safety Glasses	Number	30
22.	Dust Masks	Number	30
23.	Safety Boots	Pair	30

Classroom Aids:

The aids required to conduct sessions in the classroom are:

1. White Board / Black Board / Smart Board
2. Marker
3. Projector

Annexure 5: Industry Validations Summary

S. No	Organization Name	Representative Name	Designation	Contact Address	Contact Phone No	E-mail ID	LinkedIn Profile *(if available)*
1	Ayoleeza Consultants Pvt. Ltd.	Praveen Dubey	Deputy HR	Unit No. B-901, 9th Floor, Urbtech Trade Centre,Tower-B Sector-132, Noida(New Delhi NCR)-201304	7208744092	praveen.dubey@ayoleeza.com	

2	Chetak Enterprises	Amit Kumar	Asst. Quality Cum Material Engineer	10-11, Hanuman Nagar Ext, Jaipur 302021, Rajasthan	8743053306		
3	JMC Projects India Ltd.	Raju Y	Deputy Manager – Quality	3rd and 4th Floor, Tower-3, Okaya Center, Block Industrial Area, Sector 62, Noida, Uttar Pradesh 201301	8467847383	raju.y@kalpataruprojects.com	
4	MYC Infra Pvt.Ltd.	Deepak Yadav	Project Coordinator	50 A,PKT-B Flats Sector-105 ,Noida , Uttar Pradesh ,India 201304	9411997000	erdeepakyadav25@gmail.com	
5	SRM Institute of Science and Technology	Dr. T.Ch.Madhavi	Professor	Ramapuram Campus, Bharathi Salai, Chennai – 600 089	9840954753	madhavir@srmist.edu.in, tcmadhvi@gmail.com	

Annexure 6: Training Details

Training Projections:

Year	Estimated Training # of Total Candidates	Estimated training # of Women	Estimated training # of People with Disability
2025	100	20	5
2026	800	50	10
2027	800	50	10

Data to be provided year-wise for next 3 years.

Annexure 7: Blended Learning

Blended Learning Estimated Ratio & Recommended Tools:

Refer NCVET "Guidelines for Blended Learning for Vocational Education, Training & Skilling" available on:
https://ncvet.gov.in/sites/default/files/Guidelines%20for%20Blended%20Learning%20for%20Vocational%20Education,%20Training%20&%20Skilling.pdf

S. No.	Select the Components of the Qualification	List Recommended Tools – for all Selected Components	Offline: Online Ratio
1	☐ Theory/ Lectures - Imparting theoretical and conceptual knowledge	NA	It can be Online or Offline (any ratio) It can be Online or Offline (any ratio)
2	☐ Imparting Soft Skills, Life Skills and Employability Skills /Mentorship to Learners	NA	It can be Online or Offline (any ratio)
3	☐ Showing Practical Demonstrations to the learners	NA	It can be Online or Offline (any ratio)
4	☐ Imparting Practical Hands-on Skills/ Lab Work/ workshop/ shop floor training	NA	It can be Online or Offline (any ratio)
5	☐ Tutorials/ Assignments/ Drill/ Practice	NA	It can be Online or Offline (any ratio)
6	☐ Proctored Monitoring/ Assessment/ Evaluation/ Examinations	NA	It can be Online or Offline (any ratio)
7	☐ On the Job Training (OJT)/ Project Work Internship	NA	It can be Online or Offline (any ratio)

Annexure 8: Acronym and Glossary

Acronym

Acronym	Description
AA	Assessment Agency
AB	Awarding Body
CoE	Centers of Excellence
ICE	Institute of Civil Engineers
ISCO	International Standard Classification of Occupations
NCO	National Classification of Occupations

NCrF	National Credit Framework
NQR	National Qualification Register
NSQF	National Skills Qualifications Framework
OJT	On the Job Training
SIDH	Skill India Digital Hub
ToA	Training of Assessor
ToT	Training of Trainer
TRC	Textile-Reinforced Concrete

Glossary

Term	Description
Qualification	A formal outcome of an assessment and validation process which is obtained when a competent body determines that an individual has achieved learning outcomes to given standards
Qualification File	A Qualification File is a template designed to capture necessary information of a Qualification from the perspective of NSQF compliance. The Qualification File will be normally submitted by the awarding body for the qualification.
Sector	A grouping of professional activities based on their main economic function, product, service or technology.