

EFNARC Nozzleman Certification Scheme

EFNARC Nozzleman Training and Certification Plan

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Definitions

EFNARC Nozzleman Certificate: The certificate obtained if an individual complies with the requirements in this document.

EFNARC Nozzleman course: The course that individuals need to attend and pass to live up to the requirements to obtain an EFNARC Nozzleman certificate.

Modules: Different parts and activities included in an EFNARC Nozzleman course and required in order to obtain an EFNARC Nozzleman certificate.

Examiner: A person that is an EFNARC Certified Nozzleman Examiner and is certified by EFNARC to teach at EFNARC Nozzleman courses.

Course provider: An organisation that organises an EFNARC Nozzleman course. The teaching must however, unless specified in this document, be conducted by an Examiner.

Employer: An employer to an individual(s) going through an EFNARC Nozzleman course.

VR-simulator: A sprayed concrete virtual-reality simulator used in an EFNARC Nozzleman course.

Simulator provider: An organisation that owns rights to and has units of a VR-simulator that is being used in an EFNARC Nozzleman course.

Instructor: A person, independent from the Employer, assigned by the Course provider or Examiner, who supervises the virtual training and assessment and/or theory exams during an EFNARC Nozzleman course.

EFNARC Nozzleman - Training and Certification Plan

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1. Introduction

EFNARC's Nozzleman Certification Scheme was introduced in 2009 in order to set up a qualification for sprayed concrete operators.

Before the introduction of EFNARC C2 in 2019, the Nozzleman Certification did not involve any form of standardized training. Instead, it simply served to facilitate the standardized assessment of already experienced operators (minimum 3 years). To respond to the industry's need for training of novice personnel and qualified Nozzlemen, EFNARC C2 combined both training and assessment and allowed all operators to attend, without considering their previous experience.

Also, before the introduction of EFNARC C2, EFNARC experienced problems with upholding the quality of the assessments. In order to continuously improve the certification process, EFNARC established a higher quality control. Therefore, theory tests now need to be conducted online, and objective assessment through simulators is mandatory. Furthermore, the Examiners will not be allowed to assess their colleagues i.e. working in the same company or group.

The new Nozzleman Certificate

The EFNARC C2 process has proven itself in the last three years and will therefore replace the previous procedures as of January 1st, 2023, with some further improvements, as the new Nozzleman Certificate. This means that, from this date onwards, all new applications and renewals will switch to the new certificate, and there will be only one unified EFNARC Nozzleman Certificate.

This improvement is aimed at ensuring the highest quality, reducing confusion between the previous certificates, and giving more value to the whole certification scheme.

The new certification will bring together different qualities of both previous schemes (top industry-standard training, independence, quality control, objectivity) and it will be open to experienced and inexperienced nozzlemen.

The EFNARC Nozzleman Certification scheme is endorsed by the International Tunnelling and Underground Space Association (ITA).

2. Training plan

2.1 Aim and execution

The aim of the EFNARC Nozzleman course is to equip novice and experienced Nozzlemen with the necessary knowledge and skills to perform safe, high quality, efficient and cost effective

robotic concrete spraying. This will be obtained by EFNARC facilitated training courses including theoretical, virtual, and practical elements, involving teaching by professionals with vast experienced from the industry in combination with objective assessments by VR-simulators. Ultimately, the course attendees shall be enabled to practically achieve highest standards in concrete spraying.

2.2 Attendee prerequisites and registration

There are no prerequisites for individuals for attending an EFNARC Nozzleman course. A basic understanding about underground construction works, machine operations, related risks and concrete technology is advantageous.

Thus, to obtain the certificate, the Nozzleman must have passed the training and delivered written proof of minimum forty (40) days of robotic spraying experience.

The Examiner or Course provider arranging the EFNARC Nozzleman course shall require a valid identification (e.g. ID-card or passport) and should note at least name, date of birth and nationality of all attendees, which then is registered with EFNARC. The registration of the Nozzleman for the course must be done by the Examiner via the EFNARC's website.

Examiners and course providers shall be responsible for their own handling of attendees' personal data. Examiners and course providers shall furthermore guarantee that the handling and transferring of data to EFNARC is performed in accordance with EFNARC's intended purpose of being able to issue, document and oversee personal certificates. Examiners, Course providers and EFNARC also commit to collaborate and, to a reasonable extent, assist one and another around ensuring that international and national data protection regulations and laws are followed.

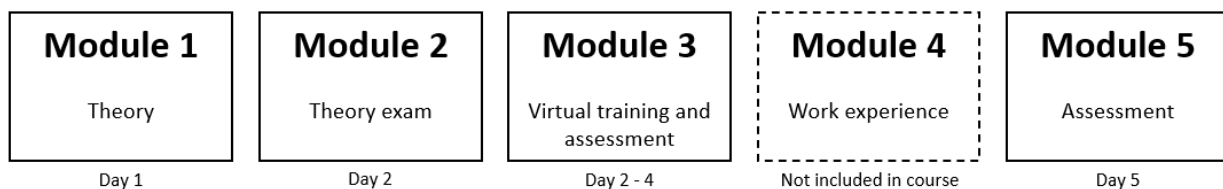
2.3 Assessment objectivity

The practical assessment needs to be conducted by an unbiased EFNARC Examiner, which means that Examiners can train their colleagues for Module 1 - 3 but are no longer allowed to conduct the practical assessment (Module 5) of their colleagues i.e., persons working in the same company or group.

2.4 Modules

To obtain an EFNARC Nozzleman certificate, individuals need to pass four (4) modules, as well as show that the individual has at least forty (40) days of work experience. Hence, an almost novice operator may achieve an EFNARC Nozzleman certificate after the course.

The table below depicts a summary of various modules and duration of the entire training. Though all the below EFNARC Nozzleman course modules are mandatory, the modules can be completed in any order.



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2.4.1 Module 1 - Theory

The Examiner must hold a classroom lecture following the EFNARC presentation.

The lecture shall include the following subjects covered during the minimum specified time frame:

Subject	Min. time	Material supplied by
Concrete technology	60 min	EFNARC
Spraying equipment	30 min	EFNARC
Designer expectations	30 min	EFNARC
Application	30 min	EFNARC
Surface finishing and curing	30 min	EFNARC
Standards and testing	60 min	EFNARC
Health, safety and environment	60 min	EFNARC
Local and national rules and regulations for sprayed concrete	According to need	Examiner / Course provider
Q&A	According to need	

2.4.2 Module 2 - Theory exam

An online theory examination consisting of 30 multiple-choice questions. Individuals must correctly answer at least twenty-six (26) of the thirty (30) questions to attain a pass mark on the exam. The online exam can be accessed via a website assigned by EFNARC upon request.

The theory examination includes randomly selected questions from the EFNARC database. In this respect, each exam following a specific EFNARC Nozzleman course will be unique.

All examinees of the exam shall be supervised by an Examiner or Instructor. Examiners or Instructors are not permitted to offer or provide any assistance related to answering exam questions. However, participants with learning difficulties may have the questions read to them verbally by the Examiner or Instructor.

The theory exam can be attained in multiple languages, including English, Spanish, Italian, Finnish, and German. Additional languages can be added upon specific request with a minimum lead time of four (4) weeks. EFNARC may charge a fee for the creation of additional language versions.

2.4.3 Module 3 - Virtual training and assessment

The virtual training and assessment shall be performed by individuals passing minimum ten (10) specified scenarios on a concrete spraying VR-simulator, certified by EFNARC (see chapter 2.5.2). All attendees shall be granted at least twenty-four (24) hours to pass the training and

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assessment. Up to two (2) attendees may share one (1) VR-simulator. There are no maximum time limits to perform the module 3 - the only set criteria is to pass the specified scenarios.

The virtual training and assessment must always be supervised by an Examiner or Instructor to ensure that the intended individuals are actually performing the training and assessment themselves. Aside from providing verbal instructions, Examiners or Instructors are not permitted to assist attendees during the training and assessment.

The results and data from the training and assessment shall be accessible online by EFNARC.

2.4.4 Module 4 - Work experience

Everyone is required to demonstrate that they have at least forty (40) days of robotic concrete spraying experience. The individual does not need to have any work experience before attending an EFNARC Nozzleman course. However, having work experience is mandatory part of obtaining an EFNARC Nozzleman certificate.

2.4.5 Module 5 - Assessment

An Examiner must conduct a practical session using a robotic spraying equipment and sprayed concrete with a commonly used mix design. The session can be held for maximum eight (8) attendees and shall assessment where the following activities are evaluated:

Activity (demonstrated by the Examiner)	Min. time
Pre-application checking	30 min
Startup procedure	30 min
Application and test panel spraying procedures	30 min
Shutdown procedure	30 min
Troubleshooting and problem solving	15 min
Health and safety	45 min

All attendees shall each spray a test panel and/or a surface. The test panel shall be according to EN 14488-1, or another standard applicable where the EFNARC Nozzleman course is held. If instead spraying a surface, then that surface shall be sprayed with minimum 1,0 m³ of sprayed concrete.

The Examiner shall document each attendee by filling in the assessment form.

2.5 Training provider accreditation

2.5.1 Teaching

All instructions shall be provided by an EFNARC Examiner and shall be in line with the detailed aspects of the EFNARC Nozzleman Certification Scheme. Instructors may be responsible for

parts of an EFNARC Nozzleman course in line with what has been previously specified in this document.

2.5.2 VR-simulator

The VR-simulator used in module 3 shall be certified by EFNARC. This can be achieved by a Simulator provider demonstrating to EFNARC that:

1. the VR-simulator has minimum ten (10) predefined scenarios that, together with rest of the technology, fulfil the specification.
2. the VR-simulator is recognised by five (5) EFNARC Examiners, representing at least three (3) different companies, to
 - i) fulfil the specification and
 - ii) is suitable as a training and assessment tool for Nozzlemen
3. the VR-simulator can be adapted to include specific procedures requested by EFNARC.
4. ten (10) individuals have gone through the training and assessment with the VR-simulator in accordance with the specification. The training and assessment records shall show that all ten (10) have taken more than eight (8) effective hours on them to complete the scenarios, consuming at least forty (40) m³ sprayed concrete.
5. an independent body like e.g. an university has performed a study demonstrating that the VR-simulator has an acceptable level of validity.

If a new simulator provider is interested in certifying a simulator, please contact EFNARC for detailed specifications.

2.6 Training material, contacts, and forms

The theory presentation together with all forms and information about the simulators are available on EFNARC website (<https://efnarc.org/>). To gain access, Examiners must register to the Member section of the site.

3. Certificate

3.1 Obtain the certificate

To obtain an EFNARC Nozzleman certificate, individuals need to demonstrate that they have gone through and passed Modules 1, 2, 3 and 5 and have the required work experience (module 4). The Examiner or Course provider arranging an EFNARC Nozzleman course shall hence share all mandatory information with EFNARC when requesting certificates.

3.2 Certificate validity time

An EFNARC Nozzleman certificate is valid for five (5) years.

3.3 Renewal or transfer of an EFNARC Assessment certificate or EFNARC C2 certificate to an EFNARC Nozzleman Certificate

In the case of transfer/renewal of the old Nozzleman Assessment or EFNARC C2 certificate, holders will need to demonstrate that they have done Modules 2 and 4 (theory exam well as a handing in proof of 40 days spraying activity since the last certification).

3.4 Issue certificate

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Examiners or course providers shall contact EFNARC or an assigned body in order to request the issuing of an EFNARC Nozzleman certificate to an individual. EFNARC will then evaluate the provided records that shows that the individual has passed all required modules.

EFNARC requires that the following are supplied and correct upon issuing an EFNARC Nozzleman certificate:

1. Module 1 eligibility: registration through EFNARC's website.
2. Module 2 eligibility: Results from an online exam showing minimum twenty-six (26) correct answers. Exam is conducted through EFNARC.
3. Module 3 eligibility: results, training and assessment data that shows that all necessary scenarios are passed. The Simulator providers save all simulator data and results and shall have them accessible for EFNARC.
4. Module 4 eligibility: a digital copy of a document demonstrating proper and minimum required experience. The Examiner uploads an experience document through EFNARC's website.
5. Module 5 eligibility: digital copy of the assessment form. The Examiner uploads an assessment form through EFNARC's website.

Once an Examiner have requested a certificate, and EFNARC can see that all needed modules have been passed, then EFNARC will request payment for the certificate and upon receiving it, issue a stamped version of the EFNARC Nozzleman certificate. This will be sent to the Examiner by email to be distributed by the Examiner to course attendees.

3.5 Price

The price for attending an EFNARC Nozzleman course are individually set by Examiners or Course providers that offer the course.

Multiple factors (number of participants, need of training personnel, location etc.) affect the cost of the simulator training, so the simulator providers will provide an estimate on a case-by-case basis for Examiners.

The price for the certificates is set by EFNARC's Executive Committee on an annual basis:

Attendee registration and online exam	50 Euro*
Issuing or renewing an EFNARC Nozzleman Certificate	100 Euro*

*At the time when this document version was written.

For updates, visit the EFNARC Homepage: www.efnarc.org