



## EFNARC

Secretary: Dr Roland Harbron

P / F: +44 1925 74 05 81  
e-mail: roland.harbron@talktalk.net  
www.efnarc.org

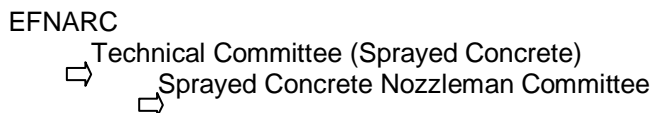
*"achieving the highest standards"*

## Nozzleman Scheme Questions and Answers

### Janne Lehto, Chairman of the Nozzleman Certification Scheme

#### 1. On Organization

- (1) What organization have you established to realize a Nozzleman Certification Program / who at EFNARC will manage the program?  
Is the scheme below correct?



#### ANSWER:

The program is managed by EFNARC Sprayed Concrete Committee. The scheme consists of Examiner courses and Nozzleman courses. The first Examiner course took place September 21-23 2009 in Hagerbach gallery. We have planned to do the second course in November.

- (2) Is the Scheme finalised?

#### ANSWER:

We are just launching our scheme along the first Examiner course.

- (3) What organization do you establish for operation of certification program including management, for examples, operation of examinations, success judgement, registration and re-certification procedure, etc.?

#### ANSWER:

EFNARC is co-operating with CUC, Foundation International Centre for Geotechnics and Underground Construction; see more information on the following web-page: <http://www.icguc.org/>

- (4) When will the first certification session be held and where.

#### ANSWER:

The first Examiner course has been successfully completed and the next one will be arranged in November. The 2,5 days Examiner assessment courses are arranged in Hagerbach Test Gallery in Switzerland, see the following link to Hagerbach Test Gallery's web-page: <http://www.hagerbach.ch/sites/esite1.htm>. For practical course arrangements EFNARC is co-operating with a professional training organisation CUC (the international Centre for Geotechnics and Underground Construction) which operates in Hagerbach Test Gallery. Those participants of the first Examiner assessment course that have passed the theory and practical tests will receive their certificates and an Examiner Tool Package from EFNARC administration shortly after the assessment. They can then start assessing experienced Nozzlemen for their theoretical and practical skills at their workplace (this is called Nozzleman Assessment).

- (5) Is it offered publicly where Nozzlemen come from different companies to one location at different

frequencies throughout the year? Or only offered on a private basis when requested by shotcrete contractors?

ANSWER:

The EFNARC Nozzleman Certification Scheme operates through Examiners who assess experienced Nozzlemen for their theoretical and practical skills at their workplace. This means usually that Examiner goes to Nozzleman's worksite rather than Nozzlemen travelling to one location to participate in a Nozzleman Assessment course. However, EFNARC does not define exactly where and when assessment of Nozzleman should happen but EFNARC has created the needed support documentation for Nozzleman assessment. The support documentation consists of a 150 slides self-study theory package ("The Nozzleman Course Notes") which defines the best work practices, the theory and practical assessment forms and checklists that also defines the minimum criteria and skills for the Nozzleman and the feedback form. This material package is called Examiner Tool Package and Examiners are required to use it in their work as EFNARC Nozzleman Examiner.

## 2. On Nozzleman Certification Program

(1) What types of structure, slope, tunnel, maintenance and/or renewal work, are intended for?

ANSWER:

EFNARC Nozzleman scheme concentrates solely on mechanised wet sprayed concrete applications in tunnelling (new and maintenance works).

(2) Will project owners require certified Nozzlemen to stay in a job site in near future?

ANSWER:

There is no evidence or sign that project owners will require this but EFNARC has put the Nozzleman Scheme together so that in future this is at least possible. Of course clients have not been able to require certification as there has not been such thing available earlier. After launching the Nozzleman scheme EFNARC hopes that clients find this program and start referring to it in their project requirements.

(3) What kind of concrete incentives do certificated Nozzlemen have?

ANSWER:

One incentive is of course the written certificate which they will get from EFNARC. By showing this certificate to their employer they can prove that they have knowledge how to do quality sprayed concrete. This may help them to get a job and may also have an impact on the salary.

(4) Could you estimate how many Nozzlemen are working in these fields, and how many Nozzlemen will get a certification examination?

ANSWER:

This is a very difficult and also a very good question which we have not been able to find clear answer yet. As there are perhaps 200 or more sprayed concrete machines doing sprayed concrete in Europe and each machine has often two operators (as contractors are doing two shift) the total "market" could be 400-500 operators (as minimum). This means that we would need perhaps some 30-50 Examiners to do the needed assessments. Of course we cannot reach everybody and it will anyway take several years before EFNARC scheme could reach such a position that it is generally and widely known and accepted by all parties (clients, contractors, operators). Our target is now to get this started and think about future more after that.

## 3. On Management of Certification Program

(1) What is a procedure from an application of examination to registration after success? A flow chart is convenient.

ANSWER:

The procedure is as follows:

1. Examiner arranges Nozzleman Assessment and Certification course in the connection of his

own training course. Nozzleman Certification course itself is only an assessment course and does not include training.

2. Nozzleman fill in an application form and send it to Examiner. Application form he can get direct form Examiner.
3. Examiner checks the Nozzleman application and if ok he sends the participation approval and EFNARC's self study theory package (150 slides) to the Nozzleman.
4. Examiner arranges the assessment course after his own training course. Examiner can use the EFNARC theory package in his training course. Assessment includes both theory examination (25 questions) and practical spraying demonstration which can be done during one day in Nozzleman's worksite. Examiner observers the operator during spraying and check that he uses right work methods and is not doing fatal mistakes.
5. After spraying demonstration Examiner makes also an interview of the Nozzleman and check that Nozzleman really understands all the most important topics. Examiner also gives feedback to the Nozzleman and tells him if he has passes (or not passes the test) and how he should develop his skills in future.
6. After successful test Examiner fill in the assessment form and send it to EFNARC with the suggestion to issue Nozzleman certificate to the Nozzleman candidate.
7. EFNARC issues the certificate and send it to the Nozzleman. Certificate is valid 3 years after which it must be renewed.

- (2) What does the program consist of and what is examined specifically? Ex: Pre-requisite (or minimum experience) required to attend the certification? Training required? Written examination? Performance examination (panel shooting and rebar encapsulation evaluation or core grading, vertical and overhead orientations, nozzleman/robot position while shooting, standardized test panel, etc.)?

ANSWER:

The Examiner assessment course covers the following:

- Aims of the EFNARC Nozzleman Certification Scheme
- Theoretical workshop highlighting the key topics of a 150 pages self-study theory package called " the Nozzleman Course Notes"
- Practical workshop demonstrating best practice spraying and testing of concrete (we are showing in practice the right and wrong work methods)
- Theory examination
- Practical assessment of Nozzleman spraying with intentional errors that the candidate Examiner should note and record
- Oral examination and final assessment to recommend the award of Nozzleman Examiner Certificate
- Examiner commitment (Examiner must sign a commitment where he promises to follow EFNARC rules and procedures when he is doing Nozzleman assessments)

- (3) Do you have a plan of training course for un-certified Nozzlemen? Is it for a written and/or a practical examination? Are your four publications on sprayed concrete used for a training course?

ANSWER:

EFNARC Nozzleman Certification Scheme is not training course but Examiner's can provide training as part of their own business. Examiner's are supposed to be peoples working for equipment and chemical suppliers or consultation and training companies which normally offers sprayed concrete training courses as part of their own business. EFNARC has created a 150 slide theory package as mentioned earlier which Examiner's can utilize during training courses. The theory package includes all the information what Nozzleman is expected to know and basically he doesn't need to know the other documents.

- (4) What is "study packs" which will be distributed to all applicants (shown in your Homepage)?

ANSWER:

The theory package is called "The Nozzleman Course Notes" and it includes 150 slides and a lot of pictures. This theory package defines the best practice and indicates the right and wrong work methods. It also includes basics in concrete technology, mix-design, additives, spraying equipment technology, designer's and client's expectations and safety, health and environment.

(5) Is there a program policy with all pertinent info?

ANSWER:

EFNARC Sprayed Concrete committee has created a master document called the "Operation Manual" which defines the rules and procedures of the scheme. The "Operation Manual" is approved by the EFNARC Executive Committee.

(6) Do you introduce a way of Continuing Professional Development (CPD) program to Nozzlemen after success? This might be a one of conditions to get a re-certification.

ANSWER:

EFNARC expects that Nozzleman is using his skills during the next 3 years period after he must renew his certificate. Nozzleman must include copy of his work certificate(s) from his employer(s) in his application.

(7) How long is the term of validity (three years is right?), and what are conditions to get a re-certification examination and its examination contents?

ANSWER:

As mentioned earlier the validity of the certificate is 3 years. After that the Nozzleman must go through a new assessment course (Nozzleman must go through the same procedure as was mentioned in answer for the question no. 3.1.

(8) What and how do you nominate and authorize Examiners for a written and a practical examination?

ANSWER:

Examiner must go through a 2 day's Examiner course which is arranged in Hagerbach test gallery by CUC. During this course Examiners must do a theory examination (50 questions) and practical assessment. Examiners must also agree to follow EFNARC procedures and best practice in their work as EFNARC Examiner. Also Examiners must renew their Examiner certificate after 3 years.

(9) What is a criterion of success of examinees?

ANSWER:

Examiner must pass both the theory examination and practical part. Practical part means that Examiner is following a Nozzleman who is doing intentional errors during spraying and Examiner must be able to indicate all those errors.

#### 4. On Written Examination

(1) What is a time length and how many do you make an examination question?

What is a type of questions and answers, a multiple-choice test and/or a true-false question?

ANSWER:

Examiners must go through 50 multiple-choice questions in 1.5 hours. Nozzleman must do 25 questions in reasonable time which is not exactly defined.

(2) What organization or who makes a question (technical committee, the 3<sup>rd</sup> party, etc.)?

ANSWER:

EFNARC Sprayed concrete committee provides the exam questions.

(3) Do you make questions every year or pick up from a question stock which is produced in advance?

ANSWER:

All questions and right answers have been produced in advance. Examiners must do all 50 questions. Examiner then uses same exam questions and pick up 25 of them for Nozzleman assessment course. Examiner is expected to change those 25 questions so that he is not allays picking up the same

questions.

(4) What is criterion of a written examination success?

ANSWER:

Examiner and Nozzleman must get right certain amount of the questions. Examiner assessment is more demanding than Nozzleman. Following table shows this in more detailed:

Minimum pass marks for Examiner and Nozzleman assessment:

Category	Examiner	Nozzleman
A. Concrete Technology	12 / 16	2 / 4
B. Application and Equipment	20 / 25	12 / 15
C. Testing	3 / 4	1 / 2
D. Safety, Health and Environment	4 / 5	3 / 4
Total	39 / 50	18 / 25

5. On Practical Examination

(1) What are methods and contents of practical examination? Is an oral examination and a core-sampling test included?

ANSWER:

Please see 3.1 and 3.2.

(2) Do you carry out a practical examination together with a written examination and hold it as occasion demands by an applicant? Who decides a construction site where an examination is held?

ANSWER:

Please see 3.1 and 3.2. Construction site for Nozzleman assessments is defined by Nozzleman (who of course must agree this with his employer in advance). We expect that in general all contractors support this and let their operator's to do the assessment during work time.

(3) Are mixture of sprayed concrete materials, slump value and other properties regulated by your organization through a practical examination?

ANSWER:

Yes.

(4) Do you regulate a sprayed concrete system for a practical examination, a kind of machine, hose length and its diameter, air pressure, mixing way, etc.?

ANSWER:

Equipment type and/or brand are not defined. We expect air pressure of 7 bar and air flow > 10 m<sup>3</sup>/min. Hose length and or diameter is not defined in detailed but as we expect that state-of-art sprayed concrete equipments are used this will not be a problem.

(5) Do you regulate specified activities of Gunman who partially control a sprayed concrete system during a practical examination?

ANSWER:

We have created a separate checklist for Nozzleman practical assessment which includes also this procedure.

(6) What are check points of a practical examination while a Nozzleman sprays concrete?

ANSWER:

Yes. Please see answer 5.5.

(7) It is understood that "Both Examiners and Nozzlemen will keep log books." What is the meaning of this?

ANSWER:

This refers to their work experience and that they must be able to show their experience when they renew their certificates.

6. On Cost Management

(1) A practical examination is surely cost expensive (examiner's fee, lent a sprayed concrete system, materials, co-worker's cost, coring test, etc.). Who bears its cost, examinee, employer, and/or a sponsoring group such as your organization?

ANSWER:

As mentioned earlier we suppose that Nozzleman practical assessment happens in his worksite and we expect that Nozzleman's employer takes care of all their costs (incl. concrete, equipment rent and co-workers).