

French original of the letter comes from ASN website:

(<http://www.asn.fr/sections/infos-locales/reacteur-epr/flamanville-epr-controle-asn/sections/acces-lettre-suite/?Installation=107&libel=R%E9acteur%20EPR%20de%20Flamanville>)

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Hérouville-Saint-Clair, 25 January 2008

Director of Development, Flamanville 3

BP 28

50340 FLAMANVILLE

SUBJECT: Inspection of major nuclear installations.

Inspection INS-2007-EDFFA3-0007 of 3 and 4 December 2007.

Ref: DEP-CAEN-0045-2008.

Dear Director

In the context of the responsibilities of the *Autorité de sûreté nucléaire* (ASN – Nuclear Safety Authority) regarding the inspection of major nuclear installations, as set out in Article 40 of law no. 2006-686 of 13 June 2006 relating to nuclear transparency and security, a preannounced inspection took place on 3 and 4 December 2007 on the construction site of the Flamanville 3 reactor.

You will find below a summary of the inspection as well as the demands and observations resulting from it.

Summary of the inspection

This inspection focused on the inspection of concrete production activities and of work on the first lift of the common raft of the nuclear island (referred to as “first concrete” in the EDF construction schedule).

The inspection began on the afternoon of 03/12/2007. The inspectors returned to the site during the night of 03–04/12/2007 and finally for a third time on the morning of 04/12/2007.

While overall the operation to pour the first lift of the common raft went satisfactorily, the points noted, which now form the subject of the demands and observations in the present letter, nevertheless show that there is a need to strive for greater rigorousness in order to ensure that the desired quality of execution is more reliably obtained.

A. Demands for corrective actions

A1. The qualification testing of the procedures for implementing *activities bearing on quality*¹ (ABQs)

In order to verify the results of digital simulations of the thermal behaviour of concrete due to the heat of hydration, you conducted an experiment measured by instruments. I note however that the specifications for this test, as well as the analysis of the results obtained, were produced in haste without any quality assurance process.

I draw your attention to the fact that during the inspection of 25/10/2007 the inspectors had already noted that the concrete pumping qualification tests were conducted without the specifications for the conditions of the test having first been pronounced "fit to be carried out".

I consider this lack of rigour in the conduct of tests conducted to validate key parameters and hypotheses bearing on processes for the implementation of civil engineering ABQs to be unsatisfactory. I ask you to correct this situation:

- **by defining your quality standards for qualification tests for ABQ implementation processes;**
- **by ensuring that these standards are kept to, notwithstanding the pressures of the installation's construction schedule.**

A2. The formulation of the concrete

The batch reports taken during the inspection show W/C (water/cement) values obtained ranging between 0.47 and 0.49. Standard NF EN 206-1, in Annex F "Recommendations on limits for composition of concrete", recommends a W/C ratio below 0.45 for structures of exposure class XS3. W/C values above 0.45 are not conducive to the limiting of shrinkage cracking in the concrete or to the durability of reinforced concrete structures in sea air.

In accordance with my position on the observance of best practice, of which I have already informed you in the letter following up the inspection of 25/10/2007 (ref. Dep-Caen-0955-2007), I ask you to keep to an E/C value ranging between 0.4 and 0.45 for concretes of class XS3, except where justified by incompatibility with safety standards.

¹ In the sense of the decree of 10 August 1984

A3. The site concrete laboratory

At the site concrete laboratory, the inspectors noted that the cement samples that had been taken, while each having an identifying mark, were piled up haphazardly with no filing system, due to lack of storage facilities. In view of the number of samples already present, it was impossible in these conditions for the inspectors to satisfy themselves that the samples of the cements used in the concrete for the raft were actually there.

I ask you to ensure that the concrete laboratory is provided, as soon as possible, with adequate means for storing and archiving the samples that are taking, in order to return quickly to a satisfactory situation.

The inspectors also noted a lack of stringency in the signing of granulometry test reports: several reports either bore no signature, or bore that of the head of the laboratory but not that of the laboratory technician who carried out the test.

I ask you to institute whatever actions you judge to be the most effective to make the concrete laboratory personnel more alert to quality, so as to prevent any repetition of these infractions.

A4. Adherence to the implementation and inspection plan for the concrete plants

The implementation and inspection plan (IIP) for the concrete plants of Bouygues' civil engineering package EXOQ00050C identifies a number of abnormal events that can affect the quality of the concrete produced, and stipulates the corrective and/or verification actions to be carried out.

On several occasions the inspectors noted that following abnormal events of types mentioned in the IIP (displacement of the hygrometric probes necessitating their resetting; abnormally long duration of mixing), the required concrete sagging tests to enable the batch concerned to be validated were not carried out.

The inspectors noted that the operators in the concrete plant control room lacked a precise knowledge of the IIP's stipulations, and that they relied on their knowhow and their case-by-case understanding of events to make *a priori* judgements as to the lack of consequences for the quality of the concrete produced.

Without calling into question the experience and technical competence of these operators, this attitude whereby personal judgement is allowed to prevail over knowledge and respect for established quality procedures reveals a lack of a safety culture among those involved which must be remedied.

I ask you to take whatever measures you judge to be most effective to:

- ensure that those who have to apply IIPs or supervise their application are familiar with them and respect them;
- develop the safety culture of those working on-site (knowledge of the safety implications of their activity, importance of knowing and respecting established quality procedures, the interrogative process etc)

A5. The height of the concrete chute

The inspectors noted that around the edge of the raft it was not possible to observe the requirement for the height of the concrete chute to be below 1.5m. As a result of the subsidiary reinforcement around the circumference, the gaps between the reinforcement proved too narrow to introduce the concrete pouring sleeves into the structure.

I ask you:

- to analyse why the need to adapt the reinforcement plan for the raft by means of concreting shafts, in order to respect the defined standard of a concrete chute height of below 1.5m, was not identified;
- to take such preventive and/or corrective actions as you decide are necessary in order to observe this standard during the next concreting activities classed as ABQ.

B. Additional information

B1. Monitoring of the actual heating of the concrete in the first lift of the raft

I ask you to send me:

- within two weeks, the results of the measures you have carried out to monitor the actual heating of the concrete in the first lift of the raft;
- beyond the second lift of the raft, your analysis of these results.

B2. Criterion for duration of concrete mixing and archiving of batch wattmeter graphs²

² Graph by which the duration of mixing is evaluated (measure over time of the power used in mixing)

Having noted down directly from the command and control monitor of a concrete plant the references of batches which, following a problem with the opening of a raw material feed trapdoor, had had mixing durations displayed in excess of 90 s, the inspectors noted that the operators:

- were able to trace the archived files of normal wattmeter graphs in the command and control IT application;
- were unable to trace the archived files of abnormal wattmeter graphs (duration of mixing over 90 seconds) in the command and control IT application.

Since the duration of mixing is among the parameters which influence the conformity of the concrete produced by the plant, I ask you to verify whether the command and control IT application for the concrete plants is properly archiving all the wattmeter graphs of the batches used.

C. Observations

C1. Quality

Regarding the development of the documents sent out by Bouygues, the inspectors noted that the alterations made when an index was changed were not pinpointed, contrary to quality assurance best practice.

Except where otherwise indicated, please inform me of your observations on and responses to these points within no more than one month. I ask you to identify clearly the resulting commitments that you make and in each case to specify the timescale for their implementation.

Yours faithfully

On behalf of the President of the ASN and by delegation,
Head of the Caen division

Thomas HOUDRÉ