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QUALITY ASSURANCE PLAN FOR THE AL3 TEST PROCEDURE

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Abstract

This paper describes the new quality assurance plan for the *Alarms-of-Level-3* (AL3) test. The aim of the plan is to introduce engineering techniques and to standardise and simplify the procedures for carrying out tests following Safety Instruction 37 (IS37). The procedures are to co-ordinate all the services involved (fire brigade, maintenance and computer support) and to create a consistent documentation. When the procedures are implemented, it will be possible to determine with confidence how field actions are carried out and to measure actual performance. The focus will be on personnel training and documentation. It is important however to keep documentation and procedures to a reasonable level that can be maintained at appropriate intervals. The plan is the result of an internal requirement from ST/MC and a formal request from Installations Nucléaires de Base (INB).

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1 INTRODUCTION

The group *Alarms and Access* (ST/AA) is in charge of the test of fire and gas detection, synoptic panels and evacuation systems. All this equipment can generate *Alarms-of-Level-3*, that means, safety alarms. There are two types of test: performance and technical test. The frequency of the verification of the status of the installation (performance or technical test) must be at least every six months [1]. After each test, ST/AA shall maintain records containing the type of test, the location of the system, the material verified, the results of the test and the faults detected [2]. The records of the tests shall be used to determine the system availability and performance. To improve the present procedures, the AA group will write a Quality Plan that will clearly define:

- a) Inspection and testing plan
- b) Inspection and test status
- c) Control of nonconforming systems
- d) Document and data control

2 QUALITY PLAN

The ISO 10005 defines a *Quality Plan* (QP) as a document setting out the specific quality practices, resources and sequence of activities relevant to a particular product, project or contract. A quality plan provides a mechanism to link specific requirements of the project to existing generic quality system procedures. If a documented quality system does not exist, a quality plan may be a stand-alone document [3].

A quality plan must define clearly the product or project to which it is applied, must describe the scope of the contract, product or project, the quality objectives, the specific exclusions and the conditions of its validity.

For the AA group the product or project is the full commissioning and maintenance of detection and access systems. For the detection systems we consider also its acceptance test before commissioning. The group has a double role as customer and supplier. It is a customer of a consortium of companies that carries out the maintenance, and it is the supplier of detection systems for CERN. Therefore we need two Quality Plans. The first Quality Plan between CERN and the AA group and the second Quality Plan between the AA group and the consortium of companies. Both will be strongly related, but will handle different aspects of the commissioning and maintenance of detection and access systems.

3 ALARM-OF-LEVEL-3

The CERN TIS *Safety Instruction 37* (IS37) defines *Alarm-of-Level-3* (AL3) as accident or serious abnormal situation, especially where people's lives are or may be in danger. This requires an immediate action by the Fire Brigade and Rescue Group [4].

Level 3 covers alarms arising from:

- a) Smoke (fire) detectors
- b) Flammable gas detectors signalling serious leaks
- c) Red telephones
- d) Actuation of a general emergency stop
- e) Oxygen concentration detectors
- f) Water leak (flooding) detectors
- g) Actuation of local evacuation signals
- h) Blocked lift with trapped occupants
- i) "Dead man" devices

After any alteration to the environment of a level 3 alarm system, the *Territorial Safety Officer* (TSO/GLIMOS) must organise, together with the *Technical Inspection & Safety Commission* (TIS) and the group technically in charge of the equipment, a full test of the effectiveness of the system in its new environment. In case the installation is disabled for more than four hours, it is necessary to follow a special procedure that it is described in the IS37.

4 HOW THE QUALITY PLAN HANDLES THE TEST OF ALARM SYSTEMS

This section will specify how we want to follow the tests carried out at the installations that can produce *Alarms-of-Level-3* and how we will record them. For this purpose we will follow the points established for a Quality Plan. The reason for this approach is that to integrate the documentation, the planning, the status and the control of the test, we need something more than a procedure that only describes the tests. The document must not only fix the steps to follow during the test, but must also explain the limits of the test, which actions must be taken after it, and how the tests must be recorded to have a complete traceability of an installation. The fulfillment of a technical or performance test must imply a control of the nonconformity, an analysis of the reliability of the installation, and, if necessary, an adaptation of the maintenance. If the test of the equipment is handled as described in this section we will describe the whole context.

A QP covers twenty points of the life of a project. In these points, the relationship between the client and the supplier is established. The points that directly affect the tests of *Alarms-of-Level-3* are:

- a) The scope of the quality plan
- b) The document and data control
- c) The process control
- d) The inspection and testing
- e) The control of inspection, measuring and test equipment
- f) The inspection and test status
- g) The control of nonconforming product
- h) The corrective and preventive actions

- i) The control of quality records
The most important points are described below.

4.1 Scope of the Quality Plan

The product that AA will supply to its customers at CERN is the commission of detection and access control systems, its maintenance and evolution. The purpose of a detection system is to signal an abnormal situation (avoiding false alarms) at the earliest possible moment, and to give an alarm to the Safety Control Room (SCR) and the Technical Control Room (TCR) so that appropriate actions can be taken [5].

The scope of the contract between CERN and the AA group is to ensure the performance, design, installation work, modification, reparation and maintenance service in the safety alarms, and access control fields.

The quality objective of the group is to ensure a certain safety integrity level for the systems managed by the group. The limits will follow the standards. [6]

4.2 Document and data control

One of the points handled in the QP is the *Document and Data Control*. The plan should indicate all the relevant documents, maps, plans, technical documents, for the start up, maintenance and evolution of the detection system. The plan should indicate how the documents are identified. It must specify how and who give access to the documents, and how and who reviews and approves the documentation. For each kind of document, there will be the definition of all these parameters and a template.

4.3 Inspection and testing

In the Quality Plan any relevant inspection and test plan must be described. This may include:

- a) How the AA group verifies the service given by the subcontractor
- b) The localization of test points
- c) The description of the inspection
- d) Job description schedule (“Gamme”) and acceptance test
- e) Where inspections or test are required to be witnessed or performed by regulatory authorities
- f) When, where and how the AA group (required by CERN or regulatory authorities) will use third parties to perform type tests, witness testing, product verification and validation, and material, products, process or personnel certification

4.4 Inspection and test status

The quality system should ensure that required inspections and tests are performed. The plan will indicate any specific requirement and method for the inspection and test status of the equipment, documents and data [7]. The system should provide a way to identify the status of the equipment or any document related to it. This includes the marking of nonconforming products.

4.5 Control of nonconforming product

The plan will indicate how the nonconforming products are identified and controlled. It must also indicate how to handle these products and the actions taken to meet the requirements. If it is impossible to meet the user requirements, the plan will define under what circumstances it is possible to ask for a waiver. The plan should indicate in that case who has to ask for the waiver, how, and what information is to be provided and who can give it.

4.6 Control of quality records

The plan should indicate among other things how records specific to the product are to be kept, for how long, where and by whom. The form of the records, the storage, retrievability, disposition and confidentiality must also be defined. Finally, it will state in what language the records will be provided.

5 CONCLUSION

The Quality Plan of the AA group will include the procedure for the *Alarms-of-Level-3* test. This will introduce the procedure in the maintenance work of the group. The documentation of the tests will be attached to the life of the installation, improving its traceability and control. This gain in the traceability will give the possibility to analyse better the history of the equipment, and to learn from it. The QP will reduce to a minimum the number of documents used by the services involved in the tests. A way to follow the status of the tests will be defined and in case of nonconformity it will be established how to handle it. The Quality Plan is a means to try to improve the service given by the AA group.

References

- [1] R7 Détection automatique d'incendie. Règle d'installation (1997).
- [2] CEI 839-5-1:1991 Alarm systems Part 5: Requirements for alarm transmission systems. Section 1: General requirements for systems (1991).
- [3] ISO 10005:1995 Quality management-Guidelines for quality plans (1995).
- [4] IS 37 Rev. 2 - Alarms and alarms systems. CERN/TIS (1998)
- [5] ISO 7240-1:1988 Fire detection and alarm systems. Part 1: General and definitions (1988)
- [6] CEI 61508-5:1998 Functional safety of electrical/electronic/programmable electronic safety related systems. Part 5: Examples of methods for the determination of safety integrity levels (1998).
- [7] CEI 839-1-4:1989 Alarm systems Part 1: General requirements. Section Four - Code of Practice (1989).