Quality Assurance Definition

QUALITY ASSURANCE CATEGORIES

Abstract
This document provides guidelines for assigning the Quality Assurance Category of the LHC systems, sub-systems, assemblies and parts. Quality Assurance Categories are used to identify the most critical items of the LHC and to ensure that a correct level of Quality Assurance is assigned to every item.

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**History of Changes**

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1. PURPOSE

To provide guidelines for assigning the Quality Assurance Category of the LHC systems, sub-systems, assemblies and parts.

- To ensure a correct level of Quality Assurance and Quality Control for each item.
- To identify the most critical items of the LHC.

2. SCOPE

This procedure is applicable to:

- All LHC systems, sub-systems, assemblies and parts.
- The complete life cycle of the Project, from design up to commissioning and operation.
- All Institutes, Contractors and Suppliers involved in the LHC Project.

3. POLICY

A graded approach to Quality Assurance is used to place the most emphasis and allocate adequate resources to those items of the LHC that would have the most detrimental effect on safety, performance, cost and schedule in case of failure.

This is achieved by assigning, at the design stage, a QA category to all the LHC hardware items. This category is then used to assign the correct level of Quality Assurance at each stage of the life-cycle of the items.

4. RESPONSIBILITIES

At the basic design stage of all LHC systems, sub-systems, assemblies and parts the Project Engineer (PE) in charge of the item shall determine the appropriate QAC for the item.

The Division or Group Leader responsible for the system, sub-system, or assembly to which the item belongs has the ultimate responsibility to approve the proposed QAC.

The LHC Project Management has the overall responsibility to review and approve the QAC designations.

5. GUIDELINES

The QAC of an item is determined by evaluating the consequences of the item’s failure in terms of:

- The financial loss incurred by the redesign and/or replacement of the failed item
- The LHC unscheduled downtime brought about by the failed item.

In the case of a failure occurring before the item is in operation and causing a delay in the LHC construction schedule, this delay shall be considered as LHC downtime.
Quality Assurance Categories based on the preceding criteria are indicated in table 1.

<table>
<thead>
<tr>
<th>Category</th>
<th>Impact of failure</th>
<th>Financial loss</th>
<th>LHC unscheduled downtime</th>
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<tbody>
<tr>
<td>A</td>
<td>Catastrophic</td>
<td>Over 2 MCHF</td>
<td>1 week or more</td>
</tr>
<tr>
<td>B</td>
<td>Significant</td>
<td>Over 200 kCHF and less than 2 MCHF</td>
<td>Less than 1 week</td>
</tr>
<tr>
<td>(none)</td>
<td>Minor</td>
<td>Less than 200 kCHF</td>
<td>No immediate incidence on operation</td>
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Table 1: Quality Assurance Categories

When assigning the QAC of an item, the following guidelines shall be followed:

- The selection of the QAC is based either on the cost of replacement of an item or on the consequences of its unavailability or malfunction for the operation of the LHC.
- When using table 1, only one of the criteria has to be met to assign the QAC.
- QAC need not be assigned to items such as tooling, transport and measuring equipment etc., which are not essential to the LHC operation.
- The impact of failure shall be assessed independently for each item of a system, sub-system, or assembly. This means that the QAC of a lower level item can be less significant than the QAC of the upper level item it belongs to. For example, a part or a sub-assembly can be in category B even though the assembly it belongs to is in category A.
- QAC should be specified as early as possible in the design process [1], and in any case before drawing production starts.
- The QAC is written in the item’s drawing title block [2], and it determines the review and approval process of the drawing.
- QAC are used to determine the Quality Assurance activities applicable to the item during manufacturing, assembly, installation and commissioning.

![Figure 1: Location of QAC in drawing’s title block]
6. RELATED DOCUMENTATION

[ 1 ] LHC-PM-QA-307.00  Design Process and Control
[ 2 ] LHC-PM-QA-402.00  Design Standards - Mechanical Engineering and Installations