

## Quality Assurance Definition

# DOCUMENT TYPES AND NAMING CONVENTIONS

### *Abstract*

The purpose of this document is to identify the types of document used for the construction of the LHC and to define the naming conventions applicable to documents.

An overview of the purpose of the different document types, and their role in the Project, is presented. This aims at helping all technical and administrative staff working with LHC documents, either as authors, editors, controllers, reviewers or other, to have a common understanding of the use of each document.

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### *History of Changes*

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## 1. PURPOSE

To define the types of document used for the construction of the LHC and to define the document naming conventions.

To outline the purpose of each document type and its role in the LHC configuration baseline, or elsewhere in the Project. This description aims at helping all technical and administrative staff working with LHC documents, either as authors, editors, controllers, reviewers or other, to have a common understanding of the use of each type of document, thereby easing the preparation of the documents in accordance with the requirements.

## 2. SCOPE

The definitions given in this document are applicable to all documents that are either part of the LHC configuration baseline, or closely related to the baseline, and relevant to the following Project activities:

- Management.
- Quality assurance
- Engineering.
- Contracting.
- Fabrication, Assembly, Test, Installation.
- Operations, Maintenance.

New document types may be defined during the course of the LHC project. These will then be added to the present document.

This document does not apply to LHC Project Reports and LHC Project Notes or to engineering drawings.

However reports, notes and engineering drawings appear in different places in this document to present as complete a view as possible of the Project's document handling.

## 3. RESPONSIBILITIES

Managers and supervisors at CERN, Institutes and Contractors shall ascertain that personnel affected to the preparation, review and changes to documents are aware of and understand the definitions described in the present document.

The roles and responsibilities of individuals involved with document handling are detailed in "Documents and parameters process and control" [ 1 ].

## 4. LHC DOCUMENT MODEL

### 4.1 DOCUMENT CATEGORIES

The documents are categorised in the following groups, which are elaborated below:

- Management.
- Quality assurance.
- Engineering.
- Contracting.
- Fabrication, Assembly, Test, Installation.

- Operations, Maintenance.

**Management documents** include scheduling and planning documents, organisational documents, and minutes of meetings from the LHC Project Committees under the Project Leader's Office.

**Quality assurance** documents include the Quality Assurance Policy and the procedures, definitions, standards, templates and instructions defined to support the handling of all documents, to ensure that the documents are prepared consistently and the LHC baseline can be maintained to support the LHC development optimally.

**Engineering** documents include the engineering specifications, engineering drawings, technical illustrations etc. prepared to establish the design of the LHC. These documents form the basis for the LHC development, carried out by CERN, Institutes, Contractors and Suppliers.

**Contracting** documents include the documents which form the contractual interface with the contractors developing, manufacturing and installing equipment for the LHC.

**Fabrication, Assembly, Test and Installation** documents are prepared to support and document the development and validation of the equipment, in particular that developed by contractors, and form the interface between CERN and the contractors for the contract completion activities.

**Operations and Maintenance** documents are used to support the operation and maintenance of LHC equipment after delivery to CERN.

## 4.2 DOCUMENT TYPES

For each of the categories listed above a number of documents types are defined. The complete list of document types is given in section 5.1.3 and a description of each type and its use is given in chapter 6.

## 4.3 DOCUMENT MODEL

The ISO 12207 standard [ 2 ] defines a number of processes relating to a project life cycle. Although being prepared for software projects, these identified processes are also highly relevant for projects including engineering and construction items.

The ISO 12207 processes are grouped in life cycle, supporting and organisational processes, as indicated in figure 1.

The document categories forming the LHC baseline are indicated on the diagram with rounded boxes, and the arrows indicate which of the main life-cycle processes the categories pertain to.

For each of the ISO 12207 processes, a number of activities are defined in the standard. The LHC defined processes and documentation describe and define parts of these activities, and identify which LHC entities are involved. A full mapping may be provided at a later point in time.

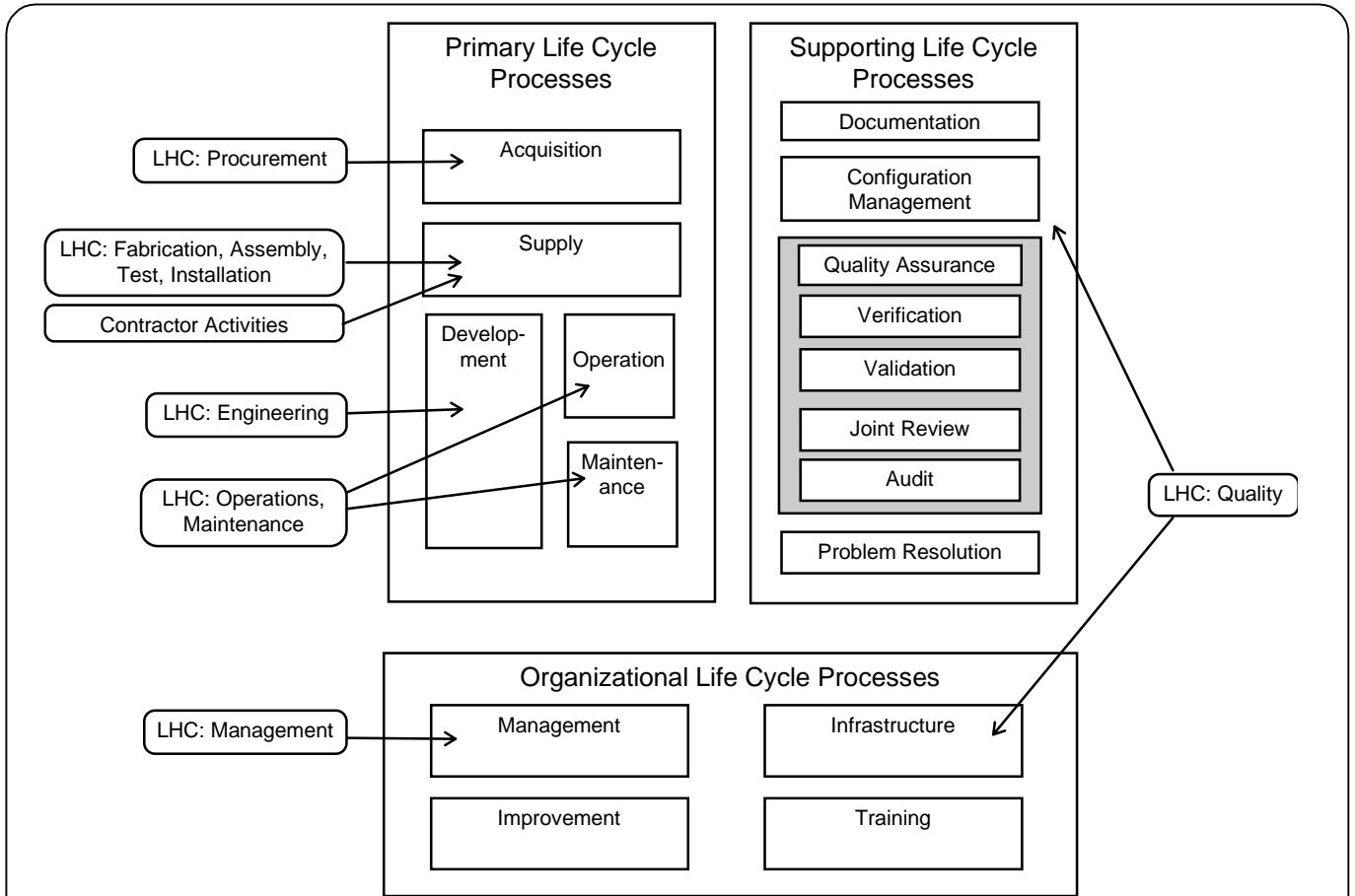


Figure 1: LHC Documents in the ISO 12207 Processes

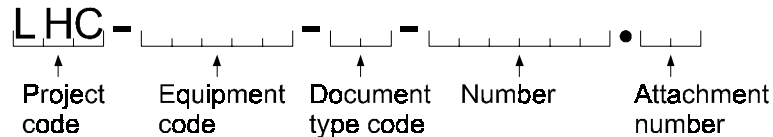
## 5. DOCUMENT NAMING CONVENTIONS

All documents are identified by a **document name** and by an **EDMS number**. The document name is structured to favour human readability whereas the EDMS number favours computer readability. These two identifications are mandatory; for some document types they may be complemented by the document identification of the CERN group, the Institute or Contractor producing the document. (See section 5.4).

## 5.1 DOCUMENT NAME

### 5.1.1 DOCUMENT NAME STRUCTURE

The document name has the following structure:



Field	Description	Format
Project code	For the LHC project: LHC	3 upper case characters
Equipment code	An LHC item equipment code	1 to 5 digits or upper case characters
Document type code	A code identifying the purpose of the document (see section 5.1.2)	2 upper case characters
Number	A user or system controlled number or a combination thereof.	3 to 6 digits
Attachment number	For material attached to the main document.	2 digits or characters

Table 1: Document Name Structure

All the fields shall be filled in all cases.

The separator between project code and equipment code, equipment code and document type code, document type code and number is a dash (minus sign).

The separator between the number and attachment number is a dot (full stop).

### 5.1.2 EQUIPMENT CODE

Equipment codes are defined in the "Equipment Naming Conventions" [ 3 ].

For documents of general interest, for example management and quality assurance, the pseudo-equipment code PM shall be used.

### 5.1.3 DOCUMENT TYPE CODE

The Document type code is composed of 2 characters. The list of document types and corresponding codes is shown in table 2.

Category	Document Type	Doc. Type Code	
Management	LHC Construction Schedule	M	S
	Minutes of LHC Project Committees	M	M
	LHC Project Organisation Chart	M	G
Quality	Policy, Definitions, Procedures, Standards, Instructions	Q	A
Engineering	Engineering Specification: <ul style="list-style-type: none"> <li>• Functional Specification</li> <li>• Interface Specification</li> <li>• Design File</li> </ul>	E	S
	Engineering Change Request	E	C
	Engineering Drawing <small>[see note below]</small>	CDD	
	Technical Illustration	E	I
	Minutes of Preliminary Design Review	E	M
	Minutes of Safety Reviews	E	Y
Contracting	Technical Specification (attached to a contract)	C	C
	Technical Description for Market Survey	C	S
	Technical Specification (attached to an Invitation to Tender or a Price Inquiry)	C	I
Fabrication	Procedure	F	P
	Report	F	R
	Minutes of meetings	F	M
Assembly	Procedure	A	P
	Report	A	R
	Minutes of meetings	A	M
	Work package data sheet	A	W
Test and measurements	Procedure	T	P
	Report	T	R
	Minutes of meetings	T	M
	Work package data sheet	T	W
Installation	Procedure	I	P
	Report	I	R
	Minutes of meetings	I	M
	Work package data sheet	I	W
Operation, Maintenance	Procedure	O	P
	Report	O	R
	Minutes of meetings	O	M

**Note:** The management of Engineering Drawings is described in "Drawing Management and Control" However engineering drawings are mentioned here and in chapter 6 for completeness and to clarify the distinction with technical illustrations.

Table 2: Document Type Identifier

#### 5.1.4 NUMBER

The number field in a document name is composed of 6 digits and may be used in three different ways:

1. It is a meaningless sequential number supplied by the EDMS.
2. It is entirely selected by the user. The EDMS will check that the number is not already in use and reject it if it is.
3. It is divided in two parts, one part controlled by the user, the other part supplied by the EDMS.



### 5.1.5 ATTACHMENT NUMBER

The attachment number is composed of 2 digits according to the following rules:

- The main document has attachment number 00 (zero zero)
- The first attached document has attachment number 01 (zero one)
- The second attached document has attachment number 02 (zero two)
- The last possible attachment number is 99

## 5.2 DOCUMENT REVISION INDEX

The document revision index is composed of 2 digits separated by a dot.

When registered in EDMS new draft documents are given the revision index 0.1, followed by the text "**-draft**".

Prior to release, new revisions of draft documents may be created with the revision index 0.2, 0.3 and so on.

Upon the first release of a document the revision index shall be updated to 1.0.

After release, the revision index shall be incremented whenever the document is changed in any way:

- In the case of **minor changes** only the second digit of the revision index is incremented, for example from 1.0 to 1.1.
- In the case of **major changes** the first digit of the new revision index is incremented while the second digit is set to 0, for example from 1.1 to 2.0.

Draft for both minor and major revisions are indicated by the text "**-draft**" following the new revision index.

#### Example:

LHC-PM-QA-301.00 rev 0.1-draft	First draft of a new document
LHC-PM-QA-301.00 rev 0.2-draft	Second draft of new document
LHC-PM-QA-301.00 rev 1.0	First reviewed and approved release
LHC-PM-QA-301.00 rev 1.1-draft	Draft of a minor revision
LHC-PM-QA-301.00 rev 1.1	Release of a minor revision
LHC-PM-QA-301.00 rev 2.0-draft	Draft of a major revision
LHC-PM-QA-301.00 rev 2.0	Release of a major revision

## 5.3 EDMS NUMBER

The EDMS number is a computer identification number automatically attributed by the EDMS system when a document is registered. It is composed of a number of digits without structure or meaning.

## 5.4 OTHER DOCUMENT IDENTIFICATIONS

In addition to the LHC document name, other document identifiers can be added to accommodate current document management practices in the group preparing the document. However, the document name and document EDMS number as described above, are compulsory for all documents.

## 6. DOCUMENT TYPE DESCRIPTIONS

In the following sections, each of the document types identified in table 2 is described in a standardised form. Each table indicates for the document its purpose, format, contents, review and approval requirements, version control requirements and appropriate template..

### 6.1 LHC CONSTRUCTION SCHEDULE

To be prepared

### 6.2 MINUTES OF MEETING

	Description
<b>Purpose</b>	To record decisions made at the meeting
<b>Format</b>	Document, may be supported by illustrations
<b>Contents</b>	<ul style="list-style-type: none"> <li>▪ Object of the meeting</li> <li>▪ Date, place, time</li> <li>▪ Participants</li> <li>▪ Agenda</li> <li>▪ Decisions</li> <li>▪ Action Items</li> </ul>

### 6.3 PROJECT ORGANISATION CHART

To be prepared

## 6.4 QUALITY ASSURANCE DOCUMENTS

	Description
<b>Purpose</b>	To define the LHC Project Quality Assurance Plan
<b>Format</b>	Document, document template
<b>Contents</b>	<p><i>Policy</i> To define the LHC Project Quality Assurance requirements of the processes of a certain Project activity.</p> <p><i>Definition</i> To describe various common conventions in use throughout the Project</p> <p><i>Procedure</i> A concentrated description of a course of actions to be carried out in order to implement a policy. This may be in diagrammatic form with associated task descriptions.</p> <p><i>Standard</i> To define the detailed requirements of elements (such as documents, data, drawings, etc) of the Project.</p> <p><i>Template</i> To provide a common layout and structure for specific document types.</p> <p><i>Instructions</i> To provide detailed information supporting the execution of specific tasks.</p>
<b>Review and Approval requirements</b>	<i>Policy, Definition, Procedure, Standard and Templates</i> documents are to be controlled by the member of the QAP Working Group and approved by the Deputy to LHC Project Leader for Quality Assurance
<b>Version control</b>	Yes, except for <i>Instructions</i>
<b>Template</b>	Engineering Specification Template [ 4 ]

## 6.5 ENGINEERING SPECIFICATIONS

Engineering Specifications define the requirements and design of the individual LHC system, subsystem assemblies and parts. Three kinds of engineering specification are defined:

- Functional specification
- Interface specification
- Design file.

For clarification, the difference between Engineering Specifications and LHC Project Reports and Notes is underlined here:

### **LHC Project Reports**

LHC Project Reports are used to present a synthesis on a subject which should in general have been presented earlier in one or several "LHC Project Notes". These are LHC specific conclusions expected to be valid for a longer period or more general results, new technical solutions and theoretical or experimental developments worth a publication.<sup>1</sup>

They are reviewed by the group leader of the author and approved by the Project Leader Office before release.

### **LHC Project Notes**

<sup>1</sup> See memorandum DG/DI/LE/jf/97-23, "LHC Project Publications" - L.R. Evans

LHC Project Notes are used to describe the conceptual design of a system, a summary of interesting results of on-going studies, a proposal for alternatives or new methods not yet studied in depth, final results of calculations or measurements using well established theories and methods.

LHC Project Notes are internal CERN working documents and are the sole responsibility of the author(s). They require the authorisation of the author's group leader for release.<sup>1</sup>

The main difference between LHC Project Reports and Notes and LHC configuration baseline documents is the following:

- LHC Reports and Notes are reviewed prior to their release but there is no acknowledgement from the engineers and other personnel involved that the information conveyed by the documents has been assimilated.
- Baseline documents are distributed with a request for comments and formal acknowledgement from the engineers and other personnel involved as described in (review and approval process as described in "Documents and parameters process and control" [ 1 ]).

|| The documentation of the design of a system, sub-system, assembly or part, describing how to manufacture, install and operate that system, sub-system, assembly or part, must be done with Engineering Specifications and Engineering Drawings and not with LHC Project Notes and Technical Illustrations. ||

## 6.5.1 FUNCTIONAL SPECIFICATIONS

	Description
<b>Purpose</b>	To ensure that all personnel involved in the design process use the same verified input information to carry out the design.
<b>Format</b>	Document following Engineering Specification Template
<b>Contents</b>	<p>The functional specification shall outline the <b>requirements</b> of the product's design by refining and completing the conceptual design described in the "LHC Conceptual Design" [ 6 ], in the LHC Parameters and Layouts database and in LHC Project notes. It shall establish that the design requirements are appropriate and address the intended use of the equipment.</p> <p>The functional specification should address at least the following points:</p> <ul style="list-style-type: none"> <li>• The performance objectives, operating conditions, and the requirements for reliability, availability, maintainability</li> <li>• Mechanical, electrical, cryogenic, radiation resistance and other technological constraints to be respected by the design</li> <li>• Safety and regulatory requirements constraints</li> <li>• Manufacturing and installation constraints</li> <li>• The basic technical interface requirements of the design</li> <li>• Requirements for calculations, test and development work, including the construction of prototypes.</li> </ul> <p>This list is not exhaustive and should be completed as appropriate for each individual case.</p> <p>The documents, parameters, and other information and data used to establish the specification shall be listed as references.</p>
<b>Review and Approval requirements</b>	See [ 1 ]
<b>Version control ?</b>	Yes
<b>Template</b>	Engineering Specification template [ 4 ]

## 6.5.2 INTERFACE SPECIFICATIONS

	Description
<b>Purpose</b>	To ensure that all groups and individuals involved by the product and its operational environment are aware of the product's interfaces and given the opportunity to review and approve these interfaces.
<b>Format</b>	Document following Engineering Specification Template
<b>Contents</b>	The interface specification shall describe and document, in particular with the help of drawings, the product's physical and functional boundaries with other systems, sub-systems and equipment. It shall also describe and document the responsibility boundaries of all groups or individuals involved in the design.
<b>Review and Approval requirements</b>	See [ 1 ]
<b>Version control ?</b>	Yes
<b>Template</b>	Engineering Specification template [ 4 ]

### 6.5.3 DESIGN FILE

	Description
<b>Purpose</b>	To record the design decision process and to describe the design choices that have led to the final design.
<b>Format</b>	Document with attachments
<b>Contents</b>	The design file is a summary of the basic and detailed design process. It shall consist of a short description of the evolution of the completed design with the results obtained by analysis, measurements and tests that demonstrate that all the requirements and constraints set out in the functional specification are met.
<b>Review and Approval requirements</b>	See [ 1 ]
<b>Version control ?</b>	No
<b>Template</b>	None defined

### 6.6 ENGINEERING CHANGE REQUEST

	Description
<b>Purpose</b>	To control and document engineering changes of the LHC baseline configuration by: <ol style="list-style-type: none"> <li>1. Submitting proposed engineering changes of the baseline configuration to the appropriate groups and individuals for review before their implementation. This is the Change Request stage.</li> <li>2. Requesting of the concerned groups and individuals that they implement approved changes. (Change Order stage).</li> <li>3. Notifying the appropriate groups and individuals of the decisions and actions undertaken following the request. (Change Notification stage).</li> </ol> The three stages are carried out with one single document.
<b>Format</b>	Document following Engineering Change Request Template
<b>Contents</b>	The Engineering Change Request is a description of a proposed change to the LHC configuration impacting cost, schedule, parameters, technical performance, durability, interchangeability, systems interface, safety. It shall contain references to all affected systems, sub-systems and equipment and to all affected documents and drawings. Once the proposed change is reviewed and approved the change request is updated with the actions to be carried out and becomes a change order. Once the actions are completed the change request is updated again and becomes a change notification. In the case of a rejected request, the change order stage is skipped and the change request is updated to a change notification directly.
<b>Review and Approval requirements</b>	See [ 5 ]
<b>Template</b>	Engineering Change Request template [ 7 ]

## 6.7 ENGINEERING DRAWINGS

	Description
<b>Purpose</b>	<p>1. All definitions of hardware equipment parameters, dimensions, tolerances and manufacturing, assembly and installation processes. These drawings are covered by "Design Standards-Mechanical Engineering and Installation" [ 8 ]</p> <p>2. All definitions of processes operational parameters. These drawings are covered by "Design Standards-Electrical Schematics"[ 9 ] and "Design Standards-Fluids Schematics" [ 10 ].</p>
<b>Format</b>	Drawings prepared with a standardized layout
<b>Contents</b>	<p>Engineering drawings are pictorial representation that follow rules and codes established by the ISO or by other standard organisations for the appropriate field of engineering.</p> <p>The presentation is standardised by the use of drawing formats which defines sizes, views, scales, drawing frame, titles block with a drawing number, a title, author and controllers signatures.</p>
<b>Review and Approval requirements</b>	See [ 11 ]
<b>Version control ?</b>	Yes
<b>Template</b>	CERN standard format, Institute or Contractor standard format

## 6.8 TECHNICAL ILLUSTRATIONS

	Description
<b>Purpose</b>	To provide a pictorial representation of a product or process of general interest that can be used by all for presentations and documents.
<b>Format</b>	Document no specific layout
<b>Contents</b>	<p>Technical Illustrations are sketches, diagrams, photos, scanned images, electronic images. They are prepared by:</p> <ul style="list-style-type: none"> <li>• any computer software application capable of producing the appropriate file format (HPGL, HPGL2, Acrobat PDF, GIF, JPEG)</li> <li>• scanning paper documents</li> <li>• digital still cameras.</li> </ul>
<b>Review and Approval requirements</b>	Verified by a controller
<b>Version control ?</b>	Yes
<b>Template</b>	None

## 6.9 TECHNICAL DESCRIPTION FOR MARKET SURVEYS

	Description
<b>Purpose</b>	To provide the basic technical description of products for which a Market Survey (MS) is carried out. Market Surveys precede Invitations to Tender to inform industry about future requirements. They also tell CERN what the market can offer and which firms could qualify to receive an Invitation to Tender
<b>Format</b>	Document following Market Survey Template
<b>Contents</b>	Brief technical description of products or services
<b>Review and Approval requirements</b>	Review and approval by Technical Specification Committee, see [ 1 ]
<b>Version control ?</b>	Yes
<b>Template</b>	Technical Description for Market Surveys template [ 12 ]

## 6.10 TECHNICAL SPECIFICATIONS

	Description
<b>Purpose</b>	To provide the detailed technical description of products for which an Invitation to Tender, a Price Inquiry or a Contract is carried out. Invitations to Tender, also referred to as Calls for Tender, are used to obtain price quotations from Industry for requirements above 200 000 CHF. Price Enquiries are used for requirements below 200 000 CHF
<b>Format</b>	Document following Technical Specification Template
<b>Contents</b>	Complete technical description of products or services
<b>Author</b>	Project Engineer
<b>Review and Approval requirements</b>	Review and approval by Technical Specification Committee, see [ 1 ]
<b>Version control ?</b>	Yes
<b>Template</b>	Technical Specification template [ 13 ]

## 6.11 FABRICATION, ASSEMBLY, TEST, INSTALLATION PROCEDURES

To be prepared

## 6.12 FABRICATION, ASSEMBLY, TEST, INSTALLATION REPORTS

To be prepared

## 7. RELATED DOCUMENTATION

[ 1 ]	LHC-PM-QA-303.00	Documents and Parameters Process and Control
[ 2 ]	ISO/IEC 12207:1995	Information Technology - Software Life Cycle Processes
[ 3 ]	LHC-PM-QA-204.00	Equipment Naming Conventions
[ 4 ]	LHC-PM-QA-501.00	Engineering Specification Template
[ 5 ]	LHC-PM-QA-304.00	Configuration Management-Change Process and Control



[ 6 ]	CERN/AC/95-05(LHC)	Large Hadron Collider Conceptual Design
[ 7 ]	LHC-PM-QA-502.00	Engineering Change Request Template
[ 8 ]	LHC-PM-QA-402.00	Design Standards - Mechanical Engineering and Installations
[ 9 ]	LHC-PM-QA-403.00	Design Standards – Electrical Schematics
[ 10 ]	LHC-PM-QA-404.00	Design Standards – Fluids Schematics
[ 11 ]	LHC-PM-QA-305.00	Drawing Management and Control
[ 12 ]	LHC-PM-QA-503.00	Technical description of Market Survey template,
[ 13 ]	LHC-PM-QA-506.00	Technical Specification template