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Provides a clear and coherent picture of the status of a project or machine at a given point in time.

In order to achieve this, we use three important tools

- Changes to the machines and transfer lines are documented, circulated and approved in the Hardware Baseline (also known as a Product Breakdown Structure) using EDMS
- We register the layouts of the accelerators and all changes to them within the Layout Database that has to remain up-to-date.
  - Sequence of functional positions = space management
  - Integration and Installation Drawings match the recorded layout to ensure that envelopes of reserved space still match the physical equipment dimensions
- Naming is critical throughout the lifecycle of the machines/projects. To store and manage naming, we use the Naming Portal

Keyword is coherence between the tools.
Configuration Management of Accelerator Layouts
Hardware Baseline...

- ...is an EDMS (Electronic Document Management System) based tool.
- The hardware baseline contains all the information needed to re-build the machine, including:
  - Engineering Specifications, Drawing Folders, ECR, Procurement Documents (IT, DO, MS…)
  - LHC Baseline was the first to be issued
  - SPS and PS Complex Hardware Baselines are in progress
- Logical structure of nodes, based on hardware types and functions
- Documentation can be linked to multiple locations
Handling Changes

- **How:** using Engineering Change Requests (ECRs)
  - Determine an associated name for the change (equipment, function, layout, service…)

- **What for:**
  - Inform other stakeholders and get their approval/refusal
  - Impact analysis.
  - Allow all persons concerned the opportunity to comment about the impact of changes on surrounding equipment or general planning.
Handling Changes

- Where: in the HW baseline for long-term traceability
  - Identify the adequate node in the structure
  - All changes concerning given equipment recorded in the same place in the HW Baseline

- When: prior to the change taking place
- Resulting action: update the HW Baseline (Engineering Specifications, Drawings...) and the Layout Database.

Document type. For example: ES = Engineering Specification, EC = Engineering Change request, TP = Test Procedure etc.
Handling Changes
Usage of the Naming Service

- The naming portal is the source for all codes in EDMS, CDD and Layout.
  - Equipment codes (types) - description of the equipment
    - Includes CDD (CERN Drawing Directory) naming for design office
  - Functional positions for mechanical and electrical layouts – functional naming in the layout database
    - It takes into account optics naming (ABP and OP)
- According to Naming Conventions
  - LHC, SPS, PS Complex
  - QA documents linked within the naming portal

<table>
<thead>
<tr>
<th>Machine Layout code</th>
<th>Functional Equipment code</th>
<th>Equipment design code</th>
<th>Five-character Equipment code</th>
</tr>
</thead>
<tbody>
<tr>
<td>XT00.MQD.4100</td>
<td>MQD</td>
<td>PXIQLNWL</td>
<td>MQNLI</td>
</tr>
<tr>
<td>XT00.MQF.4200</td>
<td>MQF</td>
<td>PXMQNLINW</td>
<td>MQNLI</td>
</tr>
<tr>
<td>XT00.MCHV.6100</td>
<td>MCHV</td>
<td>PXMCCAZWW</td>
<td>MCCAZ</td>
</tr>
</tbody>
</table>

- Machine region / zone
- Variants on equipment type
- Functional description
  - ‘D’ = Defocusing,
  - ‘F’ = Focusing
- ‘Convention’ reference:
  - PX = PS Complex, SP = SPS, HC = LHC
Usage of the Naming Service

- Design office use the equipment code for registering drawings

- Manufacturing stage - asset naming
  - Reference for a specific piece of equipment

Accelerator / Project Code - LHC, SPS, PS_, PSB, ISL...

Only equipment code (excludes the variant)
Naming – Electrical Functional Positions

- Electrical circuit naming:

- Electrical power converter naming:

- All names registered in the naming database, and functional positions with additional attributes declared in the layout database:
Managing Layouts - Usage of the Layout Database

- Stores the sequence (layout) of accelerator and transfer line components.
  - Equipment types and details
  - Functional positions for mechanical and electrical layouts
  - Asset names – functional position is exported to MTF database and associated to an asset. Layout just shows the result.
  - Expert name – optional, alternative functional name
- Updated as a result of ECRs - all past layout information is kept for traceability purposes (database is versioned – see following slide)
  - Functional positions become ‘expired’, not deleted
- Accessible to all CERN users (CERN IP address)
Machine Layout Versioning – Release Notes

- Modifications to the layout of the machines (using ECRs) are buffered and grouped into versions in the Layout Database
- Release notes summarise the modifications between versions done to the layout/optics inside the database
- Triggered by:
  - Technical stops (few days)
  - Extended technical stops (2-3 months)
  - Long shutdowns (e.g. LS1)

This document summarizes all changes introduced to the LHC Collider layout with this version 2011-03 for both the mechanical and electrical layouts. Drawings associated to the layouts can be found in these release notes. Please refer to the associated sub-document to find the MAD Input File used by AB/ABP to calculate the optics of the Collider.

SUMMARY OF CHANGES

The optics of the Collider has not drastically been changed. Its base is still a version 6.5 for the mechanical layout and a version 1.5 for the electrical layout. Since the Collider is in operation, the version name adopted corresponds to its start year/month. This version is then called 2011-03

- MECHANICAL LAYOUT
  - ELECTRICAL LAYOUT
  - DIFFERENCES TO THE 6.502 VERSION

MECHANICAL LAYOUT

The changes on the mechanical layout have been classified by categories and domains. Some of the changes are introduced following Engineering Change Orders, some are corrections that were needed when analyzing the vacuum layout continuity or when analyzing the mechanical aperture model of the Collider.
Layout Database

Navigator with functional position names – logically ordered

Position relative to a defined origin

Equipment type & description from naming service

Dimensions

Links to other information (EDMS, MTF, NORMA…)

2013-11-14
Layout Database

- Layout database linked to GIS portal to show the precise location of functional positions (example: PS-Booster racks)
Current Status

• Defined in Layout database:
  • Accelerators: LHC, SPS, PS-Ring, PS-Booster, LEIR.
  • Linacs: L4
  • Isolde Complex: HIE-Isolde
  • Transfer Lines: TI2, TI8, TD62, TD68, TT2, LT, BI, BTP, BTM, TT10, TT60…

• Defined with a Hardware Baseline:
  • Linac 4, LHC, HIE-Isolde
  • In progress: SPS, PS-Ring, PS-Booster, AD, LEIR, ELENA

• The scope is growing to include new projects and catch up with existing facilities (reverse engineering)
The purpose of Configuration and Change Management of the Accelerators Layout is to provide a clear picture of a project/machine at a given point in time.

It is achieved through the use of:

- **Hardware Baselines:**
  - Store for all information on the hardware installed in a given machine.
  - Only concerns ‘hardware’ (products), not activities.

- **Handling of Changes:**
  - Engineering Change Requests
  - Stored in Hardware Baseline
  - Proper versioning of documents is important

- **Naming:**
  - Important at all stages of the project/machine lifecycle
  - Documentation in HWBaseline, Equipment types, Functional positions, Mechanical design, Manufacturing

- **Layout Database:**
  - Stores the sequence (layout) of components, including electrical components and circuits.
  - Naming is stored
  - Links to other information sources – GIS portal to visually display functional position locations

Summary
Summary

• Further information:
  • Naming Service: accelerators-naming.service@cern.ch supported by BE-CO-DA and EN-MEF-DC
  • Naming Portal: https://cern.ch/service-acc-naming supported by BE-CO-DA
  • Layout Service: layout-service@cern.ch supported by BE-CO-DA and EN-MEF-DC
  • Layout Web Interface: https://layout.web.cern.ch/layout/ supported by BE-CO-DA
  • EDMS: https://edms.cern.ch supported by GS-ASE
  • Configuration and Change Management of the Accelerators Baselines: ecr-configuration@cern.ch supported by EN-MEF-DC