EN-CV Quality Management Process

EN-Technical Meeting – Zohra YETTOU – EN-CV-PJ

2024-03-21

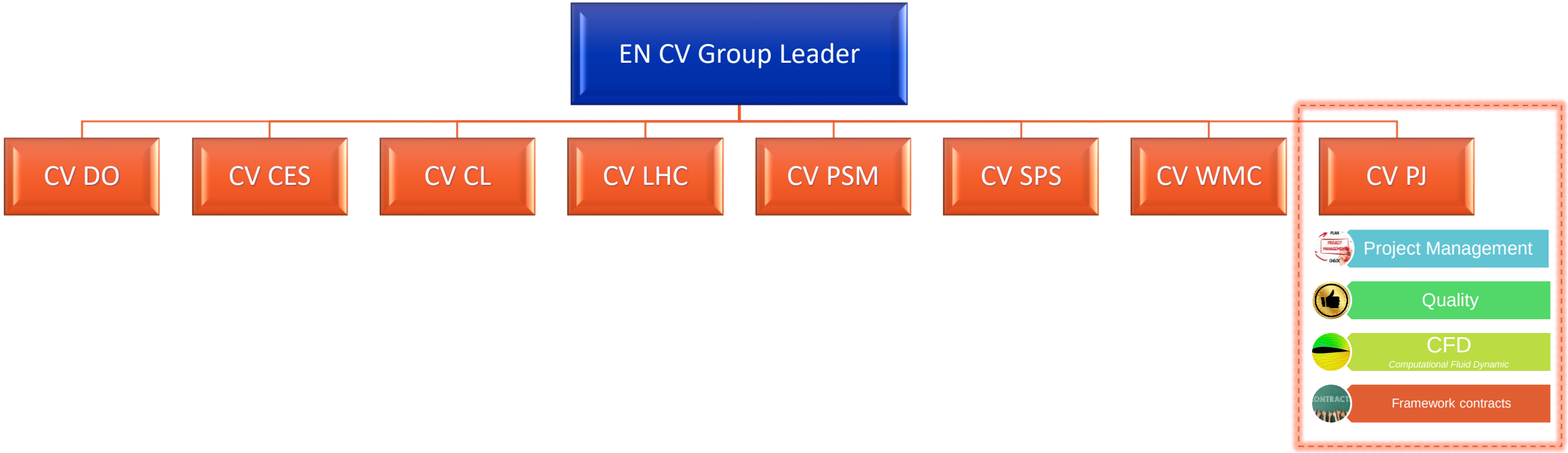
Reference (https://indico.cern.ch/event/1389807/)

Agenda

Introduction

EN CV (Cooling and ventilation) group is part of the CERN engineering department, in charge of the design, installation, commissioning, operation and maintenance of CERN's Cooling Ventilation systems , pumping stations, air conditioning plants and fluid distribution systems for the whole of CERN’s accelerator complex, its experimental areas.
Its mission is to ensure that CV projects are delivered according to CV technical prescriptions, with the required quality and without compromising safety aspect.

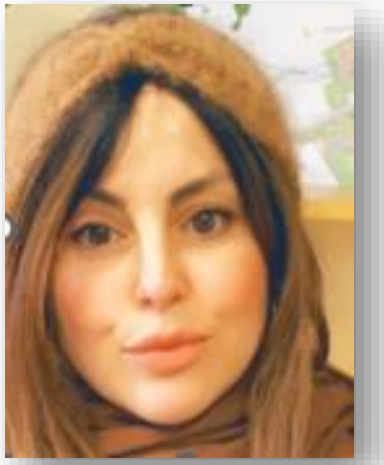
EN-CV Group Organization



https://en.web.cern.ch/group/cv

EN-CV Quality Team

Who are we?



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PJ Quality Engineer

Roberto Ales BOZZI
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PJ Project Leader

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CES Documentation Specialist

EN-CV Quality Approach

The CV group has implemented a Quality approach to appropriately describe how the project organization is set up and how CV projects are carried out/sequenced in order to improve coordination and management of interfaces between CV sections and contractors.

The basis of our quality approach is:

We write what we do

We do what we wrote

How did CV proceed?

CV Quality Management Strategy is based on three main axes:

Definition of Quality Criteria

- Technical Prescriptions
- Procedures, Flowcharts and Templates
- Technical Specifications

Control and Monitoring

- Quality Control Plan: work site supervision
- Installation Acceptance Workflow
- Documentation

Continuous Improvement

- Reporting
- KPI
- IT tools

EN-CV Quality Strategy

Definition of Quality Criteria

Technical Prescriptions

EN-CV Technical Prescriptions

CVTPs describe the technical requirements for the supply and installation of the various equipment linked to CERN's cooling and ventilation systems.

- Ventilation system
- Piping and accessories system
- Control and regulation
- Electrical Installation
- Hydraulic Instrumentation
- Documentation
- CMMS (*Computerized Maintenance Management System)*
- Identification of HVAC components
- Compressed Air Instrumentation
- Identification of Hydraulic components
- Pneumatic Control system
- Compressed Air Pipeline equipment
- Equipment I/O Interface Rules and Naming
- Standard Electrical Drawings

EDMS:
https://edms.cern.ch/document/1271868/11.0

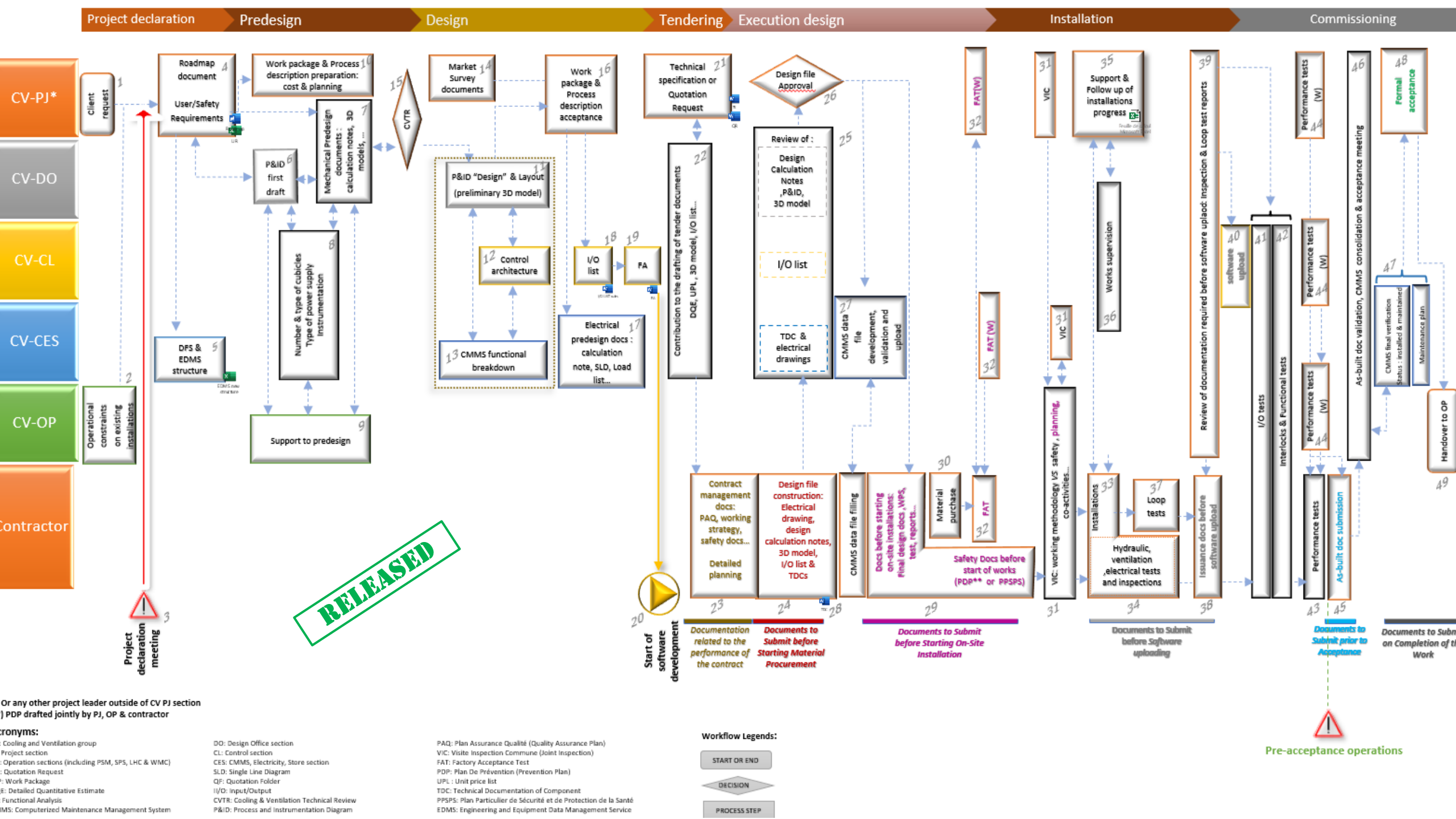
- 1271866 (v.4.13) CVTP - Control and Regulation
- 1271867 (v.3.0) CVTP - Hydraulic Instrumentation
- 1271868 (v.11.0) CVTP - Electrical Installations
- 1271869 (v.3.0) CVTP - Identification of HVAC components
- 1271896 (v.3.0) CVTP - Documentation
- 1271902 (v.3.0) CVTP - CAMMS Database
- 1272594 (v.1.0) CVTP - Compressed Air Instrumentation
- 1324480 (v.3.0) CVTP - Identification of hydraulic components
- 1470287 (v.1.0) CVTP - Pneumatic Control Systems
- 1470288 (v.1.0) CVTP - Compressed Air Pipeline Equipment
- 2155161 (v.1.0) CVTP - Equipment I/O Interface Rules and Naming Convention
- 2369279 (v.2.0) CVTP - Standard electrical drawings
- 1064206 (v.4.0) CVTP - Labeling of equipment
- 1271864 (v.6.0) CVTP - Ventilation Systems
- 1271866 (v.4.12) CVTP - Control and Regulation

EN-CV Quality Strategy

Definition of Quality Criteria

Technical Prescriptions

Flowcharts, Procedures and Templates


Project declaration
Predesign
Design
Tendering
Execution design
Installation
Commissioning
CV-PJ*
CV-DO
CV-CL
CV-CES
CV-OP
Contractor
Client request
Roadmap document
User/Safety Requirements
Work package & Process description preparation: cost & planning
Mechanical predesign documents : calculation notes, 3D models, ...
P&ID first draft
DFS & EDMS structure
Number & type of cubicles Type of power supply Instrumentation
Support to predesign
Operational constraints on existing installations
Project declaration meeting
CVTR
Market Survey documents
Work package & Process description acceptance
P&ID "Design" & Layout (preliminary 3D model)
Control architecture
CMMS functional breakdown
I/O list
FA
Electrical predesign docs : calculation note, SLD, Load list...
Technical specification or Quotation Request
Contribution to the drafting of tender documents DQE, UPL, 3D model, I/O list...
Design file Approval
Review of : Design Calculation Notes ,P&ID, 3D model
I/O list
TDC & electrical drawings
CMMS data file development, validation and upload
FAT(W)
FAT (W)
FAT
Material purchase
Contract management docs: PAQ, working strategy, safety docs... Detailed planning
Design file construction: Electrical drawing, design calculation notes, 3D model, I/O list & TDCs
CMMS data file filling
Docs before starting on-site installations: Final design docs ,WPS, test, reports...
Safety Docs before start of works (PDP** or PPSPS)
Start of software development
RELEASED
VIC
VIC: working methodology VS safety , planning, co-activities...
Support & Follow up of installations progress
Works supervision
Installations
Hydraulic, ventilation ,electrical tests and inspections
Loop tests
Review of documentation required before software upload: inspection & Loop test reports
Issuance docs before software upload
software upload
I/O tests
Interlocks & Functional tests
Performance tests (W)
Performance tests
As-built doc submission
As-built doc validation, CMMS consolidation & acceptance meeting
CMMS final verification Status : installed & maintained
Maintenance plan
Formal acceptance
Handover to OP
Documentation related to the performance of the contract
Documents to Submit before Starting Material Procurement
Documents to Submit before Starting On-Site Installation
Documents to Submit before Software uploading
Documents to Submit prior to Acceptance
Documents to Submit on Completion of the Work
Pre-acceptance operations
Or any other project leader outside of CV PJ section
) PDP drafted jointly by PJ, OP & contractor
cronyms:
Cooling and Ventilation group
Project section
Operation sections (including PSM, SPS, LHC & WMC)
Quotation Request
Work Package
E: Detailed Quantitative Estimate
Functional Analysis
IMS: Computerized Maintenance Management System
DO: Design Office section
CL: Control section
CES: CMMS, Electricity, Store section
SLD: Single Line Diagram
QF: Quotation Folder
I/O: Input/Output
CVTR: Cooling & Ventilation Technical Review
P&ID: Process and Instrumentation Diagram
PAQ: Plan Assurance Qualité (Quality Assurance Plan)
VIC: Visite Inspection Commune (Joint Inspection)
FAT: Factory Acceptance Test
PDP: Plan De Prévention (Prevention Plan)
UPL : Unit price list
TDC: Technical Documentation of Component
PPSPS: Plan Particulier de Sécurité et de Protection de la Santé
EDMS: Engineering and Equipment Data Management Service
Workflow Legends:
START OR END
DECISION
PROCESS STEP

EN-CV Quality Procedure

The purpose of this document is to describe in an exhaustive way the different stages of the project, deliverable review & acceptance process workflow and project milestones to:

- Facilitate and optimize the implementation of processes
- Improve coordination and management of interfaces between stakeholders


EN-CV Quality Organisation Note &
Project delivery workflow

Abstract

Detailed Flowchart and Project Milestones

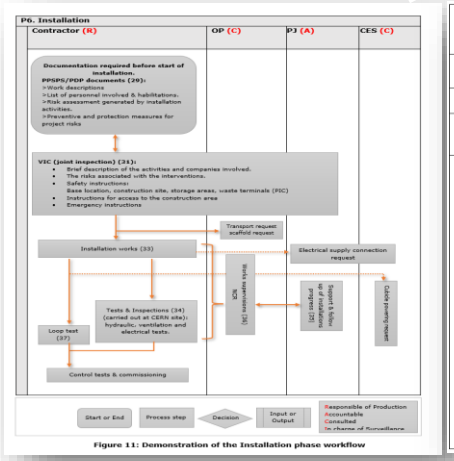
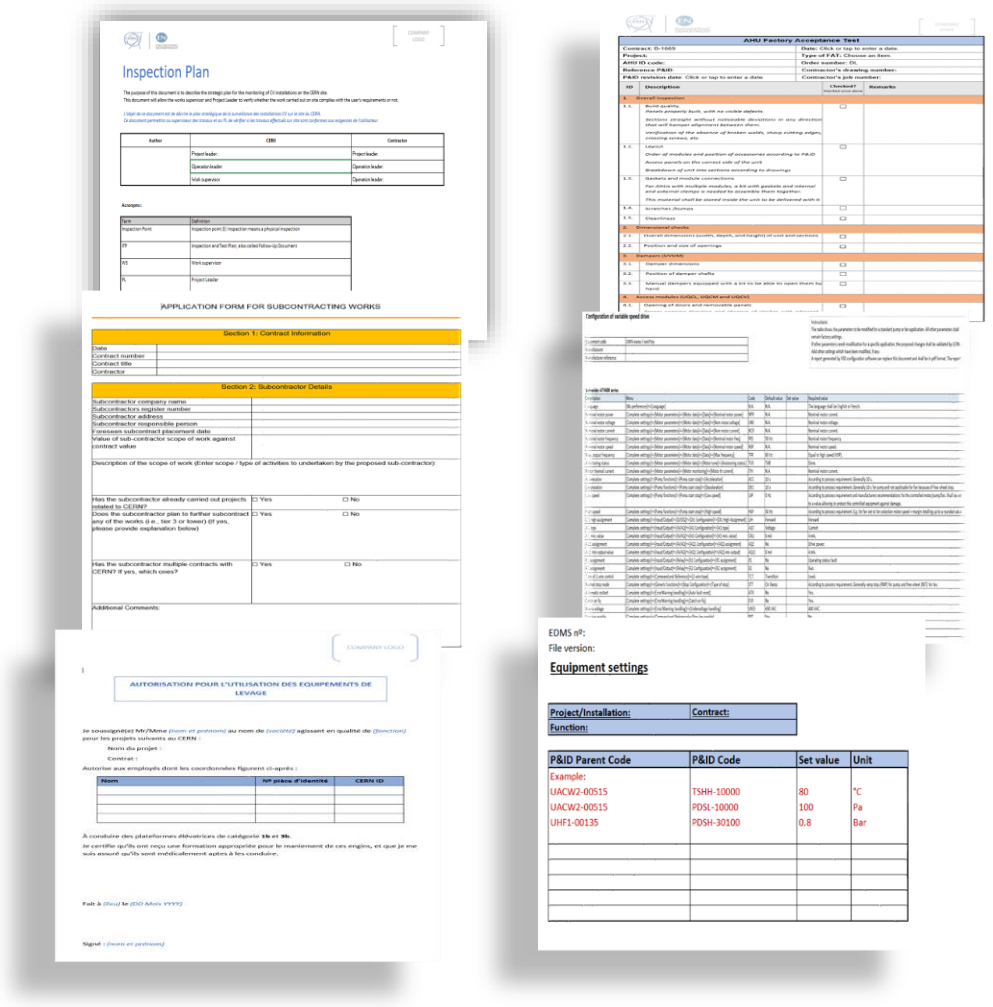


Figure 11: Demonstration of the Installation phase workflow

Purpose	• Review and update (if necessary) of all documents required to start site installation. • Notification to CV shareholders of the start of site installation. • Support, coordination and supervision of the contractor works.
Main Reference Document(s)	Fiche de poste [XXV] Acceptance procedure for CV installations [XXXII] Contractual documents
Relevant Dates	Expected process start date: The VIC meeting should be held before the start of CERN site installation.
Key Stakeholders	Responsible of Production: Contractor Accountable: PJ Contributors: CES, CL, OP, and contractor Informed: Group Leader and Users
Scope	**Definition:** After the issuance of the documentation (31) required for the start of installation, the VIC meeting (31) should be held to allow the contractor to launch the installation works. Installation is carried out by the contractor, works supervision is realised by OP sections and installation support is provided by PJ. **Inputs required:** Before starting site installation, the contractor shall submit all documents related to installation launch and safety aspects (29): Design Calculation Notes, P&ID, 3D models, TDC, electrical drawings, I/O list, working strategy, PAQ, WPS, reports, PDP, etc. **Key steps** 1. The contractor submits safety documents (29) to prepare the VIC meeting. 2. The PL sets up VIC meeting (31) with contractor, supervisors, CES and HSE. If all points discussed during VIC are agreed, the HSE responsible with PL give the green light to the contractor to start installation. 3. The contractor starts site installation works (33). 4. OP sends transport requests to EN-HE. 5. PL or OP send a scaffold request to BE-EA. 6. PL or CES requests cubicle electrical supply connection to EN-EL. 7. CES requests also cubicle powering to EN-EL. 8. The contractors carry out "hydraulic, electrical & ventilation" tests at CERN site. 9. The PL with OP supervisor follow up the work progress, tests, inspections, and non-conformities. 10. The contractor performs the loop test (37). 11. PL with OP supervisors review & accept test reports and NCR to start commissioning and control tests.

Templates

Template	Reference	Status
TDC (Technical Documentation of the Component)	1890293	Released
AHU (Air Handling Units) FAT	2841188	Released
Cubicle FAT	2841175	Released
Quality Control Plan	2873974	Released
VSD Equipment settings	2994826	Released
AHU lifting beams	2892764	Released
Authorization to use lifting equipment	2919483	Released
PAQ checklist	2753573	Released
Application form for subcontracting works	2921166	CV Engineering Check
Bill of Materials	2702207	CV Engineering Check
Chiller FAT	2939538	CV Engineering Check
Reception Form	2965383	CV Engineering Check
CMMS Equipment List	2974523	In work
Technical Inspection Visit	3045767	In work

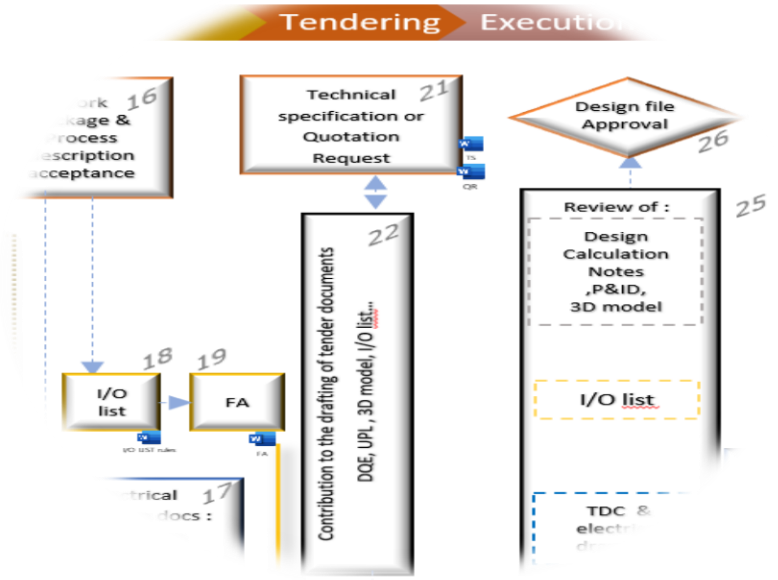


EN-CV Quality Strategy

Definition of Quality Criteria

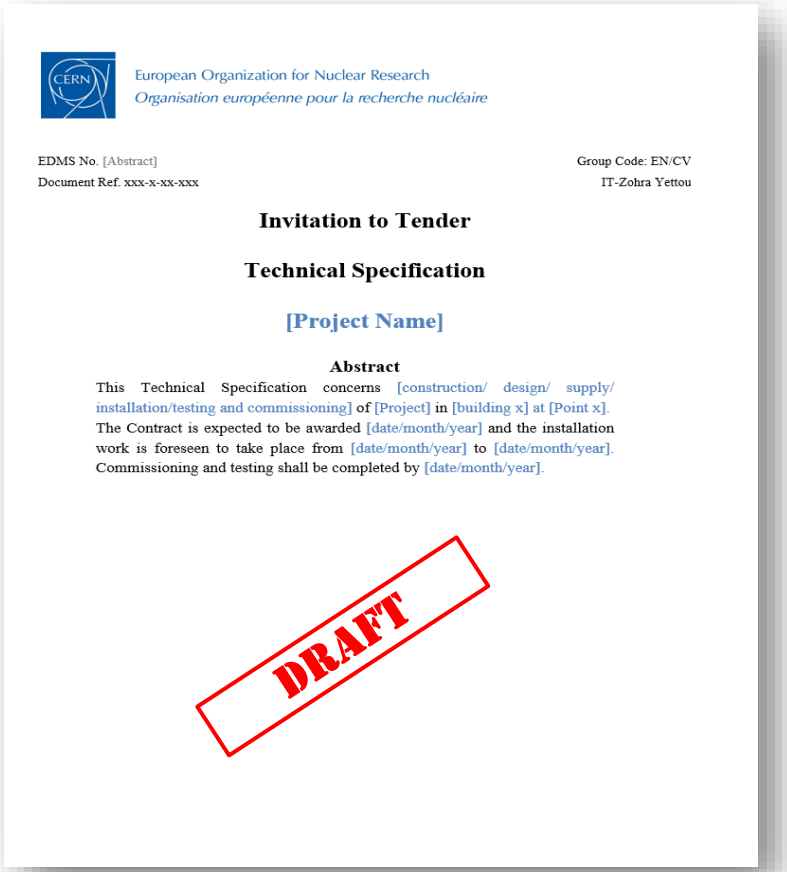
Technical Prescriptions
Procedures, Flowchart and Templates

Technical Specification Development



EN-CV Technical specifications

Technical specifications are set of technical clauses linked to a specific installation or equipment and applicable to the entire project.



European Organization for Nuclear Research
Organisation européenne pour la recherche nucléaire

EDMS No. [Abstract] Group Code: EN/CV
Document Ref. xxx-x-xx-xxx IT-Zohra Yettou

Invitation to Tender

Technical Specification

[Project Name]

Abstract

This Technical Specification concerns [construction/ design/ supply/ installation/testing and commissioning] of [Project] in [building x] at [Point x]. The Contract is expected to be awarded [date/month/year] and the installation work is foreseen to take place from [date/month/year] to [date/month/year]. Commissioning and testing shall be completed by [date/month/year].

DRAFT

CONTENT

SCOPE OF THE SUPPLY

SPECIFICATION OF THE TECHNICAL DELIVERABLES

SPECIFICATION OF THE ACTIVITIES

SPECIFICATION OF THE DOCUMENTATION

APPLICABLE RULES, NORMS AND STANDARDS

PERFORMANCE OF THE CONTRACT

CERN REPRESENTATIVES

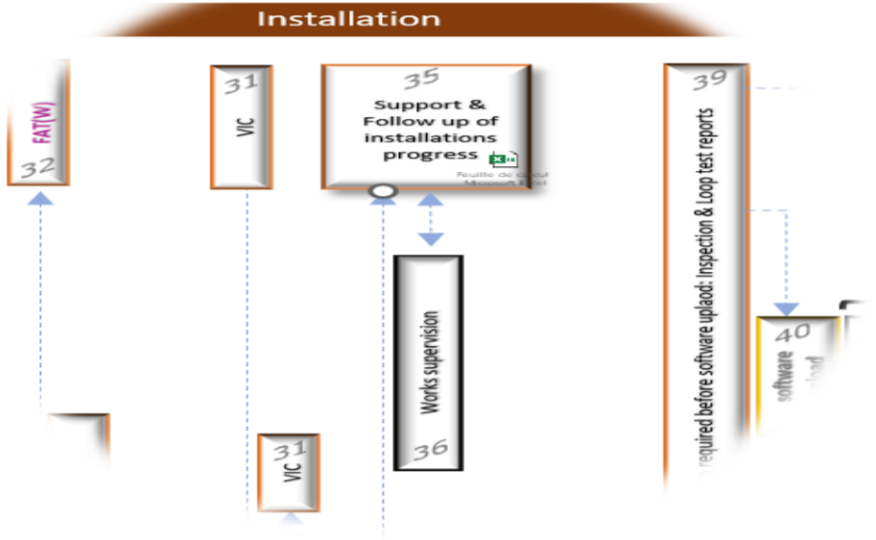
EN-CV Quality Strategy

Definition of Quality Criteria

Control and Monitoring

Quality Control Plan

Work Site supervision



Quality Control Plan

The CV quality control plan (or Inspection Plan) aims to describe the strategic way to monitor installations from the start of installation work until acceptance.

The quality control plan will allow site supervisors and the project manager to check the progress of the work carried out on site and whether it complies with CV requirements.

Work site supervision

Generic site work

- List of reference docs (prerequisites) for starting the installation
- Work site installation (similar steps for ventilation, electricity and hydraulics)

Ventilation

- AHU installation
- Ducts installation
- Tests

Electricity

- Work site installation
- Earthing of ducts, pipes, CTA and cable ladder, electrical cabinets, supports, etc.

Hydraulic

- On-site works
- Welding
- Tests

Commissioning

- Cables
- Inspections
- Control tests

https://edms.cern.ch/document/2873974/2

EN-CV Quality Strategy

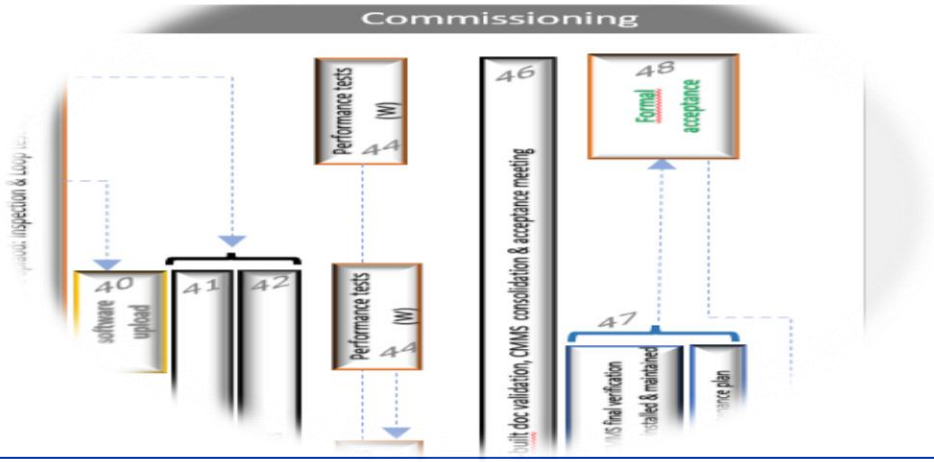
Definition of Quality Criteria

Control and Monitoring

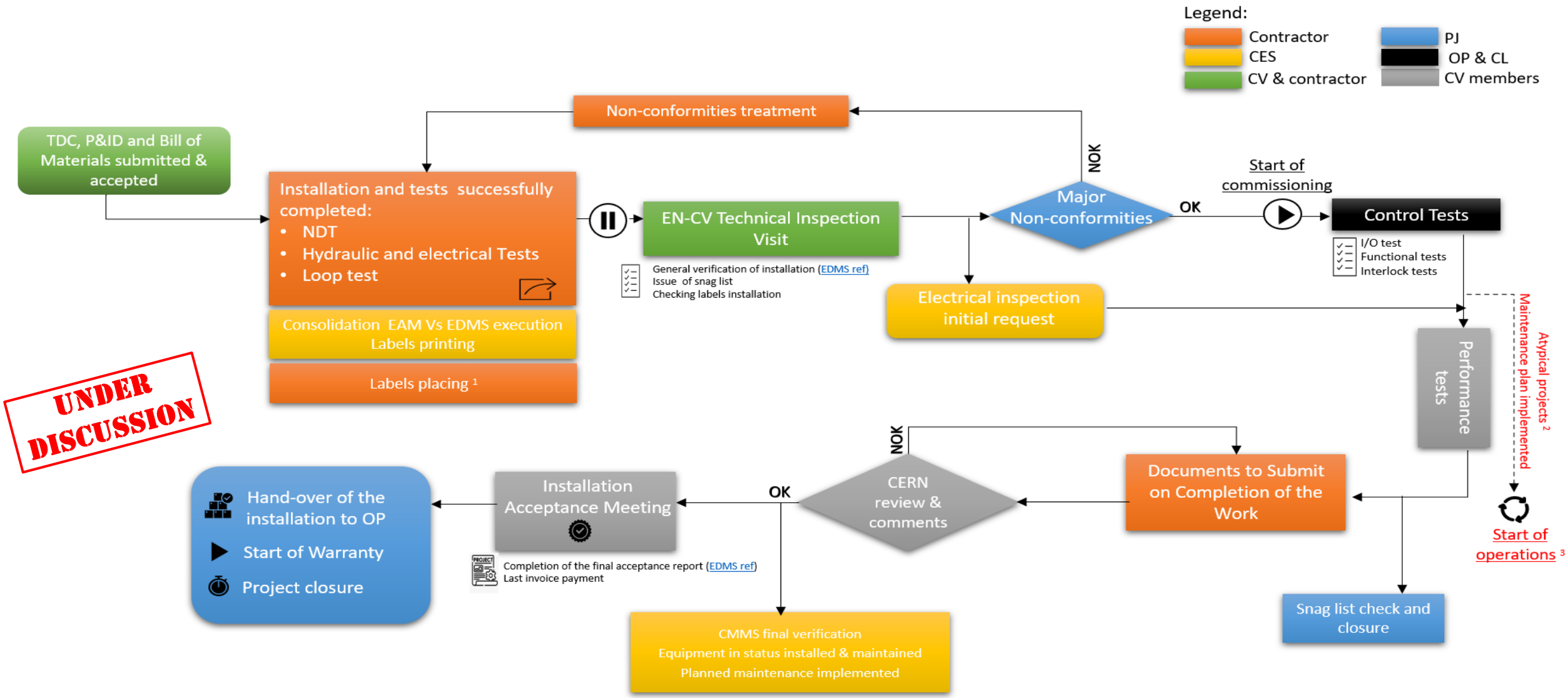
Quality Control Plan

Work Site supervision

Installation Acceptance



Installation Acceptance Workflow



[1] If consolidation carried out by CES, otherwise the contractor will provide temporary labelling.
[2] As-Built documentation submission should be submitted according to deadline mentioned in the Technical specification
[3] Required documents:
- The updated versions of P&ID, electrical diagrams and TDC
- Performance tests reports

EN-CV Quality Strategy

Definition of Quality Criteria

Control and Monitoring

Quality Control Plan

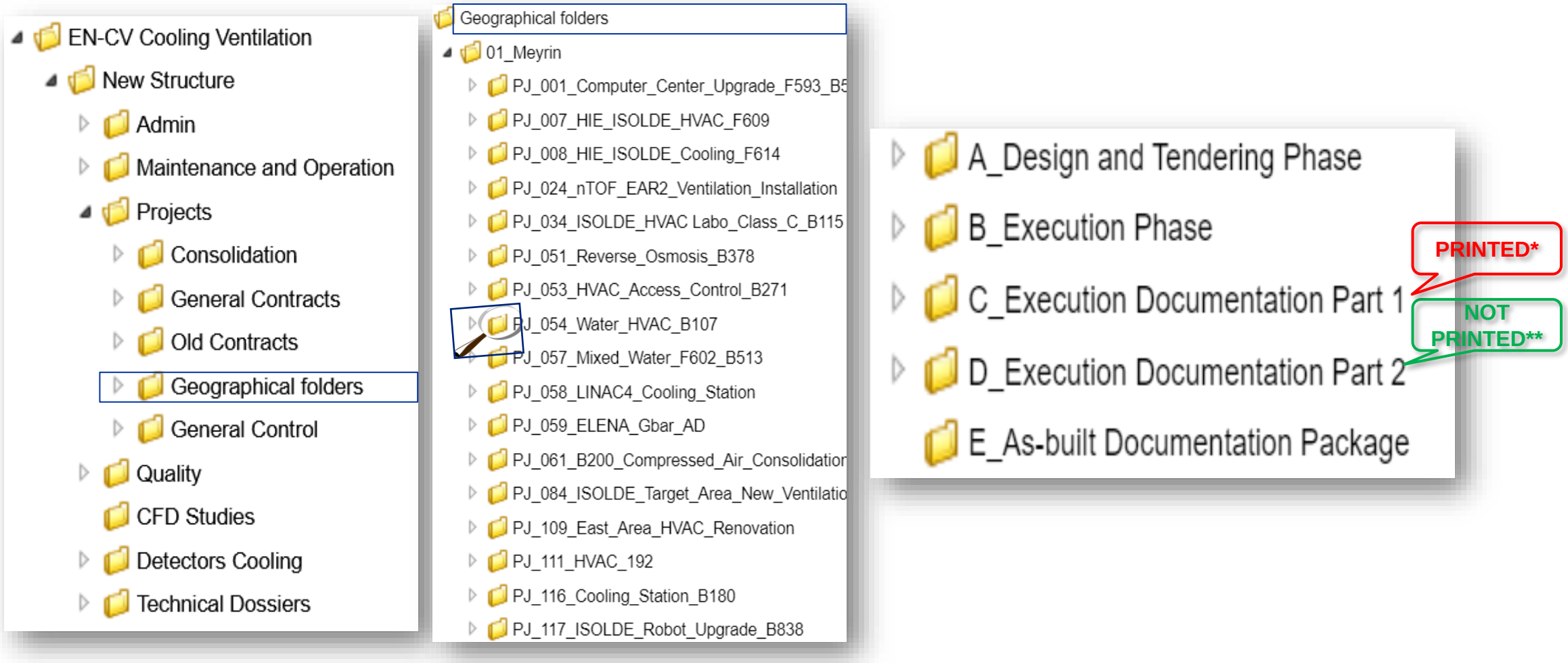
Work Site supervision

Installations Acceptance

Project Documentation

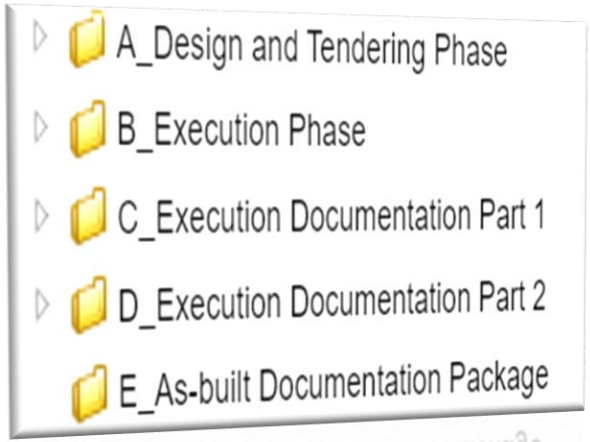
Project documentation structure

EDMS Project Structure:
https://edms.cern.ch/ui/#!master/navigator/project?P:1808570161:1808570161:subDocs



* Become As-built part1
** Become As-built part2

Project documentation structure



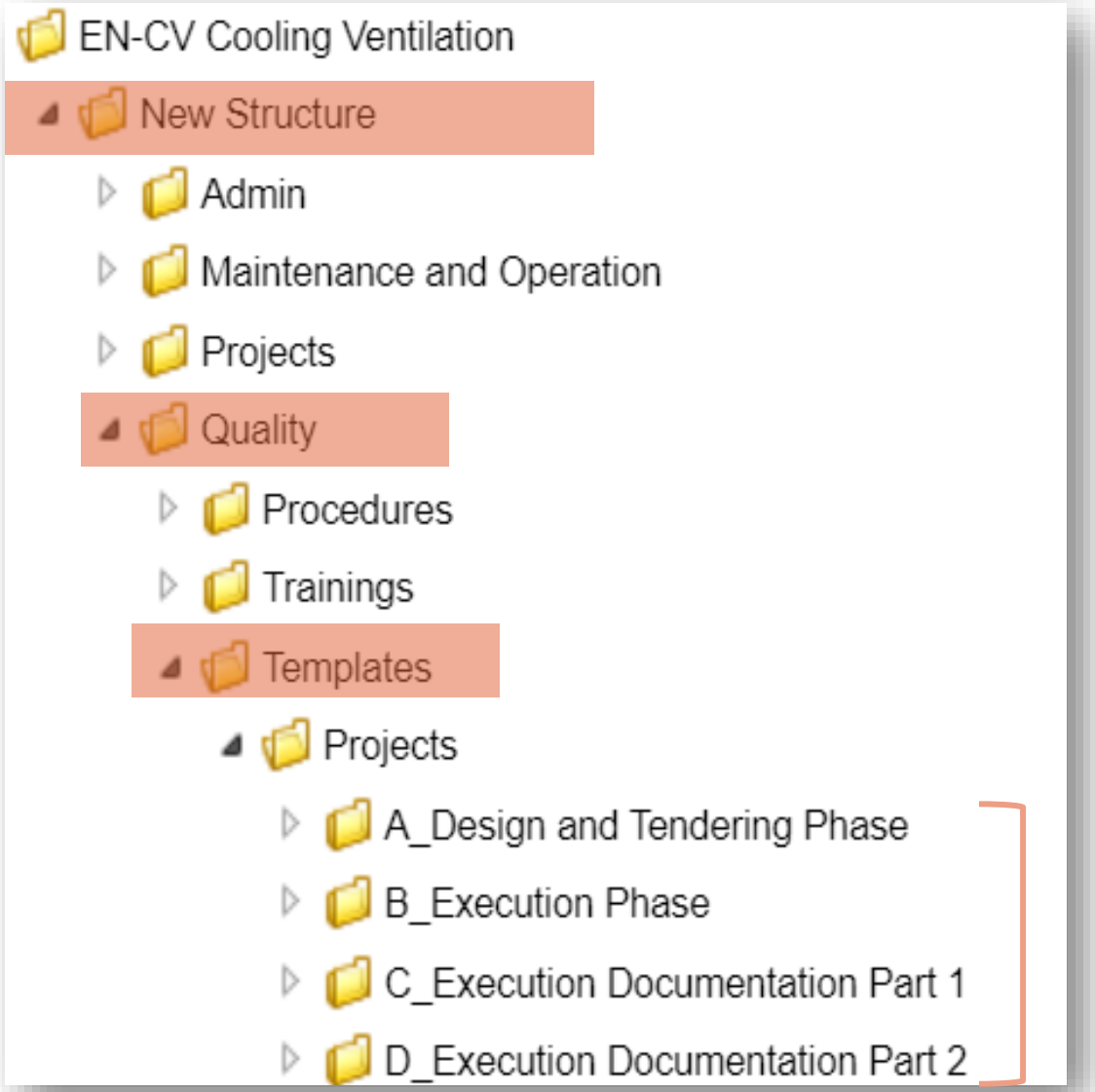
A	Design and Tendering Phase
10	Roadmap
20	Administration CERN
21	Minutes and Presentations
22	Quality and Organization
23	Cost
24	Planning
25	Service Orders and Correspondence
30	Project Definition
31	User Requirements
32	Work Package
33	Engineering Change Request
34	Engineering Specifications
35	Safety
40	Design
41	Mechanical
42	Electrical
43	P&ID and Layout
44	Simulations
50	Tendering
51	Market Survey
52	Invitation to Tender/Quotation Request
53	Quotations
54	Contract/Orders
55	Invoices
60	Photos

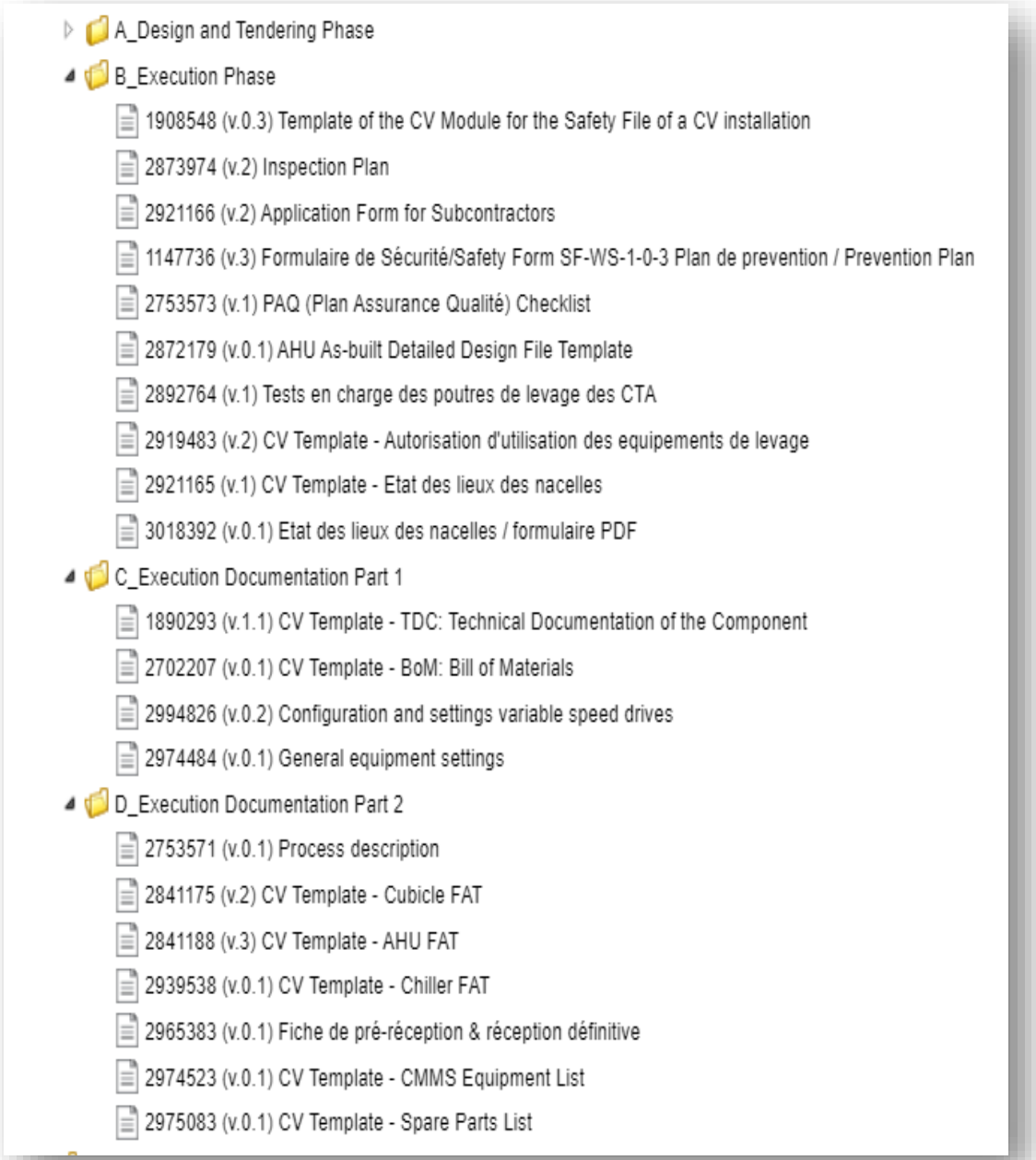
B	Execution Phase
70	Minutes and Presentations
71	Working Strategy
72	Safety
73	Quality
74	Cost
75	Planning
76	Progress Reports
77	Commissioning Reports
78	Warranty Interventions
79	Photos

C	Execution (As-built) Documentation Part 1
1	Process and Instrumentation Diagrams (P&IDs)
2	Electrical Drawings
3	Technical Documentation of Components (TDCs)
3.1	TDC - Hydraulic
3.2	TDC - Ventilation
3.3	TDC - Compressed Air
4	Equipment Settings

D	Execution (As-built) Documentation Part 2
5	IOM Instructions
6	Calculation Notes
6.1	Mechanical Calculation Notes
6.2	Electrical Calculation Notes
7	Critical Spare Parts List
8	Tests
8.1	Test reports - Factory/Outside CERN
8.2	Test reports - At CERN
9	CMMS Data
9.1	Equipment List
9.2	Maintenance Plan
10	Control
10.1	Specifications
10.2	Control Tests
11	Certificates
11.1	Calibration Certificates
11.2	Material Certificates
12	Drawings
12.1	Mechanical/Layout Drawings
12.2	3D Models
13	Acceptance and Start of Warranty
E	As-built Documentation Package

Templates Structure





EN-CV Quality Strategy

Definition of Quality Criteria

Control and Monitoring

Continuous Improvement

Assessments

Continuous improvement

CV group wishes to maintain three areas of improvement:

Reporting

KPIs

IT tools

EN-CV Quality Strategy

Definition of Quality Criteria

Control and Monitoring

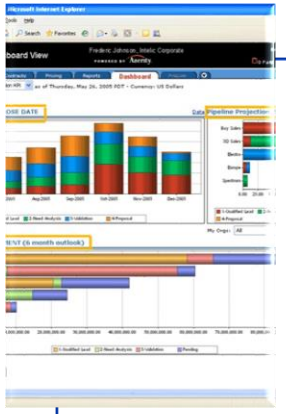
Continuous Improvement

Reporting

Reporting:

What happened?

Each Project Manager monitors the status of project-related milestones, prerequisites, authorized deviations and closure of deviations.



Develop a “dashboard” to enable consistent monitoring of CV projects.

Definition of Quality Criteria

Control and Monitoring

Continuous Improvement

Reporting

KPI

Key Performance Indicator

KPIs are used to evaluate the performance of the group/department or the company in general. These KPIs allow to quantify the achievements of the group in terms of planning, quality of work on site, commissioning, reduction of non-conformities and costs.

The indicators are numerous, and it is up to the group to choose the metrics according to its expectations and in relation to its activity.

What are the most important quality KPIs?

- Milestones on Time
- Supply Chain Audit reports and findings
- Internal Process Audit reports and findings
- Non conformances ratio
- Investigations where issues have occurred, and actions required to prevent re-occurrence

Definition of Quality Criteria

Control and Monitoring

Continuous Improvement

Reporting

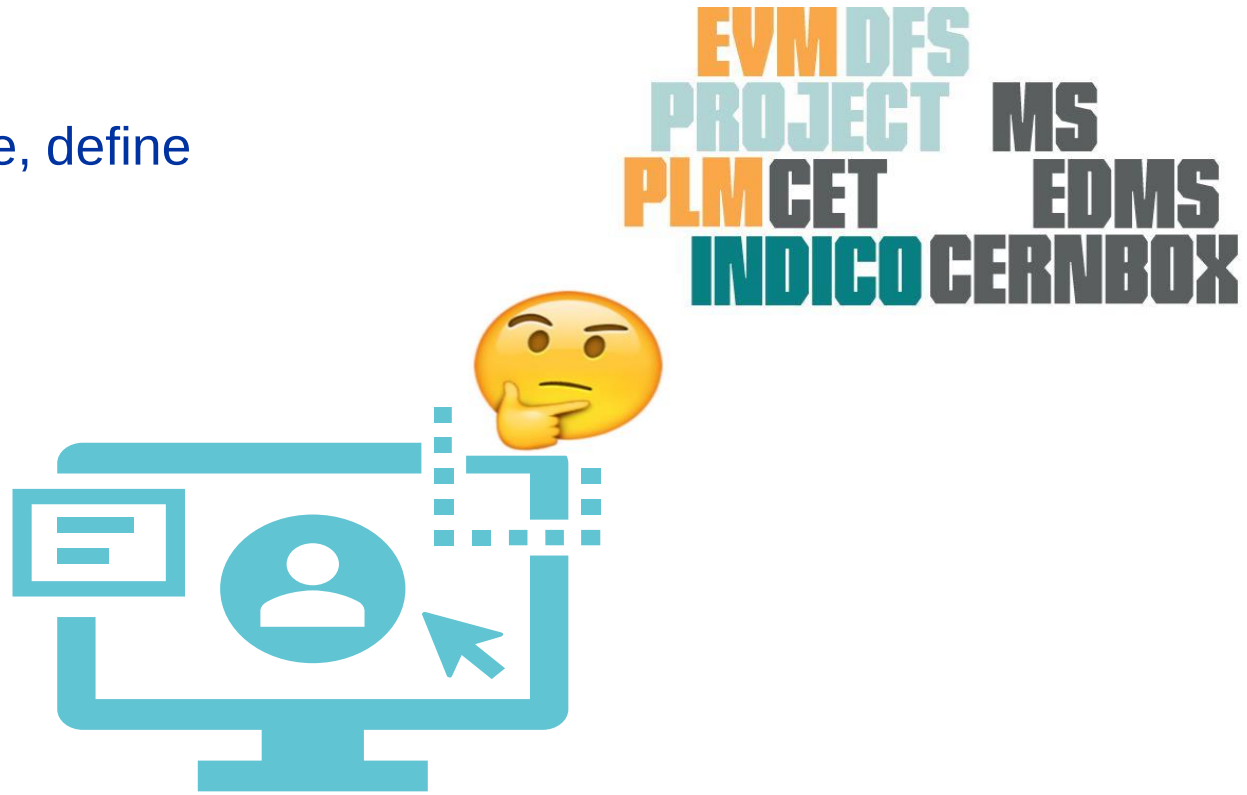
KPI

IT Tools

IT tools

The last part of our Quality approach is the tool that would deploy it.

This software should manage the project schedule, define responsibilities and team involvement to track the documentation review process and milestones.



Next Steps

- Continuation of development of new Templates
- Finalization of the CV quality procedure
- Finalization of CV Technical Specification
- Improve management of non-conformities
- Raising awareness of CV teams about new quality approach

QMS Benefits

Thank you

What would you like to add?

We would like to collect your ideas, examples and OPEX.