Nonconformities HL-UK / CERN WP4 Handling, sharing and approval

EDMS 2894857

H. Garcia Gavela on behalf of the HL-LHC PDQR Office

16/05/2023

Outline

- HL-LHC Nonconformities
- Handling of NCRs
- Content
- Conclusions

Outline

- **HL-LHC Nonconformities**
- Handling of NCRs
- Content
- Conclusions

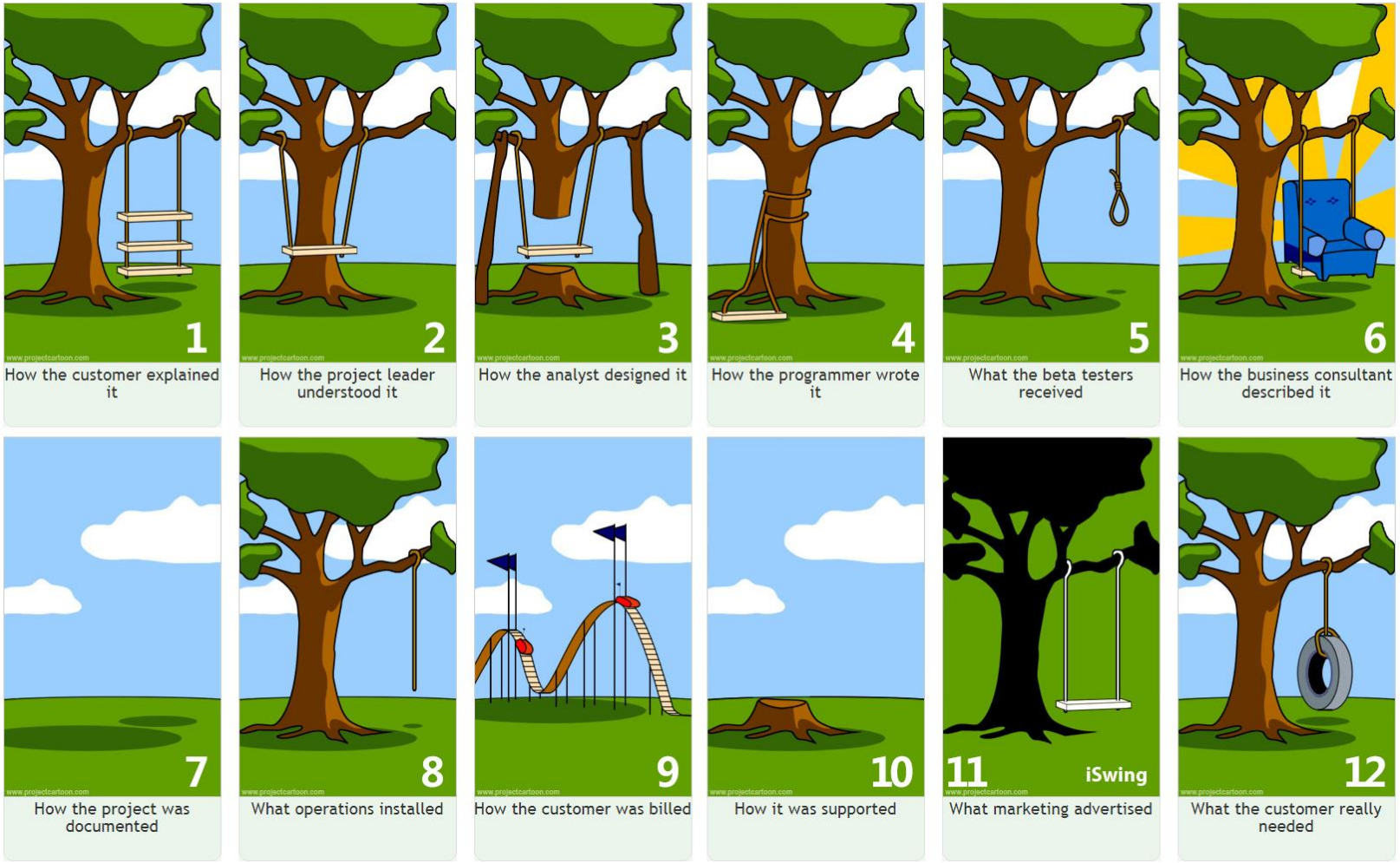
HL-LHC Nonconformities

- **Nonconformity** → Non fulfilling of a **requirement** (of any kind)

3.6.9
nonconformity
non-fulfilment of a *requirement* (3.6.4)

- Requirements for Cryomodules are specified in the **Engineering Specifications**, including their annexes (Drawings, Procedures) or are coming from the **normative** (**standards**, **rules**, etc)
- HL Nonconformity Process for Collaborations EDMS 2149457
- Full process on Launching a Nonconformity using EDMS is explained in EDMS 1908145
- NCRs will follow the HL-LHC Template to communicate with CERN in order to comply with HL-LHC NC Policy (class, criticality, decision, corrective/preventive actions…)
- **CERN** will provide support in the **preparation of the NCRs** as well with the **evaluation**. Nevertheless, we expect **Collaborations pre-filled the template** with the **related info** as well as with a **first assessment**

Requirements



Without requirements there are not nonconformities

Requirements

- **Without requirements** we **cannot talk** about **quality**
- **Requirements** only "**exist**" if there is a **verification method** : Each requirement shall be stated in such a way that an objective verification can be defined for it
- Only **requirements** that are **necessary**, **measurable**, **achievable**, and **verifiable** shall be included in the **specifications**
- **Requirements** are to worded to provide a **definitive basis for acceptance or rejection**. If **no requirements**, **no nonconformities** (to be **treated accordingly** and to be used for **lessons learned** and **improvement**)
- **Reviewers** allow you to understand **how others understand your requirements**. **Experts** will help on **defining requirements**
- Main goal of the documentation review process is to ensure that **requirements** (including applicable normative) are clearly **defined**, **revised**, **agreed** and **propagated** among the different stakeholders. **Coordination at Project Level**

Project Documentation

- **Documentation** is a key player for any project:
  - It provides **provision of objective evidence**;
  - It proves the **conformity of the requirements** established by a customer;
  - It enables **repeatability and traceability** of the work done;
  - It provides provision of **appropriate training**;
  - In the event of a **nonconformity**, it allows tracing the info back and searching for the **root cause**.
- In **projects at large scale**, with **high personnel turnover** (temporary contracts, students, etc) **proper documentation** (handling, storage, accessibility) becomes **critical** for an adequate **knowledge transfer**
- **Communication (internal and external)**

Requirements

WP4 Engineering Specifications issued for Cryomodule and Cryomodule components
They are the main basis to check applicable requirements

EDMS NO. 2043014 | REV. 1.0 | VALIDITY VALID

REFERENCE : LHC-ACF_A-ES-0001

ENGINEERING SPECIFICATION

HL-LHC LHC CRAB CAVITIES:

CRYOMODULES FOR CRAB CAVITIES

Abstract

This engineering specification concerns the supply of cryomodules for dressed bulk niobium RF cavities of two types (DQW and RFD) for the High Luminosity Large Hadron Collider project.

TRACEABILITY

Prepared by: L. Dassa	***Date:*** 2021-04-26
Verified by: G. Arduini, I. Bejar Alonso, K. Artoos, V. Baglin, K. Brodzinski, G. Burt, T. Capelli, S. Claudet, P. Fessia, C. Gaignant, M. Garlasche', H. Garcia Gavela, R.T. Garcia, J. Gascon, F. Gerigk, T. Jones, S. Marsh, E. Montesinos, R. Laxdal, H. Mainaud Durand, E. Montesinos, T. Otto, C. Pasquino, D. Perini, G. Bregliozzi, V. Rude, M. Sosin, L. Tavian, M. Therasse, K. Turaj, G. Vandoni, N. Valverde Alonso, O. Williams, M. Zerlauth	***Date:*** 2021-04-27
Approved by: F. Bertinelli, R. Calaga, O. Capatina, F. Gerigk, O. Bruning	***Date:*** 2021-05-19

Distribution: NA

Rev. No.	*Date*	*Description of Changes (major changes only, minor changes in EDMS)*
0.1	2020-06-22	1st version
0.2	2020-07-01	2nd version: cryogenic / alignment / survey / metrology sections updated
0.3	2020-12-07	3rd version: vacuum sections updated / general review / T. Jones comments integrated
0.4	2021-02-19	4th version: integration of comments received during circulation within the WP4 (see EDMS related pages where comments are stored)
0.5	2021-04-26	5th version: integration of comments received by V. Baglin, C. Pasquino, N. Valverde Alonso
1.0	2021-05-19	1ST Release Version of the document

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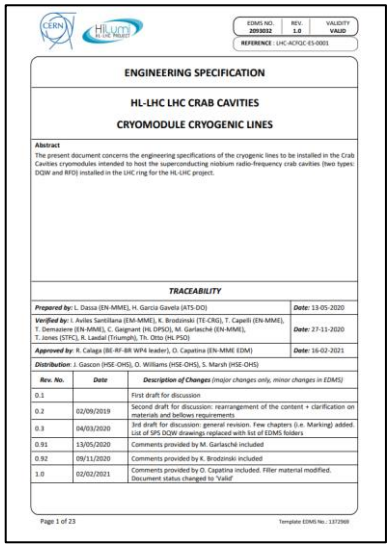

EDMS NO. 2093032 | REV. 1.0 | VALIDITY VALID

REFERENCE : LHC-ACFQC-ES-0001

ENGINEERING SPECIFICATION

HL-LHC LHC CRAB CAVITIES

CRYOMODULE CRYOGENIC LINES

Abstract

The present document concerns the engineering specifications of the cryogenic lines to be installed in the Crab Cavities cryomodules intended to host the superconducting niobium radio-frequency crab cavities (two types: DQW and RFD) installed in the LHC ring for the HL-LHC project.

TRACEABILITY

Prepared by: L. Dassa (EN-MME), H. Garcia Gavela (ATS-DO)	***Date:*** 13-05-2020
Verified by: I. Avilas Santillana (EN-MME), K. Brodzinski (TE-CRG), T. Capelli (EN-MME), T. Demaziere (EN-MME), C. Gaignant (HL DPSO), M. Garlasché (EN-MME), T. Jones (STFC), R. Laxdal (Triumph), Th. Otto (HL PSO)	***Date:*** 27-11-2020
Approved by: R. Calaga (BE-RF-BR WP4 leader), O. Capatina (EN-MME EDM)	***Date:*** 16-02-2021

Distribution: J. Gascon (HSE-OHS), O. Williams (HSE-OHS), S. Marsh (HSE-OHS)

Rev. No.	*Date*	*Description of Changes (major changes only, minor changes in EDMS)*
0.1		First draft for discussion
0.2	02/09/2019	Second draft for discussion: rearrangement of the content + clarification on materials and bellows requirements
0.3	04/03/2020	3rd draft for discussion: general revision. Few chapters (i.e. Marking) added. List of SPS DQW drawings replaced with list of EDMS folders
0.91	13/05/2020	Comments provided by M. Garlaschè included
0.92	09/11/2020	Comments provided by K. Brodzinski included
1.0	02/02/2021	Comments provided by O. Capatina included. Filler material modified. Document status changed to 'Valid'

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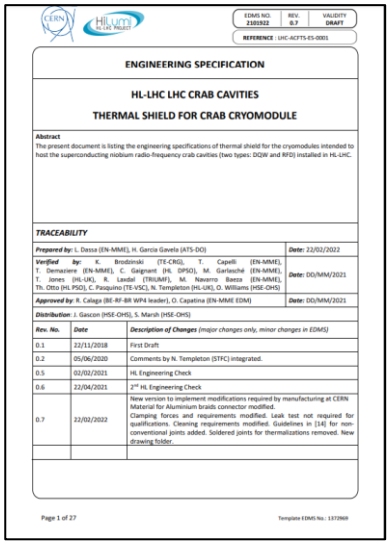

EDMS NO. 2101922 | REV. 0.7 | VALIDITY DRAFT

REFERENCE : LHC-ACFTS-ES-0001

ENGINEERING SPECIFICATION

HL-LHC LHC CRAB CAVITIES

THERMAL SHIELD FOR CRAB CRYOMODULE

Abstract

The present document is listing the engineering specifications of thermal shield for the cryomodules intended to host the superconducting niobium radio-frequency crab cavities (two types: DQW and RFD) installed in HL-LHC.

TRACEABILITY

Prepared by: L. Dassa (EN-MME), H. Garcia Gavela (ATS-DO)	***Date:*** 22/02/2022
Verified by: K. Brodzinski (TE-CRG), T. Capelli (EN-MME), T. Demaziere (EN-MME), C. Gaignant (HL DPSO), M. Garlaschè (EN-MME), T. Jones (HL-UK), R. Laxdal (TRIUMF), M. Navarro Baeza (EN-MME), Th. Otto (HL PSO), C. Pasquino (TE-VSC), N. Templeton (HL-UK), O. Williams (HSE-OHS)	***Date:*** DD/MM/2021
Approved by: R. Calaga (BE-RF-BR WP4 leader), O. Capatina (EN-MME EDM)	***Date:*** DD/MM/2021

Distribution: J. Gascon (HSE-OHS), S. Marsh (HSE-OHS)

Rev. No.	*Date*	*Description of Changes (major changes only, minor changes in EDMS)*
0.1	22/11/2018	First Draft
0.2	05/06/2020	Comments by N. Templeton (STFC) integrated.
0.5	02/02/2021	HL Engineering Check
0.6	22/04/2021	2nd HL Engineering Check
0.7	22/02/2022	New version to implement modifications required by manufacturing at CERN Material for Aluminium braids connector modified. Clamping forces and requirements modified. Leak test not required for qualifications. Cleaning requirements modified. Guidelines in [14] for non-conventional joints added. Soldered joints for thermalizations removed. New drawing folder.

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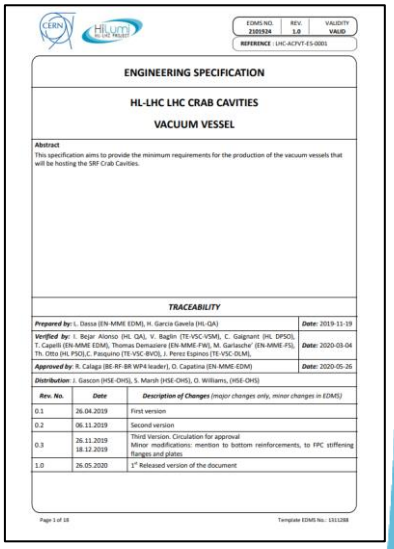

EDMS NO. 2101924 | REV. 1.0 | VALIDITY VALID

REFERENCE : LHC-ACFVT-ES-0001

ENGINEERING SPECIFICATION

HL-LHC LHC CRAB CAVITIES

VACUUM VESSEL

Abstract

This specification aims to provide the minimum requirements for the production of the vacuum vessels that will be hosting the SRF Crab Cavities.

TRACEABILITY

Prepared by: L. Dassa (EN-MME EDM), H. Garcia Gavela (HL-QA)	***Date:*** 2019-11-19
Verified by: I. Bejar Alonso (HL QA), V. Baglin (TE-VSC-VSM), C. Gaignant (HL DPSO), T. Capelli (EN-MME EDM), Thomas Demaziere (EN-MME-FW), M. Garlaschè (EN-MME-FS), Th. Otto (HL PSO),C. Pasquino (TE-VSC-BVO), J. Perez Espinos (TE-VSC-DLM),	***Date:*** 2020-03-04
Approved by: R. Calaga (BE-RF-BR WP4 leader), O. Capatina (EN-MME-EDM)	***Date:*** 2020-05-26

Distribution: J. Gascon (HSE-OHS), S. Marsh (HSE-OHS), O. Williams, (HSE-OHS)

Rev. No.	*Date*	*Description of Changes (major changes only, minor changes in EDMS)*
0.1	26.04.2019	First version
0.2	06.11.2019	Second version
0.3	26.11.2019 18.12.2019	Third Version. Circulation for approval Minor modifications: mention to bottom reinforcements, to FPC stiffening flanges and plates
1.0	26.05.2020	1st Released version of the document

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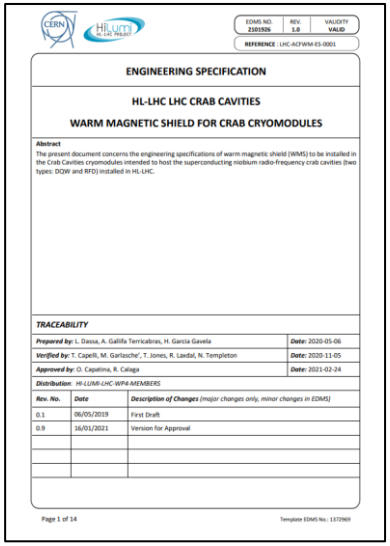

EDMS NO. 2101926 | REV. 1.0 | VALIDITY VALID

REFERENCE : LHC-ACFWM-ES-0001

ENGINEERING SPECIFICATION

HL-LHC LHC CRAB CAVITIES

WARM MAGNETIC SHIELD FOR CRAB CRYOMODULES

Abstract

The present document concerns the engineering specifications of warm magnetic shield (WMS) to be installed in the Crab Cavities cryomodules intended to host the superconducting niobium radio-frequency crab cavities (two types: DQW and RFD) installed in HL-LHC.

TRACEABILITY

Prepared by: L. Dassa, A. Gallifa Terricabras, H. Garcia Gavela	***Date:*** 2020-05-06
Verified by: T. Capelli, M. Garlasche', T. Jones, R. Laxdal, N. Templeton	***Date:*** 2020-11-05
Approved by: O. Capatina, R. Calaga	***Date:*** 2021-02-24

Distribution: *HI-LUMI-LHC-WP4-MEMBERS*

Rev. No.	*Date*	*Description of Changes (major changes only, minor changes in EDMS)*
0.1	06/05/2019	First Draft
0.9	16/01/2021	Version for Approval

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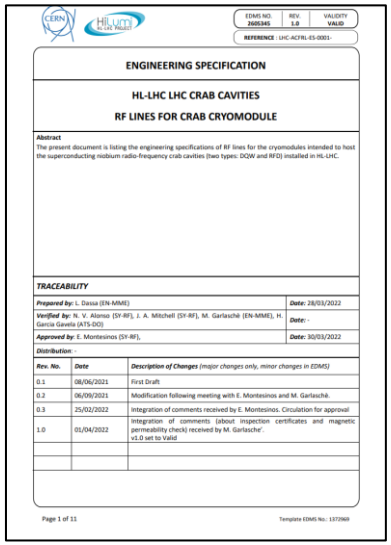

EDMS NO. 2605345 | REV. 1.0 | VALIDITY VALID

REFERENCE : LHC-ACFRL-ES-0001-

ENGINEERING SPECIFICATION

HL-LHC LHC CRAB CAVITIES

RF LINES FOR CRAB CRYOMODULE

Abstract

The present document is listing the engineering specifications of RF lines for the cryomodules intended to host the superconducting niobium radio-frequency crab cavities (two types: DQW and RFD) installed in HL-LHC.

TRACEABILITY

Prepared by: L. Dassa (EN-MME)	***Date:*** 28/03/2022
Verified by: N. V. Alonso (SY-RF), J. A. Mitchell (SY-RF), M. Garlaschè (EN-MME), H. Garcia Gavela (ATS-DO)	***Date:*** -
Approved by: E. Montesinos (SY-RF),	***Date:*** 30/03/2022

Distribution: -

Rev. No.	*Date*	*Description of Changes (major changes only, minor changes in EDMS)*
0.1	08/06/2021	First Draft
0.2	06/09/2021	Modification following meeting with E. Montesinos and M. Garlaschè.
0.3	25/02/2022	Integration of comments received by E. Montesinos. Circulation for approval
1.0	01/04/2022	Integration of comments (about inspection certificates and magnetic permeability check) received by M. Garlaschè'. v1.0 set to Valid

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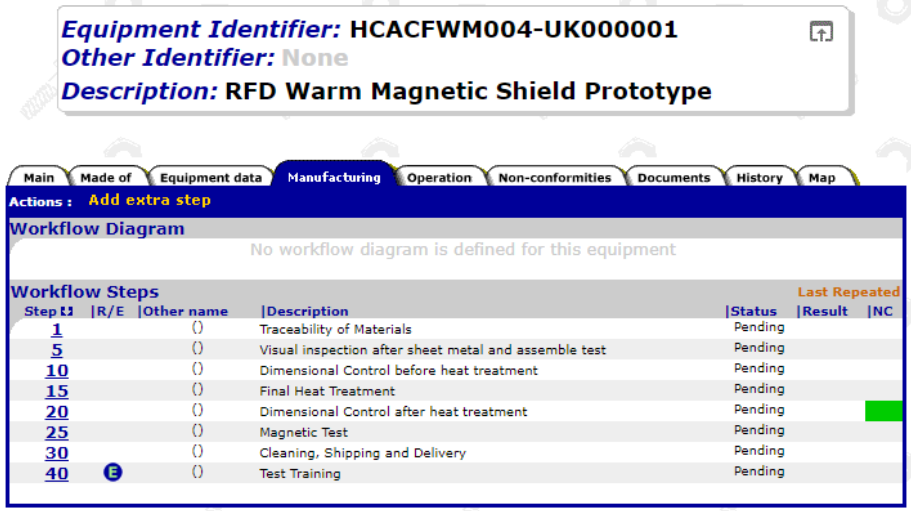
HL-LHC Nonconformities

- **Nonconformities** are part of the **any kind of production** and **it does not mean** the **equipment cannot be used**
- **Nonconformities ≠ Deviation Requests**
  - **Nonconformity** – A deviation from an established requirement is detected
  - **Deviation Request** – Request to do something different from an established requirement
- We are **NOT** here to **search for guilties** but to **learn from these issues and improve**.
- **Root cause** and **corrective/preventive actions** are of utmost importance (solve the issues found and avoid recurrence so the process is optimized).
- NCRs can lead to overcosts or delays so it is mandatory to trace them properly and apply the lessons learned in the future

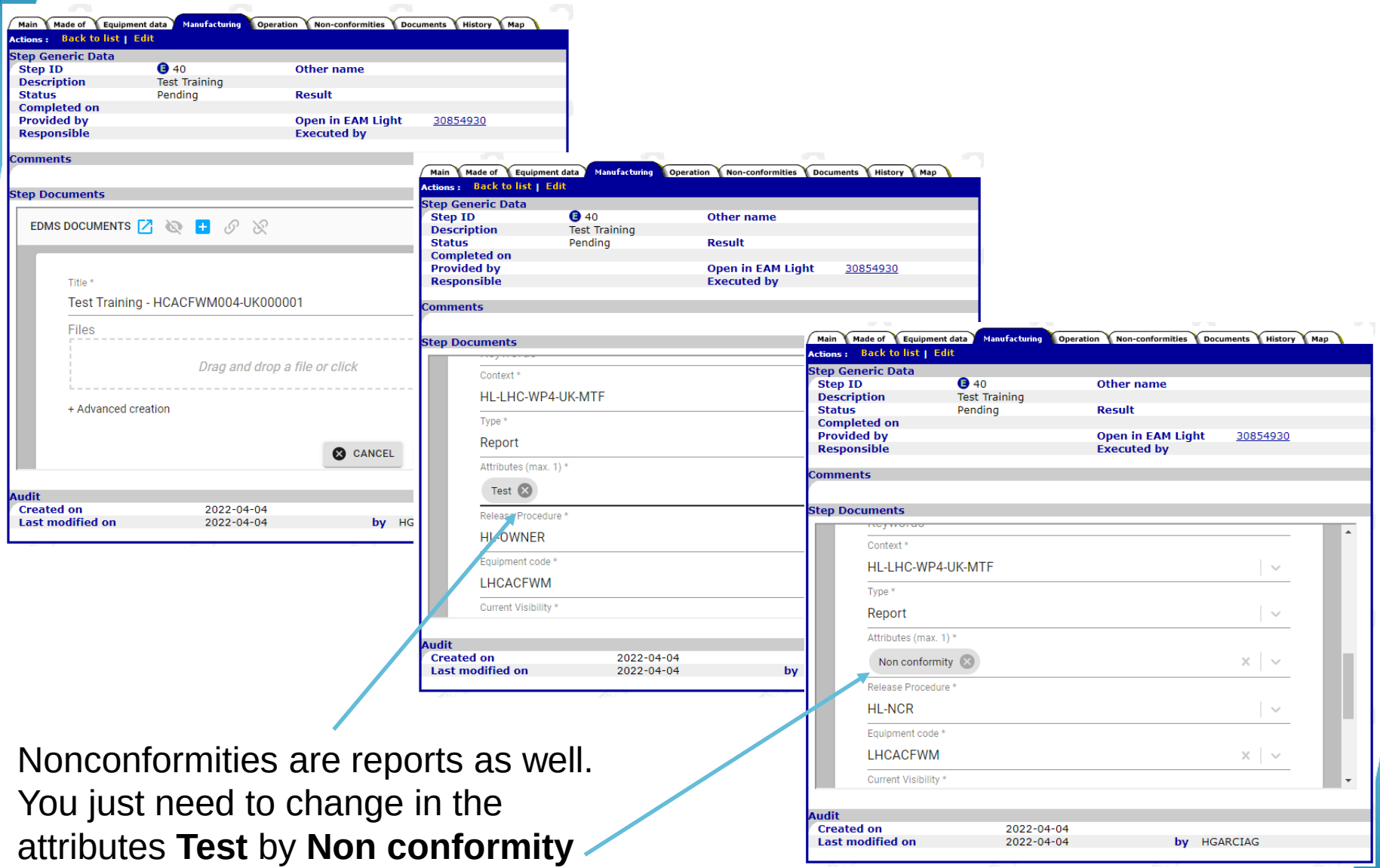
Outline

- HL-LHC Nonconformities
- **Handling of NCRs**
- Content
- Conclusions

Create EDMS Document via MTF

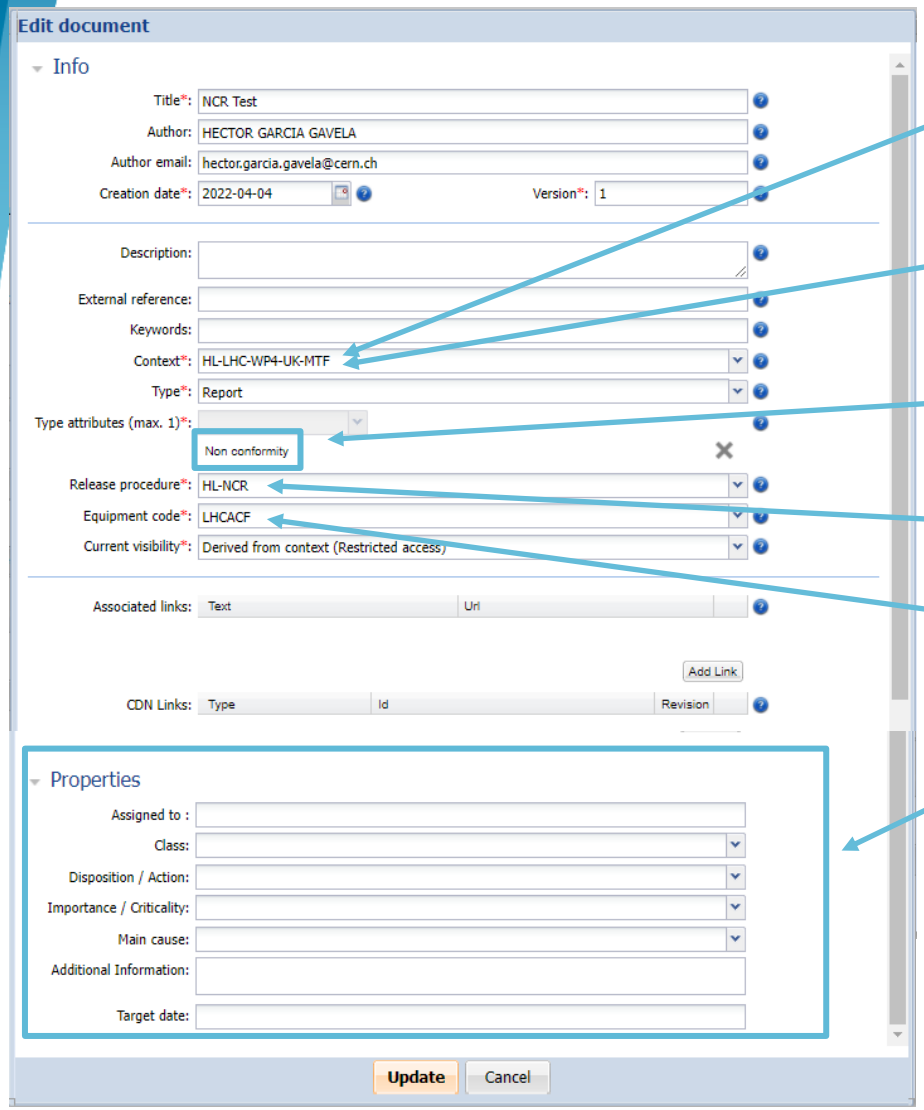


Create EDMS Document via MTF



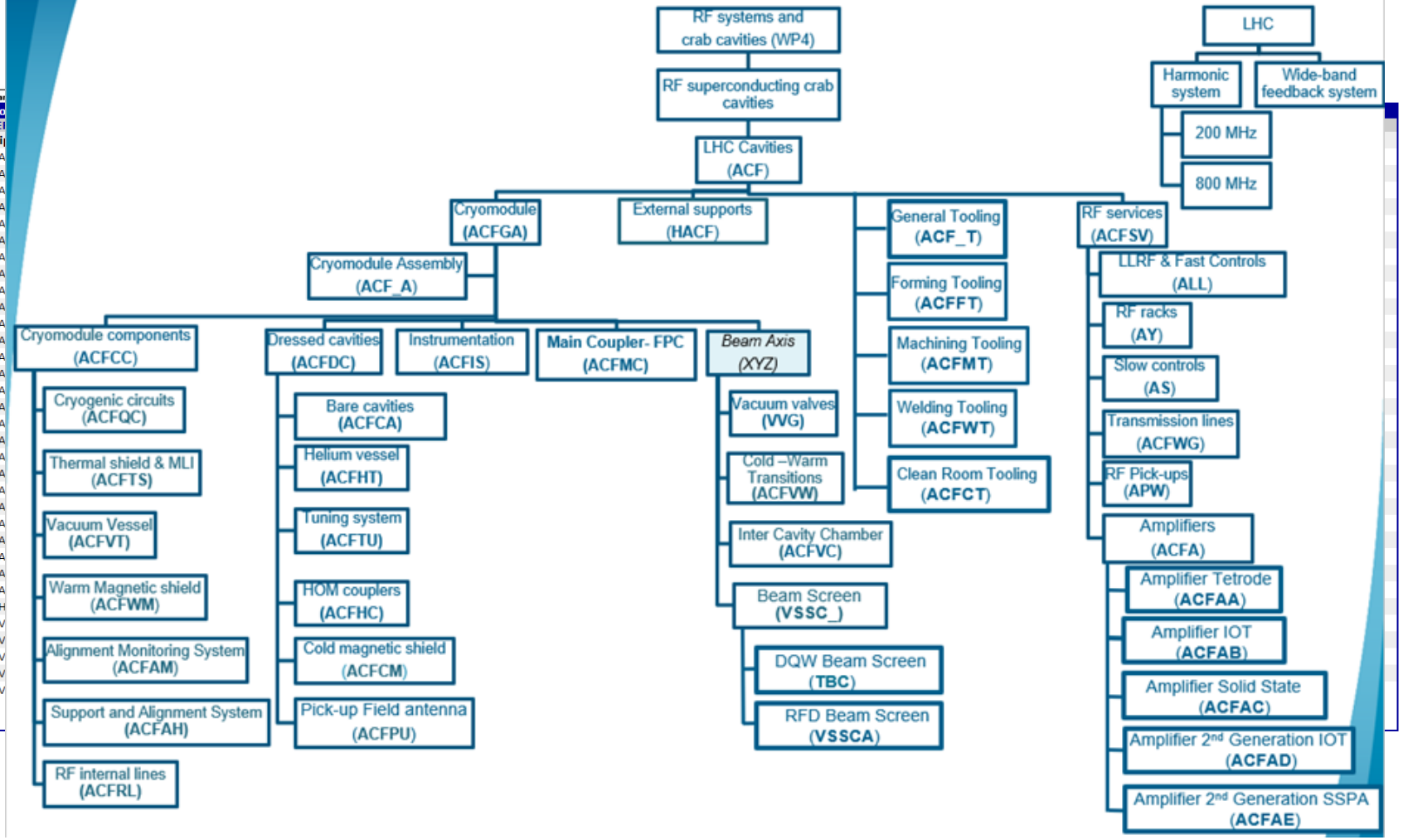
Nonconformities are reports as well.
You just need to change in the attributes **Test** by **Non conformity**

Create EDMS Document



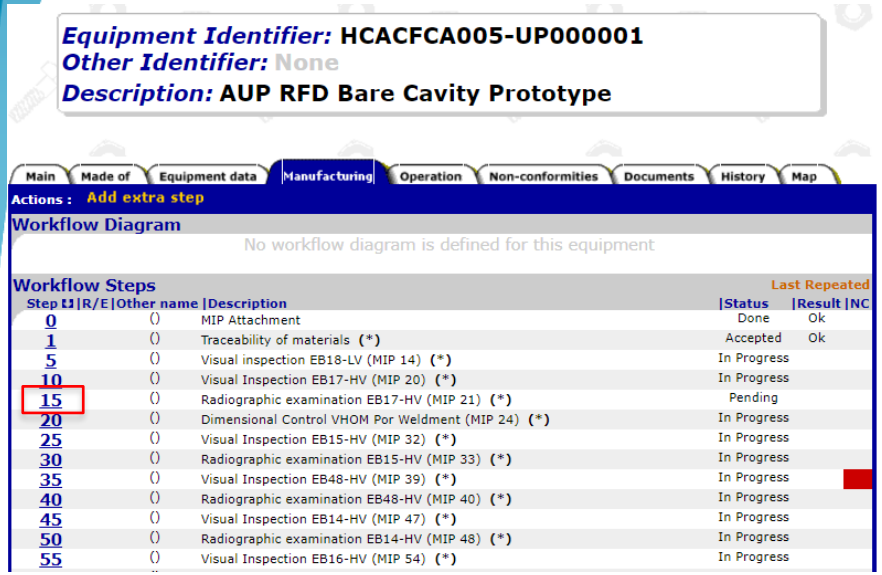
- If you create the NCR directly in MTF, the context by default is already set (**HL-LHC-WP4-CANADA-MTF)**.
- If you create the file in EDMS, choose the context – **HL-LHC-WP4-CANADA-MTF**
- **Type of Document – Report and Type Attribute Non conformity**
- Release Procedure **HL-NCR (important!!)**
- **Equipment Codes (See next Slide)**
- Once you issue the document, please fill in all the associated **EDMS metadata** (**Info and Properties**). Same info that will appear in the Template
- Always start with the version 0.1
- The **HL-LHC NCR Template** correctly filled in shall be added to the EDMS document

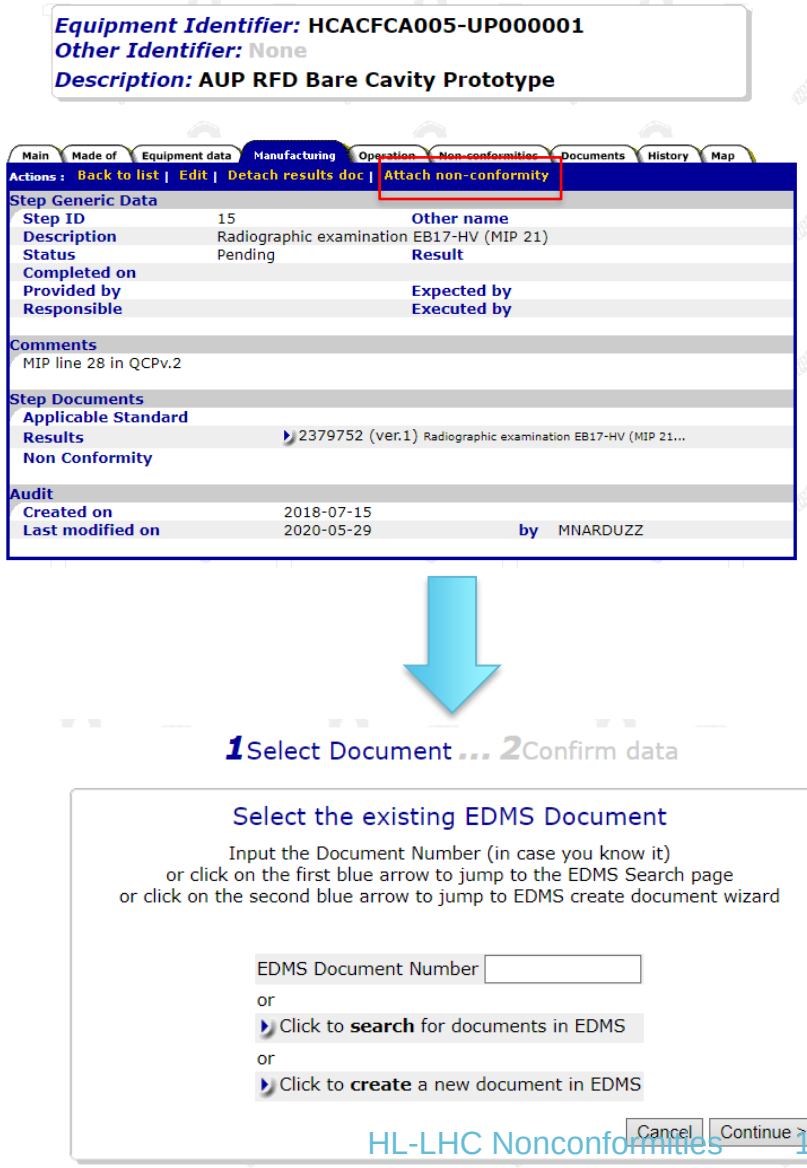
Create EDMS Document via MTF



Attach NCR in EDMS Document to MTF

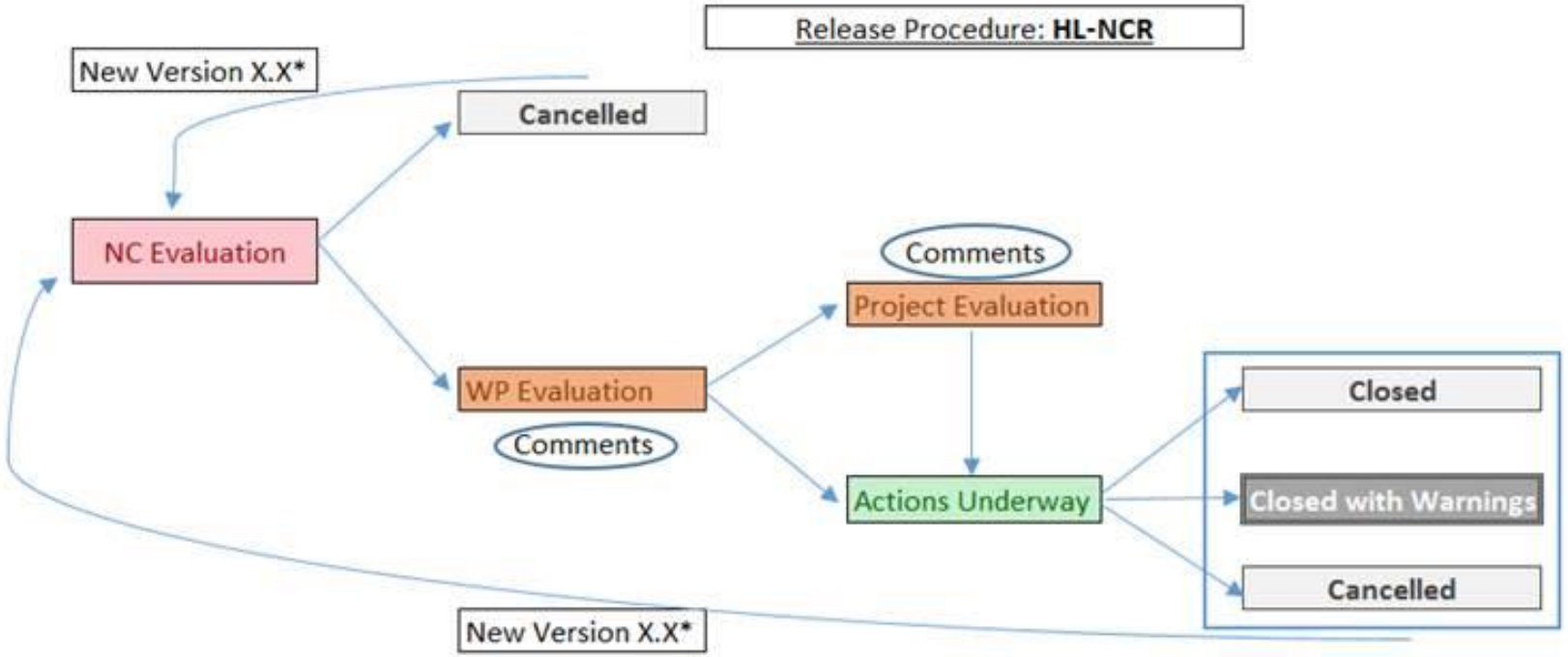
The NCR shall be attached to the applicable MTF Step (where the deviation is found)





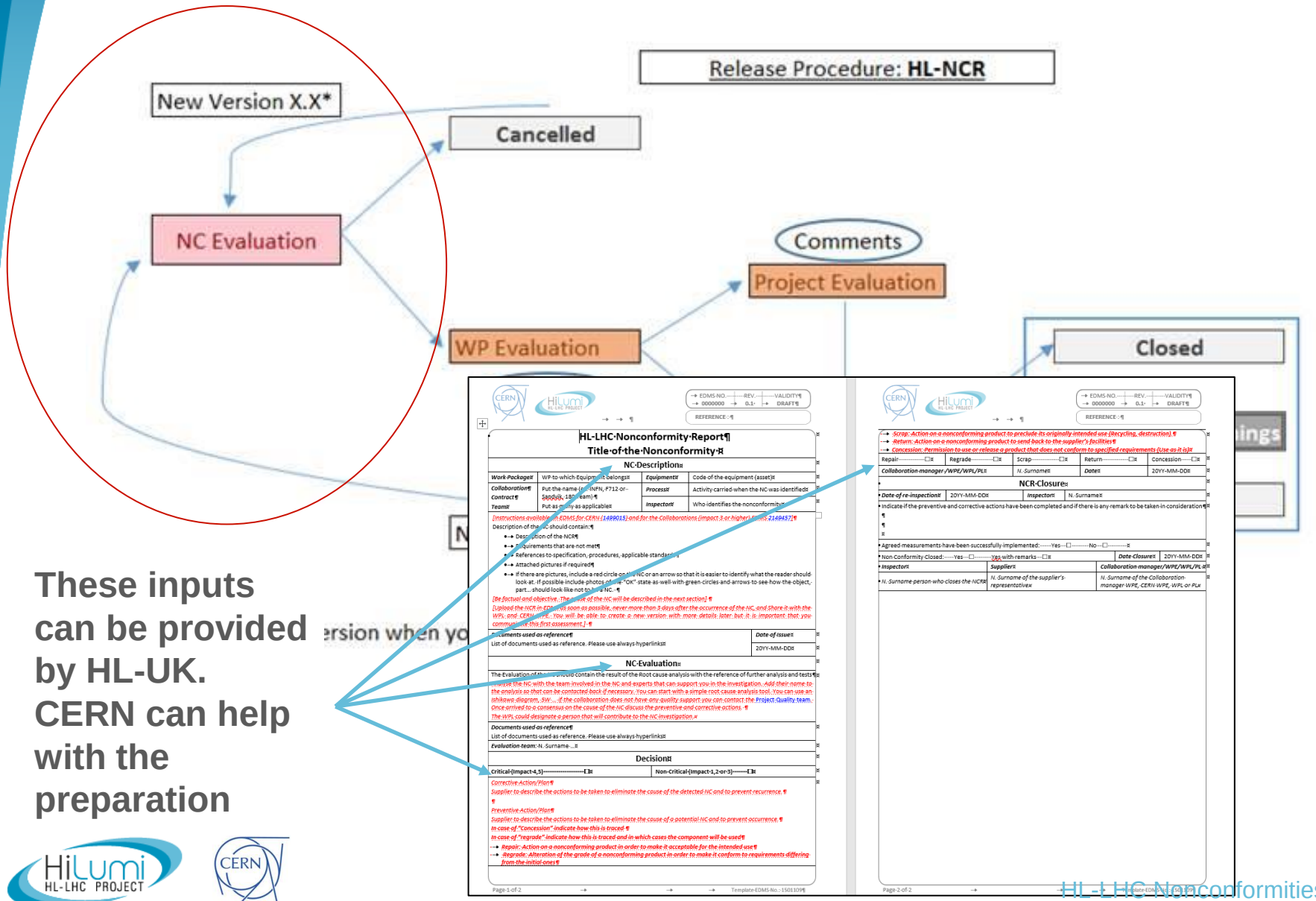
- If the document is already created in EDMS then we can attach it to MTF
- If it is not created in EDMS yet, the document can be created directly in EDMS by using MTF

Document life-cycle



*Create a new version when you have a new file to be uploaded.

Document life-cycle



These inputs can be provided by HL-UK. CERN can help with the preparation

Outline

- HL-LHC Nonconformities
- Handling of NCRs
- **Content**
- Conclusions

NC Description

NC Evaluation

HL-LHC·Nonconformity·Report¶
Title·of·the·Nonconformity·¤

NC·Description¤			
Work·Package¤	WP·to·which·Equipment·belongs¤	***Equipment¤***	Code·of·the·equipment·(asset)¤
Collaboration¶ Contract¶ Team¤	Put·the·name·(ex.·INFN,·F712·or·· Sandvik,·180·Team)·¶ Put·as·many·as·applicable¤	***Process¤***	Activity·carried·when·the·NC·was·identified¤
		Inspector¤	Who·identifies·the·nonconformity¤

[Instructions·available·on·EDMS·for·CERN·(1499015)·and·for·the·Collaborations·(impact·3·or·higher)·EDMS·2149457]¶

Description·of·the·NC·should·contain:¶

- → Description·of·the·NCR¶
- → Requirements·that·are·not·met¶
- → References·to·specification,·procedures,·applicable·standards¶
- → Attached·pictures·if·required¶
- → If·there·are·pictures,·include·a·red·circle·on·the·NC·or·an·arrow·so·that·it·is·easier·to·identify·what·the·reader·should·look·at.·If·possible·include·photos·of·the·"OK"·state·as·well·with·green·circles·and·arrows·to·see·how·the·object,·part…·should·look·like·not·to·be·a·NC.··¶

[Be·factual·and·objective.·The·cause·of·the·NC·will·be·described·in·the·next·section]·¶

[Upload·the·NCR·in·EDMS·as·soon·as·possible,·never·more·than·3·days·after·the·occurrence·of·the·NC,·and·Share·it·with·the·WPL·and·CERN·WPE.·You·will·be·able·to·create·a·new·version·with·more·details·later·but·it·is·important·that·you·communicate·this·first·assessment.]··¶

- Provide all the available information about the Nonconformity (Description, requirement/s not met, etc.) – **W**hat, **W**here, **W**hen, **W**ho
- Be **factual** and **objective**. **We are not assessing the causes and the impact yet**. First we need to know what went wrong. The **root cause** of the NC as well as the **consequences** will be described in the next section (**NC Evaluation**)
- **Add** references to **reports** and **other documentation** to be used as reference and **supportive documentation** of the Nonconformity
- Provide **pictures** and/or any other **relevant material** that can be useful for the analysis

NC Evaluation

NC Evaluation

NC Evaluation
The Evaluation of the NC should contain the result of the Root cause analysis with the reference of further analysis and tests *Analyse the NC with the team involved in the NC and experts that can support you in the investigation. Add their name to the analysis so that can be contacted back if necessary.* You can start with a simple root cause analysis tool. You can use an *Ishikawa diagram, 5W…. if the collaboration does not have any quality support you can contact the* Project Quality team. *Once arrived to a consensus on the cause of the NC discuss the preventive and corrective actions.* *The WPL could designate a person that will contribute to the NC investigation.*
Documents used as reference List of documents used as reference. Please use always hyperlinks
Evaluation team: N. Surname…

- The root cause of the Nonconformity is herein detailed – **W**hy, **H**ow
- A **method statement** can be proposed to the evaluation team (if Repair is required)
- The **impact** of the Nonconformity is to be explained (technical and project level)
- **Corrective actions** to close this NC and **Preventive actions** to avoid recurrence are herein proposed. These actions shall be assessed and confirmed during the follow step (**WP Evaluation**). A new version of the document might be required depending on the decision (more information is requested for completeness, different method statement…)

Handling and Sharing of Nonconformities

The NC Class triggers how it is to be communicated -> Marco is your entry point

Impact assessment	Assessment scale	Financial loss	Reputation	Alignment with Business Objectives (WP Deliverables)	Who I shall inform in the project	When
Catastrophic / Extreme	5	Requiring resources outside the collaboration that can not be covered by the project	Large media (or scientific media) coverage - International coverage	Occurrence of the risk will significantly deter the achievement of all the objectives (ex, delay of the full project, not delivery of a component fully under the responsibility of the collaboration, ...)	PL, WPL, WPE	As soon as detected
Major	4	Requiring resources outside the collaboration that can be covered by the project	Host MS press coverage - Scientific media - Escalating community activism	Occurrence of the risk will significantly hamper the achievement of the of the objectives (ex, delay beyond the collaboration margin but not yet the WP margin, request of a permanent deviation permit for a component, engineering change request afecting the WP, ...)	PL, WPL, WPE	As soon as detected
Moderate	3	Requiring resources outside the collaboration but that can covered inside the WP	Local press coverage - Neighbourhood reputation (public, suppliers, etc.)	Occurrence will have some adverse effect on the achievement of the objectives (ex, delay eliminating al the margin, request of a deviation permit for a component, engineering change request, ...)	WPL, WPE	In the 3 days
Minor	2		No one has heard of the occurrence of risk outside CERN; Problem dealt with at CERN's management level.	Occurrence of the risk will have minimal impact on the achievement of the entity's business objectives (magnet, cold mass, cryoassembly)	WPE	During periodic feedback
Negligible	1		No one has heard of the occurrence of the risk outside he department who owned the risk; problem dealt at department management level	Occurrence of the risk will have very little or no impact on the achievement of the entity's business objectives (magnet, cold mass, cryoassembly)	WPE	During periodic feedback

The NC will be assessed by the Collaboration with the team involved in the NC (Production, inspection ...). The first check shall be how this NC affects the project (Impact). If the NC has a relevant impact on the project (delays beyond the margin, additional means beyond the collaboration, damage to the image of the project, etc.), then the WPL shall be informed.

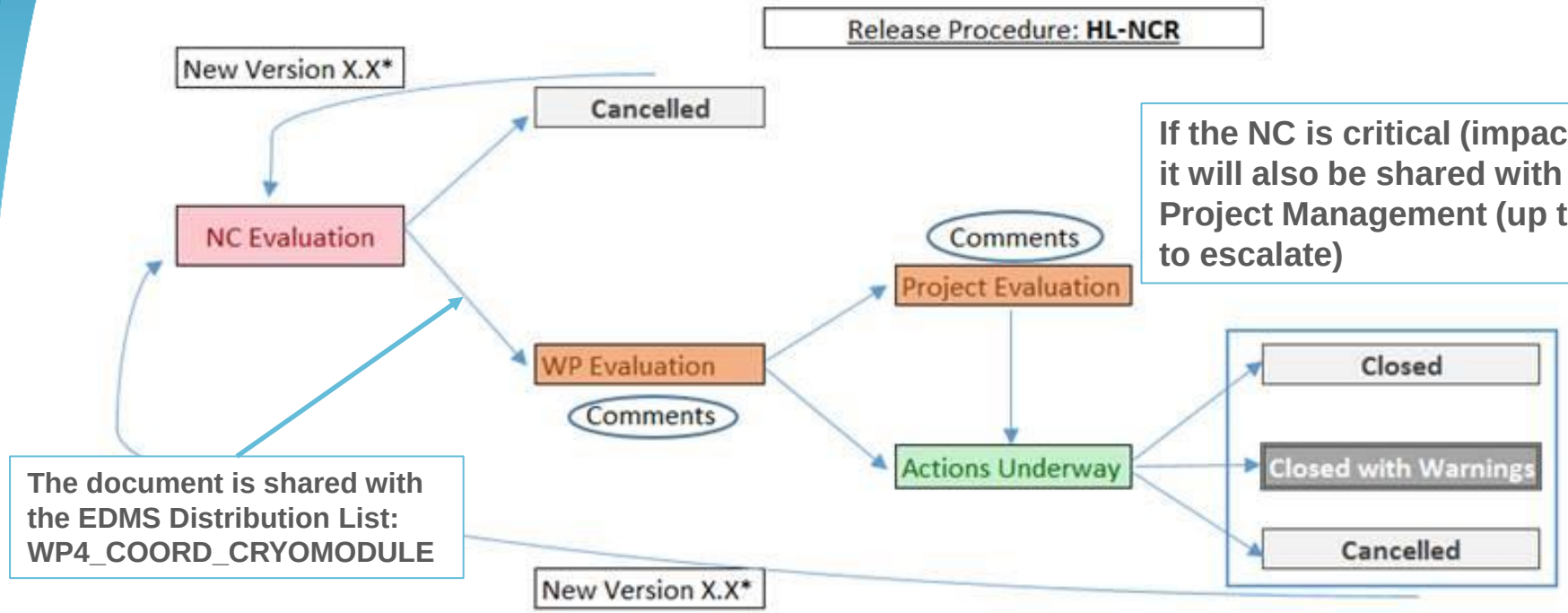
The Collaborations Impact matrix (EDMS 1863763) can be used to evaluate the NC but, in case of doubt, the NC shall be always escalated to the next project level (Share with us!)

Handling and Sharing of Nonconformities

	Technical impact	Schedule impact	Financial impact	Others
Class 5	• Major implications for the project • It requires a clearance from CERN to move fwd. • Out of specified performance • Potential loss of one full item	• > 2 months of Delay • Time window not respected, and project schedule needs to be updated		- Same issue happens more than times - Potential change in the specification
Class 4	• Major implications for the project • It requires a clearance from CERN to move fwd. • Potential loss of one partial item • Repair to be performed, which requires CERN approval	• 1 month < Delay < 2 months • Time window not respected, and project schedule needs to be updated		- Same issue happens up to three times - Potential change in the specification
Class 3	• It requires a clearance from CERN to move fwd. • Potential loss of one partial item • Repair to be performed, which requires CERN approval	• 1 week < Delay < 1 month • Time window not respected but project schedule does not need to be updated		- First time it happens - Potential change in the specification
Class 2	• Minor implications	• < 1 week of Delay		
Class 1	• Minor implications	• No delays are accounted		

- Time Reference – **Delivery of the equipment to CERN**
- **In case of doubts, inform us! – Minor issues may have a later major impact, if they are not properly addressed upon occurrence!**
- Of course, a **potential regrade** (change in the specification) needs **CERN Approval** (…and **proper discussion** between HL-UK and CERN-WP4). Regrades will most likely lead to Deviation Requests
- **Class 1, Class 2 up to WPE to approve it, Class 3 WPL and Class 4 and 5 to be shared with the PL**

Document life-cycle (Share with CERN)



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WP Evaluation (CERN Assessment and feedback)

WP Evaluation

Project Evaluation

- Once the document is shared with **WP4_COORD_CRYOMODULE,** we will provide Feedback via EDMS

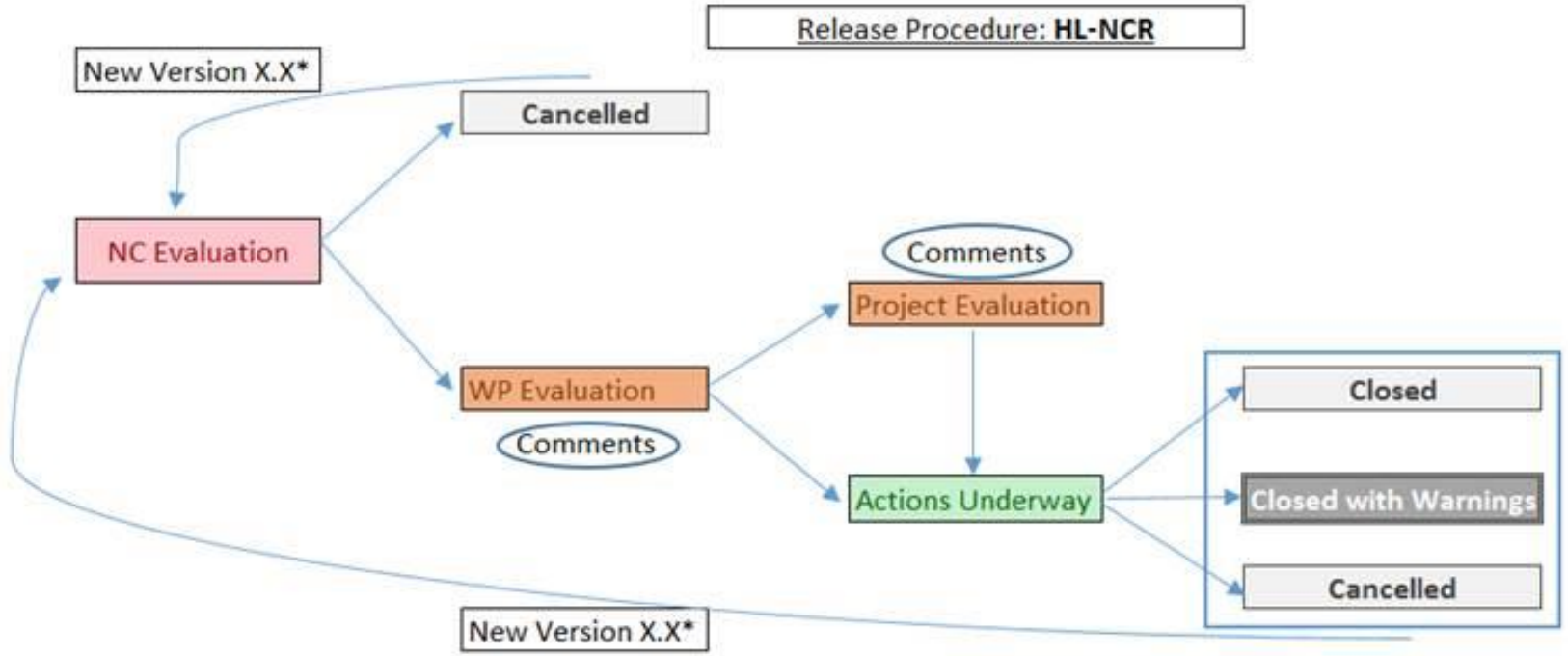
Decision				
Critical (Impact 4,5) ☐		**Non-Critical (Impact 1,2 or 3)** ☐		
Repair ☐	Regrade ☐	Scrap ☐	Return ☐	Concession ☐
Collaboration manager /WPE/WPL/PL		*N. Surname*	***Date***	20YY-MM-DD

- Based on the previous income CERN will assess the information and provide a decision (Full process is traced through EDMS).
- The decision about the Nonconformity shall be integrated in the document

Repair ☐	Regrade ☐	Scrap ☐	Return ☐	Concession ☐

- **Repair:** Action on a nonconforming product in order to make it acceptable for the intended use
- **Regrade:** Alteration of the grade of a nonconforming product in order to make it conform to requirements differing from the initial ones
- **Scrap:** Action on a nonconforming product to preclude its originally intended use (Recycling, destruction).
- **Return:** Action on a nonconforming product to send back to the supplier's facilities
- **Concession:** Permission to use or release a product that does not conform to specified requirements (Use as it is)

Document life-cycle



*Create a new version when you have a new file to be uploaded.

The status of the NC will remain in Actions Underway until it is proven that the NC has been solved

NC Closure

NCR Closure

Date of re-inspection	20YY-MM-DD	***Inspector***	N. Surname

Indicate if the preventive and corrective actions have been completed and if there is any remark to be taken in consideration

Agreed measurements have been successfully implemented: Yes ☐ No ☐

Non Conformity Closed: Yes ☐ Yes with remarks ☐ ***Date Closure*** 20YY-MM-DD

Inspector	***Supplier***	***Collaboration manager/WPE/WPL/PL***
N. Surname person who closes the NCR	*N. Surname of the supplier's representative*	*N. Surname of the Collaboration manager WPE, CERN WPE, WPL or PL*

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- Once the Nonconformity is solved, the document shall be updated (new version to be issued). **The reference to the report(s)** that proves the Nonconformity is closed is to be added in MTF (additional MTF Step if needed) and the Status of the Nonconformity is changed to Closed or Closed with Warnings
- No measurable actions = No closure of the NC

Outline

- HL-LHC Nonconformities
- Handling of NCRs
- Content
- **Conclusions**

Some reasons a problem-solving process often fails

- **Jumping** from **analysis** to a **solution** too **quickly**
- Using data that are **inaccurate** or **biased**
- Failing to include the **right people** in the **problem-solving** process
- **Mistaking** a **symptom** for the **root cause** of the problem
- Failing to **test a solution before implementing it**
- Failing to **evaluate the potential benefits** and **costs** of the chosen solution

Conclusions

- **Nonconformities** are part of the **production** of any component. When a specified requirement is not fulfilled a Nonconformity is to be issued
- The metadata as well as the information of the NC is to be provided by the Collaboration with support from CERN
- CERN will assess the NCR and provide the feedback (**assessment** of the **proposal** and **decision**)
- **Actions** are to be **implemented** (if any) **before closing** the Nonconformity
- NCR to be attached to the corresponding **MTF Step** and when necessary the step shall be repeated to prove that the Nonconformity is closed (**if repair**)
- Every NCR should answer to the 5W-1H (**Who, When, Where, What, Why, How**) – Otherwise it is most likely incomplete

Q&A

Closing the NC- pre-steps

- Who will verify the actions? (internal auditors or similar)
- Once the actions are implemented, how long until they are verified as effective?
- Where will the verification activities be recorded?
- What verification indicators will be used (reduced scrap rates, reduced nonconformances, reduced customer complaints, trained personnel, and so on)?
- Do the indicators provide evidence that the actions solved the problem and didn't create any new ones?
- Will the actions require ongoing monitoring? If so, what is the frequency of the monitoring?
- Who will the verification results be reported to? How? When?

Closing the NC

- The independent person's role is to perform a check and balance at the end of the problem-solving process. However, there is nothing wrong with the person(s) who implemented the action being present when the actions are being reviewed. In fact, that is suggested, because that person should be able to clearly describe, as well as show, confirmation of effectiveness of the actions taken.
- The closure dates should be recorded, as it provides the evidence that the problem is now resolved and all steps have been completed. Without completing the verification step, actions will appear in a perpetual state of "openness" and their status difficult to determine. If we bypass the verification step we will never be sure that the solution fixed the problem so it doesn't come back.
- Long-term monitoring of implemented actions ensures that the solutions are working the way they were intended. It also determines whether or not the actions taken were the best long-term solution so that the problem will not occur again

Finding solutions – In the context

Your solutions/actions

- How will the actions affect the customer?
- Will the actions negatively affect other processes within the organization?
- How much will it cost to implement the actions?
- Do we have the necessary resources?
- How long will it take?
- Who is going to do it?
- Due to limited resources, will we need to implement a short-term solution while planning for a more permanent one?

Finding the solution - The Why not principles

Nalebuff and Ayres created four approaches that act as catalysts for developing solutions to problems. Each is represented by a question:

- What would an “unconstrained” person do? Be a bit bolder and more outrageous than you might otherwise be. Typically, solutions prompted by this question will not be feasible in real life, but might represent a core idea that can be expanded upon.
- Why don’t you feel my pain? Individual and corporate actions have consequences to others that are not priced in the market. Looking for inefficient behaviour by buyers or sellers is a systematic way both to identify problems and to solve them. Some problems create an external harm that is greater than the internal benefit.
- Where else would it work? Great solution exists for a different problem, one similar enough to your problem that the solution can be an inspiration. This normally requires some translation to fit the context and institutions of the new setting.
- Would flipping it work? There are symmetries all around us and sometimes flipping things around provides a powerful new solution. This is done by breaking down the existing practice into its component parts and writing a description in simple, declarative sentences.

Corrective versus Preventive action

Corrective action

- occurs as a result of a reported problem and is considered a reactive approach.
- should be taken to eliminate the cause of existing problems, thus preventing them from recurring.
- should not be considered disciplinary action or a means in itself, but rather, part of the problem-solving process that analyzes issues with the intent of improving. It is important to note that the mere act of correcting a problem is different than taking corrective action. When correcting a problem, immediate action is taken which may or may not involve the additional steps of determining the root cause of the problem or following up for effectiveness. Correcting alone may not result in resolving the issue.

Preventive action

- Is the response to information or knowledge that indicates that a potential problem might occur. This information or knowledge could come from trend analysis, risk analysis, market analysis, or previous experience. Using this information allows the organization to prevent the problem from happening in the first place.
- Prevention of potential problems may require different thinking, since a preventive approach requires us to ask the “what-ifs.” One way to start thinking about preventive action is to brainstorm the kinds of preventive actions that are experienced every day.

Preventive actions

Action to eliminate the cause of a **potential** nonconformity or other potential undesirable situation.

In general is the weakest point of the analysis because requires to go beyond the NC. You should ask yourselves

- There is any similar **component** where the same NC could happen?
- There is any similar **process** where the same NC could happen?
- If happened here **why did not happen** in the similar object/process?
- Did I communicate the NC to colleagues that could be interested?

For all actions

- State clearly:
  - What you want to do,
  - When you want to do it,
  - How long the action will take to be implemented
  - Who will do it,
  - How much will cost
  - Which is the result expected and how you will measure the success of the action
- Obtain endorsement of the stakeholders
- Trace the action and obtain the endorsement on writing

I keep six honest serving men

(They taught me all I know);

Their names are <u>What</u> and <u>Why</u> and <u>When</u>

And <u>How</u> and <u>Where</u> and <u>Who</u>.

Rudyard Kipling