HSE
Occupational Health & Safety
and Environmental Protection Unit

Launch Safety Agreement (Conventional aspects)

LIU-SPS ac Coating & Impedance Reduction

Following the Launch Safety discussion held on: 24.11.2015

From: HSE/SEE group– J. Gulley

To: Paul Cruikshank, TE/VSC; Anne Funken, BE/ASR.

CC:

Date: 01.02.2016

EDMS: 1584091

Subject: Launch Safety Agreement (Conventional aspects) of ac Coating & Impedance Reduction.

PURPOSE & SCOPE

This document, entitled **Launch Safety Agreement (Conventional aspects)**, provides an overview of the conventional (non-radiological) Safety requirements applicable to the aC Coating & Impedance Reduction and its related Safety documentation. After the **launch Safety discussion**, it is the 2nd Step of the editorial process in the **Safety Documentation Management** procedure (EDMS 1177755).

This document is itself an integral part of the Safety File/Folder[1] for the ac Coating & Impedance Reduction project that the Project Leader or its PSO shall:

- maintain and keep updated during the life cycle of the project in order to demonstrate responsible Safety management through compliance with the Safety requirements and practices stated in this document;
- make available to the HSE Unit upon request and before any periodic inspection.

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- Safety File: set of documents and data relating to the assessment of the Safety, at all stages of their life cycle, of Installations, projects, facilities or CERN Experiments and the corresponding implementation measures and procedures as well as lessons learned.
- Safety Folder: a set of Safety Files relating to a Complex.

1 CONTENTS

2 INTRODUCTION

The definition of the Safety requirements is based on the CERN Safety rules which are available on the HSE Unit web page (http://cern.ch/safety-rules). Whenever CERN Safety rules do not exist the Safety requirements are based on Host States Regulations, European Directives, international standards and best practices.

The standards referred to in this document are available in the CERN document server, CDS (http://cdsweb.cern.ch/).

The life cycle of the ac Coating & Impedance Reduction project shall respect the phases defined in the **Safety Documentation Management** procedure:

- Study Phase
- Project Phase:

- Design and engineering phases
- Manufacture and assembly phases
- Construction and/or installation phases
- Commissioning phase

- Operations Phase
- Dismantling Phase.

The Safety documentation to be provided is the core of the Safety File/Folder 'demonstrative part' as per the **Safety Documentation Management** procedure.

3 DESCRIPTION OF THE PROJECT

The **Launch Safety Agreement (Conventional aspects)** is established based on the information provided by Project Leader for aC Coating & Impedance Reduction during the **launch Safety discussion** held on 24.11.2015 in building 30.

3.1 General information

In presence of, Jaime Perez Espinos, Anne Funken (PSO) and Paul Cruikshank, the Project Leader for ac Coating & Impedance Reduction, an overview of the project was provided:

In order to mitigate against so-called electron cloud effects in the SPS, some of the existing vacuum chambers will be coated with amorphous carbon (aC) on their inner surfaces. To apply the aC coating, the vacuum system has to be dismantled; some of the chambers will be coated in the SPS tunnels, others will be transported to surface buildings. The aC coating activities will begin in the EYETS 2016 and may extend to LS3.

A parallel upgrade to reduce the longitudinal impedance of SPS will also be undertaken. This will be achieved by installing shields inside the existing vacuum system at specific locations near to the QF and QD magnets and their adjacent short straight sections (SSS). As with the aC coating, the vacuum system must be dismantled in order to make this upgrade; some of the impedance reduction components will be installed in the SPS tunnel, others will be installed in surface buildings. The impedance reduction activities will begin in the EYETS 2016 and may extend to LS3.

3.1.1 SPS layout

Figure 1 shows a 64 metre standard period of the SPS. Each cell contains 8 main dipoles of 2 types, MBA and MBB, one QF magnet with adjacent SSS, and one QD magnet with adjacent SSS. Whilst the MBA, MBB, QD and QF magnets are identical in each standard cell, the SSS configurations are numerous, made up from one beam position monitor, up to 3 corrector magnets and up to 3 vacuum chambers assembled on a single girder.

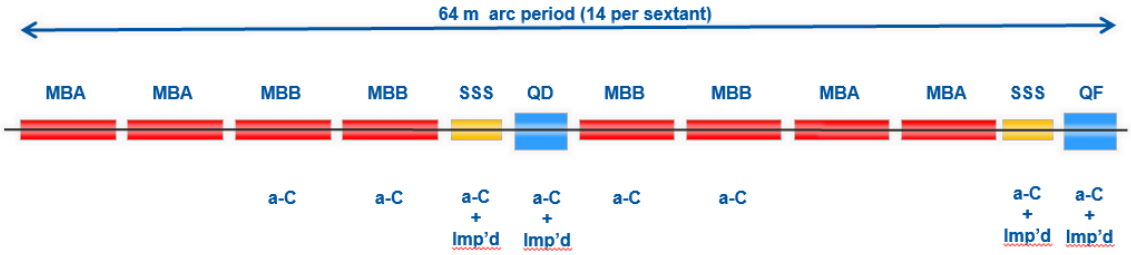

Figure 1: SPS arc period

Figure 2 shows a 64 metre dispersion suppressor (DS) period of the SPS. With respect to the standard cell, 2 MBA dipoles are missing and replaced with circular drift chambers.

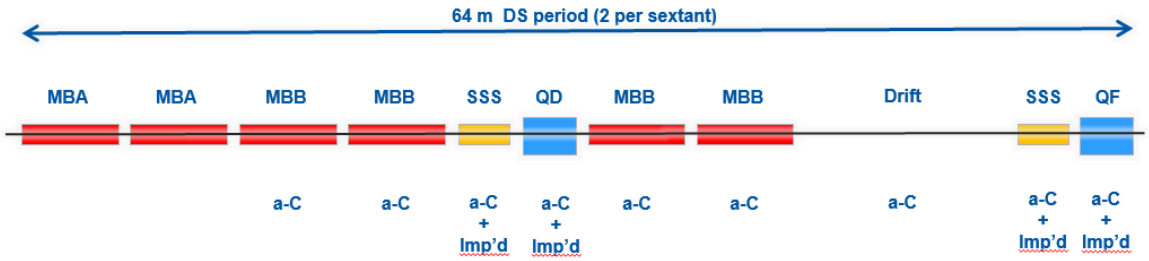

Figure 2: SPS dispersion suppressor period

Figure 3 shows part of a 64 metre long straight section (LSS) period. With respect to the standard cell, all main dipoles are missing. Special accelerator components are joined by circular drift chambers. As each LSS period is different, so too the length of the drift chambers.

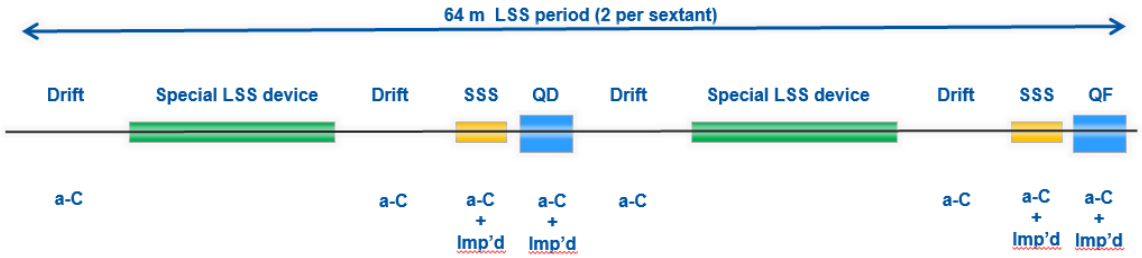

Figure 3: SPS Long Straight Section period

3.2 Description of the project

The vacuum chambers of the MBB magnets and the QF magnets will be treated (aC coating and impedance reduction) in-situ in the SPS tunnel. The vacuum chambers of the QD magnet, SSS type QD, SSS type QF and Ø159 mm drift chambers will be transported and treated in surface buildings 867

and/or 181. The remaining vacuum chambers will not be moved or treated eg MBA magnets, special components of the LSS.

The aC coating and impedance reduction can only be implemented during long stoppages of the SPS; EYETS, LS2 and LS3. Performance of the upgrade will be assessed following each implementation campaign in EYETS and LS2 before go ahead is given to continue.

During the EYETS 2016 the chambers to be treated will be limited to SPS arc 4/5. All magnets, SSS girders and vacuum chambers to be transported outside of the SPS tunnel will transit via BA3. The strategy for LS2 and LS3 has yet to be confirmed.

During EYETS 2016 personnel from the teams mentioned below will enter and exit via BA4 or BA5.

Chamber type	Location	aC	Impedance reduction	EYETS 2016	LS2	LS3
MBB	Tunnel	Yes	No	0.1 arc	0.9 arc	5 arcs
QD	867	Yes	Yes	0.1 arc	0.9 arc	5 arcs
SSS QD	867 & 181	Yes	Yes	0.1 arc	0.9 arc	5 arcs
QF	Tunnel	Yes	Yes	0.5 arc	5.5 arcs	-
SSS QF	867 & 181	Yes	Yes	0.5 arc	5.5 arcs	-
Drift	181	Yes	No	10%	90%	-

Table 1 – aC coating & impedance reduction deployment in EYETS, LS2, LS3

The activities to achieve aC coating and impedance reduction on each of the chambers types are:

Vacuum system disassembly/reassembly (TE-VSC):

The SPS vacuum system is equipped with conical vacuum flanges and clamps. Following venting of the vacuum system to atmospheric pressure, the clamps and seals are removed at each location where adjacent vacuum chambers need to be displaced. The vacuum system will be reassembled with the same components, except for the seals, pumped and leak tested. Bakeout is not required.

Main magnet disassembly/reassembly (TE-MSC):

The SPS main magnets must be disconnected electrically and hydraulically prior to their transportation. Electrical consignation (procedure to be defined) and water purging of the cooling circuits (procedure to be defined) are prerequisites prior to the disconnection activities. The Cu busbar cutting operations at magnet removal, and busbar re-brazing operations at magnet reinstallation are performed in accordance to SPS procedure to be defined.

SSS girder disassembly/reassembly (TE-MSC):

Corrector magnets and instrumentation on the SSS girders must be disconnected electrically and hydraulically prior to their transportation. Electrical consignation (procedure to be defined) is a prerequisite prior to the disconnection activities. The cooling water circuits are isolated locally with shutoff valves before disconnection of flexible water hoses. Instrumentation cabling, in some cases attached to the SSS girder, will be labelled, disconnected and stored in the main cable trays.

Transport and handling (EN-HE):

QD magnets, SSS QD girders, SSS QF girders, and drift chambers will be transported to building 867 using conventional SPS handling equipment (so-called Dumont, Pratt side loader, trailers, Volk tractor). Following their treatment for aC coating and impedance reduction, the same handling equipment will be used for their return to the tunnel.

SSS QD girders and SSS QF girders will be disassembled and reassembled in 867 using conventional handling equipment (overhead beam crane).

Survey & alignment (EN-SU):

QD magnets, SSS QD girders and SSS QF girders will be surveyed prior to their removal for aC coating and impedance reduction, followed by survey and realignment following their reinstallation. The tooling and methodology can be found in procedure to be defined.

Impedance reduction (TE-VSC):

Impedance reduction is achieved by the installation of shielding components at the extremities of the existing vacuum chambers. QF magnet chambers will be treated in the SPS tunnel. All other vacuum chambers, those of the SSS QD girder and SSS QF girder, will be treated in building 867. Some vacuum chambers will be equipped with studs in order to attach the impedance reduction shielding. The studs will be permanently fixed to the vacuum chamber by spot welding according to procedure to be defined.

Figure 4: Impedance reduction shielding at SSS QF chamber extremity

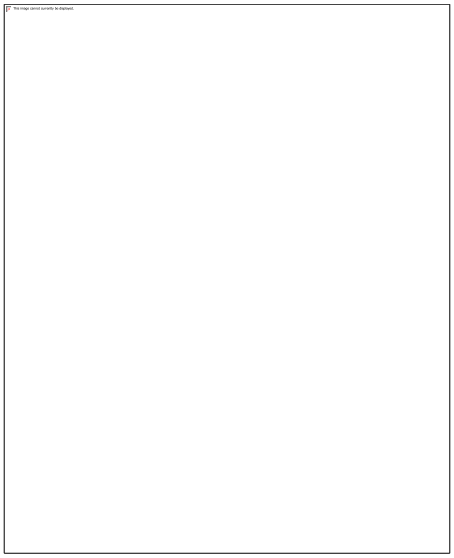

Figure 5: Spot welding of studs to existing SSS QF vacuum chamber

aC coating (TE-VSC):

The amorphous carbon coating is achieved by a magnetron sputtering technique. Following the insertion of a graphite target into the vacuum chamber, the vacuum chamber is evacuated using mobile turbomolecular pumping groups. Using argon as the discharge gas, a plasma is established, sputtering the graphite target (cathode) and creating an amorphous carbon layer on the vacuum chamber wall (anode) over a period of several hours.

Depending on the chamber to be treated, different coating apparatus will be applied. For the chambers to be treated in building 181, the existing vertical coating apparatus will be used. For the aC coating activities in buildings 867 and the SPS tunnel a horizontal configuration will be used. The carbon target will be inserted in several 2m modular sections up to a maximum train length of 13.2 metres (2 adjacent MBB dipole chambers).

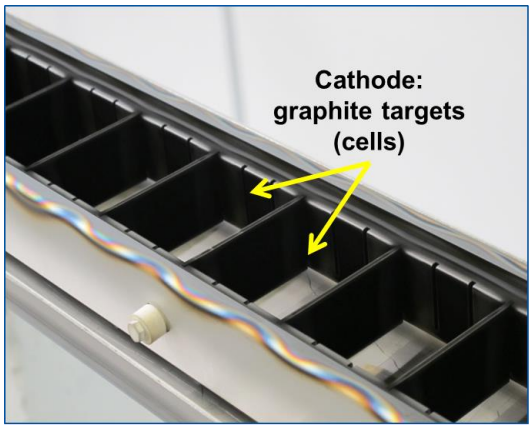

Figure 6: aC coating apparatus for SPS dipole magnets

Figure 7: Vertical coating setup in building 181

Plasma cleaning - option (TE-VSC).

Vacuum chambers which cannot be dismounted for conventional UHV wet cleaning may require O_2 plasma discharge cleaning. Following the insertion of the anode train into the vacuum chamber, the system is evacuated using mobile turbomolecular pumping groups. Using oxygen as the discharge gas, a plasma is established, bombarding the vacuum chamber wall, and reacting with organic contaminants to form H_2O, CO, CO_2 that can be pumped.

Figure 8: aC coating apparatus for SPS dipole magnets

3.3 Schedule

Start date:	Sep. 2015
Completion date:	End LS3 (2025)

Table 2 - Schedule

3.4 Organization

Role	Name	DEP/GR
Project Leader	Paul Cruikshank	TE/VSC
PSO	Anne Funken	BE/ASR
DSO	M. Tavlet (BE), T. Otto (TE)	-
LIU-SPS Activity Coordinator	B. Goddard	TE/ABT

HSE-SEE Correspondent	J. Gulley	HSE/SEE
HSE-RP Correspondent	H. Vincke	HSE/RP

Table 3 - Organization

4 DOMAINS

Table below shows the details of the project by domain.

DOMAINS	YES	NO	DETAILS (type, quantity, level etc.)
Occupation of the premises	Some of the activities of the project will be carried out in-situ in the tunnel, others in building 181 (coating) and building 867 (disassembly, coating, impedance reduction, reassembly)		
CIVIL ENGINEERING			
Earthworks, drainage (excavation, underground networks etc.)		✘	
Bearing structure (concrete, metallic etc.)		✘	
Ancillary works		✘	
Special works (cutting, demolition etc.)		✘	
Platforms, walkways, guards rails, stairs and ladders		✘	
Other		✘	
HANDLING, LIFTING AND MOTORISED DOORS			
Lifting and handling equipment	✓		In-situ Lifting quadrupoles using DUMONT side lifter. Lifting Short Strip Sections using PRATT side lifter. Lifting vacuum chambers and small magnets. Volk Tractor + trailer. Loads ranging from several kg up to several tonnes. Some equipment will be activated. Surface buildings 867 & 181 Overhead crane
Personnel lifting equipment		✘	
Motorised doors		✘	
Other			
ELECTRICAL INSTALLATIONS			

Normal power (18 kV, switchboards EMD)			
Transformers (18/0.4 kV, EMT)		✘	
Normal power (400 V, switchboards EBD)	✓		Coating process (220 V supply). Spot/stud welding in 867 & tunnel.
Assured power (switchboards EAD)		✘	
Safety power (switchboards ESD)		✘	
UPS (switchboards EOD)		✘	
48 V (dc switchboards ECD)			
General Emergency Stop System	✓		
Local Emergency Stop System			
Other	✓		Mobile coating station to be purchased. High voltage power supply (? kV) for the plasma generation.
HVAC			
Heating		✘	
Ventilation		✘	
Air conditioning		✘	
Special requirements (temperature, humidity etc.)		✘	
Safety aspects (presence of gas, smoke extraction, over-/under pressure areas)	✓		Punctual spot welding (1-2 s) – no development of fumes.
Exhausts		✘	
Pressure equipment	✓		Argon gas bottles during coating process (small bottle/continuous supply). Nitrogen gas bottles for venting of vacuum sectors.
Other	✓		Existing ventilation in tunnel. Local Exhaust Ventilation (LEV) units, where necessary, for longer weld times.
FLUIDS			
Water (raw, drinking etc.)		✘	
Clean and waste water	✘		Purging of the cooling circuits

Compressed air	✓		Use existing networks. Mobile pumping group. Dry-pumps, 'oil-free'.
Other			Oxygen plasma 'Mobile plasma clean bench' for cleaning in-situ. 10^{-1} mbar closed circuit. Wet cleaning (ultrasonic baths, detergent & rinsing) to be performed at surface building (buildings 102/867).
OTHER			
Storage and handling of chemicals	✓		Small quantities of alcohol, for local surface cleaning.
Environmental restrictions (polluted sites, protected area, etc.)		✘	
Waste (conventional, hazardous, etc.)	✓		Collars, flanges, seals, replacement of Stainless Steel spring contacts, vacuum chambers, fingers in Cu-Be. All parts potentially activated.
Internal environment conditions	✓		Coating process temperatures > 100 C but no direct contact exposure.
Reliability of equipment (redundancy, back-up system, etc.)			

Table 4 - Details by domain

5 SAFETY REQUIREMENTS AND SAFETY DOCUMENTATION PER DOMAIN

The following paragraphs list the minima requirements and documentation in matters of conventional Safety per each Safety domain covered by the project.

Radiological risks are not addressed in the present document, except for what concerns the location of permanent workplaces and non-professionally exposed personnel. For the details on Safety requirements concerning radiation protection, HSE/RP group provides references that are out of the scope of the present document.

The required Safety documentation per domain is assembled in a Safety Folder containing *n*-Safety Files by the Project Leader. A copy has to be provided to the HSE-SEE Correspondent for the project, member of the HSE unit.

The HSE-SEE Correspondent of the project (HSE-SEE main contact) shall be informed of any further exchange between the Project Leader and any Safety specialists involved in the project, including the HSEHSE-RP Correspondent.

5.1 Products and materials

5.1.1 General requirements on products and materials

Products purchased on the market must comply with CERN Safety rules (in case of absence, with Host States Regulations or European Directives) and as such are legally required to bear the CE marking, whenever applicable.

Products bearing the CE marking comply with provisions of the applicable European Directives and Regulations. Compliance with legislation often requires simultaneous application of several Directives, Regulations and other legislation and relevant harmonized standards.

European Regulations and Directives oblige the manufacturer to draw up technical documentation (covering the design, manufacture and operation of the product) containing information to demonstrate the conformity of the product to the applicable requirements. The technical documentation has to be delivered with the product (see ch. 5.1.2).

All materials to be used in the building shall comply with the following Safety rules:

- CERN Safety Instruction IS 41 - The use of plastic and other non-metallic materials at CERN with respect to fire safety and radiation resistance.

5.1.2 Safety documents for products and materials

The following documents are part of the Safety documentation of the project:

- EC declaration of conformity
- Declaration of Performance
- Technical/Material and Safety data sheets
- Instruction manual.

5.2 Mechanical Safety

5.2.1 Pressure equipment

Pressure equipment shall comply with the following CERN Safety rules:

- CERN Safety Regulation SR-M - Mechanical equipment
- CERN General Safety Instruction GSI-M-2 - Standard Pressure Equipment

Moreover, there are specific sets of rules applicable only to certain types of standard pressure equipment. Those rules are defined in the following Specific Safety Instructions, of which the following are applicable to this project:

- CERN Specific Safety Instruction on pressure vessels (SSI-M-2-1),
- CERN Specific Safety Instruction on safety accessories for standard pressure equipment (SSI-M-2-3),
- CERN Specific Safety Instruction on metallic pressurized piping (SSI-M-2-4),

According to CERN Safety rules, pressure equipment shall meet the essential requirements set by the following applicable European Directives:

- Directive 97/23/EC on pressure equipment - Pressure Equipment Directive (PED)

Pressure equipment designed and manufactured according to harmonized European standards benefit from presumption of conformity with the essential requirements laid down in the above mentioned European Directives.

In accordance with the CERN Safety rules, the use of harmonized European standards is compulsory for pressure equipment designed and/or manufactured at CERN. The use of other design codes or national standards shall be reviewed and approved by the HSE unit.

5.2.2 Safety documents for pressure equipment

The Safety documents of the pressure equipment shall contain (not exhaustive list) the following items:

- Project Phase:

- Design & Engineering file:
  - Conceptual design and manufacturing drawings and diagrams of components, sub-assemblies, circuits, … with descriptions and explanations
  - Conditions of use (working fluid / pressure)
  - Results of design calculations
  - Technical specification
- Construction / Manufacturing file:
  - Manufacturing drawings
  - Records of welding inspections
- Commissioning file:
  - EC Declaration of Conformity of the equipment (if applicable)
  - Material and welders' certificates
  - Welding procedures approval record or specification

- Records of pressure test carried out
- Instruction manual which shall include information (operation & maintenance instructions)
- HSE initial inspection report.

- Operations Phase:

- Records of tests and maintenance
- HSE periodic inspection report.

- Dismantling Phase: refer to ch.5.8

5.2.3 Welding activities

All welding and related activities shall comply with the requirements specified in the applicable standard for each type of equipment. In case of absence of standard for a specific equipment, it is recommended to consult the HSE Unit in order to define the welding requirements.

In addition the following safety recommendations shall be respected for all welding activities:

- Personal Protective equipment: Appropriate protective clothing required for any welding operation shall be adopted based on the size, nature and location of the work to be performed.

  Goggles or other suitable eye protection shall be used during all gas welding

  Helmets and hand shields shall be made of a material which is an insulator for heat and electricity, and shall be arranged to protect the face, neck and ears from direct radiant energy from the arc.
- Fire hazards. If the object to be welded or cut cannot readily be moved, all movable fire hazards in the vicinity shall be taken to a safe place.
- Guards. If the object to be welded or cut cannot be moved and if all the fire hazards cannot be removed, then guards shall be used to confine the heat, sparks, and slag, and to protect the immovable fire hazards.
- Consumables: All welding consumables should conform to the requirements specified in EN 13479.

5.2.3.1 Welding Procedures

All welds shall be made in accordance with a Welding Procedure Specification (WPS). WPS shall be established in accordance with the part of standard ISO 15609 applicable to the chosen welding process. WPS shall be appropriately qualified and a Welding Procedure Qualification Record (WPQR) shall be prepared as per the procedure stated in ISO 15607.

5.2.3.2 Welders

Welders shall be qualified and certified by an official body under the requirements stated in the applicable harmonized standard covering the design and/or manufacturing.

Moreover, welders performing welds on CERN site are subject to an internal qualification procedure, in order to ascertain the welder's aptitude to perform the necessary welding tasks. Such internal qualification procedure is carried out by EN-MME-FW (contact Gilles Favre).

5.2.3.3 Non-destructive examination (NDT)

The NDT techniques/ acceptance level are defined in the applicable ISO standards:

- Visual Inspection (VT) –ISO 17637 / ISO 5817 (VT Acceptance criteria – steel) / ISO 10042 (VT Acceptance criteria – Aluminium)
- Radiographic Test (RT) –ISO 17636 / ISO 10675 (RT Acceptance criteria – Part 1: Steel, Part 2: Aluminium)
- Ultrasonic Test (UT) –ISO 17640 / ISO 11666, ISO 23279, ISO 22825, ISO 15625
- Penetrant Test (PT) – ISO 3452 / ISO 23277
- Magnetic Particle Test (MT) –ISO 17638 / ISO 23278

The minimum extent of NDT shall be defined by the applicable design/manufacturing standard. For metallic piping, category 0 piping shall be inspected as category I (as per EN 13480-5), see EDMS 1414108.

The NDT shall be carried out either by EN-MME-MM, or by a competent external body (other than the welder) with the supervision of EN-MME-MM.

All personnel performing NDT shall be qualified according to EN ISO 9712 or provide proof of their knowledge and their experience.

5.3 Electricity

Electrical installation shall comply with the Safety requirements provided in the following Safety rules:

- CERN Safety Code C1 - Electrical safety code
- CERN Safety Instruction IS 5 - Emergency stops
- CERN Safety Guideline EL-0-0-1 - Installation of Safety lighting - Installation d'éclairage de Sécurité
- Directives ATEX 1999/92/EC and 94/9/EC
- French 'Règlement de sécurité contre l'incendie dans les établissements recevants du public', Articles EL and EC
- EN 62305 series: Lightning protection standard.

Low voltage and high voltage electrical installations shall comply with the Standards which are referred in the following CERN Safety rule:

- CERN Safety Instruction IS 24 - Regulations applicable to electrical installations.

All the electrical materials shall comply with the Safety requirements provided in the following CERN Safety rules:

- CERN Safety Instruction IS 23 - Criteria and standard test methods for the selection of electric cables and wires with respect to fire safety and radiation resistance
- CERN Safety Instruction IS 48 - Fire prevention for cables, cable trays and conduits.

5.3.1 Safety documents of electrical equipment and installation

The safety documents for electrical equipment and installations shall include the following items:

- Study Phase:

- Conceptual Design Report (CDR)
  - Project Phase:
- Design & Engineering file:
    - Electrical single line diagrams
    - Results of design calculations
    - Technical specification and technical data sheets of the equipment and cables
    - General drawing of the building/area including earthing grid, connections points and electrical networks in the area
    - Risk assessment for lightening as per IEC-62305
    - ATEX risk assessment including classification of ATEX zones, choice of the classes of materials and "Document Relatif à la Protection Contre les Explosions DRPCE'.
- Construction / Manufacturing file:
    - List of cables with technical characteristics
    - HSE report with pictures foundation earth electrode and earthing connections.
- Commissioning file:
    - As built file including diagrams, block diagrams, interconnection diagrams of electrical and safety installations, earthing grid, technical data of installed equipment, results of calculations
    - EC declaration of conformity for ATEX material
    - Instruction manual (operation & maintenance instructions)
    - Records of test carried out (AUG, Insulation, testing protections, …)
    - HSE initial inspection report.
  - Operations Phase:
- Records of tests and maintenance
- HSE periodic inspection report.
  - Dismantling Phase: refer to ch.5.8

5.4 Chemical Safety

5.4.1 Activities involving hazardous chemical agents

Activities involving hazardous chemical agents at CERN shall comply with the following CERN Safety rule:

- Safety Regulation on chemical agents (SR-C);
- General Safety Instruction (GSI-C1) on prevention and protection measures;
- General Safety Instruction (GSI-C3) on monitoring of exposure to hazardous chemical agents in workplace atmospheres.

The following Safety forms shall be completed, when required, for the use of hazardous chemical agents:

- Safety Form C-1-0-2 – Chemical Inventory (example);
- Safety Form C-1-0-4 – Respirator use (example);

The following Guideline documents are available for consultation, when completing the Safety forms:

- Safety Guideline C-1-0-2 – Chemical Protective Gloves;
- Safety Guideline C-1-0-3 – Practical Guide for users of Local Exhaust Ventilation (LEV) systems;

5.5 Fire protection

The project shall comply with the following CERN Safety rules:

- CERN Safety Code E - Fire protection.

The following Swiss/French legislation applies, if not differently stated in CERN Safety Code E:

- Swiss Directives on Fire prevention, AEAI
- French Code du Travail for premises not open to public.

For fire prevention requirements on material, cables, etc. please refer to ch. 5.1 and ch. 5.3.

5.5.1 Fire protection documents

The Safety documents in fire protection matters shall include the following items:

- Project Phase:

- Design & Engineering file:
  - Report indicating the sources of fire hazard, giving the following information:
    - Foreseen destination of use, manufacturing process or activity
    - Estimated maximum number of occupants in the area
    - Rough estimate of type and quantities of combustible materials (as part of construction elements and equipment, used in the process or for maintenance, stored etc.)
  - General drawings (scale 1:50, 1:100 or 1:200) of the different areas with indication of their destination including the stairs and emergency issues. They shall also include the position of the working places, of the machines, of the fire extinguishers and of other extinguishing

systems (if present), of the evacuation plans and of the following technical installations (not exhaustive list) :

- under pressure vessels
- Heating and ventilation installations, fuel or oil tanks, gas installations
- Lifts
- Installations dedicated to transformation or storage of materials particularly inflammable, explosive or harmful
- Evacuations paths (also showing the path's length) and emergency issues. The type, opening direction and width of escape doors should be reported. The conformity to all the applicable safety requirement should be demonstrated also taking into account the foreseen number of evacuees.
- Relevant fire protection systems (water extinguishing systems, hose reels, fire detection, smoke extraction, etc.).

- Commissioning file:
  - HSE Evacuation plan.

- Operations Phase: -
- Dismantling Phase: -

5.6 Workplace

Working places, equipment and auxiliary means shall be designed in conformity with the principles of ergonomics, including ventilation and lighting, indicated in the following rules:

- Commentaire de l'ordonnance 3 relative à la loi sur le travail (Switzerland), Chapitre 2, Section 3, articles 15, 16, 17, 23 and 24

Workplaces shall be designed following the "Summary of the safety requirements for workplaces" EDMS 1134034.

5.6.1 Safety documents for workplace and accessibility

The workplace Safety documents shall include:

- Design & Engineering file:
  - Drawing and description of the workplace and working areas

5.7 Protection of the environment

5.7.1 General requirements

With regard to protection of the environment CERN Safety Policy states that Organization is committed to ensure the protection of the environment. This can be achieved by ensuring that environmental requirements and guidelines set by the Host State regulations, European Directives, international standards and best practices are implemented in all CERN's facilities and activities susceptible to harm the environment.

CERN facilities, activities shall comply with the relevant provisions contained in the following regulations:

- French Code de l'environnement

- Swiss Loi fédérale sur la protection de l'environnement (Loi sur la protection de l'environnement, LPE).

All facilities and activities susceptible to harm the environment shall use adequate pollution-prevention measures (notably best available techniques), prevention of waste generation and adequate waste management, use energy efficiently, ensure accident prevention and damage limitation in order to achieve a high level of protection of the environment.

5.7.2 Air

Atmospheric emissions shall be limited at the source and shall comply with the relevant provisions of the following regulations:

- French Arrêté du 02 février 1998 relatif aux prélèvements et à la consommation d'eau ainsi qu'aux émissions de toute nature des installations classées pour la protection de l'environnement soumises à autorisation, articles 26, 27, 28, 29, 30
- Swiss Ordonnance sur la protection de l'air (OPair).

The design of exhaust air discharge points shall comply with the requirements of the CERN Safety Guideline C-1-0-3 - Practical guide for users of Local exhaust ventilation (LEV) systems, section 5.1.3.

5.7.3 Water

The project leader shall ensure the rational use of water in his project. Applicable emission limit values for effluent water discharged in the Host States territory are defined in the following regulations:

- French Arrêté du 02 février 1998 relatif aux prélèvements et à la consommation d'eau ainsi qu'aux émissions de toute nature des installations classées pour la protection de l'environnement soumises à autorisation, art. 31 and art.32
- Swiss Ordonnance sur la protection des eaux (OEaux).

For the punctual release of water, a water release request shall be submitted in the CERN Service Portal.

5.7.4 Hazardous substances for the environment

The introduction of hazardous substances for the environment or potentially polluting substances for the environment shall comply with the relevant provisions contained in the following regulations:

- CERN Safety Regulation SR-C- Chemical Agents
- French Code de l'environnement Livre V : Titre II – articles R.521-3 to R.521-54 and Titre IV
- Swiss Ordonnance sur la réduction des risques liés à l'utilisation de substances, de préparations et d'objets particulièrement dangereux (Ordonnance sur la réduction des risques liés aux produits chimiques, ORRChim).

The usage or storage of hazardous substances for the environment or potentially polluting substances for the environment shall comply with the relevant provisions contained in the following regulations:

- CERN SR-C and Safety Guideline C-1-0-1 : Storage of hazardous chemical agents
- French Arrêté du 02 février 1998 relatif aux prélèvements et à la consommation d'eau ainsi qu'aux émissions de toute nature des installations classées pour la protection de l'environnement soumises à autorisation, art. 31 and art.32

5.7.5 Soil

Applicable regulation related to water protection and usage and/or storage of hazardous waste ensure the protection of any damage to soil.

5.7.6 Environment Safety documents

The environment Safety documents shall include:

- Study Phase: -

- Conceptual Design Report (CDR)

- Project Phase:

- Design & Engineering file:

- Construction / Manufacturing file:

  - Ventilation network drawings with extraction points, documentation on air treatment units (if applicable).

- Commissioning file:

- Operations Phase:

  - Results of analysis of air or water emissions.

- Dismantling Phase: refer to ch.5.8

5.8 Worksite

For the work done by contractors, the document "Working on CERN site" EDMS 1155899 shall be notified during the invitation to tender phase (if any).

5.8.1 Safety Coordination

According to the CERN rules, the work/activity done in the “SPS tunnel” for aC Coating and Impedance Reduction is classified as work/activity to be carried out in the framework of a Technical Stop (but not part of a Category 1 worksite).

5.8.1.1 Work/Activity to be carried out in the framework of a Technical Stop

5.8.1.2

Technical Stops are considered to be special operations within a particular organization.
Each Technical Stop is subject to work and Safety coordination - requiring tasks to be scheduled - and to a Work and Safety coordination Plan (WSCP or PCTS) summarizing the main general issues to be followed for and during the technical stop.

The project leader shall contribute to the Safety coordination of the technical stop managing Safety for the work/activity, and:

- Assess the risks/ask the contractor to assess the risks connected with each of the activities carried out and define/ask to define the associated preventive and protective measures, documenting such provisions in writing and forwarding them to the organic unit responsible for the coordination of the Technical Stop;
- Communicate with the organic unit responsible for the coordination of the technical stop to ensure that all the necessary provisions can be made in advance with regard to planning, managing and ensuring the safety of concurrent activities;
- Organizes and minutes common inspections when necessary or requested;
- Take account of and implement any provision requested in the framework of coordination meetings and VICs;

- Ensure that all personnel are informed of Safety requirements and have all the necessary means to meet them.

Each work/activity is subject to an authorization issued by CERN (via Impact system) in order to start.

5.8.2 Training

Depending on the type of activity related to the work, Safety training courses shall be followed by the working personnel.

More details on compulsory Safety training may be found at the web page for Safety Training.

5.8.3 Electricity

5.8.3.1 Electrical worksite installations

Temporary electrical installation and emergency light required in the worksite shall be compliant with the following rules:

- CERN Safety code C1 - Electrical Safety code
- CERN Guide de Sécurité EL-0-0-1 - Installation d'éclairage de Sécurité

They have to be verified by a certified body under the responsibility of the company realizing the works before being fed.

After analysis of the needs (power, type of use, etc.), CERN's Electrical Engineering Service (EN-EL or GS-SE) can supply, upon a justified request made to the CERN technical contact, the necessary power via a general worksite switchboard to which the contractor may connect his own electrical worksite installations, equipped with the appropriate means of protection.

The 400 V, 32 A or 63 A electrical sockets are CE marked and the 230 V and 10 A sockets are Swiss type wall outlets. Contractors can only plug electricity cubicles on these wall outlets, with a protection conforming to CERN rules (see section 5.3).

5.8.3.2 Electrical material

- Safety lamps: they shall be of a professional type with a protected bulb; they shall not be dismountable and shall have a minimum mechanical protection rating of IP 45. They shall comply with EN 60 598 standard
- Extension leads: the use of type H07 ZZ-F cables is compulsory on worksites. In case of Class 1 materials, they shall include a protection conductor
- Electricity cubicles: they shall be installed by the contractor and shall allow power points to be connected without having to open the door of the cubicle, which must remain locked. They shall be fitted with a highly sensitive differential device (30 mA) to protect the circuitry and equipped with an emergency shutdown device. They are to be officially received by CERN

5.8.4 Fire protection

For all activities related to execution works, the respect of the following Swiss Directive in matters of fire protection is recommended:

- Swiss Directive de protection incendie Prévention des incendies et protection incendie organisationnelle, AEAI 12-15

5.8.5 Hot work and welding

Welding activities may be needed in installation phase. The description of this activity shall be included in the Safety documents.

The hot work activity shall comply with the Safety requirements provided in the CERN Safety Code E - Fire protection.

Before starting the hot work activity the project leader shall ensure that:

- Fire permit form, which is available in IMPACT, is filled up and approved
- IS 37 form, which is available in EDH/IMPACT, is filled up and approved
- Any necessary compensatory measures are put in place.

5.8.6 Handling and lifting

The personnel performing the installation works is not allowed to use machines or handling equipment which are not CE marked or approved by the HSE unit.

As far as possible, handling and lifting operations at CERN shall be carried out by authorized and qualified staff from EN/HE group.

The personnel of handling and lifting equipment not belonging to CERN, shall be in possession of:

- French CACES (accepted in principle also in Switzerland) or equivalent
- Swiss Machinist permit (accepted in principle also in France) or equivalent.

The use by other personnel of handling and lifting equipment belonging to CERN is subject to:

- The attendance to the specific training designed for personnel using forklift, crane and for cherry-picker
- A special 'access request' to be formulated on EDH as it follows:

- AC-CE, for fork-lift trucks up to 6 t capacity, except lateral forklift trucks
- AC-CT, for tractors, in particular for the transport of equipment in the tunnel
- AC-N3, for working platforms
- AC-PE, for overhead travelling cranes to lift loads up to 10 t.

The obtained authorisation is valid for 5 years.

Following the manufacturer recommendations, the staff working on personnel lifting equipment could be asked to be trained in 'working in heights'.

Handling and lifting equipment operating in the worksites shall be accompanied by the documentation concerning the periodical maintenance.

5.8.7 Noise

Levels on noise on the worksites shall be compliant with the requirements provided in the:

- Swiss Ordonnance sur la protection contre le bruit (OPB) du 15 décembre 1986, article 6.
- French Décret n° 2006-1099 du 31 août 2006 relatif à la lutte contre les bruits de voisinage.

5.8.8 Protection of the environment

The discharge of water from the worksite into the CERN clean and sewage water networks shall comply with the relevant provisions contained in the ch. 5.7.3.

The project leader shall ensure that the necessary measures are taken for the safe usage and storage of dangerous substances or potentially polluting substances (e.g. paints, diluents, etc.) as mentioned in the ch.5.7.4.

The generation of waste shall be limited at the source. Waste shall be handled from its collection to its recovery or disposal according to the procedures set up by the GS Department (except the radioactive waste, which is managed by the HSE Unit). The following CERN service shall be contacted for conventional and hazardous waste management: Waste Collection and Classification. The traceability of the waste shall be guaranteed at any time.

5.8.9 Accidents and near misses

In the event of an accident or a near miss including pollution during the activities related to the installation work, maintenance, operation or dismantling of the project, the procedure described in the Code A2 shall be applied. An internal report of accidents, available in EDH (https://edh.cern.ch/Document/General/Accident) shall be filled in.

5.8.10 Worksite Safety documents

The worksite Safety documents shall include the following items:

- Work authorization (Impact)
- Works/activity safety documents (e.g. Work and Safety coordination Plan [WSCP or PCTS])
- Specific maintenance Safety procedures and inspection proofs (if applicable)
- Effluent water and waste management plan (if applicable)

Where necessary:

- Fire permit form
- IS37 form
- Noise, air or water measurements