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MQP Procedure

Procedure for Occupational Health and Safety Hazard Identification and Assessment

This document sets up requirements to identify the Occupational Health and Safety risks related to the design of all PBSs systems.

Approval Process			
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Change Log			
Procedure for Occupational Health and Safety Hazard Identification and Assessment (AJLQRF)			
Version	***Latest Status***	***Issue Date***	***Description of Change***
v0.0	In Work	30 Jul 2012	
v1.0	Signed	04 Sep 2012	Enhanced version including: - More detailed responsibilities - Clarification about the Design review implications - Assignment of the role of process owner
v2.0	Signed	20 Feb 2013	including comments from Operations and Quality
v2.1	Signed	06 Mar 2013	Minor changes after QC inputs on template used
v2.2	Approved	03 Oct 2013	version considering some of the proposed changes. Though approach per room might be beneficial, because the process shall be aligned with design reviews, it will stay per PBS. However the cross PBS hazards shall be managed by SQS, in the same way ICD manage interfaces for design reviews purposes.
v3.0	Signed	09 Jan 2014	Consequence descriptors, flow chart, and incorporation of reviewers' comments.
v4.0	Signed	28 Apr 2014	- Comments from HR incorporated - Tolerable risk level introduced - process amended to give priority to iterative exchange between PBS and SQS.
v4.1	Signed	22 Oct 2014	Amending according to HR comments.
v4.2	Approved	22 Oct 2014	Further small amendments
v5.0	Approved	21 Nov 2014	Major Changes related to formerly received comments.
v6.0	Approved	08 Mar 2016	The procedure has been modified to reinforce the responsibility of PBSs to evaluate the occupational safety risks, whereas the current focus had SHS initiate the process and lead it. Accountability for TRO has been enhanced which is the main aim of this modification.

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1 Purpose

Occupational Health and Safety (OHS) risks are amongst the most outstanding for the ITER project. Besides nuclear risks, IO staff and contractors are and will be exposed to a wide range of hazards that may achieve critical levels. Examples of those are, but are not limited to:

- Cryogenic related oxygen deficiency (ODH)
- Hydrogen and explosion risks
- Fire risk
- Circulation of and interaction with heavy plant equipment (trucks, cranes, etc.)
- Electrical hazards (power supplies substations, electrical buildings, maintenance).

This document defines the MQP process to identify the OHS hazards and define the level of risks related to them.

2 Scope

This procedure aims to define the rules and process for risk identification, assessment and implementation of control measures thereto. The outcome of the risk assessment process shall include all risk mitigation measures that remove or reduce the risk through design solutions. This procedure shall be applied at each design stage for each and every systems pertaining to ITER PBSs.

Other types of risk assessment, such as pre-task hazard assessment, and other risk control measures (such as administrative controls and Personal Protective Equipment) will be included: however the main focus is design embedded controls.

Risks related to public and workers exposure to radiological hazards are not included in the scope of this document

3 Definitions and acronyms

Physical Protection

Physical OHS protection is implemented *within system or interfacing systems design*. This is an inherent protection, embedded in the component, assembly or system itself. Examples of this type of safety protections are:

- Safety relief valves
- Anti-two block devices on cranes
- Roll cages on heavy plant equipment
- Hand Rails on elevated work platforms (collective protection)
- Anchor points on elevated work platforms (individual protection)
- Locking systems for maintenance operation avoiding any uncontrolled action when the equipment is being serviced or worked on. (including trapped-key interlock systems)

I&C protection

I&C protection is an instrumented function of ITER that protects / warns personnel against possible immediate risks due to machine or systems failures, malfunctioning (with parameters exceeding pre-established values) or normal hazardous operation. Some examples:

- Oxygen monitoring for the Cryoplant

- Leak detection on pressure equipment
- Circuit breakers
- Warning to alert personnel entering areas where inert gas fire suppression system has been triggered.

HIRA: Hazard Identification and Risk Assessment

SHS: Occupational Health and Security Coordination Division (part of ITER SQS Department)

ISMS: Integrated Safety Management System

MRI : Maximum Reasonable Impact: the largest credible consequence from a risk taking into account the credible scenarios where personnel might be exposed to it

OHS : Occupational Health and Safety

Systems : Except where specified, this refers to Structures, Systems or Components

4 References

Plant Control Design Handbook (ITER_D_27LH2V)

ITER Procedure for Performing Hazard and Operability (2F5L5M)

Investment Protection Working Group Terms of Reference (IDM_D_4695S4)

ITER_D_6LCG7B - Occupational Health and Safety Management Plan

ITER_D_24VQES - Quality Classification Determination

ITER_D_2832CF - Design Review Procedure

5 Responsibilities

PBS responsible officers:

- They are responsible for the performance of HIRA and for the implementation of the current procedures, identifying OHS risks control measures, hence responsible for the delivery of HIRA related to their systems.

SHS division:

- Identifies what is expected from PBS in terms of OHS in the scope of the present procedure (ITER_D_RY8HAF - Template for PBS occupational safety demonstration).
- Overview the HIRA report and review the risk control measures.
- Provide support to PBSs in the elaboration of the report.
- Prompts interfacing PBS in case of cross Plant Breakdown Structure risks impact either by the generation of a combined hazard or through the need for incorporation of mitigation measures by another PBS.

Department Directors:

- Final approval to the HIRA.

Domestic Agencies:

- They shall include HIRA and OHS controls for their systems and in-kind supplies that are consistent with this Procedure for approval during Design reviews.

Other stakeholders whose input shall be considered for the implementation of the HIRA process are:

- **Tokamak Assembly Section / Division TAD:**

- **ITER AOP Human Factors experts:**
- **PBS 48**
- **Area managers.**

6 Flow chart

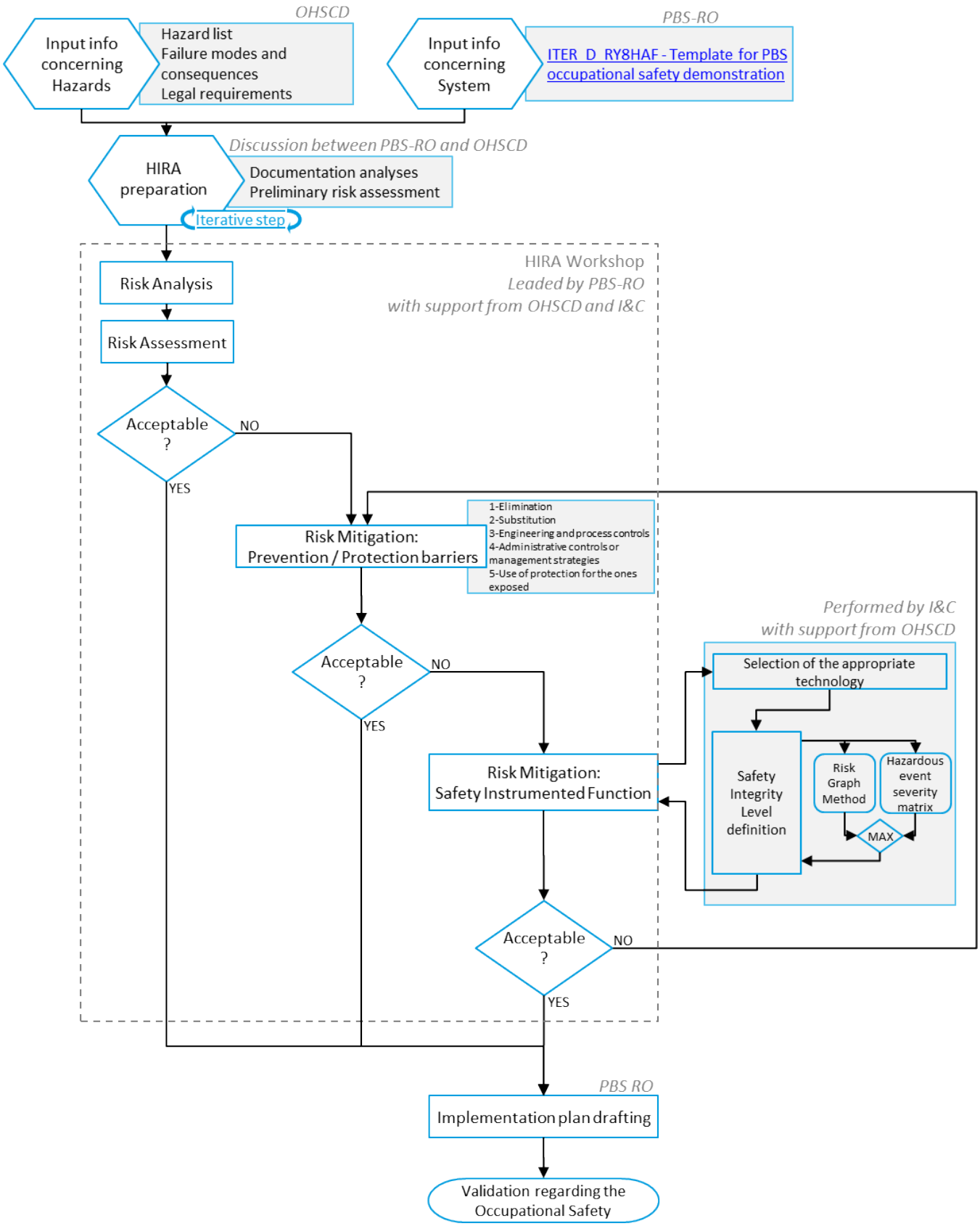

Figure 1: HIRA flow chart

7 Process

The controls for OHS risks and hazards shall be identified as a result of a thorough and comprehensive hazard identification and risk assessment process (HIRA). This shall be formally documented and approved, and shall take into account potential severity of injuries and illnesses as a result of unwanted events during construction and operation of the ITER plants and systems.

Once these controls identified the residual risk shall be re-assessed to evaluate the adequacy of the applied controls.

HIRA is part of the OHS management work cycle as described in Occupational Health and Safety Management Plan (6LCG7B v2.0)

In other words HIRA is a reiterative process that shall need continuous (regular) review

7.1 Preparation

- PBS to make data available to describe the system being analysed (DDD, PFDs, P&IDs and other relevant schematics videos, drawings, CMM, etc.).
    - They shall use the appropriate template (ITER_D_RY8HAF - Template for PBS occupational safety demonstration) to identify all risks and related control measures and fill in a preliminary risk table.
    - SHS to support in identifying applicable legal standard (European directives, French labour code articles and other French texts).
- SHS to review the Preliminary risk table submitted by PBS TRO for comments, amendments, completion.
    - This step might **require several iterations**.

7.2 Validation

The hazard / risk table will be validated within a workshop where all the above mentioned stakeholders will take part in order to provide inputs to the final version. The workshop shall be facilitated by SHS.

7.2.1 Risk scoring

The scoring methodology applies the risk matrix quoted in annex1.

7.2.2 Integration of existing measure and additional controls

All controls that have already been taken into account in the design of the system / plant shall be identified in order to spot those that are paramount to be added. This step is when **I&C function might be listed (if already existing) or further defined**.

The following hierarchy shall be applied in the process of identifying risk mitigating measures:

1. Elimination - the risk is controlled by eliminating the hazard
2. Substitution – a change to the process to use or produce a less hazardous consequence
3. Engineering and process controls (Examples: obstacles preventing personnel to reach zones where they are exposed to hazards, noise adsorbed on equipment, anti-two-block devices on cranes.)
4. Administrative controls or management strategies (e.g. procedures)
5. The use of protection for the ones exposed (e.g. personal protective equipment).

Elimination must be the first control method to be considered and any reasons why this is not being adopted must be documented.

7.3 Action management

Identified control measures as identified from the risk assessment process shall be implemented under the responsibility of the PBS Responsible Officer. The design requirements identified shall be included in design documents.

7.4 HIRA review

The HIRA process shall be reviewed during the preparation for each design review stage. HIRA shall also be a part of the input package for design reviews, whatever the stage (conceptual, preliminary, final).

7.5 HIRA planning

The process shall be associated with design reviews and the outcome of HIRA evaluations shall be included as a deliverable for design reviews from conceptual to final.

8 Forms, templates and records

The final version of the HIRA report will be extracted from an Access data base that will be managed by SHS where all information from the risk assessment table will be uploaded. This pdf file will be sent to the PBS TRO for upload in a dedicated location within the PBS IDM folders.

Annex 1

The scoring to qualify a certain risk shall apply the following risk matrix:

Likelihood	**Consequence**				
	Minor *First aid treatment*	**Medium** *Reversible health effect / Medical treatment*	**Serious** *Severe reversible effect / Lost time injury*	**Major** *Irreversible health effects / fatality*	**Catastrophic** *Multiple fatalities*
Almost certain *More than 1/y*	Moderate	High	Critical	Critical	Critical
Likely **Between** *1/y and 1/10y*	Moderate	High	High	Critical	Critical
Possible *Between 10/y and 1/30y*	Low	Moderate	High	Critical	Critical
Unlikely *Between 1/30y and 1/100y*	Low	Low	Moderate	High	Critical
Rare *Less than 1/100y*	Low	Low	Moderate	High	High

Table 1: Risk matrix

The tolerable risk level shall be identified as follows:

- Risks associated with consequences up to 3: the objective shall be to achieve a global Moderate risk rating.
- Risks whose consequences cannot be decreased below 3: the objective shall be to achieve a global High risk rating. However this shall be complemented through the implementation of robust administrative procedures and protocols to offset the impossibility of consequence decrease (thus reducing likelihood as much as possible).

The following definitions apply:

- Consequence: impact of a certain hazard on any person's Health and Safety. For any given hazard the scoring shall take into account the Maximum Reasonable Impact (MRI): this is the largest credible consequence from a risk taking into account the credible scenarios where personnel might be exposed to it.
- Likelihood: description of the inherent probability of a certain consequence to occur.

The following pages include a list of descriptors for consequences and likelihood.

Consequence	Minor	Medium	Serious	Major	Catastrophic
Health	Reversible health effects of little concern, requiring first aid treatment at most. Examples: minor irritations of eyes, nose and or skin, or minor muscular discomfort	Reversible health effects that would result in medical treatment. Examples: temperature effects; medicament being taken for travel effects; stress induced back-pain; sunburn.	Severe, reversible health effects that would result in a lost time illness. Example: acute / short-term effects from extreme temperatures; muscular-skeletal effects; vibration effects; infectious diseases from contaminated water	Single fatality or irreversible health effects or disabling illness. Examples: effects of suspected carcinogens, mutagens, teratogens and reproductive toxicants, chronic noise induced hearing loss or a short-term high-risk effects,	Multiple fatalities or serious disabling illness to multiple people. Examples: extended effects known human carcinogens, mutagens, teratogens and reproductive toxicants, and life threatening respiratory sensitization
Safety	Typically a first aid and no medical (specialist) treatment.	Typically a medical treatment.	Typically a lost time injury.	Single fatality and/or severe irreversible damage or severe impairment to one or more persons. Example: amputation	Multiple fatalities or permanent damage to multiple people.

Table 2: Consequence descriptors

Table 3: likelihood descriptors

Likelihood	Frequency
Almost Certain	Occurs more than 1/y
Likely	Between 1/y and 1/10y
Possible	Between 1/10y and 1/30y
Unlikely	Between 1/30y and $1/10^2$y
Rare	Less than $1/10^2$y

The resulting risk scoring will be as follows:

Rating		Definition	Scoring description	Action	Quality Class
IV	***Critical***	*High probability of event occurring with potential for significant harm to people*	*Risks that significantly exceed the risk acceptance threshold and need urgent and immediate attention.*	Identify and implement Controls to reduce risk ***before going to next design review.*** Controls cannot be limited to administrative solutions.	*1, 2 or 3*
III	***High***	*High probability of event occurring with potential for harm to people*	*Risks that exceed the risk acceptance threshold and require proactive management review. Includes risks for which proactive actions have been taken, but further risk reduction is impracticable.*	Design can go to next phase if ***prior to in-kind procurement stage.*** Controls cannot be limited to administrative solutions.	*1, 2 or 3*
II	***Moderate***	*High probability of event occurring with a low consequence of harm to* ***Or*** *Low probability of event occurring with a high consequence of harm to people*	*Risks that lie on the risk acceptance threshold and require active monitoring and implementation of risk reduction as practicable*	Identify and implement controls but ***no hold point in the design process***. Administrative controls are acceptable if it is possible to prove that physical mitigation solutions are not practicable.	*2, 3 or 4*
I	***Low***	*Low probability of event occurring with a low consequence of harm to people*	*Risks that are below the risk acceptance threshold and require management in line with existing priorities.*	Control measures may be limited to administrative solutions.	*3 or 4*

The following shall be taken into account when using the ITER risk matrix during the risk evaluations:

- The choice between likelihood / consequence level shall be driven by the experience of participants to the OHS RA, similar projects (e.g. JET) records, industrial data, and other relevant sources.
- The figures in the descriptors are not 100% exact and can trigger discussion. When different opinions are faced during the scoring process, the HSCD Representative shall make the final decision