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**MQP Level 3**

# MQP L3 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 thedesign of all PBSs systems.

| *Approval Process* | | | |
|---|---|---|---|
| | *Name* | *Action* | *Job Title / Affiliation* |
| *Author* | **Regad M.** | **10 Oct 2025:signed** | **Occupational Health & Safety Office...** |
| *Co-Authors* | | | |
| *Reviewers* | **Lebourgeois T.**<br>**O'Connor N.** | **14 Oct 2025:recommended**<br>**10 Oct 2025:recommended** | **Design Control Coordinating Officer**<br>**Quality Coordinator** |
| *Approver* | **Peaucelle X.** | **20 Oct 2025:approved** | **Section Leader** |
| *Information Protection Level: Non-Public - Unclassified*<br>*RO: O'Connor Noel* | | | |
| *Read Access* | **GG: MAC Members and Experts, AD: ITER, AD: External Collaborators, AD: External Management Advisory Board, AD: Nuclear Safety Inspectors, AD: OBS - Quality Management Division (QMD), AD: DA, AD: Auditors, AD: ITER Management Assessor, project administrator, RO, GG: TBM Project Team, GG: TBM_IM_Teams...** | | |

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| *Change Log* | | | |
|---|---|---|---|
| **MQP L3 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:<br>- More detailed responsibilities<br>- Clarification about the Design review implications<br>- 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.<br>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<br>- Tolerable risk level introduced<br>- 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. |
| v6.1 | Approved | 08 Oct 2025 | Updated text to align with new Iter organization and editorial amendments to text. The process itself has not been changed. As this process applies to design process, the review has been limited to the design process representative. Attached Tracked changes version of document. |

# Table of Contents

# 1 Purpose

The purpose of this document, recorded within the ITER Management and Quality Program (MQP), is to describe the workflow

- to identify potential Occupational Health and Safety (OHS) hazards
- to identify, assess and mitigate risks
- to perform necessary controls.

The main outcome of a successfully driven Hazards Identification and Risk Assessment (HIRA) process is that design solutions provide necessary risk mitigation measures to either remove or reduce identified risks of OHS hazards.

# 2 Scope

This Level-3 MQP work instruction shall be used by all IO and DA resources involved in ITER design activities, especially those listed in Section **Error! Reference source not found.**, and applies to each design stage for all Structures, Systems and Components pertaining to ITER Plant Breakdown Structure (PBS).

The focus in this document is on design embedded controls. However, other types of risk assessment, such as pre-task hazard assessment, administrative controls and Personal Protective Equipment (PPE) are included within the HIRA process. Therefore, are within the scope of this document a wide range of hazards to which IO staff members and contractors may, are and will be exposed to, such as:

- Cryogenic related oxygen deficiency (ODH)
- Explosive atmosphere (ATEX)
- Laser systems
- Circulation of and interaction with heavy plant equipment (trucks, cranes, etc.)
- Electrical hazards (power supplies substations, electrical buildings, maintenance).

The IO OHS team maintains a more exhaustive OHS Hazard List [10].

Are excluded from the scope of this document:

- Risks related to public and workers' exposure to radiological hazards that are described in a dedicated document [16].
- Corporate risks that are descried in a dedicated document [11].

# 3 General Principles

This document is maintained in the frame of MQP OHS process. HIRA process is part of the OHS management work cycle as described in MQP L2 Occupational Health and Safety Overall Procedure [03].

HIRA process is aligned with the principles described in:

- MQP L0 ITER Policy on Safety, Security, Quality and Environment Protection [11]
- MQP L1 ITER Integrated Safety, Environment and Security Management System (ISMS) Manual [12]

Moreover, this MQP L3 HIRA work instruction shall be used in conjunction with:

- MQP L2 Procedure for CAD Work Planning, Specification and Control [13]
- MQP L2 Design Input Control Procedure [14]
- MQP L3 Identification of OHS Requirements related to Design [09]
- MQP L3 Product and Geographical Breakdown Structures Management Procedure [15]
- Quality Classification Determination [04]

# 4 Flow chart

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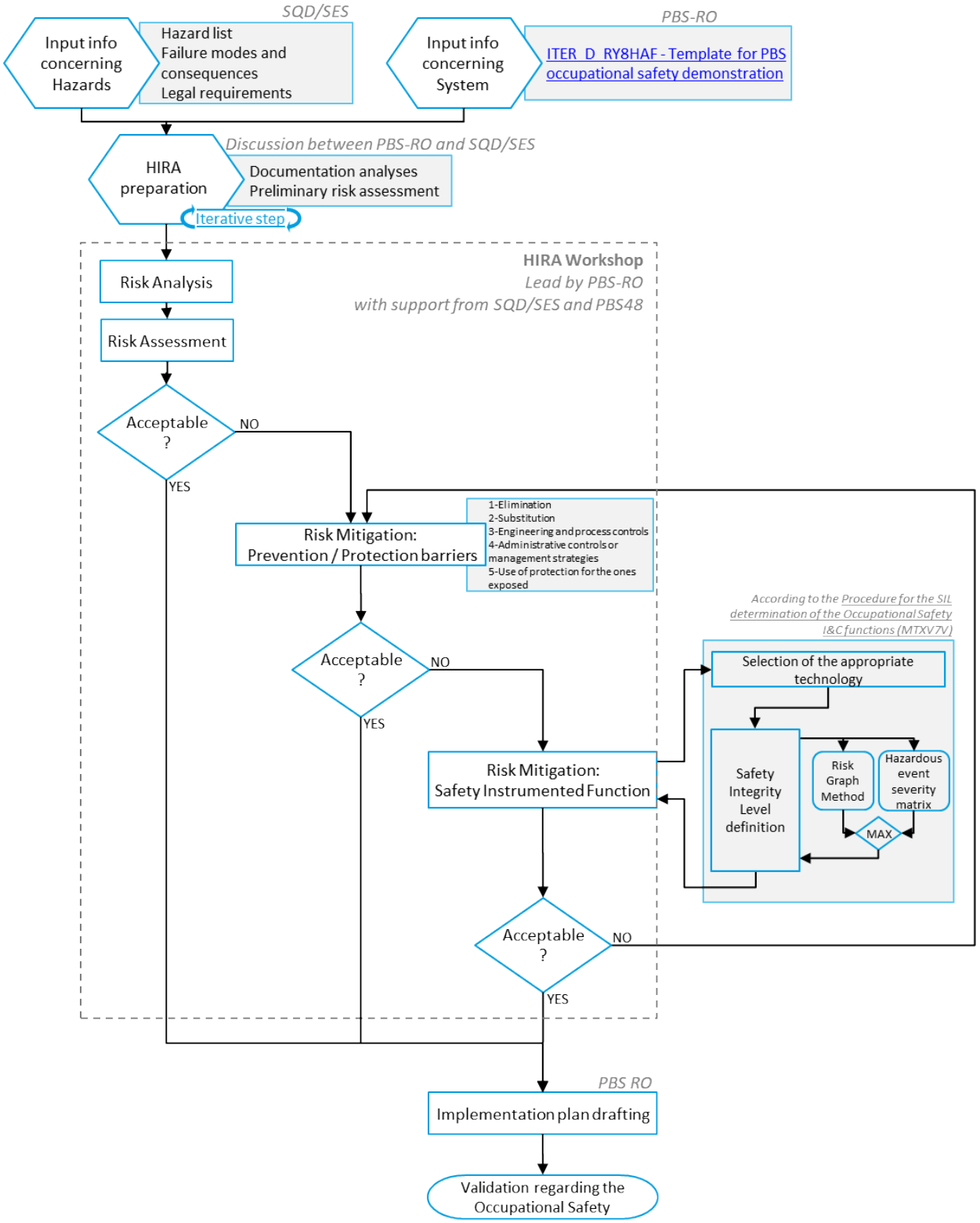


**Figure 1: HIRA flow chart**

# 5 Workflow

As illustrated in the Figure 1 above, HIRA is an iterative process that may require several successive review cycles.

First, 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);
- 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 have been identified, residual risks shall be re-assessed to evaluate the adequacy of the planned controls.

## 5.1 Preparation

- PBS-RO shall make data available to describe the system being analysed (DDD, PFDs, P&IDs and other relevant schematics videos, drawings, CMM, etc.).
    a) They shall use the appropriate template [06] to identify all risks and related control measures and fill in a preliminary risk table.
    b) HAZOP studies prepared in compliance with [02] are valuable inputs.
    c) SQD/SES shall support in identifying applicable legal requirements (European directives, French labour code articles and other French texts) as per [09].
- SQD/SES shall review the Preliminary risk table submitted by PBS-RO for comments, amendments, completion.
    d) This step **may require several iterations**.

## 5.2 Validation

The hazard / risk table shall be validated within a workshop where all the above-mentioned stakeholders shall have been invited in order to provide inputs to the final HIRA report. The workshop shall be facilitated by SQD/SES.

### *5.2.1 Risk scoring*

The scoring methodology applies the risk matrix quoted in annex1.

### *5.2.2 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.

### *5.2.3 Documentation / Records*

The final version of the HIRA report will be extracted from the Access database that is managed by SQD/SES where all information from the risk assessment tables will be uploaded. The HIRA report will be sent to the PBS RO for upload in a dedicated location within the PBS IDM folders. SQD/SES centralize links (shortcuts) to these reports in RGNMPZ.

## 5.3 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.

## 5.4 HIRA review

The HIRA process shall be reviewed during the preparation for each design review stage (as defined in [05]). HIRA shall be a part of the input package for design reviews, whatever the stage (conceptual, preliminary, final).

## 5.5 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.

# 6 Responsibilities

**PBS responsible officers:**

- Shall ensure that HIRA workflow is acknowledged and implemented by all members of their design team(s) so that OHS risks and control measures are identified.
- Shall ensure the delivery of HIRA related to their Structures, Systems and/or Components.

**SQD/SES:**

- Shall facilitate the collection of inputs from PBSs through PBS occupational safety demonstration [06].
- Should overview HIRA reports and review planned risk control measures.
- Shall provide support to PBSs in the elaboration of their HIRA reports.
- Shall liaise with interfacing PBS(s) in case of cross-PBS risks
    e) either due to a risk of a combined hazard
    f) or through the need to incorporate mitigation measures by another PBS.

**Project Leaders**:

- Shall formally approve the HIRA reports in accordance with Sign-Off Authority (SOA) for Project Documents [07].

**Domestic Agencies (DA):**

- Shall include HIRA and OHS controls for their Structures, Systems, Components at Design reviews.

Inputs of the following shareholders shall be considered during the HIRA process:

- **Transverse function officers** [08], notably TF-H, TF-M and TF-N.
- **PBS 48** – Central Safety System, notably as expert of requirements as defined in the Plant Control Design Handbook [01]

# 7 Interactions with other processes

## 7.1 Link with Design process

The Hazards Identification and Risk Assessment (HIRA) is an input to the Design Process.

# 8 Abbreviations, Acronyms and Definitions

| Term | Acronym | Definition |
|---|---|---|
| **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:<br>- Safety relief valves<br>- Anti-two block devices on cranes<br>- Roll cages on heavy plant equipment<br>- Hand Rails on elevated work platforms (collective protection)<br>- Anchor points on elevated work platforms (individual protection)<br>- 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:<br>- Oxygen monitoring for the Cryoplant<br>- Door locking until Safe State For Access (SSFA) is obtained<br>- Stop of system upon detection of enclosure opening. |
| Hazard Identification and Risk Assessment | **HIRA** | |

| | | |
|---|---|---|
| Security, Environment and Safety Section | **SES** | Security and Safety Section (part of the ITER Safety & Quality Department) |
| Integrated Safety Management System | **ISMS** | |
| Maximum Reasonable Impact | **MRI** | The largest credible consequence from a risk taking into account the credible scenarios where personnel might be exposed to it |
| Occupational Health and Safety | **OHS** | |
| | **Systems** | Except where specified, this refers to Structures, Systems or Components |

# 9 References

[01] Plant Control Design Handbook (27LH2V)
[02] MQP L3 ITER Procedure for Performing Hazard and Operability (2F5L5M)
[03] MQP L2 Occupational Health and Safety Overall Procedure (6LCG7B)
[04] Quality Classification Determination (24VQES)
[05] MQP L3 Design Review Procedure (2832CF)
[06] Template for PBS occupational safety demonstration (RY8HAF)
[07] MQP L2 Sign-Off Authority (SOA) for Project Documents (2EXFXU)
[08] Transverse Functions Management Process (ADJV67)
[09] MQP L3 Identification of Occupational Health & Safety Requirements related to Design (TME48W)
[10] OHS Hazard List (SEBK7V)
[11] MQP L0 ITER Policy on Safety, Security, Quality and Environment Protection (43UJN7)
[12] MQP L1 ITER Integrated Safety, Environment and Security Management System (ISMS) Manual (4HCWJU)
[13] MQP L2 Procedure for CAD Work Planning, Specification and Control (U34884)
[14] MQP L2 Design Input Control Procedure (U34CSG)
[15] MQP L3 Product and Geographical Breakdown Structures Management Procedure (UXM79P)
[16] MQP L2 Radiation Safety Management Procedure (8S9U24)
[17] MQP L2 Risk and Opportunity Management Procedure (22F4LE)

# Annex 1: Risk Matrix for Risk Scoring

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.

**Table 2: Consequence descriptors**

| Consequence | Minor | Medium | Serious | Major | Catastrophic |
|---|---|---|---|---|---|
| **Health** | Reversible health effects of little concern, requiring first aid treatment at most.<br>Examples: minor irritations of eyes, nose and or skin, or minor muscular discomfort | Reversible health effects that would result in medical treatment.<br>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.<br>Example: acute / short-term effects from extreme temperatures;<br>muscular-skeletal effects; vibration effects; infectious diseases from contaminated water | Single fatality or irreversible health effects or disabling illness.<br>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.<br>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.<br>Example: amputation | Multiple fatalities or permanent damage to multiple people. |

**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<br>Controls to reduce risk ***before going to next design review.***<br><br>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.***<br><br>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***<br>*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***.<br><br>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 SQD/SES Representative shall make the final decision.