Pr8187 - Safety in Design Procedure

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References	Refer to Section 3 of this document

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Pr8187 - Safety in Design Procedure

1. Purpose

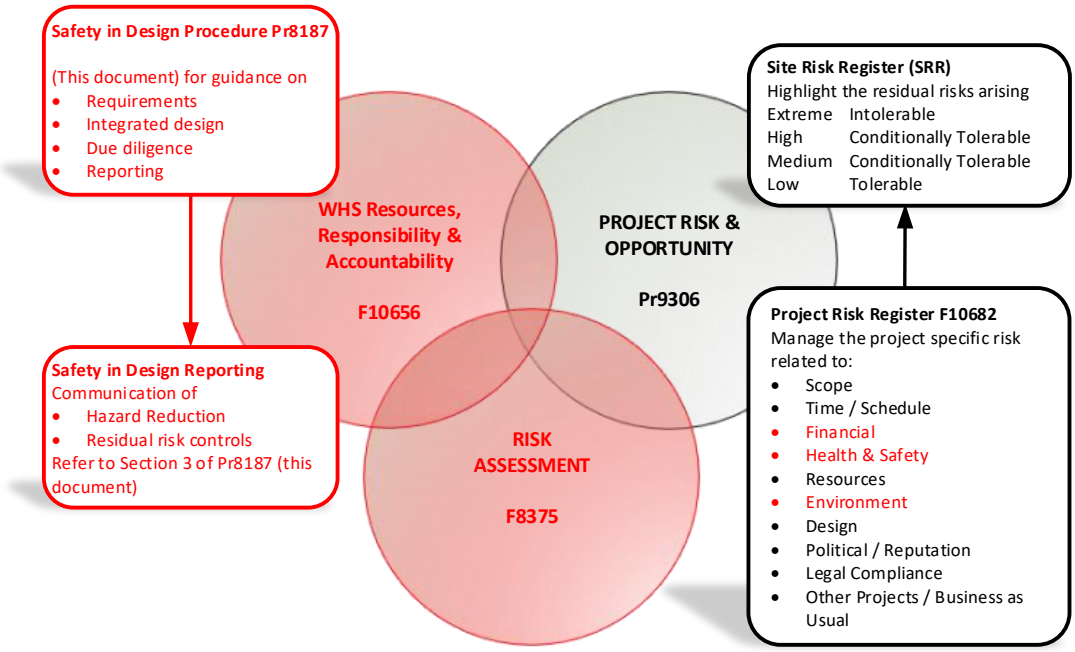
This Procedure outlines the framework pertaining to Safety in Design (SID) principles and techniques applied during the delivery phases of all Unitywater projects.

This Procedure has been developed to assist Contractors and Unitywater persons with the continuous improvement of all SID processes, by:

- A more integrative approach to SID, as depicted in **Figure 1** below. For guidance on implementation of early hazard prevention strategies for design, i.e. finally towards more efficient SID delivery.
- To meet the minimum regulatory obligations relating to safe design, in terms of the given Unitywater WUC requirements. For guidance on the selection of appropriate design review techniques, towards more effective SID delivery.

NOTE This Procedure reflects Unitywater's minimum expectations and any additional SID processes, which may be required by local legislation or practice, must also be complied with.

Figure 1: Integrated application of Safety in Design



2. Scope

This procedure shall apply to works to be constructed by contract, sub-contract or direct labour.

This procedure shall apply to works being constructed directly for Unitywater or other authority or for an owner/developer who will hand over the ownership of the constructed works to Unitywater or who will retain ownership.

This procedure shall be read in conjunction with the reporting templates and the SID Guidelines (Pr10883).

3. References

3.1 General

SID processes must fulfil the requirements of statutory Local, State and Commonwealth Authorities and current applicable Australian Standards. Alternatively, where no Australian Standard exists, work must conform to the most current and applicable International Standard.

If the requirements of this Specification do not comply with the minimum requirements of the statutory regulations and standards, the Statutory regulations and standards shall apply. If the requirements of this Specification are more exacting than the minimum requirements of the statutory regulations and standards, this Specification shall apply.

The Contractor must not deviate from the provisions of the relevant standard without first obtaining agreement in writing from Unitywater.

All Contractors have an obligation to comply with all relevant legislation and regulations. As a minimum the following legislation and related regulations shall apply:

3.2 Applicable Legislation and Regulation

The following legislation and related regulation shall apply:

a. *Work Health and Safety Act 2011* (Qld)
b. *Work Health and Safety Regulation 2011* (Qld)
c. *Water Supply (Safety and Reliability) Act 2008* (Qld)
d. *Environmental Protection Act 1994* (Qld):
    - *Environmental Protection (Air) Policy 2019*
    - *Environmental Protection (Noise) Policy 2019*
    - *Environmental Protection (Water and Wetland Biodiversity) Policy 2019*
e. *Environmental Protection Regulation 2019* (Qld)
f. *Building Act 1975* (Qld)
g. *Building Fire Safety Regulation 2008* (Qld)
h. *Electrical Safety Act 2002* (Qld)
i. *Electrical Safety Regulation 2013* (Qld)
j. *Fire and Emergency Services Act 1990* (Qld)
k. *Professional Engineers Act 2002* (Qld).

3.3 Codes of Practice

- National Construction Code (NCC) and The Guide 2022
- Queensland Electrical Safety Code of Practice 2021 - Managing electrical risks in the workplace
- Queensland Electrical Safety Code of Practice 2020 - Working near overhead and underground electric lines
- Queensland Electrical Safety Code of Practice 2020 – Works.

Other Queensland Work Health and Safety related Codes of Practices for design, build, maintain and demolition requirements:

- Abrasive blasting Code of Practice 2021
- Concrete pumping Code of Practice 2019
- Confined spaces Code of Practice 2021
- Demolition work Code of Practice 2021
- Excavation work Code of Practice 2021
- First aid in the workplace Code of Practice 2021
- Formwork Code of Practice 2021
- Hazardous manual tasks Code of Practice 2021
- How to manage and control asbestos in the workplace Code of Practice 2021
- How to manage work health and safety risks Code of Practice 2021
- How to safely remove asbestos Code of Practice 2021
- Labelling of workplace hazardous chemicals Code of Practice 2021
- Managing noise and preventing hearing loss at work Code of Practice 2021
- Managing risks of hazardous chemicals in the workplace Code of Practice 2021
- Managing risks of plant in the workplace Code of Practice 2021
- Managing the risk of falls at workplaces Code of Practice 2021
- Managing the work environment and facilities Code of Practice 2021
- Mobile crane Code of Practice 2024
- Safe design of structures Code of Practice 2021
- Scaffolding Code of Practice 2021
- Steel construction Code of Practice 2004
- Tilt-up and pre-cast construction Code of Practice 2003
- Tower crane Code of Practice 2017
- Traffic management for construction or maintenance work Code of Practice 2008
- Welding processes Code of Practice 2021.

3.4 International and Australian Standards

Table 1: Legislation and Regulations

Standard	Title
AS 31000	Risk Management - Principles and Guidelines
AS 4024	Safety of Machinery
AS 4801	Occupational Health and Safety Management Systems
AS 61508	Functional safety of electrical/electronic/programmable electronic safety-related systems
AS IEC 61511	Functional safety - safety instrumented systems for the process industry sector
AS IEC 61882	Hazards and Operability (HAZOP) studies

3.5 Unitywater Reference Documents

Table 2: Unitywater Reference Documents

Item	Title
Pr10883	Safety in Design Guidelines
Pr9743	Electrical Safety Procedure
Pr10973	Working Around Switchboards Guide
Pr9306	Risk Management Procedure
Pr8202	Incident Reporting and Notification Procedure
Pr9744	Contractor Management (Safety) Procedure
Pr10331	Capital Construction - Deliver Capital Works Procedure
Pr8182	Isolation - Lock Out Tag Out (LOTO) Procedure
Pr11057	CIPM - Capital Infrastructure Project Manual
Pr10876	Threat and Vulnerability Management Standard
Pr10881	Plant and Fleet - Asset Management Manual
F11016	Unitywater HAZID electronic recording template
F11017	Unitywater HAZOP electronic recording template
F11018	Unitywater CHAZOP electronic recording template
F11019	Unitywater CHAIR electronic recording template
Pr10731	Risk Assessment and Scoring Criteria Tool
F10682	Risk Register Template
BP8044	Risk Management Policy
F10844	Operational Readiness Checklist

4. Definitions/Abbreviations

Table 3: Definitions / Abbreviations

Term	Meaning
ALARP	As Low As Reasonably Practicable
AS	Australian Standard
CHAIR	Construction Hazard Assessment Implication Review **CHAIR1** - is performed at the conceptual stage of a design, which is the best opportunity to make fundamental change, even though much of the design is still to be determined. **CHAIR2** - focuses on construction and demolition issues and is performed just prior to construction, when the full detailed design is known. **CHAIR3** - focuses on maintenance and repair issues and is performed at the same time as the CHAIR 2 study.
CHAZOP	Control/Computer HAZOP studies
C&I	Control and Instrumentation
CIP	Capital Investment Plan
CMP	Construction Management Plan
D&C	Design and Construct
EI&C	Electrical, Instrumentation & Control Systems
FR	Feasibility Report
FS	Functional Specification
GA	General Arrangement drawing (equipment)
HAZID	Hazard Identification
HAZOP	Hazard and Operability Studies
MCPS	Minor Capital Project submission
OR&ES	Operational Renewals and Enhancement submission
ORR	Operational Risk Register – Unitywater template F10682 or equivalent, includes: • Sewage Treatment Risk Management Register (STRMR), or • Network Management Risk Register, Safety (NMRRS)
P&ID	Piping and Instrumentation Diagram
PCBU	Person conducting a Business or Undertaking
PCN	Process Control Narrative
PFD	Process Flow Diagram
PM	Project Manager
PRR	Project Risk Register represented by the F10682 template
QLD	Queensland
RA	Risk Assessment
SDR	Supplier Data Register
SDS	Safety Data Sheet (chemical)
SFAIRP	So far as is reasonably practicable

Term	Meaning
SID	Safety in Design
SDRL	Supplier Data Requirements List
SLD	Single line diagram
SMP	Safety Management Plan
SOW	Scope of work
SOP	Standard Operating Procedure
STEP	Site Access, Tenure, Environment and Planning
STP	Sewage Treatment Plant
UW	Unitywater
WHS	Workplace Health & Safety
WUC	Work under the contract

5. Recordkeeping

The table below identifies the types of records relating to this documented process and their storage location:

Type of Record	Storage Location
Risk registers (PRR, ORR), Safety in Design Report, hazard studies using HAZID, HAZOP, CHAZOP, CHAIR recording templates.	Within relevant project folder in Objective

6. The Safety in Design Methodology

Currently, the timing of the SID process is not well defined and is often left until the design is almost complete, before conducting the review session (so-called HAZOP etc.) resulting in many things to belatedly require fixing in the design. The purpose of this procedure is to improve the efficiency and effectiveness of the SID practice.

Pr8202 - Incident Reporting and Notification Procedure, emphasises:

- EARLY INTERVENTION: The aim of SID is to ensure the health and safety of persons who may have interactions with the infrastructure being designed by considering hazards as early as possible in the planning and design approach.
- ALL AFFECTED PARTIES: SID practices take into consideration the safety of all persons who may interact with the infrastructure being designed. This includes those who construct, operate, clean, maintain and demolish the infrastructure.
- LIFECYCLE: SID involves successfully balancing a wide set of design objectives (i.e. practicality, aesthetics, cost, functionality), without compromising the health and safety of those persons potentially affected by the infrastructure over its life.

6.1 The Unitywater Safety in Design Framework

The SID functional flowchart, depicted in Appendix A of this Procedure, outlines the extent and boundaries of the SID application at Unitywater.

6.1.1 Requirements

Unitywater in conjunction with any likely outsourced planning function(s), start the process off with a well-structured internal scoping of the prospective project – making sure to identify and highlight critical hazards and potential flaws that may have a major design impact on a project, giving due consideration to the Unitywater Gateway Decision Process for Capital Works.

- Gate 1 – Project Creation: Permission for the project to be created and enter the CIP:
    - Stakeholder identification and engagement pertaining to download the associated operational risk register (ORR) and establish the initial project risk register (PRR) to inform amongst other, the Safety in Design requirements.
- Gate 2 – Project Justification: Permission for the project to proceed from planning and solution identification to detailed design and delivery:
    i. Review initial PRR after Gate 1
    ii. Assess/options evaluation – identify risks with each option
    iii. Identify project Scope that can be delivered with minimal risk – Lock in preferred options, include risk assessment.

    NOTE whilst every endeavour has been made to refer to critical Safety in Design tools, this procedure should not restrict the Facilitator from engaging another appropriate Safety in Design tool.
- Gate 3 – Pre-market submission: Permission to approach the market with an agreed procurement and delivery strategy:
    - Handover project / program to Infrastructure Delivery.
    - Hazards raised during planning and recorded in the project risk register template, F10682 is communicated in Project Documentation.
- Gate 4 – Post Market Submission: approval of contracts to engage the preferred supplier:
    - SID track record of Contractor.
- Gate 5 – Project Closure and Review:
    - Unitywater PM making sure residual project risks i.e. Admin Controls and outstanding medium or higher risks are uploaded to the pertinent ORR.

6.1.2 Integrated Design

Safety consideration during design development – NOTE: In the process of designing projects, it will not always be possible to clearly delineate who has responsibility, and in which circumstances, for the elimination or minimisation of hazards associated with the project. The duties may be concurrent and overlapping.

In practical terms, success in the delivery of SID, strongly depends on whether:

- it forms a key part of the Contractor's SMP for the project.
- is integrated with all the Contractor's design processes (including outsourced 3rd party and/or vendor design activities).
- is fully implemented on the project, with identified risk prevention actions satisfactorily addressed and reported on in the final report – Refer Section 8 of this Procedure.

6.1.3 Due diligence

The emphasis is on the corporate governance responsibilities. Designers must show that they have taken reasonable steps to address all the credible hazards associated with the design.

The tab colours legend for the electronic hazard studies templates/spreadsheets – F11016 - HAZID template; F11017 - HAZOP template; F11018 - CHAZOP template; and F11019 - CHAIR template are:

- Red - Introductory pages, which must be filled out by the Contractor in collaboration with the designer, prior to the SID workshop and not altered during the workshop.
- Green - Working pages or node sheets, which are to be used during the workshop.
- Blue - Closure pages, which are to be used by the Contractor, after the workshop, once agreed actions have been implemented and closed.
- Grey - Template sheets. These sheets are not to be altered at any time (with the exception of the guidewords set to be adjusted only if necessary, prior to the workshop) as the overall spreadsheet functionality is dependent on these.

6.1.4 Reporting

The outcomes from the SID (Hazard studies) sessions conducted are recorded in the relevant Unitywater electronic templates:

- F11016 - HAZID template
- F11017 - HAZOP template
- F11018 - CHAZOP template
- F11019 - CHAIR template.

Section 8 of this Procedure describes the specific format and typical topics that the Contractor must cover in the SID Report to be submitted to Unitywater, for acceptance at the specified design milestones, as nominated in the project documentation.

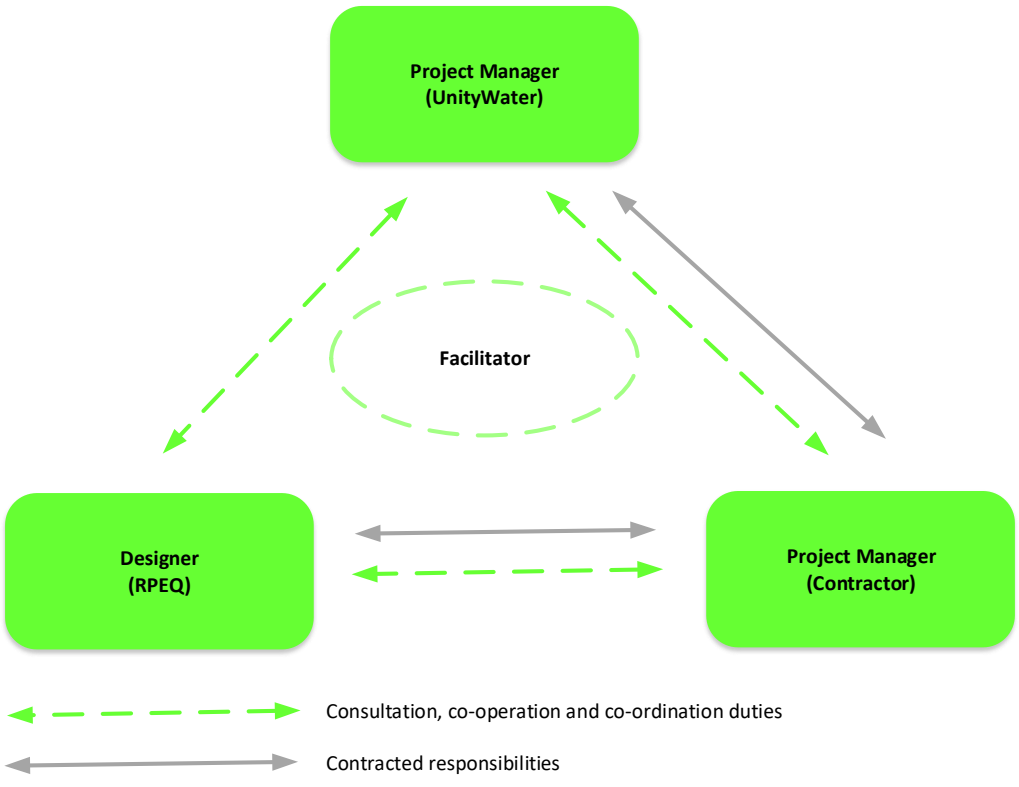
The outcomes of the associated project risk workshops are recorded in the designated project risk register (PRR, template F10682), provided with the tender documents, which entail:

1. The respective Unitywater Planning Group is responsible for pre-populating the register with project specific risks, nominated at Gates 1 and 2.
2. The Contractor must schedule and conduct project risk workshop(s) as required during Gates 3 and 4. The up to date PRR must be submitted to Unitywater on request.
3. The Unitywater PM is finally responsible for uploading of the residual risk items into the pertinent ORR, at Gate 5.

6.2 Roles and Responsibilities

Roles and responsibilities, from a SID perspective, can be complex and it should be noted that "some design tasks, although related, may be controlled by different parties due to the contractual arrangements. In a design and construct or collaborative project delivery model, the primary collaboration will be between the Unitywater PM and the Contractor PM, with participation of the Designer subject to the terms of their engagement", as depicted in **Figure 2** below.

Figure 2: This Model May Apply Where Design And Construction Activities Are Integrated



The following table highlights the key roles engaged and corresponding responsibilities for safe design outcomes from the delivery of Unitywater projects.

Table 4: Key Roles

Person with Control	Responsibility for achieving safe design outcomes
Project Manager	An appropriately qualified person who has been assigned the responsibility to manage a fixed asset design or modification on behalf of (i) Unitywater or (ii) the Contractor respectively. The PM is the single point of contact, typically responsible for: • Ensuring compliance with this procedure for their project. • Ensuring all actions are adequately completed. • Selecting suitably qualified facilitators for hazard studies. • Lessons learned are communicated to Unitywater stakeholders.
Designer	A person who conducts a business or undertaking (PCBU) whose profession, trade or business involves: (i) Preparing sketches, plans, drawings, documents, directions, or advice (verbal or written) for infrastructure, facility or equipment including variations to existing infrastructures, facilities and equipment. (ii) Making decisions for incorporation into a design that may affect the health and safety of persons who construct, use or carry out other activities in relation to the structure. Note that a person conducting a business or undertaking who alters a design without consulting the original designer will assume the duties of a designer. Any changes to the design of a structure may affect the health and safety of those who work on or use the structure and must be considered by the person altering or modifying a design. Workplace Health & Safety Qld, Safe design of structures, Code of Practice [2021] and *Work Health & Safety Act* 2011 Section 22.
Contractor	The Contractor has duties to confirm that the construction work is planned and managed in a way that eliminates or minimises health and safety risks so far as is reasonably practicable. The Contractor may also be a designer if they undertake design work or if they alter or modify a design without consultation with the original designer. Design changes must also be certified by RPEQ and the Contractor must confirm, in the SID Report, that any changes they make to the design does not create additional risks to health and safety.

Person with Control	Responsibility for achieving safe design outcomes
Facilitator and Scribe (workshop)	The workshop is performed by a group of people who are involved in the design and construction of the project, the composition of the team being dependent on the scope and nature of the design under review – Refer Appendix B of this Procedure, for a Resources Map for different SID workshops. Note that the success of the workshop is strongly dependent upon the ability of a facilitator to select and use the experience and expertise of the study team to critically evaluate the design. It is recommended that the facilitator should have the following attributes: • Facilitator must have an engineering qualification relevant to the project scope. • Facilitator must be independent and not involved or connected with the design of the specific project, in any way. • An understanding of the principles of SID and construction with, as a minimum, a broad understanding of the project. • The ability to bring out the views of a diverse range of people participating in the workshop to constructively challenge the design concept. • The ability to keep workshop on track and moving along (issues that can't be resolved relatively quickly should be listed for action outside the workshop). NOTE that the facilitator nomination must be accepted, by the Unitywater PM, before a SID workshop commences.
Registered Professional Engineer of Qld (RPEQ)	All workers and Contractors performing work related to Unitywater assets shall comply with the Queensland Professional Engineers Act 2002 (PE Act): Professional engineering services for Queensland are required to be carried out by a registered professional engineer of Queensland (RPEQ); and a person can carry out professional engineering services for Queensland whilst unregistered if they are carrying out the services under the direct supervision of a RPEQ who is responsible for the services. A professional engineering service is defined as a service that requires, or is based on, the application of engineering principles and data to a design, or to a construction, production, operation or maintenance activity, relating to engineering. Note the requirement for RPEQ is not limited to design. Final design documents are to include a record of the RPEQ responsible for the work. The Board of Professional Engineers of Queensland (BPEQ) regulates the profession of engineering in Queensland. The main function of BPEQ is the administration of the PE Act and managing the RPEQ system. The Professional Engineers Act 2002 and the Professional Engineers Regulation 2003 can be downloaded from the BPEQ website http://www.bpeq.qld.gov.au.
Head of Asset Management	As Document Owner responsible for: • Conducting and/or delegating regular reviews to ensure this procedure and related resources (e.g. forms, website content) remain fit for purpose, consistent and current. • Approving this procedure for publication. • Ensuring all relevant stakeholders and team members have been consulted and feedback is captured and actioned (where applicable). • Ensuring appropriate communication and/or training is provided to relevant team members when implementing a new, amended or obsolete document (where applicable). • Monitoring compliance with internal/external requirements (e.g. monitor legislation changes and assess/update this procedure when required).

The Table, depicted in Appendix B of this Procedure, defines the minimum expertise required for conducting SID workshops.

6.3 Hazard Studies / Safety in Design Tools

The overall intent of SID is to systematically and comprehensively identify and assess hazards and associated risks to Health, Safety, Environment and Financial Performance and examine whether actual and potential negative impacts can be avoided, or their magnitude reduced, during design.

Due diligence requirements emphasise the corporate governance responsibilities of Unitywater and Contractors and must demonstrate that reasonable steps were taken to:

- Acquire and update their knowledge of health and safety and environmental matters.
- Understand the operations being carried out by the PCBU in which they are employed, and the hazards and risks associated with the operations.
- Ensure that the PCBU has, and uses, appropriate resources and processes to eliminate or minimise health and safety and environmental risks arising from work carried out.
- Ensure that the PCBU has appropriate processes in place to receive and respond promptly to information regarding incidents, hazards and risks.
- Ensure that the PCBU has, and uses, processes for complying with duties or obligations under the *Work Health and Safety Act 2011* (the WHS Act) and for verifying compliance with those duties.

The purpose of this section is then to highlight the practical execution of SID, by the assessment and elimination or control of hazards, associated with Unitywater projects, using recognised technical hazard studies and SID tools, to make sure that:

- A rigorous process has been conducted to identify and analyse all possible hazards / adverse events that may arise.
- All such adverse events / hazards are reduced to ALARP – Hierarchy of Controls apply.
- PM, Designer and Contractor are responsible until they formally pass the prevention of the risk to Unitywater.
- Presence and effectiveness of engineered risk preventions must be referenced in the PRR.
- The pertinent ORR must contain references to the documents and systems which show how the residual risk is controlled.

6.3.1 Pre-requisites

The pre-requisites for planning and execution of the hazard study workshops, entail:

- The Contractor must appoint the Facilitator and Scribe – in accordance with Section 6.2 Roles and Responsibilities of this Procedure. Unitywater will nominate the facilitator if the Contractor's proposed candidate is not accepted by the Unitywater PM.
- The Contractor must schedule and issue workshop invitations timely (i.e. minimum notice period is 10 business days before workshop is held).
- The Contractor must compile, in conjunction with the Facilitator and Scribe:
    i. the Agenda
    ii. the Design documentation pack for review. The Contractor must issue design documents, a minimum of 10 days prior to the workshop for preview by all nominated attendees.

NOTE: Unitywater review period is 10 business days, unless specified otherwise in the project documentation. Unitywater stakeholder review comments must be returned to the Contractor and the SID studies based on UNITYWATER review comments being incorporated into the design. The project schedule must make adequate allowance for design documentation review period, followed by SID workshops.

- The Contractor must pre-populate associated register(s), done in conjunction with the Facilitator, for presentation at the workshop session (preliminary input information)
    i. the Hazard studies templates – F11016 to F11019
    ii. the project risk register – F10682**.**
- Unitywater will make available and monitor key resources required for each workshop session. Where Unitywater does not provide the independent faculty engineer(s), the Contractor must provide independent engineers, acceptable to the Unitywater PM.

NOTE every nominated team member must delegate a suitable responsible person with decision making authority to attend in place thereof.

- Unitywater review comments to the design documentation must be returned to the Contractor before the SID workshop is held. The SID workshop must be based on the Unitywater review comments being actioned or addressed in the design documentation.
- Where 3D model is specified for the Project, the model must be reviewed and accepted by the stakeholders.

6.4 The HAZID Process

6.4.1 The Purpose

Support the design activity by the identification of significant hazards associated with the design for a project and to develop adequate safeguards to control any imposed risks. Furthermore, the HAZID must consider early constructability and commissioning so design can allow for these phases to be efficiently completed and de-risk the project.

6.4.2 Timing

Contractor must undertake the HAZID during the concept design Gate – generally done at 30% design progress, usually during the project milestone 2 Gate. The Project Documentation will define milestone when HAZID must be done.

6.4.3 Typical Input Documents for HAZID

- Equipment General Arrangements – mandatory.
- Site Layouts and Elevations – mandatory.
- Where 3D model is specified for the Project, the model must be provided showing access, egress and layout of all equipment items including location of operator control facilities.
- Existing Process Flow Diagram (PFD) for any brownfields Projects.
- The Contractor pre-populates the electronic HAZID template for validation and update during the HAZID workshop – Refer F11016 for standard HAZID template.

6.4.4 Team

The team composition must be agreed between the Unitywater PM and the Contractor PM. It normally, as a minimum, includes:

- Independent Facilitator supported by Scribe.
- Project Manager(s) – Unitywater and Contractor.
- Designer (e.g. electrical, mechanical, civil/structural, process engineers).
- Independent technical specialists, as required (e.g. electrical mechanical, civil/structural, process engineers).
- Unitywater – Operations representation (site).
- Unitywater – Maintenance representation (site).
- Unitywater – Health and Safety representative.
- Unitywater – Network Operations.
- A competent 3D operator (if 3D model is applicable).

Refer Appendix B - Resources Map for Safety in Design Workshops.

6.4.5 Methodology

Practically it is a guideword driven process, similar to HAZOP, to review preliminary hazards associated with a project:

- Confirm session is duly represented (establish a quorum – Attendance register signed).
- "Breakdown Structure" defined in the AGENDA – Refer F11016 for electronic template details.
- Outline design intent and allow time for clarification questions.
- Where 3D model is specified for the Project – walk thru the model to familiarise stakeholders.
- Where 3D model is not specified for the Project – provide photos of existing site and equipment.
- Review previous actions and update any progress to date (as applicable).
- Apply custom HAZID guidewords, embedded in template F11016, to stimulate discussions regarding potential hazardous events and their associated consequences. Refer list of HAZID guidewords in F11016.
- The Scribe records significant hazard outcomes in the HAZID record, F11016, for Contractor distribution to all involved parties.

6.4.6 Post workshop activities

The actioned parties undertake appropriate risk prevention activities before final closure and sign-off of actions noted. Done by Contractor in collaboration with Unitywater persons at the workshop.

6.5 The HAZOP Process

6.5.1 Purpose

To review the detailed design and/or procedures to identify hazards and significant operability problems due to abnormal modes of operation.

6.5.2 Timing

Required for projects involving the process operations, at all Unitywater sites. The HAZOP workshop is generally done at milestone 2 and outstanding items revisited at milestone 4 design completion. The Project Documentation will define the milestone when HAZOP must be done.

6.5.3 Input Documents for HAZOP

- Piping & Instrumentation Diagram (P&ID) – mandatory.
- Process flow diagrams (PFD) – optional.
- Process Control Narrative (PCN) – mandatory.
- Functional Specification (FS) – optional.
- Instrument loop diagrams – optional.
- Single line diagrams (SLD) – optional.
- Plant layout drawing and equipment general arrangement (GA) – mandatory.
- Isolation / pressure relief philosophy – mandatory.
- Commissioning plans and procedures – optional.
- Safety Data sheets (SDS) – mandatory.
- The Contractor pre-populates the electronic HAZOP template for validation and update during the HAZOP workshop – Refer F11017 for standard HAZOP template.

6.5.4 Team

The team composition must be agreed between the UNITYWATER PM and the Contractor PM. It normally, as a minimum, includes:

- Independent Facilitator supported by the Scribe.
- Project Manager(s) – Unitywater and Contractor.
- Designer (e.g. process, mechanical and C&I engineers).
- Note: civil/structural and electrical engineers are not required at HAZOP, unless specified otherwise by Unitywater.
- Independent technical specialist, as required (e.g. process, mechanical and controls and instrument engineers).
- Unitywater Operations representation (site).
- Unitywater Maintenance representation (site).
- Depending on the type of process to be reviewed, attendance by others may be required, e.g. Unitywater Safety and/or Environment team members. The Unitywater PM will determine if required.

Refer Appendix B - Resources Map for Safety in Design Workshops.

6.5.5 Methodology

HAZOP studies are conducted in general accordance with AS IEC 61882, which amounts to in brief:

- Confirm session is duly represented (establish a quorum – Attendance register signed).
- The Designer outlines the design intent and allow time for clarification questions by
  i. Explaining the design and its representation.
  ii. Explaining how a defined deviation can occur and the corresponding system response.
  iii. Explaining the operational context within which the element under study will operate, the operational consequences of a deviation and the extent to which deviations may be hazardous.
- Specialist(s) – provide expertise relevant to the system and the study. May be called upon for limited participation with the role revolving amongst different individuals.
- Review previous actions and update any progress to date (as applicable).
- So-called NODES defined in the AGENDA and highlighted on master P&ID's – The detailed "Node by Node" study commences at this point. Apply HAZOP guidewords, embedded in template F11017, to stimulate discussions regarding deviations from the design intent for adequate understanding of potential causes/consequences and associated safeguards provided in the design.
- If, in the opinion of the team, the combination of the consequences and the likelihood of occurrence are enough to warrant action, as the existing safeguards are not deemed adequate, then additional risk prevention action(s) is required.
- The Scribe, as instructed by the Facilitator, must record significant hazard outcomes in the HAZOP record F11017 and reach consensus on matters arising.

6.5.6 Post workshop activities

The actioned parties undertake appropriate risk prevention activities before final closure and sign-off of actions noted. Note that for major risk areas, a situation may require more quantitative assessment – to be done off-line by the Contractor.

6.6 The CHAZOP Process

6.6.1 Purpose

The importance of electrical, electronic and programmable electronic systems in safety related applications, is steadily growing. If the control system is sufficiently complex for the facility, it may be useful to consider this system in a separate HAZOP (sometimes referred as a CHAZOP; the 'C' prefix used to indicate computer based – both control and protective) or as a discrete component of a more general HAZOP.

CHAZOP must be looked at as three distinctly different, but consecutively run Gates. Each Gate involves a systematic and critical review using guidewords similar to those used in HAZOP:

- System CHAZOP
- Loop CHAZOP
- Sequence CHAZOP.

All projects with control systems components must have a CHAZOP unless specified otherwise in the Project Documentation.

6.6.2 Timing

Starting the CHAZOP typically requires that the control system design meets the requirements set out in the control system functional specification and that:

- the HAZID is completed
- a design review and process HAZOP has been completed and all outstanding items are actioned.

The System CHAZOP is undertaken prior to ordering the Automation / Control / Protection system equipment.

The Loop CHAZOP is undertaken when any critical instrument loops have been configured and certainly before all loops design are completed. This will identify the requirements for the entire system and set standards for further design.

The sequence CHAZOP is undertaken, similar to Loops, once any sequences within a system have been documented in the functional specification. This will identify particular requirements of the system and set standards for further design.

The Project Documentation will define milestone when CHAZOP must be done.

6.6.3 Typical Input Documents for CHAZOP

- Piping & Instrumentation Diagram (P&ID) – mandatory.
- Process Control Narrative (PCN) – mandatory.
- Functional Specification (FS) – mandatory.
- Instrument loop diagrams – mandatory.
- Single line diagrams (SLD) – optional.
- Commissioning plans and procedures – mandatory.
- The Contractor pre-populates the electronic CHAZOP template for validation and update during the CHAZOP workshop – Refer F11018 for standard CHAZOP template.

6.6.4 Team

The team composition must be agreed between the Unitywater PM and Contractor PM and must include the following resources:

- Independent Facilitator supported by the Scribe.
- Project Manager(s) – Unitywater and Contractor.
- Designer (e.g. process and controls and instrument engineers).
- Note: electrical engineers only required during electrical protection system review, unless specified otherwise by Unitywater.
- Independent technical specialist, as required (e.g. process and controls and instrument engineers).
- Unitywater Operations representation (site).
- Unitywater Control System maintenance representation.

Refer Appendix B - Resources Map for Safety in Design Workshops.

6.6.5 Methodology

Considered where the process demands a control system with high reliability and complexity. All Unitywater projects with Control and Instrumentation scope require a CHAZOP. In such cases, a CHAZOP study entail, in brief:

- Confirm session is duly represented (establish a quorum – Attendance register signed).
- The "breakdown structure" must be defined in the AGENDA – Refer F11018 for electronic template details.
- Outline applicable Gate of the design System/Loop/Sequence and allow time for clarification questions.
- Review previous actions from SID workshops and update any progress to date with required control system, process control functionality.
- The detailed study commences at this point. Apply applicable CHAZOP guidewords, embedded in template TEM581, to stimulate discussions regarding deviations from the design intent for adequate understanding of potential causes/consequences and associated safeguards provided in the design.
- If, in the opinion of the team, the combination of the consequences and the likelihood of occurrence are sufficient to warrant action, as the existing safeguards are not deemed adequate, then additional risk prevention action(s) is recommended.
- The Scribe, as instructed by the Facilitator, must record significant hazard outcomes in the CHAZOP record and refer to F11018 and reach consensus on matters arising.

6.6.6 Post workshop activities

The actioned parties undertake appropriate risk prevention activities before final closure and sign-off of actions noted. Note that for major risk areas, a situation may require more quantitative assessment – to be done off-line by the Contractor.

6.7 The CHAIR Process

6.7.1 Purpose

Construction hazard assessment implication review (CHAIR) is a tool to assist designers, constructors Unitywater and other key stakeholders to come together to reduce construction, maintenance, repair and demolition project risks.

6.7.2 Timing

The CHAIR workshop must occur before 100% design is issue. It typically occurs around 80% design at milestone 5 completion with the CHAIR2 part focusing on construction and demolition issues and is performed just prior to construction, when the full detailed design is known. The CHAIR3 part focuses on maintenance and repair issues and is performed at the same time as the CHAIR2. The Project Documentation will define the milestone when CHAIR must be done.

6.7.3 Typical Input Documents for CHAIR

- Equipment GAs, installation details, site plans showing laydown areas and access ways etc. – mandatory
- Note that, where 3D model is specified for the Project, the model must be complete, before the CHAIR workshop commences.
- Construction methodology – mandatory
- Commissioning plans and procedures – mandatory
- The Contractor pre-populates the electronic CHAIR template for validation and update during the CHAIR workshop – Refer F11019 for standard CHAIR template.

6.7.4 Team

Performed by a group of people who are involved in the design and construction of the project, the composition of the team being dependent on the scope and nature of the design under review. The team composition must be agreed with the Unitywater PM. It normally, as a minimum, must include:

- Independent Facilitator supported by a Scribe.
- Project Manager(s) – (Unitywater and Contractor).
- Designers (e.g. electrical, mechanical, civil/structural engineers).
- Note: process and C&I engineers are optional.
- Site construction Contractor and representatives.
- Commissioning representation (Unitywater Manager and Contractor engineer).
- Operations representation (site).
- Maintenance representation (site).
- A competent 3D model operator (if 3D model is applicable).

Refer Appendix B - Resources Map for Safety in Design Workshops.

6.7.5 Methodology

A CHAIR provides a structured forum to ensure there is opportunity to foresee construction, maintenance, repair and demolition hazards, so the hazards can be eliminated or reduced to ALARP, as part of the design process.

- Confirm session is duly represented (establish a quorum – Attendance register signed).
- Outline the construction process and partition CHAIR into logical blocks of appropriate size, in the AGENDA – Refer F11019 for electronic template details.
- Review previous actions from SID workshops and update any progress to date (as applicable).
- Walk through the 3D model, where 3D model is specified in the Project Documentation.
- The detailed study commences at this point. For each logical block, use various guidewords, embedded in template F11019, to assist with the identification of safety aspects/issues. Assess whether the proposed risk controls (i.e. expected safeguards, etc.) are appropriate and conform the risk SFAIRP.
- The Contractor must record significant constructability outcomes in the electronic record, F11019 and reach consensus on matters arising.
- The Scribe records significant hazard outcomes in the CHAIR record on display, for Contractor distribution to all involved parties at completion of the workshops.

6.7.6 Post workshop activities

The Contractor undertakes appropriate risk prevention activities before 100% design documentation is issued for review.

7. Project Risk Assessments

Pr9306 - Risk Management Procedure outlines the Unitywater risk and opportunity management framework, which is a business wide risk management process with a governance structure and processes that are based on AS/NZS ISO 31000 Risk Management – Principles and Guidelines.

Risk assessment is a collaborative process between the contractor (designer) and Unitywater. Unitywater stakeholders must participate in the project risk workshop and the contractor must get Unitywater stakeholder acceptance of the proposed controls and residual risk levels.

The Contractor must include in the CMP a detailed risk analysis of every aspect of WUC, that presents potential risks to the project. This includes but is not limited to anything that could cause delays, develop into unsafe work practices, cause an environmental incident or place the installation of the equipment and other works in jeopardy.

7.1 The Purpose

The risk analysis must document the policies and processes used by the Contractor to manage the project risks in accordance with the principles of AS/NZS/ISO 31000.

7.2 Timing

Project risk and opportunity workshops must be conducted on a regular basis, in accordance with the project delivery schedule. Done at the end of each SID workshop as a minimum.

7.3 Typical Input Documents

The project risk register (PRR) template (F10682) is provided with the tender documents issued by Unitywater to the Contractor, which must contain important project specific risks nominated in Gate 1 and 2.

7.4 Team

The team composition must be agreed between the Unitywater PM and the Contractor PM and may include the following resources:

- Project Manager(s) – Unitywater and Contractor.
- Facilitator supported by the Scribe.
- Designer (e.g. civil/structural, mechanical, electrical, C&I, process engineers).
- Independent Engineer (e.g. civil/structural, mechanical, electrical, C&I, process engineers).
- Unitywater Operations representative.
- Unitywater Maintenance representative.
- Unitywater Health and Safety representative.
- Unitywater Environmental representative.
- Contractor site supervisor.

Refer Appendix B for mandatory participants at a project risk assessment workshop.

Note: Unitywater performs the RA without contractor present and especially in early Gates 1, 2 and 3, and on ad hoc projects that are not capital works.

7.5 Methodology

Gates 1, 2 and 3: Infrastructure Services (Planning) and Portfolio Investment (Planning) must collate all existing ORR entries pertinent to scoping of a project. An internal risk assessment must be conducted and ensure important project specific risks are incorporated into the project SOW.

Gates 4 and 5: The Contractor must schedule and conduct project risk workshop(s) as required, which must assess Consequence Category, as a minimum: Health, Safety, Environment, Financial Performance, using the Consequence Descriptors cited in Pr10731 - Risk Assessment and Scoring Criteria Tool. Minutes of these risk workshops and the PRR must be maintained and updated regularly, by Unitywater PM, as required throughout the phases of project delivery. This up to date PRR must be submitted on request by the Contractor, at any stage of the Project delivery.

The Unitywater PM updates the PRR items at Gate 6 to the pertinent ORR. Only items that need to be managed by Operations get uploaded to the ORR. Note that all identified risks get recorded in the PRR, including validating preventions and precautions for risk reduction, to ALARP.

Note that only Medium and above risks are uploaded to the pertinent ORR.

8. Safety in Design Report Requirements

The Contractor must provide a SID Report and submit the report and updated PRR within 10 business days of the SID workshop completion.

The following sections describe the specific format and typical topics that the Contractor must cover in the SID reports submitted to Unitywater at each project milestone.

NOTE: The blue text provides an explanation of what is required in the SID Report and should be replaced.

8.1 Table of Contents

This section must list all the sub section numbers and page numbers in the SID Report.

8.2 Executive Summary

Summary of SID processes to date. The summary must highlight (i) level of hazard reduction by design and (ii) any higher than LOW risks recorded in the PRR that are likely to require significant scope changes or control measures with significant associated costs.

8.3 Introduction

This section must provide a concise summary of:

- Background details of the project
- Scope of the project and applicable Design and/or Construct Gates
- The Contractor's SID processes, and methodology adopted for the project.

8.4 Purpose of the Report

The purpose of the report is to provide a record of the hazard identification activities undertaken and findings. The intent of the hazard studies is to provide the evidence that the appropriate reliable hazard identification activities have been carried out in accordance with the relevant process standard.

8.5 Assumptions

This section lists and discusses all assumptions made in undertaking the SID delivery on the project.

8.6 Amendment of Report

The SID report must be written by the Contractor, for final review by the Facilitator, before being issued to Unitywater.

The Contractor must provide Unitywater with an approved management of change (MOC) methodology pertaining to any amendment to SID workshop reports and/or any design modifications and/or additions resulting.

8.7 Reference Document List

This section contains a table listing all documents by Unitywater number and revision number that are referred to in compiling the SID Report. Where no Unitywater document number(s) exist, the Contractor must consult Unitywater to generate new document numbers.

8.8 Standards and Regulation

All Australian and International standards (where relevant) to the report must be listed in a table in this section. The version and title must be indicated. All documents such as hazard study registers are included in the Appendix of the SID report, for future reference.

8.9 Abbreviations List

This section contains a table indicating all abbreviations and acronyms used throughout the report – Refer Table 3 in Section 3. of this Procedure.

8.10 Hazard Studies conducted

This section highlights the HAZID, HAZOP, CHAZOP, CHAIR workshop outcome report(s), with particular reference to design evidence pertaining to Action Closure and Sign-off records. This SID report must be prepared and maintained as a live document during the design and construction phase of the project. Separate section required for each workshop.

8.11 Unitywater Milestone 1, 2, 3, 4, 5 & 6 – Outstanding Issues

The PRR contains notes and references that support Close Out of risk items - highlight any outstanding issues.

8.12 Risk reduction to ALARP

This section details risks that have been reduced, but still need to be managed by the Contractor during construction and by the Operations Manager according to a documented SOP.

8.13 Residual risks to be escalated

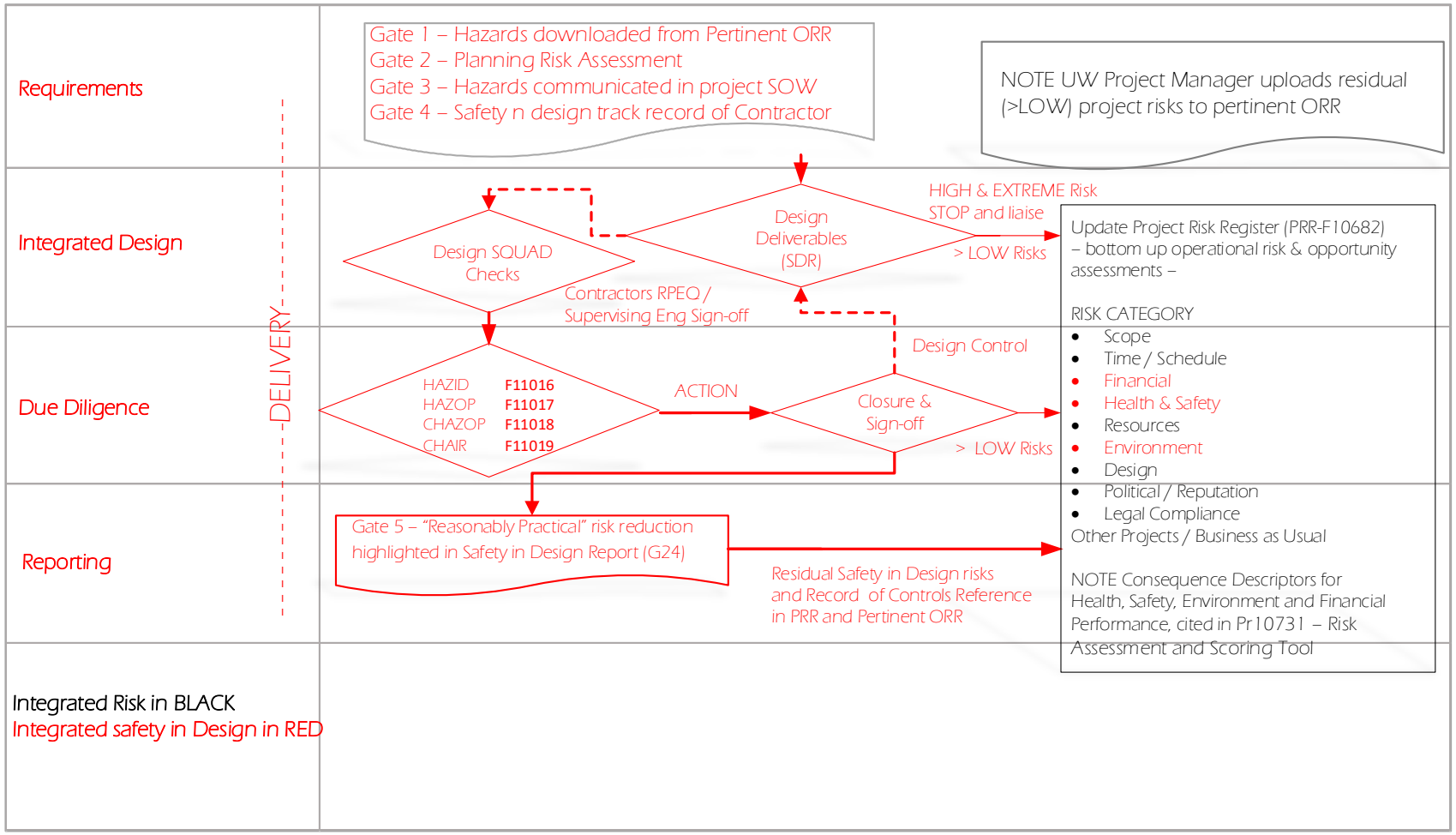
Details risks that were neither eliminated or able to be reduced to LOW risk, by changes to the design, as per Unitywater risk criteria, cited in Pr10731 - Risk Assessment and Scoring Criteria Tool.

8.14 Appendices

List the project SDR by Doc No and Title.

APPENDICIES

Appendix A: Safety in Design Functional Flowchart



Appendix B: Resources Map for Safety in Design Workshops

Team Member	***SID Workshop***				
	HAZID	***HAZOP***	***CHAZOP***	***CHAIR***	***Project Risk Assessment***
Project Manager – Unitywater and Contractor	M	M	M	M	M
Facilitator	M	M	M	M	M
Scribe	M	M	M	M	M
Designer – faculty list below					
Process	M	M	TBA	TBA	TBA
Civil/Structural	M	TBA	NR	M	TBA
Mechanical	M	M	NR	M	TBA
Electrical	M	TBA	TBA	M	TBA
Instrumentation and Control System	TBA	M	M	TBA	TBA
Independent Technical Specialists					
Process	M	M	TBA	TBA	TBA
Civil/Structural	M	TBA	NR	M	TBA
Mechanical	M	M	NR	M	TBA
Electrical	M	TBA	TBA	M	TBA
Instrumentation and Control System	TBA	M	M	TBA	TBA
Operations representative (Unitywater)	M	M	M	M	M
Maintenance representative (electrical / mechanical)	M	M	TBA	M	M
Health & Safety representative (Unitywater)	M	TBA	TBA	TBA	TBA
Site supervisor (Contractor)	NR	NR	NR	M	TBA
Commissioning engineers (Unitywater & Contractor)	TBA	TBA	TBA	M	TBA
Environmental representative (Unitywater)	TBA	TBA	TBA	TBA	TBA

M mandatory attendance at SID workshop
TBA to be advised by Unitywater PM, depending on Project Scope
NR not required