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Major Changes Incorporated In the Xxxx Edition

The following lists the major changes to the XXXX edition of TG 110, which have been incorporated in this edition:

1. First Edition

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Section 1: Introduction

The intention of this Guideline is to provide a process which will support designers to consider Occupational Health Safety and Welfare standards and regulatory requirements in the design process for infrastructure projects. The guideline will support users in aspects of design, construction and installation at the design phase, with an emphasis on issues such as access & egress, lighting, ergonomics, ventilation, fire protection to name a few.

The Guideline identifies a hierarchy of controls for managing safety in design, outlining key processes for considering safety and provides a checklist to help designers work methodically through considering safety in design.

Finally the guide identifies the approach SA Water will take in auditing design activities on a regular basis to ensure designers adequately consider safety.

Section 2: Design Criteria

Ultimately, Occupational Health Safety and Welfare considerations should be reviewed at the design stage. Over-sights in design which may lead to OHS&W issues can often be made in the initial planning stage. These issues can be expensive and difficult to correct at a later stage.

The ability to influence safety versus time is depicted in Figure 1. The ideal time to influence safety is during the concept and design phase. As the curve shows, the ability to influence safety diminishes as the schedule moves from concept toward start-up.

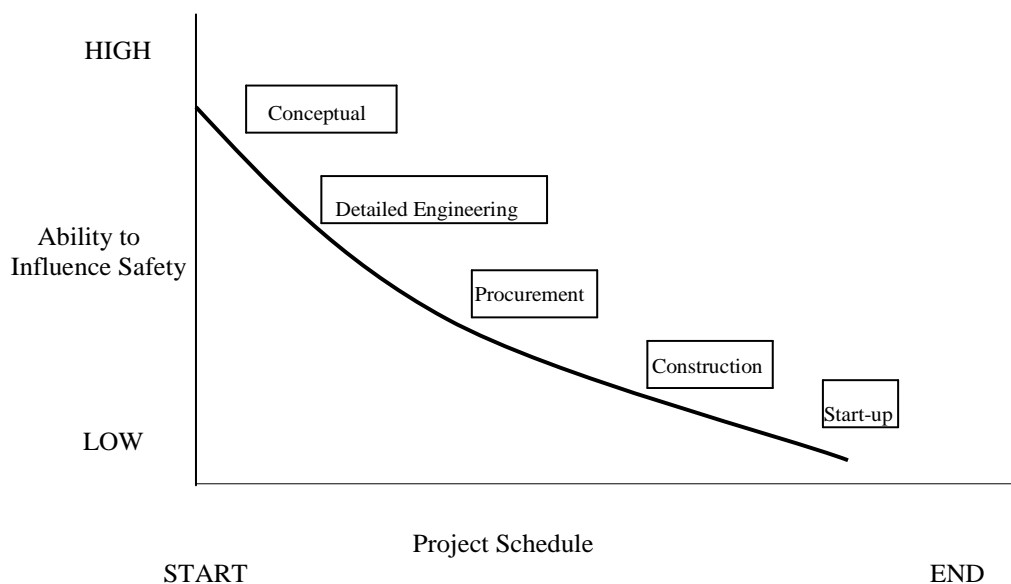


Figure 1 - Time/Safety Influence Curve

(Szymberski, 1997 as cited in Behm 2005)

Legislation lays down minimum standards for:

- General construction
- Maintenance
- Lighting and interior colour
- Ventilation and thermal control
- Means of access and egress
- Fire safety
- Heating and cooling
- Facilities and amenities
- Ergonomics
- Noise and vibration
- Pressure Vessels
- Welding

During the design phase, features which may represent an OHS&W hazard shall be reviewed and assessed to determine whether they are essential in their planned form. At the design stage the consideration of all inherent technical matters will enable the designer to consider what effects their design will have on people.

Design changes aimed at reducing hazards, arising from hazard reviews and assessments shall be incorporated in the design and verified.

Project documentation shall be updated to include all amendments, alterations and modifications required.

All design work shall be in accordance with the relevant OHS&W legislative requirements, including legislation reasonably anticipated over the life cycle of the plant and buildings.

All relevant statutory approvals and licences shall be obtained. Other occupational health and safety considerations for the design of workplaces are:

- Type of work undertaken;
- Machinery or equipment involved;
- Provision for storage space;
- Layout of workstations;
- Need for safe access and egress.

Section 3: Evaluation Process – Hierarchy of Control

To facilitate the evaluation process, the Hierarchy of Control detailed in **Figure 2** lists the control measures in priority order which can be utilized for this purpose. These control measures can be used to eliminate or minimise exposure to the hazard.

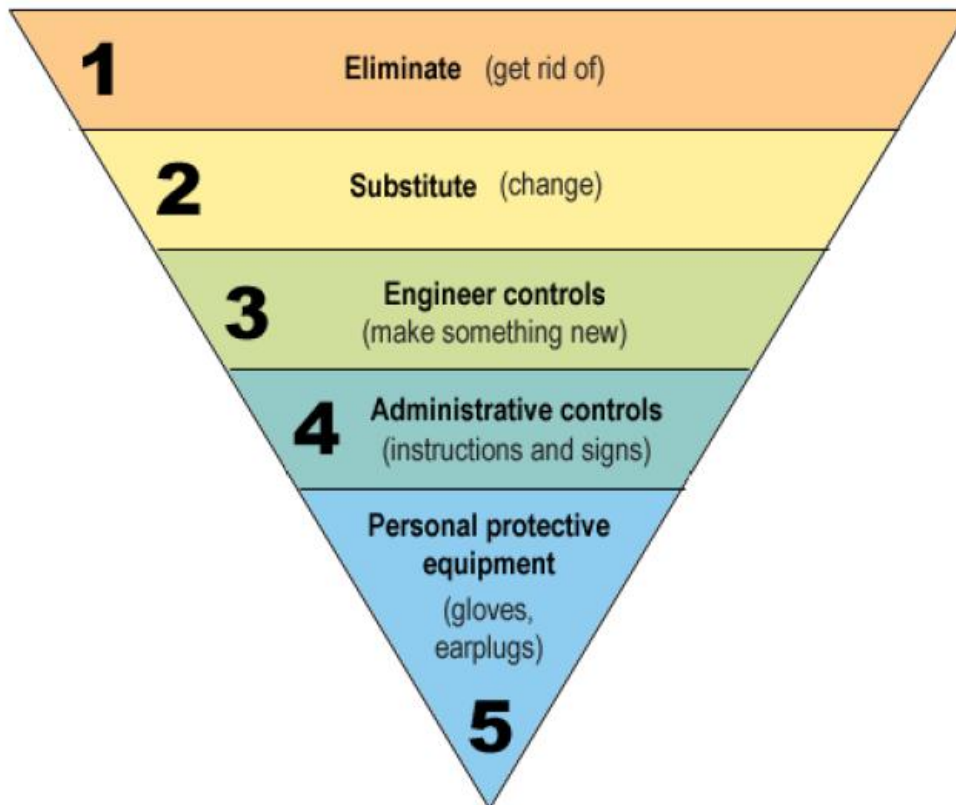


Figure 2 - Hierarchy of Control Diagram 1

Hierarchy of Control consists of **two** levels. The first is to consider elimination (Level 1 – 1st Priority) before all other options. If elimination is not practical then Level 2 controls (those which substantially reduce the risk) then must apply. Within Level 2 there are the remaining 4 priority levels of which 1 or a combination of controls can be used to substantially reduce the risk.

3.1 LEVEL 1

3.1.1 1ST Priority

• **Elimination** – Elimination completely removes the hazard, or risk of exposure to the hazard. Removal of the hazard is the ideal control situation. Examples of elimination are:

- Removal of a noisy machine from an otherwise quiet area;
- Removing the need for stressful actions and movements by redesigning the work area or work flow.

If **Elimination** is not practical then level 2 controls shall apply:

3.2 LEVEL 2

Minimisation options which substantially reduce the risk.

3.2.1 2ND Priority

• **Substitution** – Substitution involves replacing a hazardous substance, machinery or work process with a non-hazardous one. Examples of substitution are:

- Using a non-flammable solvent in place of a flammable one;
- Using chemicals in a pellet or paste form instead of dusty powders

If **Substitution** is not practical then:

3.2.2 3RD Priority

• **Engineering** – If a hazard cannot be eliminated or substituted a more acceptable alternative, then the next preferred measure is to use an engineering control. Examples of an engineering control may include:

- Make structural changes to the work environment, work systems, tools or equipment to make them safer;
- Use mechanical aids or manual handling devices;
- Using enclosures such as enclosing a noisy piece of equipment/machinery;
- Guarding machinery;
- Installing local exhaust ventilation;
- Automating a process.

If **Engineering** controls are not practical then:

3.2.3 4TH Priority

• **Administration** – Where a health and safety risk cannot be eliminated or controlled by engineering, administrative controls should be used. Administrative controls means introducing work practices which reduce risk. This limits the exposure of the employee to the hazard. They include such measures as:

- Establish appropriate administrative procedures such as policies, guidelines, standard operating procedures (SOP's) registers, work permits, signage, job rotation, job timing, routine maintenance and housekeeping;
- Reducing the period of exposure;
- Provide training on hazards and correct work procedures;
- Keep training registers and individual training records;
- Supervise for compliance with set standards;
- Developing lockout procedures.

If **Administration** controls are not practical then:

3.2.4 Last (5th) Priority

• Personal Protection Equipment (P.P.E.) – PPE such as hard hats, safety glasses and hearing protection should only be used where other measures are not practicable. Efforts to remove health and safety risks using elimination, engineering and administrative controls should continue.

• PPE should be used as part of an integrated organisational approach to health and safety management. It should complement other control methods, not replace them.

• Where protective clothing or equipment must be used, the employer must ensure that it is:

- Appropriate for the job;
- Fits the operator correctly;
- Training is provided on its need and use;
- Cleaned and maintained regularly

Section 4: Review Process

Persons involved in the design activities review process should take the following steps:

- **Communicate and Consult** – Communicate and consult with all key stakeholders (internal & external) as appropriate at each stage of the design process on possible OHS&W issues.
- **Identify Risks** – Identify possible design related hazards (where, when, why) and how these impact on OHS&W issues for the project.
- **Analyse Risks** – Determine consequence, likelihood and hence level of risk. This analysis should consider the range of potential consequences and how these could occur.
- **Evaluate Risks** – Compare estimated levels of risk against pre-established criteria and consider the balances between potential benefits and adverse outcomes. This enables decisions to be made about the extent and nature of treatments required and about priorities.
- **Treat Risks** – Develop and implement specific strategies and action plans for mitigating identified risks, (refer Hierarchy of Control).
- **Monitor and Review** – Risks and the effectiveness of treatment measures need to be monitored throughout the project to ensure changing circumstances do not alter priorities.

Depending on the complexity of the project a variety of processes can be used to structure a safety review through a design process. In its simplest form a checklist such as the one found in Table 1 on page 13 can be utilized to facilitate an assessment of safety. If concerns were found as a result of flowing through the checklist then a risk assessment should be carried out. An example template for a risk assessment forms part of this document (refer Table 2).

HAZOP

A more formal approach that should be considered in complex infrastructure projects is a HAZOP. Hazard and Operability Studies is a methodology for identifying and dealing with potential problems in a system process, particularly those which would create a hazardous situation or a severe impairment of the process. A HAZOP should be conducted when the design review has been completed and the project is at the Process and Instrumentation Diagram (P&ID) or layout stage, so that (if needed) the design can be changed without major costs.

Section 5: Audit

The consideration of OHS&W issues during the design phase of a project is to be undertaken by the person(s) engaged to carry out the design requirements for the project. All projects regardless of monetary value are to be reviewed for OHS&W issues.

To assist in the process of overseeing whether safety in design is being appropriately managed a Safety in Design Checklist has been developed (table 1) which can be used to audit projects. The checklist is intended as a guide only and the review should not be limited to the content of the list.

In the context of audit SA Water will be utilizing the checklist as a basis to audit projects to ensure that design consultants are appropriately managing safety in design.

Table 1 – Safety in design checklist

Project Title.....

Project Number.....

Docket Number.....

Project Manager.....

Completed by.....

Department/Company.....

Sign.....

Date.....

NO	WORK ENVIRONMENT	YES	NO	N/A	COMMENTS
1.	Climate	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	Will the temperature be comfortable for the employees?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	Will temperature interfere with the task to be performed?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	Will employees be exposed to work areas where there are drafts?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	Will the air be clear of contaminants and toxic substances?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	Will employees always be exposed to clean fresh air?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
2.	Noise				
	Will noise levels be comfortable?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	Will noise levels be distracting?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	Will noise interfere with communication?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	Will auditory signals be easy to hear?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	Will employees be exposed to loud noise for extended times?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
3.	Vibration				
	Will vibration levels be acceptable?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	Will vibration levels interfere with communications?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	Will any shocks/jolts from machinery be present in the work environment?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	Will vibration levels affect employees performance?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

4. Lighting

- Will lighting be sufficient to allow for normal tasks to be performed?
- Will lighting levels be comfortable?
- Will glare be avoided?
- Will excessive brightness be avoided?
- Has emergency lighting been considered?
- Will employees be able to detect defects easily under proposed lighting conditions?
- Will lighting be steady ie no stroboscopic effects from machinery?
- Has lighting been arranged to avoid shadows?
- Will lighting be sufficient to avoid looking from bright areas to dark areas?

5. Floor Surfaces

- Are floors designed to have non-slip surface?
- Are all floors at an even level?
- Have potential trip hazards been avoided?
- Have covers been designed for all drains/pits?

6. Floor Layout

- Has the floor layout been designed to permit adequate access for use/movement of equipment?
- Is there adequate space between equipment for easy movement by staff?
- Is the workplace layout large enough to accommodate safe work practices?
- Are aisles/walkways wide enough for equipment and pedestrian traffic ie 1.2m passageway and 810mm doorway?

7. Equipment

- Does equipment have appropriate machine guarding?
- Are starting and emergency stopping devices within easy reach?
- Are mechanical handling devices provided eg trolleys, air hoists etc?
- Have staff been consulted about the type of equipment and furniture to be purchased?

8. Controls/Displays

- Have control been designed so they are easy to reach from the operators usual workplace location?
- Will head and neck strain be avoided when reading displays?
- Are labels on controls and dials clear and legible?
- Are controls/dials adequately lit?
- Are the number of controls manageable by the proposed staffing numbers?
- Have all controls, dials/displays for similar functions been grouped together?
- Have written operational procedures for use of controls/dials and displays been produced?
- Is the information on display presented in a simple format?
- Will employees have adequate time to process information on display?

9. Access/Clearances

- Are access & clearance sufficient to
 - Operate controls
 - Perform tasks
 - Use equipment
- Is there sufficient room to open access doors on cabinets (eg switchboards)? Do these meet appropriate standards?
- Do stairways, walkways, ramps and landings meet appropriate standards?
- Have hand-rails and grab-rails been provided were necessary?
- Has access for persons with disabilities been provided?

