

CONTENTS

Foreword.....	6
ETU Contact Details.....	8
Web Addresses.....	10
OH&S Training Courses.....	11
Introduction.....	15
PART 1: Occupational Health and Safety Responsibilities.....	16
Legal Framework.....	16
Occupational Health and Safety Act 2004.....	16
Employers Duty.....	16
OH&S Representatives.....	17
Electricity Safety Act 1998.....	17
Electricity Safety (Installations) Regulations 2009.....	19
Codes of Practice.....	20
Compliance Codes.....	20
Industry Standards.....	20
What is expected by employees.....	21
What is expected of those in control of a Workplace.....	21
Duty to Consult with Employees.....	21
Employers with HSRs.....	22
Employers with Employees.....	22
Employers Representatives.....	23
Designated Work Groups.....	23
Employee Health and Safety Representatives.....	23
Health and Safety Committees.....	24
Safety Issue Resolution.....	24
Construction Industry.....	25
Construction Industry Induction training Course.....	25
Site Specific Inductions.....	26
Injuries and First Aid.....	26
Emergencies.....	27
WorkSafe Inspectors.....	27
Notification of Incidents and Dangerous Occurrences.....	28
Incident Notification.....	28
Preserving the Scene.....	34
Dealing with Trauma and Counselling.....	41

PART 2: Hazard Identification and Control of Risks	42
Hazard Identification.....	42
Assess Risks.....	42
Control Hazards and Risks.....	43
Monitor Controls.....	44
Safe Work Method Statements (SWMS).....	45
Health And Safety Coordination Plan (HSCP).....	46
Plant.....	46
PART 3: Electrical Safety	50
Electrical Safety Legislation.....	50
Working on or Near Live Electrical Equipment.....	54
Arc, Blast and Flash Injuries.....	55
Plan the Work.....	56
Risk Assessment - Working on or Near.....	57
Safety of Electrical Test Equipment.....	57
Electrical Installations - Generating Sets to AS/NZS 3010.....	58
Welding Power Sources.....	65
Procedures for Safely Energising or Isolating Electrical Equipment.....	78
Prior to and Following Energisation.....	78
Energising Procedure - Main Switchboard.....	79
Energising Procedure - Sub-Boards.....	80
Energising Procedure - Mechanical or Other Services.....	81
Danger Tag and Isolation Procedure.....	82
Procedure for Switching on Circuits at Sub-Boards.....	83
Supervision Guidelines for Apprentices Working on Electrical Installations.....	87
PART 4: Electrical Safety - Construction	92
Construction Wiring.....	92
Temporary Wiring Competency.....	93
Installation Methods.....	93
Cable Selection.....	93
De-Rating factors.....	94
Effect of ambient temperature.....	94
Effect of direct sunlight.....	94
Voltage drop.....	94
Installation of Construction Wiring.....	102
Cabling Run on Catenary.....	103
Mechanical Protection.....	104
Switchboards.....	105

Switchboard Design.....	106
Provision of Double Pole switches.....	110
Security of Switchboards After Hours.....	110
Protection of Final Sub-Circuits.....	110
Residual Current Devices (RCDs).....	111
Location of Switchboards in relation to Flexible Cord Length.....	112
Initial Verification of Electrical Installations.....	113
Visual Inspection.....	115
Testing.....	117
Continuity of the earthing system.....	118
Insulation resistance.....	121
Polarity Test.....	122
Correct Circuit Connections.....	123
Operation of residual current devices (RCDs).....	125
Verification of Impedance (Earth fault-loop impedance).....	127
Periodic Verification - Testing of Electrical Equipment.....	129
Testing & Tagging of Electrical Equipment.....	131
Lift Work on Construction Sites.....	133
Safe work method statement (SWMS).....	133
High risk work licences.....	134
Suspended Work Platforms.....	134
Temporary hoists.....	135
Braking systems.....	135
Upper travel limit.....	136
Suspension points.....	136
SWP installation sign-off.....	137
Licensing for Lift Shaft Rigging.....	137
Basic rigging licence.....	137
Intermediate rigging licence.....	138
Advanced rigging licence.....	138
Load rating of work platforms.....	138
Platform edge protection.....	138
Emergency response planning.....	139
Information, instruction, training and supervision.....	139
Lift shaft fall prevention.....	140
Accessing pits.....	141
Construction lighting.....	141
Welding.....	142
Working on or near live electrical equipment.....	142
Lighting.....	143
Emergency Lighting on Construction Sites.....	144

Emergency Exit Signs on Construction Sites.....	145
Task Lighting.....	146
Electrical Installation - Generating Sets to AS/NZS3010 & AS/NZS2790.....	148
De-Energisation Procedure for Demolition Works.....	153
Procedures for Safely Energising or Isolating Construction Wiring and Associated Electrical Equipment.....	157
Energising procedure main switchboard.....	158
Energising Procedure Sub-Boards.....	158
Electrical equipment and other services - switchboards.....	159
Danger Tag isolation procedure.....	159
Procedure for switching on circuits at sub-boards.....	160
Attachment 1 - Energising Procedure Notification.....	161
Attachment 2 - Sample Equipment Cards.....	162
Attachment 3 - Sample Personal Cards.....	162
Locking Out / Tagging Out, Isolation Of Plant.....	163
PART 5: Height Safety and Work Platforms.....	168
Working at Heights.....	168
Overhead Powerlines (No Go Zone).....	173
Spotter (Safety Observer).....	173
Obtaining a Permit and Working Safely.....	173
Industrial Fall Arrest Systems and Travel Restraint Systems.....	178
The Risk of Suspension Trauma.....	178
Suspended Scaffold.....	180
PART 6: Confined Spaces and Trench Work.....	190
Confined Space Requirements.....	190
Confined Space Entry Permits.....	191
Safety Precautions in Trenching Operations.....	192
PART 7: Hazardous Substances and Dangerous Goods.....	196
Hazardous Substances.....	196
Material Safety Data Sheets.....	196
Risk Control.....	197
Review of Risk Control Measures.....	197
Atmospheric Monitoring.....	198
Register of Hazardous Substances.....	198
Dangerous Goods.....	198
1. Flammable and combustible liquids.....	199
2. Liquid Petroleum Gas (LPG).....	199

3. Explosives.....	199
Filling Portable Generators.....	200
PART 8: Control of Hazardous Dusts, Fibres other Contaminants.....	202
Asbestos.....	202
Asbestos: Occupational Health & Safety Regulations 2007.....	207
Silica Dust & Silicosis.....	210
Synthetic Mineral Fibre (SMF).....	214
Medium Density Fibreboard (MDF) and Wood Products.....	214
Legionella.....	218
Bird Droppings.....	220
Polychlorinated Biphenyl (PCB).....	222
Handling Procedure for Polychlorinated Biphenyl PCB.....	227
PART 9: Noise.....	230
PART 10: Manual Handling.....	236
Hazardous Movements and Posture.....	236
Examples of Control Measures.....	237
Occupational Health and Safety Regulations 2007.....	237
Simple Rules for Manual Handling.....	238
PART 11: Personal Protective Equipment.....	240
Hard Hats.....	240
Safety Footwear.....	240
Hearing Protection.....	240
Eye Protection.....	240
Respiratory Protection.....	240
Individual Fall Protection Equipment (IFPE).....	241
Skin Protection.....	241
UV Radiation.....	241
PART 12: Further Guidance.....	246
The Environment and Your Workplace.....	246
Heat, Cold and Inclement Weather.....	251
Workplace Bullying.....	262
WorkCover.....	263
Test Sheets.....	266

FOREWORD by Troy Gray, ETU Secretary.

Dear ETU Member

The ETU is proud to provide you with a copy of this occupational health and safety book. It has been produced by the Union with generous support from many employers and those associated with the electrical industry in the hope that it will help make our workplaces safer.

Occupational health and safety is the number one priority of our Union. Ensuring that our members go home to their families safely every day is of critical importance to us and we hope that the information contained in this book will provide a strong reference point on how to improve safety in the workplace.

The most important thing to remember is that IF IT IS UNSAFE, DON'T DO IT. No one can force any worker to work in an unsafe manner.

In Victoria, workers are protected by their union and also the Occupational Health and Safety Act. Together they form an effective means of support for ETU members when dealing with health and safety matters. The ETU, in conjunction with the Victorian Trades Hall and the ACTU, has access to current information on every health and safety matter. By contacting the ETU, we can provide members with up-to-date accurate material that will assist you in dealing with issues at your workplace.

While the contents of this book can assist you in ensuring that the most stringent health and safety standards are followed, everyone should be

aware of the critical need to undergo thorough and proper training on all aspects of the work that we perform. Electrical workers have spent years learning how to work safely and efficiently. We should be encouraged to take on additional training courses such as those offered by the Electrical Trades Union including construction wiring courses and other training programs that will increase our knowledge-base and ensure that we are skilled to do the work that we are asked to do in the safest possible manner.

The ETU defends the highest of safety standards and we support the highest integrity of the electrical trades - neither should be compromised in the performance of work.

I hope that the information contained in this manual will assist you in the **PREVENTION** of incidents and illnesses at your workplace.

Yours sincerely



Troy Gray
Branch Secretary



ETU CONTACT DETAILS

SECRETARY

Troy Gray 0418 323 552 troy@etu.asn.au

ASSISTANT SECRETARY

Wes Hayes 0417 552 775 wes@etu.asn.au

Ivan Balta 0418 147 272 ivan@etu.asn.au

ORGANISERS

Arron Harris 0418 376 161 arron@etu.asn.au

Colin Williams 0419 378 182 colin@etu.asn.au

Danny Timmers 0419 378 404 danny@etu.asn.au

Gerry Glover 0418 354 359 gerry@etu.asn.au

Mick Montebello 0418 323 559 mick@etu.asn.au

Peter Mooney 0418 338 725 peter@etu.asn.au

Reno Lia 0409 188 809 reno@etu.asn.au

Damian King 0407 925 696 damian@etu.asn.au

Nathan Stott 0419 500 465 nathan.stott@etu.asn.au

Troy Knight 0400 309 557 troy.knight@etu.asn.au

Justin Sordello 0409 200 893 justin@etu.asn.au

Matt Boyd 0405 124 953 matt@etu.asn.au

Nathan Jenkins 0420 504 407 njenkins@etu.asn.au

Steve Diston 0400 938 980 steven@etu.asn.au

OH&S OFFICERS

David Tuddenham 0419 132 833 davidt@etu.asn.au

Kris Gretgrix 0438 996 620 kris@etu.asn.au

APPRENTICES OFFICER

Omar Merhi 0418 513 127 omar@etu.asn.au

TRAINING OFFICER

Danny Filazzola 0402 347 117 dannyf@etu.asn.au

WELFARE OFFICER

Pat Tutton 0409 200 841 pat@etu.asn.au

APPLICABLE AUSTRALIAN AND NEW ZEALAND STANDARDS

SOME RELEVANT AUSTRALIAN STANDARDS

- AS/NZS 3000 Wiring rules
- AS/NZS 3001 Electrical installations: Relocatable premises (including caravans and tents) and their site installations
- AS/NZS 3008.1.1 Electrical installations: Selection of cables
- AS/NZS 3010 Electrical installations: Generating sets
- AS/NZS 3012 Electrical installations: Construction and demolition sites
- AS/NZS 3017 Electrical installations: Testing guidelines
- AS/NZS 3190 Approval and test specifications: Residual current devices (current operated earth-leakage devices)
- AS/NZS 3760 In-service safety inspection and testing of electrical equipment
- AS/NZS 4836 Safe working on or near low-voltage electrical installations and equipment
- AS 1674.2 Safety in welding and allied processes - electrical
- AS 2790 Electricity generating sets: Transportable (up to 25 KW)

Note: For further reference standards, visit www.siaglobal.com

WEB ADDRESSES

ACTU

www.actu.org.au

ETU

www.etu.vic.com.au

ENERGY SAFE VICTORIA (was OCEI)

www.esv.vic.gov.au

SAI GLOBAL (Standards Australia)

www.saiglobal.com

VICTORIA GOVERNMENT GAZETTE

www.gazette.vic.gov.au

VICTORIAN PARLIAMENTARY WEB PAGE

www.dpc.vic.gov.au

VICTORIAN TRADES HALL COUNCIL, OH&S REPS

www.ohsrep.org.au

WORKSAFE

www.worksafe.vic.gov.au

OH&S TRAINING COURSES

OCCUPATIONAL HEALTH AND SAFETY REPRESENTATIVES INITIAL COURSE

If you are a health and safety representative (HSR) in the electrical industry, this course is designed for you!

It will equip you with the confidence, skills and knowledge to represent your co-workers and to help make your workplace safer.

What's in it for you? The course is tailored to the electrical trade and you will learn how to:

- Interpret the Occupational Health and Safety legislative framework and its relationship to the HSR
- Identify key parties and their legislative obligations and duties
- Establish representation in the workplace
- Participate in consultation and issue resolution
- Represent designated work group members in an OH&S risk management process undertaken by the appropriate duty holder(s)
- Issue a Provisional Notice (PIN) and direct the Cessation of Work.

On completion of the 5 days, you will receive a Certificate of Attendance.

For further information contact ETU training officer Danny Filazzola, Phone: 0402 347 117 Email: dannyf@etu.asn.au

OCCUPATIONAL HEALTH AND SAFETY REPRESENTATIVES REFRESHER COURSE

To all the existing HSRs! Is it time to attend your annual HSR Refresher OH&S training course?

This WorkSafe-approved HSR Refresher OH&S training course is an opportunity to revisit aspects of the HSR Initial OH&S training course and refresh your knowledge of the learning outcomes you covered.

We understand that you're busy and it's easy to forget learnings from courses attended. This is why it is so important to keep in touch with the latest safety skills each year. **Pre-requisite:** Have you undertaken the HSR Initial OH&S training course?

You will receive:

- A general update on legislation
- Risk management on a specific or various hazards
- An update on HSR entitlements and powers
- HSR skills development.

WHAT'S IN IT FOR YOU?

- The course is tailored to the electrical trade
- Receive a refresher session and improve your workplace safety
- Ensure you are undertaking your HSR responsibilities with diligence
- Keep up-to-date with any safety changes
- Receive a Certificate of Attendance.

For further information contact ETU training officer Danny Filazzola
Phone: 0402 347 117 Email: dannyf@etu.asn.au

SHOP STEWARD INITIAL

A 2-day introductory course designed to provide an understanding of Union organisation, ETU history and structure and your role and responsibilities as a shop steward. It also provides basic communications skills, problem solving and recruitment strategies:

- ETU and Industrial Relations legislation
- The role of shop stewards
- Understanding your workplace
- Communication skills - listening and questioning
- Problem solving
- Interviewing skills
- Talking 1-on-1, handling objections.

For further information contact ETU Training Officer Danny Filazzola
Phone: 0402 347 117 Email: dannyf@etu.asn.au

SHOP STEWARD ADVANCED

The 2-day Shop Stewards Advanced training course focuses on developing shop stewards' presentation and negotiation skills:

- Communication skills - listening and questioning
- Talking 1-on-1, handling objections
- Negotiation skills
- Presentation skills
- Running a meeting
- IR legislation update/trends.

For further information contact ETU training officer Danny Filazzola,
Phone: 0402 347 117 Email: dannyf@etu.asn.au

CONSTRUCTION WIRING – STAGE 1

This 3-day course provides qualified electricians with the underpinning skills, knowledge and competency for the installation and maintenance of construction wiring on building and demolition sites. The course includes mandatory electrical testing content therefore providing a number of crucial training outcomes in one program.

For course bookings contact futuretech:
Phone: 03 9564 4700 Email: info@futuretech.edu.au Web: futuretech.edu.au

CONSTRUCTION WIRING – REFRESHER

A 2-day refresher to update licensed electricians with the knowledge and understanding of industry standards and legislation impacting on installation practices.

For course bookings contact futuretech:
Phone: 03 9564 4700 Email: info@futuretech.edu.au Web: futuretech.edu.au

SAFE WORK PRACTICES ON OR NEAR LOW-VOLTAGE ELECTRICAL SYSTEMS (SWP)

This 4-hour course will enable qualified and licensed electricians to conduct safety risk assessments of worksites in relation to safe work practices undertaken by electrical workers. It also provides skills and strategies to develop and promote a positive safety culture for electrical workers.

For course bookings contact futuretech:
Phone: 03 9564 4700 Email: info@futuretech.edu.au Web: futuretech.edu.au

FIRST AID – LEVEL 2 (INCLUDES CPR + LVR + SWP)

This 2-day course provides participants with the skills and knowledge to perform first aid in the workplace. There is a focus on increasing a safe work environment and helping employers conform to OH&S requirements.

LVR = low-voltage rescue, SWP = safe work practices, CPR = cardiopulmonary resuscitation.

For course bookings contact futuretech:
Phone: 03 9564 4700 Email: info@futuretech.edu.au Web: futuretech.edu.au

FIRST AID – LEVEL 2 UPDATE (INCLUDES CPR + LVR + SWP)

This 1-day course provides participants with the skills and knowledge to perform first aid in the workplace. There is a focus on increasing a safe work environment and helping employers conform to OH&S requirements.

LVR = low-voltage rescue, SWP = safe work practices, CPR = cardiopulmonary resuscitation.

For course bookings contact futuretech:
Phone: 03 9564 4700 Email: info@futuretech.edu.au Web: futuretech.edu.au



INTRODUCTION

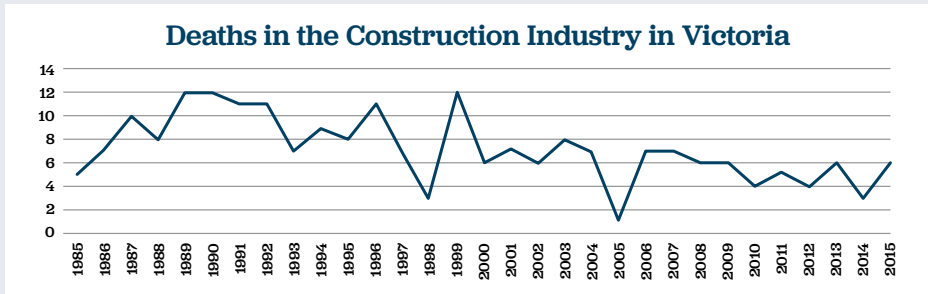
BASED ON THE NUMBER OF DEATHS, CONSTRUCTION WORKERS HAVE THE THIRD MOST DANGEROUS JOB IN AUSTRALIA.

Falling from heights is the primary reason for deaths and the second most common reason for injuries. In 2015, 26 construction workers died while working across the nation and 6 of these deaths occurred in Victoria. In comparison, agriculture, forestry and fishing was the highest at 56 deaths and the transport industry not far behind at 53.

Safe Work Australia confirm that, so far in 2016, 63 Australian workers have been killed at work.

IBIS Market Research reports 1,065,000 workers in the construction industry across Australia as of May 2016 which represents 9.3% of the national workforce. In Victoria, the construction industry employs 225,000 or 7.6%, of the State's 2.95 million employees.

Over the past 30 years, WorkSafe Victoria has reported 216 deaths in the construction industry, as revealed in the graph below which is 22% of the total deaths recorded in the workplace.



Broadly, over the past 10 years, the fatality trends for the construction industry in Victoria has declined with 30 deaths in 2006-2010 and 24 in 201-2015. The reduction is welcoming, although the deaths continue to be a concern for the sector with 30% of Victoria's workplace deaths occurring in the construction industry in 2015.

Injury rates are very high, especially on domestic construction sites. As reported by WorkSafe Victoria, every week 50 construction workers are seriously injured.

The total cost of claims in the Victorian construction industry for the period 2008-2014 was approximately 1.4 billion.

PART 1: OCCUPATIONAL HEALTH AND SAFETY RESPONSIBILITIES

LEGAL FRAMEWORK

In Victoria whilst at work we have two primary pieces of legislation that we must comply with, one of them being the Occupational Health and Safety Act 2004 (OH&S Act), the other the Electricity Safety Act 1998 (ES Act).

The OH&S Act applies in general terms to workplaces where there is an employer-employee relationship. The ES Act applies to electrical safety overall whether at a workplace or not.

The primary duty holder under the OH&S Act is the employer because they should have the management or control of the workplace. The employee also has a duty of care specified under the OH&S Act. The ES Act places the primary duty on the electrical worker to ensure that the electrical installation is safe and to standard and that the worker works safely.

Occupational Health and Safety Act 2004

The objects of the Act as defined by Section 2 are to secure the health, safety and welfare of persons at work. By protecting persons at work against risks to health or safety and assisting in securing safe and healthy work environments.

Also to eliminate at the source, risks to the health, safety and welfare of persons at work and to provide for the involvement of employees and employers and associations representing employees and employers in the formulation and implementation of health and safety standards.

Employers' Duty

The employer has a 'main duty' under Section 21 by providing and maintaining for employees, so far as is reasonably practicable, a work environment that is safe and without risk to health.

Section 21(2) sets out a number of specific duties, which are examples of how to comply with the general duty. These include: providing safe systems of work and safe plant; controlling hazardous substances; providing adequate instruction, training and supervision; and maintaining health and safety records.

These duties extend to independent contractors and independent contractor employees.

The OH&S Act defines reasonably practicable in (Section 20) as having regard to:

- the likelihood of the hazard or risk concerned eventuating;
- the degree of harm that would result if the hazard or risk eventuated;
- what the person concerned knows, or ought reasonably to know, about the hazard or risk and any ways of eliminating or reducing the hazard or risk;
- the availability and suitability of ways to eliminate or reduce the hazard or risk;
- the cost of eliminating or reducing the hazard or risk.

OH&S Representatives

Under the Act, HSRs have the right to:

- 1) Paid training leave (Section 67);
- 2) Information (Section 69.1(a)). Your employer is required to permit you to have access to any information relating to actual or potential hazards that pose a risk to the workers you represent;
- 3) Consultation (Section 35 & 36). Your employer is required to consult with you in regard to any changes that may pose a risk to the employees you represent;
- 4) Facilities (Section 69.1(e)). You are entitled to have facilities such as telephone, filing space and access to meeting rooms and photocopying etc;
- 5) Assistance (Section 58.1(f)). You can ask for assistance of any person. Ask the Union;
- 6) Paid time off (Section 69.1(d)). You are entitled to time off with pay for performing an OH&S function or duty; and
- 7) Work cessation (Section 74). If there is an immediate risk to health and safety, after consulting with the employer, either may direct that work shall cease.

The functions of a health and safety committee are to facilitate co-operation between the employer and the employees in developing and carrying out measures to ensure the health and safety of the employees.

Electricity Safety Act 1998

Legislation in regard to electrical safety has substantially changed in recent years.

In 1998 a new Act came into being, the Electricity Safety Act 1998. The Act allows for the establishment of the Office of the Chief Electrical Inspector (the office, now known as ESV). For further information, reference can be made to the office's website: www.esv.vic.gov.au.

The objectives of the office are to:

- Ensure the safety of generation, transmission and distribution systems, electrical installations and electrical equipment;
- Control electrical safety standards of work carried out by electrical workers;
- Promote awareness of energy efficiency;

- Protect underground and underwater structures from corrosion caused by stray electrical currents; and
- Maintain public and industry awareness of electrical safety requirements.

Some important aspects of the Act are:

43. Safety of Electrical Installations

- 1) A person must not install any electrical equipment which the person knows or should reasonably be expected to know is unsafe or will be unsafe if connected to an electricity supply.
- 2) A person carrying out electrical installation work must ensure that:
 - a) all electrical circuits or electrical equipment handled in the course of that work are disconnected from the electricity supply; or
 - b) adequate precautions are taken to prevent electric shock or other injury in the handling of electrical circuits or electrical equipment in the course of that work.

45. Inspection of Electrical Installation Work

A person who is responsible for the carrying out of prescribed electrical installation work must ensure that that work is inspected by a licensed electrical inspector in accordance with the regulations before the electrical installation is connected to the electricity supply, or if the electrical circuits or electrical equipment handled in the course of the work were not disconnected from the electricity supply, before the work is first used after it is completed.

The Electricity Safety (Installation) Regulations 1999 came into force on 3 May 1999. These regulations were amended in 2001 and 2004, with the current version dated 2009. S.R No 164/2009.

Some of the relevant sections of the regulations are:

202. Wiring Methods

A person must not install, alter, repair or maintain an electrical installation or a portion of an electrical installation unless the installation or the installed, altered, repaired or maintained portion of the installation complies with

- a) this Division; and
- b) Part 2 of the Australian/New Zealand Wiring Rules; and
- c) in the case of a high voltage electrical installation, AS 2067 and Appendix K of the Australian/New Zealand Wiring Rules except for the following provisions:
 - i) clauses K11.4.2 and K11.5.2; and
 - ii) the Note in clause K2.

An examples is:

AS/NZS 3000 preface states that *AS/NZS 3012 Electrical Installations - Construction and demolition sites* and *AS/NZS 3003 Electrical installations - Patient areas of hospitals and medical, dental practices and dialyzing locations* have been elevated from the status of guidance Standards to that of Standards providing additional requirements that shall be complied with.

238. Prescribed Electrical Installation Work

For the purposes of Section 45 of the Act '*prescribed electrical installation work*' means work on all or part of any of the electrical installations if they are ordinarily operated at low voltage or a voltage exceeding low voltage.

For a detailed list and definitions of prescribed electrical installation work refer to Regulation 238 of the Electricity Safety (Installation) Regulations 2009.

Service and Installation Rules

The Service and Installation Rules (SIRs) is a Code of Practice for the Connection of Electrical Installations to Distribution Companies Mains. These rules are available from some electrical wholesalers and distribution companies.

The rules as they are commonly known require customer electrical installations to comply with distribution companies' electrical supply arrangements, including service cables and consumer's mains, metering, multiple occupancies and high-voltage installations.

Electricity Safety (Installations) Regulations 2009

Requirement to Comply with AS/NZS 3000

The Regulations were proclaimed in May 1999 and amended in February 2001, and then again in 2009 with direct reference to AS/NZS 3000 and AS/NZS 3012. Not only do the Regulations mandate AS/NZS 3000 but they also amend certain provisions of AS/NZS 3000.

One example is:

Clause 7.8.1 AS/NZS 3000 - Wiring Rules states:

This clause outlines those standards that are applicable to specific electrical installations.

These Standards contain:

- a) additional requirements of this standard;
- b) requirements that, when fully satisfied, are deemed to comply with this Standards; and
- c) guidance for specific electrical installations and situations that, although not required by this Standard, may be required by relevant regulatory authorities.

Clause 7.8.2.1 Construction and demolition sites

Electrical installations for construction and demolition sites shall comply with AS/NZS 3012.

But the Electricity Safety (Installations)(Amendment) Regulations 2001 Clause 10 (1) of the Regulations requires that clause 7.11.12 of the Wiring Rules be substituted with:

THIS THEREFORE MAKES AS/NZS 3012 MANDATORY

Codes of Practice

Energy Safe Victoria has produced the Code of Practice for Safe Electrical Work for Low Voltage Electrical Installations. It is designed to constitute a set of minimum recommended procedural and safety requirements for a safe working environment for all electrical workers, including self-employed workers, authorised to perform work on electrical equipment and installations.

Codes of practice were developed under the OH&S Act 1985 to provide practical guidance on how employers may meet their obligations under the Act or Regulations.

Since the inception of the OH&S Act 2004 codes of practice no longer hold their status as was described under the 1985 Act but are able to be used as guidance material in accordance with Section 20 in relation to what a person knows or ought reasonably to know about the hazard or risk and any ways of eliminating or reducing the hazard or risk.

Compliance Codes

Compliance codes are specified in Section 149 of the 2004 OH&S Act. Compliance codes will replace codes of practice but are envisaged to be more mandatory than what codes of practice were.

Industry Standards

Industry standards are developed in a tripartite forum with the focus on a specific hazard. The industry standard provides practical guidance on hazard control to enable the employer to meet their duty of care.

The Industry Standard for Electrical Installations Construction Sites - Victorian WorkCover Authority - 2011 has been produced in order to assist the construction industry to provide and maintain an acceptable level of electrical safety so as to safeguard construction workers and the general public from electrocution and electrical shock. Energy Safe Victoria and the Victorian WorkCover Authority publish the industry standard on behalf of Foundations for Safety. The industry standard applies to fixed wiring, fixed and/or portable electrical apparatus, tools, appliances and associated flexible cords used in connection with all forms of construction work.

The industry standard should be read in conjunction with AS/NZS 3012.

What is expected by employees

The employee is to take reasonable care for their own health and safety and that of others in the workplace. The employees are also to cooperate with their employer in respect of safety and are not to willfully or recklessly interfere with or misuse anything provided in the interests of health or safety or to place at risk the health or safety of any person at the workplace.

What is expected of those in control of a Workplace

The OH&S Act 2004 requires employers to provide and maintain so far as is reasonably practicable a working environment that is safe and without risks to health.

This includes requirements to:

- Provide and maintain plant that is safe to use;
- Provide and maintain safe systems of work;
- Provide safe arrangements for the use, storage and transport of plant and (hazardous) substances;
- Maintain the workplace in a condition that is safe and without risks to health;
- Provide adequate information on hazards, as well as instruction, training and supervision to enable employees to work safely;
- Provide adequate amenities/facilities;
- Monitor the health of employees;
- Monitor conditions at the workplace;
- Provide information in languages other than English where appropriate;
- Keep information and records on the health and safety of employees;
- Obtain OH&S advice from people who are qualified in OH&S Under Part 4 of the Act, employers must also consult with employees regarding health and safety, involving; and
- HSRs where they exist.

Employers must make sure these health and safety requirements are available for employees regardless of which site they are working on or who has control of the site.

DUTY TO CONSULT WITH EMPLOYEES

A healthier work environment and improved productivity can be achieved more easily when employers and employees work together, consult on hazards and discuss and find solutions to problems cooperatively.

Workplace safety consultation is achieved through involvement of employer and employee representatives in accordance with the Victorian OH&S Act 2004 Part 4 Sections 35 and 36.

Employers with HSRs

The OH&S Act requires employers to consult with their HSRs on all occupational health and safety matters.

An employer needs to consult with the HSR:

- To identify and assess hazards or risks to health and safety in the workplace;
- Before making decisions to control risks to health and safety in the workplace;
- Before changes are implemented that may affect the health and safety of employees;
- Before policies and procedures are introduced; or
- Before making decisions about facilities for the welfare of employees.

An employer telling the HSRs what will happen is not consultation.

Therefore in consulting with HSRs an employer must:

- 1) Share information with the HSR**
This information should be provided in a timely way so that the HSR has adequate time to consider the matter.
- 2) Give the HSR a reasonable opportunity to express their views about the matter**
HSRs should be encouraged to ask questions, raise concerns, propose options, make recommendations and be part of the problem-solving process.
- 3) Take the HSR's views into account**
The views, suggestions and concerns of the HSR must be taken into account by the employer before a final decision is made.

Employers with Employees

Employers must consult with employees (including contractors and their employees) on the following matters, which are likely to affect their employees' welfare, health or safety:

- Identifying or assessing risks and hazards at the workplace;
- Making decisions about the measures to control those risks;
- Making decisions about resolving health and safety issues;
- Monitoring the health of employees;
- Providing information and training to employees;
- Determining membership of safety committee; or
- Proposing changes to the workplace that may impact on health and safety.

Consultation must follow the process of:

- a) Sharing information;
- b) Giving employees an opportunity to express their views; and
- c) Taking employees' views into account.

If workers are represented by a HSR, consultation must involve that HSR. The OH&S Regulations specify how the HSR is to be involved. Where there are HSRs, the employer must:

- Share information with the HSRs before other employees;
- Invite and meet with the HSRs;
- Give an opportunity for HSRs to express their views; and
- Take the HSRs' views into account.

More information can be found on the WorkSafe website under the topic 'health and safety representatives'.

Employers Representatives

The organisation may nominate a member of its staff to act as the employer's representative who may also be the safety officer. This person will be responsible for managing safety on site and consulting with employees and their HSRs on all the above matters.

Designated Work Groups

Employees may ask their employer to establish Designated Work Groups (DWGs) in their workplace. Employees in a DWG share similar workplace health and safety concerns and conditions.

They elect one or more HSRs and/or deputy HSRs to represent them on health and safety. A written list of DWGs must be displayed prominently at the workplace and must be kept up to date.

Employee Health and Safety Representatives

HSRs are the elected voice of workers to represent their safety interests.

Health and Safety Representatives can:

- Be assisted by elected deputies and, whenever necessary, seek the assistance of any person;
- Attend to safety issues raised by workers;
- Inspect the workplace;
- Accompany a WorkSafe inspector; or
- Be present at interviews and meetings concerning health and safety matters.

Health and Safety Representatives also have the power to:

- Issue Provisional Improvement Notices (PIN) to ensure outstanding health and safety issues are rectified; and
- Direct that work which involves an immediate risk to the health and safety of workers ceases. Under the OH&S Act these powers can only be exercised by the HSR after proper consultation with the employer.

Employers should consult fully with HSRs at all stages of the job planning and encourage open and frank two-way communication and cooperation.

Where members of a DWG elect one of their own as their HSR, the employer is required to provide HSRs and deputy HSRs with time off work to carry out their role. They must be allowed to attend an initial OH&S training course or a yearly refresher course. They must also be given time off work to attend WorkSafe-approved HSR training courses if they make a request in consultation with the employer - having given 14 days' notice of such a course. Whilst attending these training courses the OH&S Act requires that HSRs be paid as if they were at work (allowances and penalties) and that the employer has to meet all reasonable expenses associated with attending the course.

Health and Safety Committees

An employer shall establish a health and safety committee when requested to do so by a HSR. When requested by a HSR to establish a health and safety committee, the employer shall consult with the HSR as to the composition and functions of the committee.

Half of the members of a committee shall be employees

The health and safety committee can:

- Participate in regular formal site safety inspections;
- Review Safe Work Method Statements for scheduled high-risk construction work (e.g. structural trades where there is a risk of a person falling more than 2 metres);
- Assist the employer to monitor overall health and safety conditions on site;
- Develop safety policies and standards as issues arise on site; and
- Ensure the Alcohol and Drug Policy is implemented.

Safety Issue Resolution

For OH&S issues that may arise on sites, the procedure set out in the Issue Resolution Procedures (Part 2.2 of the Occupational Health and Safety Regulations 2007), or any specific safety dispute resolution agreements with equivalent fairness and employee involvement, must be followed.

CONSTRUCTION INDUSTRY

The principal contractor is responsible for identifying all site safety issues and providing and maintaining the proper systems to ensure the safety of workers, visitors and the public. This includes establishing, prior to starting work on a site, systems and processes for:

- Site amenities;
- Site security;
- The safe condition of the site;
- Safe management of trade activities;
- Ensure Safe Work Method Statements are developed for high-risk construction work;
- Safe operation of plant;
- Safety supervision;
- Site safety inductions;
- Safety signs and notices;
- Records, registers and forms; and
- Health and safety consultative arrangements.

Management is responsible for making sure that these measures are applied correctly to safeguard all site operations.

Construction Industry Induction Training Course

From July 2008 construction industry basic induction training became compulsory under new WorkSafe regulations. Workers who have previously undertaken The Foundation for Safety induction training (red card) will be recognised as having met the requirements of the new regulations in the first instance.

However, any worker who has been out of the industry for 2 years or more will have to undertake induction training again. All workers will be required to carry a specified card as evidence that they have completed the construction industry basic induction training.

This basic induction training does not replace an employer's duty to provide site-specific and task-specific instruction, supervision and ongoing training.

Note: Victorian white CIT cards are recognised in all Australian states. Victoria recognises the authorised induction cards of all other states.

Site-Specific Inductions

What is a site-specific induction?

It is an introduction to the site to inform workers about site rules and safety procedures, making sure they understand them before starting work, rather than relying on them to 'pick it up' as they go along. The initial site-specific induction should be followed by ongoing safety refreshers and training to help employees work safely and efficiently.

What should the site-specific induction cover?

It should explain to all employees and subcontractors;

- 1) Site safety rules and policies (e.g. drugs and alcohol, smoking, bullying, horseplay);
- 2) Site amenities and welfare facilities;
- 3) Site-specific hazards and control measures;
- 4) The requirements for Safe Work Method Statements (SWMS);
- 5) How safety issues and disputes are sorted out;
- 6) How to report safety hazards or unsafe work practices;
- 7) How to report accidents, incidents, dangerous occurrences and Notifiable Incidents;
- 8) What employees should do if they are injured;
- 9) First aid provisions and WorkCover claims; and
- 10) Details of employee representation on site (as per the OH&S Act or a certified agreement).

Who should conduct the site-specific induction?

The site-specific induction should be conducted by the site management and/or an authorised representative.

Injuries and First Aid

All sites must have first aid kits and First Aiders sufficient for site requirements. The names of First Aiders, first aid procedures and emergency contact phone numbers should be displayed in prominent locations visible to all workers. All site personnel should know where first aid facilities are located.

What to do if someone needs first aid treatment:

- Don't panic.
- Contact the designated First Aider.
- If anyone needs immediate first aid and the First Aider cannot be located, the site office should be contacted to arrange for an ambulance. If the office is unattended '000' (or '112' from a mobile phone) should be called to ask for an ambulance and provide:

- name and address of site/building;
- specific location of person injured;
- a contact telephone number;
- a person should go to the main site entry point to direct the ambulance;
- whilst waiting for the emergency services, ensure any injured parties are not moved unless there is a higher risk of being injured. All necessary assistance should be provided to safeguard injured persons and to keep them comfortable pending arrival of the emergency services.

Details of first aid treatment given by First Aiders should be recorded in the First Aid Treatment Book.

Emergencies

All sites should have an emergency plan that explains what to do in case of:

- Fire;
- Bomb threats;
- Gas and chemical leaks;
- Collapse of the building or structure; and
- Other emergencies.

The emergency plan should cover the following:

- The alarm signal for evacuation;
- The correct way to exit the building;
- What a person should do and what a person should not do in an emergency situation;
- The safe assembly point;
- The site personnel in charge of emergencies; and
- Contacts for emergency and rescue services.

Where appropriate an emergency evacuation drill should be conducted.

WorkSafe Inspectors

WorkSafe inspectors are appointed under the OH&S Act 2004 to deal with health and safety issues.

WorkSafe inspectors are authorised to enter workplaces at any time and to issue whatever directions are necessary for them to carry out their functions. (For example, they can issue a direction to stop a person or persons working in a way that could endanger his or her life or the lives of other workers.)

They are also authorised to:

- Issue Non-disturbance Notices - to ensure that particular parts of the site being investigated by inspectors (including plant equipment and substances) are not interfered with or subject to disturbance;
- Issue Improvement Notices - directing employers to fix safety problems within a specified time;
- Issue a Prohibition Notice - directing employers to cease unsafe activities that have immediate risks to the health and safety of workers;
- Conduct interviews and make enquiries;
- Take photographs, samples, recordings and measurements;
- Examine and copy documents; and
- Adjudicate in health and safety disputes between employers and employees - including those between ARREOs (authorised union officials) and employers.

If requested by a WorkSafe inspector, construction personnel must cooperate and provide assistance. It is an offence - for which a person could be fined and/or jailed - to obstruct, impede or hinder, threaten or assault an inspector.

NOTIFICATION OF INCIDENTS AND DANGEROUS OCCURRENCES

Incident Notification

All incidents and dangerous occurrences should be reported in the first instance to the workers' HSR and supervisor. This is to ensure that the issue is effectively dealt with.

The type of incident or dangerous occurrence and the severity of the issue determines whether it is required be reported.

Both the Victorian WorkCover Authority (WorkSafe) and Energy Safe Victoria (ESV) formerly known as (OCEI) have requirements in relation to reporting of incidents.

WorkSafe administers the Occupational Health and Safety Act 2004. The Act provides for the notification of certain incidents and dangerous occurrences.

Section 37 of the Act (below) refers to 'medical treatment'. 'Medical treatment' is defined in Section 37(4) as meaning 'treatment by a registered medical practitioner within the meaning of the Medical Practice Act 1994'.

Sections 37, 38 and 39 requires in part:

s37. Incidents to which this part applies

- 1) This Part applies to an incident that results in:
 - a) the death of a person;
 - b) a person requiring medical treatment within 48 hours of exposure to a substance;

- c) a person requiring immediate treatment as an in-patient in a hospital; or
- d) a person requiring immediate medical treatment for:
 - i) the amputation of any part of his or her body;
 - ii) a serious head injury;
 - iii) a serious eye injury;
 - iv) the separation of his or her skin from an underlying tissue such as de-gloving or scalping;
 - v) electric shock;
 - vi) a spinal injury;
 - vii) the loss of a bodily function;
 - viii) serious lacerations; or
- e) any other injury to a person or other consequence prescribed by the regulations.

- 2) This Part also applies to an incident that exposes a person in the immediate vicinity to an immediate risk to the person's health or safety through:
 - a) the collapse, overturning, failure or malfunction of, or damage to, any plant that the regulations prescribe must not be used unless the plant is licensed or registered;
 - b) the collapse or failure of an excavation or of any shoring supporting an excavation;
 - c) the collapse or partial collapse of all or part of a building or structure;
 - d) an implosion, explosion or fire;
 - e) the escape, spillage or leakage of any substance including dangerous goods (within the meaning of the Dangerous Goods Act 1985);
 - f) the fall or release from a height of any plant, substance or object; or
 - g) in relation to a mine -
 - i) the overturning or collapse of any plant;
 - ii) the inrush of water, mud or gas;
 - iii) the interruption of the main system of ventilation; or
 - h) any other event or circumstance prescribed by the regulations.
- 3) Despite sub-sections 1 and 2, this Part does not apply to an incident of a kind excluded by the regulations.
- 4) In this section, 'medical treatment' means treatment by a registered medical practitioner within the meaning of the Medical Practice Act 1994; 'mine' means:
 - a) a workplace at which work is being done under a mining licence granted under the Mineral Resources Development Act 1990; or

- b) a workplace at which exploration (within the meaning of that Act) in the form of:
 - i) underground work of any kind; or
 - ii) drilling from the surface for coal bed methane - is being done under an exploration licence granted under that Act; or
- c) in relation to a tourist mine (within the meaning of that Act), those parts of the mine that are underground and all infrastructure and plant associated with the underground workings of the mine.

s38. Duty to Notify of Incidents

- 1) An employer or self-employed person must notify the Authority immediately after becoming aware that an incident has occurred at a workplace under the management and control of the employer or self-employed person.
- 2) However, an employer or self-employed person is not required to notify the Authority if the employer or self-employed person is the only person injured or otherwise harmed, or exposed to risk, as described in Section 37 by the incident.
- 3) Within 48 hours after being required to notify the Authority, the employer or self-employed person must also give the Authority a written record of the incident, in the form approved in writing by the Authority.
- 4) The employer or self-employed person must keep a copy of the record for at least 5 years and make a copy of the record available for inspection by:
 - a) An inspector;
 - b) A person, or a representative of a person, injured in the incident or whose health or safety was exposed to immediate risk by the incident;
 - c) A representative of a person whose death was caused by the incident; or
 - d) In the case only of an employer:
 - i) if any of the employees of the employer are members of a designated work group, a health and safety representative for the designated work group; or
 - ii) the members of each health and safety committee (if any) established by the employer.
- 5) An employer or self-employed person who contravenes sub-section 1, 3 or 4 is guilty of an offence and liable to a fine not exceeding:
 - a) In the case of a natural person, 60 penalty units; or
 - b) In the case of a body corporate, 300 penalty units.

As detailed above, the OH&S Act provides for the notification of an incident where a person required immediate medical treatment for an electrical shock.

Electrical Incidents

There are legal provisions for the notification of an electrical incident.

A serious electrical incident is defined in the Electricity Safety Act 1998 as: 'serious electrical incident' meaning an incident involving electricity which causes or has the potential to cause:

- a) The death of or injury to a person;
- b) Significant damage to property; or
- c) A serious risk to public safety.

ESV has requirements to report serious electrical incidents and where a person has made accidental contact with any electrical installation or received an electric shock.

Electricity Safety (Installations) Regulations 2009

The Electricity Safety (Installations) Regulations 2009, Regulation 256 requires:

r256. Reporting of Incidents

- 1) If a serious electrical incident occurs, the following persons must, as soon as practicable, report all of the details of the incident within their knowledge to Energy Safe Victoria:
 - a) An electrical worker who becomes aware of a serious electrical incident relating to work carried out by that worker;
 - b) An operator of a high voltage electrical installation who becomes aware of any serious electrical incident occurring within that electrical installation;
 - c) An operator of a complex electrical installation who becomes aware of any serious electrical incident occurring within that complex electrical installation;
 - d) An operator of a railway who becomes aware of any serious electrical incident occurring in relation to an electrical installation associated with that railway;
 - e) An operator of a small gauge railway who becomes aware of any serious electrical incident occurring in relation to an electrical installation associated with that small gauge railway; and
 - f) Any other installation work responsible person who becomes aware of a serious electrical incident relating to work for which that person is responsible for carrying out.
- 2) A person referred to in sub-regulation (1) must, within 20 business days after the incident, send a written report of the incident to Energy Safe Victoria.

- 3) If an incident occurs involving electricity in which a person has made accidental contact with any electrical installation or received an electric shock as the result of direct or indirect contact with any electrical installation, the following persons must, within 20 business days after the incident, send a written report to Energy Safe Victoria of all of the details within their knowledge regarding the incident:
 - a) An electrical worker who becomes aware of such an incident relating to work carried out by that worker;
 - b) An operator of a high voltage electrical installation who becomes aware of such an incident occurring within that electrical installation;
 - c) An operator of a complex electrical installation who becomes aware of any serious electrical incident occurring within that complex electrical installation;
 - d) An operator of a railway who becomes aware of any serious electrical incident occurring in relation to an electrical installation associated with that railway;
 - e) An operator of a small gauge railway who becomes aware of any serious electrical incident occurring in relation to an electrical installation associated with that small gauge railway; and
 - f) Any other installation work responsible person who becomes aware of such an incident relating to work for which that person is responsible for carrying out.

Electricity Safety (Network Assets) Regulations 1999

There are also notification requirements under the Electricity Safety (Network Assets) Regulations 1999, Regulations 7 and 8.

These regulations require:

r7. Notification of serious electrical incidents

- 1) For the purposes of sections 142(1) and (2) of the Act, an electricity supplier who is a network operator who owns or operates an upstream network must:
 - a) As soon as is practicable report to the Office by telephone, on a telephone number specified by the Office, all of the details of the serious electrical incident within its knowledge;
 - b) Within 2 business days of the telephone report, send to the Office by facsimile or electronic mail a report of the incident in the form of Schedule 1 or a form containing equivalent information approved by the Office; and
 - c) Within 20 business days of the telephone report, send to the Office a report of the incident in the form of Schedule 2 or a form containing the equivalent information approved by the Office.

- 2) For the purposes of Section 142(3) of the Act, a fire control authority must:
 - a) As soon as is practicable report to the Office by telephone, on a telephone number specified by the Office, all of the details of the serious electrical incident within its knowledge; and
 - b) Within 20 business days of becoming aware that a fire is of an electrical nature, send to the Office:
 - i) A report of the incident in the form of Schedule 2 or a form containing the equivalent information approved by the Office; and
 - ii) The results of any investigation into the fire.

r8. Reporting of Incidents

- 1) If a serious electrical incident occurs in relation to a network asset of an owner or operator of a railway or tramway system, the owner or operator must:
 - a) As soon as is practicable report to the Office by telephone, on a telephone number specified by the Office, all of the details of the incident within its knowledge;
 - b) Within 2 business days of the telephone report, send to the Office by facsimile or electronic mail a report of the incident in the form of Schedule 1 or a form containing the equivalent information approved by the Office; and
 - c) Within 20 business days of the telephone report, send to the Office a report of the incident in the form of Schedule 2 or a form containing the equivalent information approved by the Office.
- 2) If an incident occurs involving electricity in which a person:
 - a) Makes accidental contact with any live high voltage electric line or live electrical equipment operated at high voltage; or
 - b) Receives an electric shock as a result of direct or indirect contact with any network assets or an electrical installation - each person to whom this subregulation applies must, within 20 business days of becoming aware of the incident, send to the Office a report of the incident in the form of Schedule 2 or a form containing the equivalent information approved by the Office.
- 3) Sub-regulation 2 applies to:
 - a) A network operator who becomes aware of such an incident that occurs in relation to its network assets; and
 - b) An electricity supplier who becomes aware of such an incident that occurs in relation to an electrical installation to which it generates, transmits, distributes or supplies electricity.
- 4) A fire control authority that attends or investigates an incident involving electricity in which a person:
 - a) Made accidental contact with any live high voltage electric line or live electrical equipment operated at high voltage; or

- b) Received an electric shock as a result of direct or indirect contact with any network assets or an electrical installation:

must, within 20 business days of becoming aware that the incident involved electricity, send to the Office a report of the incident in the form of Schedule 2 or a form containing the equivalent information approved by the Office and the results of any investigation made by the fire control authority into the incident.

Preserving the Scene

WorkSafe, Energy Safe Victoria, Victoria Police and the Coroner's Office may attend the scene of a workplace incident, injury or fatality and require the site to be left untouched.

It is against the law to tamper with or disturb the scene of a fatality unless otherwise directed by a WorkSafe inspector. The scene must not be disturbed unless this is necessary to:


- Help someone who is injured;
- Protect someone's health and safety; or
- Take essential action to make the site safe to prevent a further incident Occupational Health and Safety Act 2004.

s39. Duty to preserve incident scene


- 1) An employer or self-employed person who is required to notify the Authority of an incident that has occurred at a workplace must ensure that the site where it occurred is not disturbed until:
 - a) An inspector arrives at the site; or
 - b) Such other time as an inspector directs when the Authority is notified of the incident.

Penalty: 60 penalty units for a natural person and 300 penalty units for a body corporate.

- 2) Despite sub-section (1), a site may be disturbed for the purpose of:
 - a) Protecting the health or safety of a person;
 - b) Aiding an injured person involved in an incident; or
 - c) Taking essential action to make the site safe or to prevent a further occurrence of an incident.



ORIGINAL
SECTION 38(3) OCCUPATIONAL HEALTH AND SAFETY ACT 2004 AND
REGULATION 904 EQUIPMENT (PUBLIC SAFETY) REGULATIONS 2007


WORKSAFE VICTORIA
INCIDENT NOTIFICATION FORM
 Sept 2013

Reference Number - -

Ring 132 360 to obtain a Reference Number.
 The Reference Number is your proof of immediate notification. Immediate notification is required under section 38(1) of the Occupational Health and Safety Act 2004 and regulation 902(1) and 903(1) of the Equipment (Public Safety) Regulations 2007.

Person Submitting Details (Please print in BLOCK letters)

Name Position Title Telephone Number

Date / / Date of Incident / / Time of Incident

Name of Employer / Self-Employed Person / Person in Charge of Prescribed Equipment

Business Address (Not P.O. Box) Postcode

Name of Employer of Deceased / Injured Person(s), if any, if different from above

Address or Location where Incident Occurred

Brief Description of the Incident

Details of Deceased / Injured Person(s)

Name Male Female

Residential Address Postcode

Date of Birth / / Telephone Number

Occupation / Job Title Employee / Contractor / Member of Public

Work / Activity being undertaken at Time of Incident (Identify any Plant, Substance, Equipment Involved)

Brief Description of Injuries

Person(s) who saw Incident or first came to Scene

Action Taken / Intended, if any, to prevent recurrence of Incident

The above information is to be provided to the extent that it is known at the time of writing

Declaration

I declare that where I provide personal or health information to WorkSafe Victoria (WorkSafe) about any other individual, I am authorised to provide that information, the information has been collected in accordance with applicable privacy legislation and the individual has been or will be made aware of WorkSafe's identity and how to contact it and of the other matters of which an individual is required to be made aware when personal or health information is collected about them.

Signature Date / /

Name

Optional

WorkSafe ID

Establishment No

Incident investigated by _____ Date _____ Phone _____

1. Incident Details

(a) Details

Date of incident _____ (dd/mm/yy) Time of Incident _____ (hh:mm)
 Address of Incident _____
 Suburb _____ Postcode _____

(b) Was there a Fire? Yes No (if no go to Section 2)

Was the fire SUSPECT of an electrical origin? Yes No
 Was the fire of an electrical origin? Yes No

Provide details of fire

2. Incident Category & Details

(a) Category (Tick more than one if appropriate)

Fatality Serious Injury Minor Injury
 Significant Property Damage Minor Property Damage Highly Unsafe Situation
 Technical Defect situation Other (specify) _____

(b) Premises & location specifics (tick one box only)

Residential Industrial Commercial Construction Agricultural
 Public Open Space Other (specify) _____

(c) Specific location of incident (bathroom, garage) _____

(d) Name of owner of premise _____

3. Person involved (including victim)

[Attach additional sheets if there is more than one person involved]

(a) Details

Name _____ Age _____ Sex _____ Phone No _____
 Residential address _____ Suburb _____
 Postcode _____ Fax no _____ Email _____

(b) Injury Type (tick more than one if appropriate)

No shock or injury (go to section 3f) Electric shock Electrical burns
 Flash burns Resulting from fall Other – Specify _____

(c) Severity of injury / shock (tick one box only)

Slight Strong Severe

(d) Part of body injured (tick more than one if appropriate)

Head Eyes Neck Trunk Arms
 Hands Legs Feet Other – Specify _____

(e) Treatment provided (tick more than one if appropriate)

No Treatment Resuscitation Hospitalisation Medical Treatment Checkup

(f) Did the incident occur in the course of work?

Yes No (go to section 4)

(g) Occupation of person involved (tick more than one category if appropriate)

NWO Electrical worker Registered Electrical Contractor Licensed Electrician
 Licensed Electrical Inspector Electrical Apprentice Plumber
 Other Apprentice _____ Other – Specify _____
 (NWO: Network Operator-distribution, generation, transmission, traction company)

(h) License/REC Number (if applicable) _____

(i) What work was the person involved required to perform?

(j) Employer Details

Employer Name _____ Phone No _____
 Employer address _____ Suburb _____
 Postcode _____ Fax no _____ Email _____

4. Voltage involved

(a) Supply voltage involved in the incident

Extra low voltage (up to 50V AC or 120V DC ripple free)
 Low voltage (up to 1000V AC or 1500V DC)
 6.6kV 11kV 12.7kV (SWER) 22kV 66kV
 220kV 330kV 500kV

(b) What was the supply voltage? Phase/Phase Phase/Earth Phase/Neutral

AC DC

(c) Voltage Between points of contact _____

5. Electrical Installation – if applicable

(a) Was a private overhead electric line(POEL) associated with the incident? Yes No(Go to Section 5c)

(b) Which part of the POEL was involved?

Cross arm Steel Wood
 Pole Wood Concrete Steel Other – Specify _____
 Guy wire
 Conductor
 Insulated Uninsulated
 Copper Aluminum Copper Aluminum
 Insulator

Pole Mounted Equipment installed on the POEL (Please provide details below)

Postcode _____

Fax no _____

Email _____

(c) Was fixed wiring of a premises associated with the incident? Yes No (Go to Section 6)

Give details (*damaged insulation, faulty switches, uncovered junction box, exposed wire, manufacturer, type, etc...*)

Which part of the installation was involved in the incident?

- Switchboard
 Consumer Mains
 Overhead Underground
 Point of attachment Building structure
 Building structure Meter position
 Meter position
- Fixed Wiring
 Power Lighting
 Construction Wiring
 Other – Specify _____

6. Appliances involved with the incident – if applicable

What type was the appliance? Portable Stationary Fixed
Class of appliance Prescribed Non-prescribed
Type of appliance (iron, hair dryer) _____
Brand _____ Model No _____ Approval No _____
Other markings _____ Approximate age _____
Condition of equipment Good Fair Poor
Purchase Details _____ Available for inspection Yes No
Is Equipment compliant? Yes No Other – specify _____
Was the appliance misused? Yes No Don't know
If Yes, Give details of misuse

Manufacturer Details

Company Name _____ Contact Name _____ Phone No _____
Address _____ Suburb _____
Postcode _____ Fax no _____ Email _____

Supplier Details

Company Name _____ Contact Name _____ Phone No _____
Address _____ Suburb _____

7. RCD Information

- (a) Was a RCD installed on the circuit? Yes No (If no, then go to Section 7d)
 Manufacturer _____ Model No _____
- (b) Did the RCD Operate? Yes No Don't know
- (c) Would you have expected the RCD to have operated? Yes No Don't know
- (d) If an RCD was not installed, would an RCD have prevented the incident? Yes No Don't know

8. Electrical Supply-if applicable

- (a) Specify asset network operator,
 Generation – Company _____ Transmission - Company _____
 Distribution - Company _____ Traction – Company _____
- (b) Indicate which parts of the network were involved in the incident,
 Overhead Conductors
 Service line
 Service Conductor Aluminum Copper
 Service Type N/S Twisted Wire ABC Open Other – specify _____
 LV reticulation
 Reticulation Conductor Aluminum Copper
 Conductor Type Insulated Bare Covered – Uninsulated ABC
 HV Conductors
 Conductor Type Insulated Bare Covered – Uninsulated ABC
 Underground Conductors
 Service Line Mains Line HV Line
 Public Street lighting circuit
 Tram
 Trolley Wire Negative Cable Positive Feeder
 Train
 Trolley wire Catenary Positive Feeder Negative Cable
 Pole
 Wood Concrete Steel Other – specify _____
 Guy Wire
 Pole Train Tram
 Cross arm
 Type Steel Wood
 Insulator Polymer Pin Post Disc Other – Specify _____
 Substation
 Pole Mounted Substation Pad Mounted Equipment/Kiosk Substation
 Ground Substation Zone Substation
 Tower
 Communication Tower Wind Farm Tower Sub Transmission Tower
 Transmission Tower Distribution Tower
 Switchyard
 Terminal Station
 Power Stations
 Turbine Boilers Mine Auxiliary System Fuel Handling System
 Metering Equipment
 Fused Overhead Line Connection Box (FOLCB)

9. Description of incident

Briefly describe what the victim was doing at the time of the incident and how any injury was received (Use additional sheet and sketch if necessary for relevant detail) and the cause of the incident

10. Animal Involved – if applicable

a) Type of animal involved _____

(b) Number of animals injured or killed _____

(c) Did the animal cause the incident? Yes No

11. Witness Details – if applicable

Name _____ Phone No _____
Residential address _____ Suburb _____
Postcode _____ Fax no _____ Email _____

12. Police Officer Details – if applicable

Name of attending officer _____ Phone No _____
Rank and identification number _____ Station _____

13. Medical Officer Details – if applicable

Name of attending doctor _____ Phone No _____
Clinic or hospital address _____ Suburb _____ Postcode _____

14. Action Taken and by whom

Reported By _____ Phone _____ Date _____

Once completed please send to Energy Safe Victoria (ESV).

Mail: PO Box 262
Collins Street West
Melbourne 8007

Facsimile: 03 9686 2197
Email: info@esv.vic.gov.au

Please use the space below for any additional information, diagrams or sketches that may be relevant (record any additional details as necessary in your inspection/investigation book).

Dealing with Trauma and Counselling

It is important to remember that anyone on a site where a workplace accident occurs may be emotionally distressed and/or in shock and need counselling to deal with the trauma.

For counselling assistance contact Protect on **1300 725 88** to discuss and arrange support processes.

PART 2: HAZARD IDENTIFICATION AND CONTROL OF RISKS

HAZARD IDENTIFICATION

Identifying hazards involves finding all of the foreseeable hazards in the workplace and understanding the possible harm that the hazards may cause.

What to look for

A hazard is something in the workplace (or that will be in the workplace) that can cause harm to people.

A piece of plant, substance or a work process may have many different hazards, and each of these hazards needs to be identified. For instance, a production line may have mechanical hazards, noise hazards, electrical hazards, body stressing hazards associated with manual handling and psychological hazards associated with the pace of work.

ASSESS RISKS

Risk assessment is a process for developing knowledge and understanding about hazards and risks so that sound decisions can be taken about control. A formal risk assessment is unnecessary if the knowledge and understanding already exist.

However, there will be many times when a risk assessment is the best way of building knowledge and understanding.

Risk assessment assists in determining:

- What levels of harm can occur;
- How harm can occur; and
- The likelihood that harm will occur.

A risk assessment will provide knowledge to make informed decisions about controlling hazards and risks. The risk assessment needs to be tailored to the situation and to the organisation in which it is conducted; it can be as simple as structured discussion during consultation or it can be more elaborate and formal.

When should a risk assessment be done?

A risk assessment should be done when:

- There is only limited knowledge about a hazard or risk, or about how the risk may result in injury or illness:

- There is uncertainty about whether all of the things that can go wrong have been found; and
- The situation involves a number of different hazards that are part of the same work process or piece of plant, and there is a lack of understanding about how the hazards may impact upon each other to produce new or greater risks.

CONTROL HAZARDS AND RISKS

Duty-holders are required to ensure health and safety by controlling risks. Risks must be controlled by eliminating them so far as reasonably practicable or, if this is not possible, reducing the risks that remain so far as reasonably practicable.

Arriving at appropriate controls involves:

- Identifying the options for controls. A control option may be a single control or it may be made up of a number of different controls that together provide protection against a risk;
- Control measures are selected by working through steps 1 to 6 of the Risk Control Hierarchy;
- Considering the control options and selecting a suitable option that most effectively eliminates or reduces risk in the circumstances; and
- Implementing the selected option.
Note: mandatory controls specified in the OH&S regulations must be implemented regardless of the results of the method in this guide.

Reasonably practicable

Duty-holders are required to ensure health and safety so far as reasonably practicable. Determining what is reasonably practicable to protect people from harm involves weighing up all the following matters and making a judgment about what is reasonable in the circumstances:

- The likelihood of a hazard or risk occurring;
- The degree of harm that would result if the hazard or risk occurred;
- What the duty-holder knows, or reasonably ought to know, about the hazard or risk, and any ways of eliminating or reducing the risk;
- The availability and suitability of ways to eliminate or reduce the hazard or risk; and
- The cost of eliminating or reducing the hazard or risk.

Risk Control Hierarchy

This is a methodology designed to ensure that the control measure that provides the greatest level of safety is selected.

Apply where reasonably practicable in the order shown:

- 1) **Elimination** - remove the specific risk entirely by adopting another way of doing the job;
- 2) **Substitution** - reduce the risk significantly by using another method or process;
- 3) **Isolation** - ensure that the level of exposure of people to the hazard is kept to a minimum;
- 4) **Engineering controls** - using machinery or equipment to perform a task which protects persons from the risk;
- 5) **Administrative controls** - implementing safety instructions to minimise exposure to the risk; and
- 6) **Personal protective equipment (PPE)** - may be used when it is simply not possible to use other methods - or as an adjunct to the other controls. It should always be seen as the last resort.

MONITOR CONTROLS

Controls that are put in place to protect the health and safety of people need to be monitored to ensure that they work as planned. This requires checking them and ensuring that processes are put in place to identify and quickly fix problems.

Checking controls

Checking controls involves the same methods as in the initial hazard identification step, and creates the loop in which workplace health and safety measures are maintained.

Common methods used to check the effectiveness of controls are:

- Inspecting the workplace;
- Consulting employees;
- Testing and measuring;
- Using available information analysing records and data; and
- Any failures in current controls should become apparent if these checks are made on a regular basis.

Mandatory review of controls

There are certain situations where the OH&S Regulations require hazard and risk control measures to be reviewed and, if necessary, revised. These situations generally arise when:

- The hazard or risk changes. This can occur if there is a change to the thing, work process or system of work that gives rise to the hazard or risk;
- The current control measures do not adequately control the hazard or risk; or
- An HSR requests a review on reasonable grounds. Refer to the OH&S Regulations to find out more information about the mandatory review of controls.

SAFE WORK METHOD STATEMENTS (SWMS)

The SWMS is similar to a Job Safety Analysis (JSA), which had been previously widely used in the Victorian construction industry. Under these regulations SWMS will be required to be developed for high-risk construction work. These are examples:

- a) Where there is a risk of a person falling more than 2 metres;
- b) On telecommunications towers;
- c) Involving demolition;
- d) Involving the removal or likely disturbance of asbestos;
- e) Involving structural alterations that require temporary support to prevent collapse;
- f) Involving a confined space;
- g) Involving a trench or shaft if the excavated depth is more than 1.5 metre;s
- h) Involving a tunnel;
- i) Involving the use of explosives;
- j) On or near pressurised gas distribution mains or piping;
- k) On or near chemical, fuel or refrigerant lines;
- l) On or near energised electrical installations or services;
- m) In an area that may have a contaminated or flammable atmosphere;
- n) Involving tilt-up or precast concrete;
- o) On or adjacent to roadways or railways used by road or rail traffic;
- p) At workplaces where there is any movement of powered mobile plant;
- q) In an area where there are artificial extremes of temperature;
- r) In, over or adjacent to water or other liquids where there is a risk of drowning; or
- s) Involving diving.

Under these new regulations a SWMS means a document that:

- Lists the high-risk construction work being done;
- States the health and safety hazards and risks arising from that work;
- Describes how the risks will be controlled; and
- Describes how the risk control measures will be put in place.

Contractors engaged in high-risk construction work are not permitted to rely on generic documents containing their companies' safety rules and procedures in lieu of site-specific SWMSs.

The effectiveness of the control measures should be reviewed following implementation of the SMWS.

Employees should be consulted when developing an SWMS and should be inducted into their SWMS before starting work.

HEALTH AND SAFETY COORDINATION PLAN (HSCP)

The OH&S Regulations 2007 state that for projects of a value of \$250,000 or more, the principal contractor must make sure that a Health and Safety Coordination Plan (HSCP) is prepared for any construction work before the work starts.

An HSCP is document which describes how safety will be managed on site.

Where reasonably practicable, the principal contractor must consult with site personnel (including a HSR where applicable) when developing the plan. This may mean consulting with the main subcontractor trades involved in the most hazardous work.

During the project, the principal contractor must review the HSCP to make sure that it remains accurate and deals with all the construction work actually being done.

The principal contractor must make sure that the HSCP is kept until the construction project is finished and is readily available to site personnel.

The principal contractor must make sure that new starters are aware of, and are given access to, the HSCP before they start construction work at the workplace.

What must a Health and Safety Coordination Plan contain?

- 1) The names, positions and responsibilities of all people who look after health and safety;
- 2) The way health and safety will be coordinated on site;
- 3) The arrangement for managing incidents; and
- 4) Site safety rules.

PLANT

The Occupational Health and Safety Act 2004 and Occupational Health and Safety Regulations 2007, Part 3.5 Plant, seeks to protect people at work against risks to health or safety arising from plant and systems of work associated with plant.

Plant is defined in the OH&S Act as:

- Any machinery equipment appliance implement and tool;
- Any component of any of those things; and
- Anything fitted, connected or related to any of those things.

Types of plant that are not covered by the OH&S Regulations are:

- Plant which is manually powered;
- Plant which is primarily supported by hand;
- Ships, boats or aircraft; or
- Vehicles designed to be used primarily as a means of transport on public roads or rail.

However, Section 21(2)(a)&(b) of the Act covers all plant, and the employer must ensure that plant (and its use, handling, storage and transport) is safe and without risks to health.

Background

Without proper maintenance, safety integrity of plant cannot be ensured even if the plant has been designed and manufactured with due consideration to health and safety.

The OH&S Act and OH&S Regulations, Part 3.5 Plant place an obligation on employers to ensure plant is maintained. The Act also requires employers to provide and maintain, so far as is practicable, a working environment that is safe and without risks to health for employees who undertake inspection and maintenance work.

Selection of Plant

Before purchasing, hiring or leasing plant for use in your workplace, you should determine:

- The purpose for which the plant is designed;
- The hazards and risks (including manual handling) associated with installation, commissioning, operation, inspection, maintenance, service, repair, cleaning, transport, storage and dismantling of the plant;
- Any precautions required to address the hazards and risks;
- The manufacturer's recommendations in relation to the frequency and type of inspection and maintenance required for the plant;
- Any special skills required for people who operate the plant or carry out inspection and maintenance of the plant;
- Any special equipment required for people to undertake the inspection and maintenance of the plant.

The answers to the above questions will assist you in deciding on which particular make of plant should be procured in order to minimise the health and safety risks to people in your workplace.

System for Plant Maintenance

If the failure of an item of plant for use in your workplace has the potential to cause injuries or illnesses, you need to make sure that there is an effective system in place for ensuring the plant is properly maintained.

The system should include the following elements:

- Allocate responsibilities;
- Allocate appropriate responsibilities for people who are associated with the inspection and maintenance work (including managers, supervisors as well as people who undertake inspection and maintenance); and
- Make sure people fully understand their responsibilities.

Plant Register

Maintain an up-to-date register of the specific items of plant in the workplace requiring a preventative maintenance program.

Work Requirements

Determine what is the appropriate frequency and type of inspection and maintenance required for each item of plant on the preventative maintenance program register and record them on the register. To help you identify the information, you need to consider:

- The manufacturer's instructions;
- What is recommended in the relevant published technical standards (e.g. Australian Standards);
- Any additional factors unique to your workplace (e.g. the plant may be operating in a corrosive environment that warrants more frequent inspection and maintenance than specified in either the relevant published technical standards or the manufacturer's instructions);
- Review the frequency and type of inspection and maintenance required for each item of plant on the preventative maintenance program register in the light of information collected from previous inspections (e.g. if the previous inspections indicate there is an accelerated deterioration of the condition of the plant, more frequent inspection and maintenance would be required); and
- Amending the information that is on the preventative maintenance program register.

Procedure Development

Develop procedures for the inspection and maintenance work (including what parts of the plant need to be inspected and how the plant should be safely isolated, locked out and tagged during inspection and maintenance) using the relevant information provided by the manufacturer as the basis.

Carry out a Job Safety Analysis to identify what hazards (including manual handling) are associated with each step of the inspection and maintenance procedures and the measures required to address the hazards.

Undertake appropriate actions to address the hazards identified in the Job Safety Analysis including revising the procedures for undertaking the inspection and maintenance.

Develop procedures for the reporting of faults, damages or defects of plant and for addressing the reported deficiencies.

Resources Acquisition

- Identify the skills required by people who carry out inspection and maintenance and where those skills can be obtained;
- Engage the people who have the appropriate skills to carry out the inspection and maintenance; and
- Identify what equipment is required for people to carry out the inspection and maintenance work and have the necessary equipment available.

Inspection Equipment

Maintain an effective system for the selection, calibration and maintenance of equipment used to carry out inspections.

Provision of Information, Instructions, Training and Supervision

Make sure the people who undertake inspection and maintenance work are provided with adequate information, instructions, training (e.g. hazards associated with the work, safety procedures) and supervision for them to carry out the work in a safe manner.

Work Scheduling

Maintain an effective system for scheduling inspection and maintenance work.

PART 3: ELECTRICAL SAFETY LEGISLATION

ELECTRICAL SAFETY LEGISLATION

It is important for all workers in the electrical industry to understand that all electrical installation work, both prescribed and non-prescribed, is required to be undertaken only by registered electrical contractors and/or licence holders (as appropriate) with a certificate of electrical safety being required to be used and issued to customers (those people who requested the electrical work to be done) and a copy of the certificate provided to Energy Safe Victoria for audit purposes.

There are 3 types of certificates:

- A certificate of electrical safety for *prescribed electrical installation work* (which includes a certificate of compliance and a certificate of inspection);
- A certificate of electrical safety for *non-prescribed electrical installation work* (which includes only a certificate of compliance); and
- A *periodic certificate of electrical safety for non-prescribed electrical installation work* (which contains multiple certificates of compliance) carried out over a 3-month period.

Samples of these certificates are on the following pages.

All registered electrical contractors and/or licence holders (as appropriate) are required to purchase the relevant certificates of electrical safety, complete the necessary detailed information in relation to the electrical installation work carried out, however large or small, and distribute the certificates with the original being provided to the person who requested the electrical work to be done (customer and/or employer as appropriate).

CERTIFICATE OF ELECTRICAL SAFETY for Non-Prescribed Electrical Installation Work
ELECTRICITY SAFETY ACT 1988, ELECTRICITY SAFETY (REGULATIONS) REGULATIONS 2009

Certificate no. [Barcode]

CERTIFICATE OF COMPLIANCE

1. Responsible Person (eg electrical contractor installing electrical appliances)
RCC reg. license no. [] Telephone no. []
Name []
Business Address []

2. Licensed Electrical Installation Worker (eg electrician)
Licence no. []
Name []

3. Details of Electrical Installation
Name of customer []
Address of installation (street no. if relevant) []
Suburb of town [] Postcode [] [] [] []
Telephone []
Mile of conductors []

4. Electrical Work Undertaken
No. light points [] No. single socket outlets [] No. double []
Have you installed wiring or equipment associated with Air Conditioning? Yes No
Maximum demand in amps per phase on completion [] Consumers mains capacity in amps []
Description of work undertaken if sufficient space does not exist []

5. Has this electrical installation work failed a previous audit? Yes No
If yes, quote previous certificate number []

6. Type of property where the electrical installation work is carried out (see back of certificate for notes)
 Domestic Non Domestic Construction

I, the licensed electrical installation worker named above, who carried out the electrical installation work described above, certify that the electrical work has passed all the required tests and complies in all respects with the Electricity Safety Act 1988 and the Electricity Safety (Regulations) Regulations 2009.

Signature []
Date of completion of work [] Date Certified []

Please note: The electrical installation work described above may be subject to audit by representatives of Energy Safe Victoria.

NON-PREScribed Customer copy

energy safe VICTORIA
Creating a safer state with electricity and gas

Certificate of Electrical Safety

CERTIFICATE OF ELECTRICAL SAFETY for Non-Prescribed Electrical Installation Work

ELECTRICITY SAFETY ACT 1998, ELECTRICITY SAFETY (INSTALLATIONS) REGULATIONS 1999

CERTIFICATE OF COMPLIANCE

1 Responsible Person (eg electrical contractor, supervising electrician, electrician)

REC reg./license no. _____ District _____
 Name _____ Signature _____
 Telephone no. _____ Facsimile no. _____

2 Licensed Electrical Installation Worker (eg electrician)

License no. _____ District _____
 Name _____

3 Details of Electrical Installation

Name of customer _____
 Address of installation _____
 (include lot or if required) Suburb or town _____ Postcode _____
 Telephone _____

4 Electrical Work Undertaken

Socket-outlets: No. light points _____ No. singles _____ No. doubles _____ Other _____
 Maximum demand in amps per phase on completion _____ Consumers main capacity in amps _____
 Description of work undertaken (if sufficient space, please attach list) _____

5 Has this electrical installation work failed a previous audit? Yes No

If yes, previous certificate number _____

6 Type of property where the electrical installation work is carried out (note tick all that apply to type)
 1 Domestic 2 Commercial 3 Industrial

7 RCD installed at this site? Please specify reason:
 1 No RCD installed 2 Previously installed 3 Sale of Property
 4 Age of Property 5 Sale & age 6 New property
 7 Customer request

8 If RCD installed, specify where:
 1 Power 2 Lighting 3 Power & lighting

I, the licensed electrical installation worker named above, who carried out the electrical installation work described above, certify that the electrical work has passed all the required tests and complies in all respects with the Electricity Safety Act 1998 and the Electricity Safety (Installations) Regulations 1999.

Signature _____

9 Date of completion of work _____ 10 Date Certified _____

Certificate no. _____

Customer copy

Certificate of Electrical Safety

energysafe
VICTORIA



Energy Safe Victoria recommends Home Safety Inspections on a regular basis to ensure ongoing safety for you and your family.

NON-PREScribed

CERTIFICATE OF ELECTRICAL SAFETY for Non-Prescribed Electrical Installation Work (Periodic)

ELECTRICITY SAFETY ACT 1998, ELECTRICITY SAFETY (INSTALLATIONS) REGULATIONS 1999

Customer copy

Certificate no. _____

For clarity

CERTIFICATE OF COMPLIANCE

Date of issue _____
 Date of completion of the last job performed on this site of issue _____

1 Details of Responsible Person (eg electrical contractor, supervising electrician, electrician)

Name _____
 REC reg. no. _____ District _____
 Signature _____

2 Details of Installation

Name of customer _____
 Address of installation _____
 Suburb or town _____ Postcode _____
 Telephone no. _____

The licensed electrical installation worker who carried out the electrical installation work described below and signing below certifies that the electrical work has passed all the required tests and complies in all respects with the Electricity Safety Act 1998 and the Electricity Safety (Installations) Regulations 1999.

Licensed Electrical Installation Worker Name and License No.	Description of Non-Prescribed Electrical Installation Work Undertaken	Signature of Licensed Electrical Installation Worker Carrying Out/TESTED ELECTRICAL WORK	Date Completed	Date Certified

NOTE: If sufficient space on the form permits (attachments) using date format as above.
 Total number of jobs completed by all licensed electrical installation workers _____
 Is a residual current device installed at this site? Yes No



energysafe
VICTORIA

WORKING ON OR NEAR LIVE ELECTRICAL EQUIPMENT

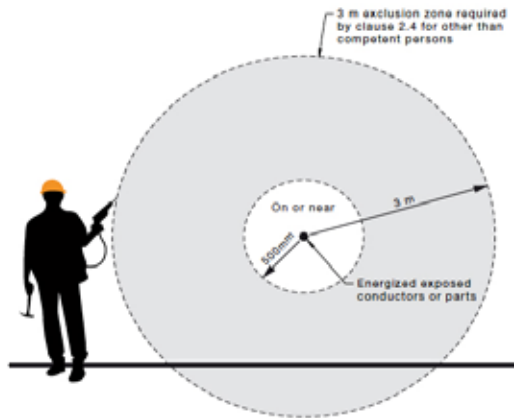
The following information shall be taken into consideration when electrical workers are to work on or near live electrical installations or equipment. Refer to AS/NZS 4836:2011.

Working on or near live electrical equipment, is defined as the following:

A situation where an electrical worker is working on or near exposed energised conductors or live conductive parts and there is a reasonable possibility that the electrical worker's body, or any conducting medium the electrical worker may be carrying or touching during the course of the work, may come closer to the exposed energised conductors or live conductive parts than 500mm.

The term 'on or near exposed energised conductors or live conductive parts' does not apply if the uninsulated and energised part is safely and securely shielded by design, or segregated and protected with barricades or insulated shrouding or insulating material to prevent inadvertent or direct contact.

It is the duty of the principle contractor that all work shall be planned and organised to minimise the risks associated with the work. This shall be documented in the Safe Work Method Statement (SWMS), and signed off by a officer of the company, before work commences.



An assessment shall be carried out at the work site before starting work to assess all risks that might have the potential to cause harm or damage.

If any person is required to work within 3m of energised exposed conductors or parts, a competent person shall identify appropriate risk treatments (see Figure).

Safety shall not be compromised because of operational pressures to carry out the work. All workers shall be made aware of the hazards of the tasks and the control measures required to mitigate them. These tasks and control measures are detailed in the SWMS.

These requirements can be achieved by demonstrating the controls as detailed in Appendix A of AS/NZS 4836, and must include the need for a person who has been specifically assigned the responsibility of observing and warning against the unsafe approach to electrical equipment, exposed energised conductors or live conductive parts and other potential risks.

If a safety observer is used as part of a safe system of work, the following shall apply:

- The safety observer shall be able to warn and, if necessary, stop the work before the risks become too high.
- The safety observer shall not carry out any other work or function that compromises their role as a safety observer, i.e. the safety observer shall not observe more than one task at a time.
- The safety observer shall be able to communicate quickly and effectively with the electrical workers performing the work.
- The safety observer shall be capable of providing assistance in the case of emergency as well as being competent to perform electrical rescue and cardiopulmonary resuscitation (CPR), as required. On an energised electrical installation, the safety observer shall be competent to perform their task and shall also be competent in electrical rescue and CPR.
- The safety observer shall be suitably attired in personal protective equipment appropriate to the situation.
- The safety observer shall not have any known temporary or permanent disabilities that would adversely affect their role and performance.
- The presence of a safety observer is one of the risk control measures to ensure electrical safety when electrical work on energised circuits and electrical equipment is being carried out.

WORKING ON LIVE EQUIPMENT MAY RESULT IN ELECTRIC SHOCK OR ARC BLAST AND FLASH BURN INJURIES.

All equipment shall be isolated prior to work commencing.

Arc Blast and Flash Injuries

Persons working on or near energised conductors of electrical equipment should be aware that fault currents of up to 20 times the rated current of the supply transformer can flow for short times during arc fault conditions.

No work is to be carried out on live electrical conductors, except for work on approved extra low voltage equipment or as authorised by the electrical engineering manager and in accordance with this section.

Plan the Work

Rescheduling the work to a time when power can be isolated must be considered first. Working on live electrical equipment must only be considered as a last resort and when an adequate risk process has been undertaken.

Suitable safety apparel must be worn and only tools and equipment appropriate for the work to be carried out must be used. Electrical workers should be aware, when working on live electrical equipment, that fault current of up to 20 times the rated current of the supply transformer can flow for short times during fault conditions.

Arcs that are produced under these conditions have the energy to cause an explosion and/or melt metallic switchboard cubicles and cause severe burns to the skin and/or cause flash burns to the face and eyes.

Circuit protection may not operate in such circumstances. Furthermore, severe damage to the electrical switchboard equipment may occur resulting in expensive repairs and lost production time.

Where fault currents exceed 2,000 amps special precautions must be used.

Consideration should be given to the use of flame resistant and non-synthetic clothing as well as protective gloves and eye protection.

Risk Assessment – Working On or Near

A Job Safety Analysis, Risk Assessment and Permit to work should be completed so work is planned to minimise the risk of inadvertent contact with live electrical equipment. All other relevant work permits (e.g. working at heights, restricted access) shall be completed to help identify any risks.

Where isolation or the use of suitable insulating barriers is deemed impractical, consideration must be given for using a safety observer when working on or in close proximity to live electrical equipment. All factors which reflect on safe working procedures should be considered, e.g. proximity to live electrical equipment, prospective fault levels, site conditions, weather conditions, work environment and noise.

Isolation

Energy isolation: A procedure consisting of all four of the following actions:

- Isolating (disconnecting, separating) the machine, or defined parts of the machine) from all energy sources;
- Locking (or otherwise securing) all the isolating units in the isolating position;
- Dissipating or restraining (containing) any stored energy which may give rise to a hazard; and
- Verifying by means of a safe procedure that the actions taken according to the above have produced the desired results.

Note: Refer to lock out / tag out section of this manual.

SAFETY OF ELECTRICAL TEST EQUIPMENT

Test equipment must be appropriate for the tests being performed. The test equipment must also be calibrated according to the manufacturer requirements (generally annually) but also appropriately rated to suit the prospective voltages, short circuit etc.

As 61010.1 specifies that the equipment labelling must state a Measurement Category (I,II,III,IV) which relates to the prospective fault current levels in the circuit to be measured and a voltage level (150, 300, 600, 1000V) that the test equipment has been designed to safely withstand. The higher the category, the more robust the equipment must be to withstand the higher fault currents and voltage transients.

GUIDE TO THE SELECTION OF PERSONAL PROTECTIVE EQUIPMENT

TASK	CURRENTS UP TO AND INCLUDING 100 A	CURRENT EXCEEDING 100 A AND UP TO AND INCLUDING 400 A	CURRENTS EXCEEDING 400 A
Work (isolated and verified)	Footwear Protective clothing (if required) Eye protection (if required) Gloves (if required) Hearing protection (if required) Safety helmet (if required) Respiratory protection (if required)	Footwear Protective clothing (if required) Eye protection (if required) Gloves (if required) Hearing protection (if required) Safety helmet (if required) Respiratory protection (if required)	Footwear Protective clothing (if required) Eye protection (if required) Gloves (if required) Hearing protection (if required) Safety helmet (if required) Respiratory protection (if required)
Switching, isolating, removing fuses or links	Footwear Protective clothing Eye protection Gloves (if required) Hearing protection (if required) Safety helmet (if required) Respiratory protection (if required)	Footwear Protective clothing Eye protection Gloves Hearing protection (if required) Safety helmet (if required) Respiratory protection (if required)	Footwear Protective clothing Eye protection Gloves Hearing protection (if required) Safety helmet (if required) Respiratory protection (if required)
Isolation verification, testing or fault finding	Footwear Protective clothing Eye protection Gloves Hearing protection (if required) Safety helmet (if required) Respiratory protection (if required)	Footwear Protective clothing* Eye protection Gloves Arc flash suit and hood (if required) Hearing protection (if required) Safety helmet (if required) Respiratory protection (if required) Face shield (if required)	Footwear Protective clothing* Eye protection Gloves Face shield Arc flash suit and hood (if required) Hearing protection (if required) Safety helmet (if required) Respiratory protection (if required)
Live electrical work	Footwear Protective clothing* Eye protection Insulating gloves Arc flash suit and hood (if required) Flame-resistant gloves (if required) Face shield (if required) Safety helmet (if required) Hearing protection (if required) Respiratory protection (if required)	Footwear Protective clothing* Eye protection Safety helmet Insulating gloves Arc flash suit and hood (if required) Flame-resistant gloves (if required) Face shield (if required) Hearing protection (if required) Respiratory protection (if required)	Footwear Protective clothing* Eye protection Insulating gloves Flame-resistant gloves Arc flash suit and hood Hearing protection Respiratory protection (if required)

*(if required): Determined by the risk assessment.

* Collar up, top buttons done up and sleeves down.

Bracelets, rings, neck chains, exposed metal zips, watches, and other conductive items shall not be worn while working on or near exposed energized conductors or live

Guide to PPE - table 9.2 out of AS/NZS 4836

The following selection methodology is provided for guidance.

Selecting the measurement category

Select the category according to the application (with typical fault current levels).

- **Category I** - very low energy circuits < 1kA e.g. electronics + vehicles use (not for 240V).
- **Category II** - low energy circuits 1-5kA e.g. home + office.
- **Category III** - medium energy circuits 5-25kA e.g. industrial use.
- **Category IV** - high energy circuits > 25kA e.g. industrial use.

Selecting the voltage level

Select the voltage level above that you will be measuring. e.g. for 230V circuits - select 300V or higher. For 400V circuits - select 600V or 1000V.

Thus a multimeter required for industrial use and needed to measure 415V will be a 'CAT III 600V' meter.

ELECTRICAL INSTALLATIONS – GENERATING SETS TO AS/NZS 3010

AS/NZS 3010 applies to electricity generating sets that are driven by internal combustion engines, and which are used for the supply of electrical installations in buildings or items of electrical equipment.

Whilst the AS/NZS 3010 is primarily focused on co-generation installations, it also provides information on installations where the generator is the only electrical source.

In addition to complying with this Australian Standard, the generating set installation is required to comply with the requirements of the Electricity Safety Act and Electricity Safety (Installations) Regulations 2009.

Generating sets providing supply to a fixed electrical installation are defined as being prescribed work in the Regulations.

The regulation includes wiring systems, switchgear, control gear and accessories installed to provide control and protection of standby generation or cogeneration electricity supply systems.

The fixed installation shall be:

- Installed to the requirements of AS/NZS 3000 and AS/NZS 301;
- Installed and inspected by a licensed electrical contractor and a certificate of electrical safety provided; and
- Inspected by a licensed electrical inspector prior to it being used for the first time, and after relocation.

Location

Generating sets shall not be operated in locations where exhaust gases, smoke or fumes could reach dangerous concentrations or enter either directly or indirectly any enclosed areas occupied by persons.

In addition, generating sets shall not be installed:

- a) In damp situations or exposed to the weather unless suitably protected; and
- b) In hazardous areas, unless the equipment and method of installation complies with AS/NZS 3000 and the additional requirements of Energy Safe Victoria. (Consideration of fuel storage may define the area as hazardous. See sections on fuel and fuel storage.)

Generating sets installed to AS/NZS 3010 not only are required to be installed in a suitable location but also are required to be provided with suitable fences, screens etc to prevent the entrance of, or interference by unauthorised persons.

These barriers should not impeded persons from performing maintenance, testing or inspection of the generator. As such adequate space is to be provided around the generating set to allow persons to perform this work.

Connection of Generating Set Bonding System

Where a generating set supplies an electrical installation that incorporates an earthing system, the bonding system of the generating set shall be earthed by connection to the earthing system of the electrical installation.

Connection to earth shall not be made by means of a separate earth electrode.

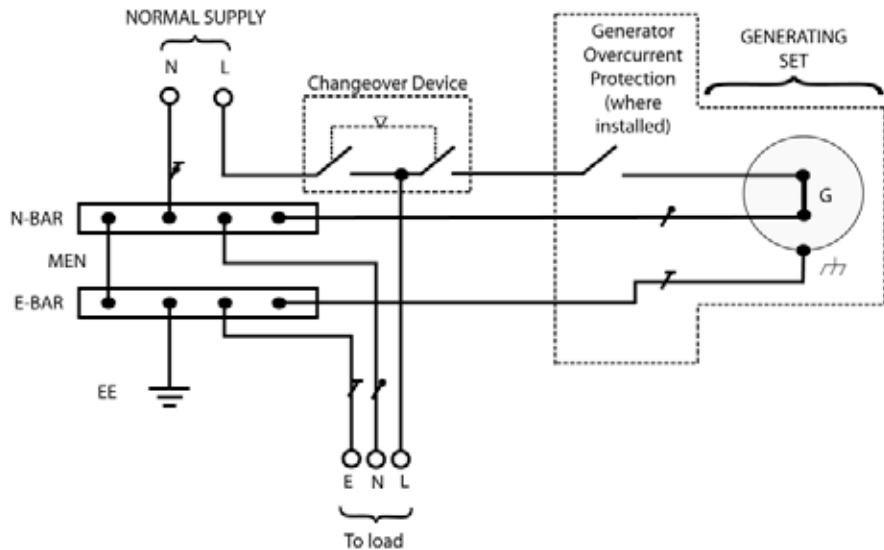
The earthing system of a high-voltage generating set shall be in accordance with the requirements of AS/NZS 3000 and, where applicable, any additional requirements of the electricity distributor.

Connection of Generating Set Windings

Where a generating set supplies an electrical installation that incorporates an earthing system, the following points, as applicable, shall be connected to the relevant neutral conductor of the electrical installation and not be directly connected to the generating set bonding system:

- a) The generating set winding connections; and
- b) One side of an otherwise unpolarised single-phase generating set winding.

Alternatively, the generating set winding referred to in items (a) and (b) above may be arranged through a protective system in a manner that ensures the disconnection of the electrical installation in the event of an earth fault.



One pole/one pole changeover arrangement for a single-phase generating set installed on a switchboard with a MEN link

STAND-ALONE POWER SUPPLIES

Generators to the requirements of AS/NZS 3010 may also be utilised, especially on construction sites as stand-alone power supplies. In addition to the provisions of AS/NZS 3010 as mentioned previously, the provisions of AS 4509.1 and AS4509.3 would also apply.

Wiring and Circuit Protection

All low-voltage wiring shall be installed and maintained by a licensed person and shall be in accordance with the requirements of the Electricity Safety Act, Electricity Safety (Installations) Regulations and the provisions of AS/NZS 3000.

One such provision of the Regulations relates to the recording of the underground route of electric lines. Regulation 404 requires:

A person who carries out electrical installation work on an underground electric line must, in accordance with this regulation, record in a permanent form on durable card or other durable material and fix within the meter box or in a position approved by the Office the route of that underground electric line.

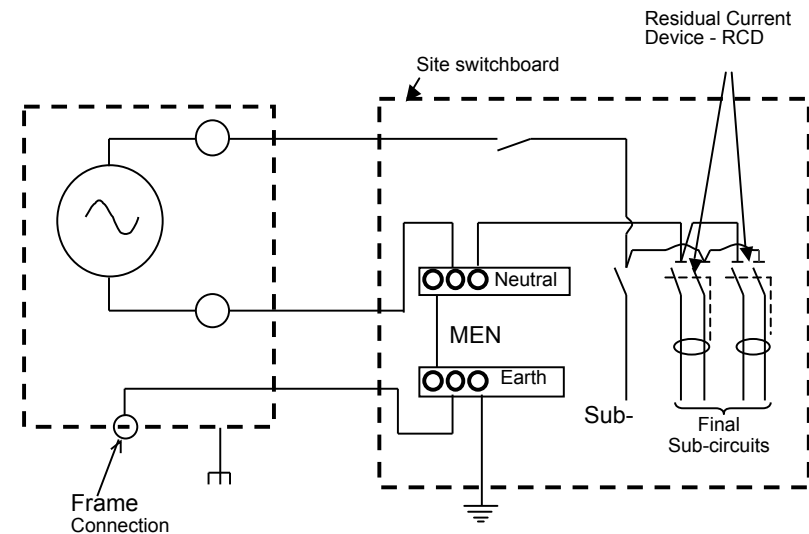
The following additional protective measures shall be taken:

- Within the system, wiring shall be protected from short circuit and overload by high rupturing capacity (HRC) fuses or appropriate type circuit-breakers (a.c. or d.c.), sized to limit the current below the maximum current-carrying capacity of any part of the connected circuit.
Note: Attention is drawn to the possibility of the battery providing high currents due to faults in renewable inputs or associated wiring.
- Where the system is deemed to be lightning prone in accordance with AS 1768, lightning protection complying with that Standard shall be provided.
- On construction sites the provisions of AS/NZS 3012 would apply. This would include such things as the provisions of RCDs on final sub-circuits and the restriction of HRC fuses to supplying fixed appliances rated at 50A per phase or greater.

Where generators are supplying fixed switchboards, the RCDs may be mounted on the switchboard.

Earthing

The system shall be adequately earthed. LV equipment shall be earthed in accordance with AS/NZS 3000. Where practicable, all the earthing points, other than for lightning protection, should be electrically bonded together.



Low-voltage connection from stand-alone single phase generator to site switchboard

Generating Sets

For generating sets, the following shall apply:

- a) All generating sets shall be restrained from movement during normal operation;
- b) Where a generating set is capable of automatic or remote manual starting, a warning notice shall be clearly visible on approach to, and located within 1 m of, the generating set, bearing the words: **DANGER: THIS EQUIPMENT STARTS AUTOMATICALLY**; and
- c) The generator engine shall be provided with a device to prevent the starting of the generator set when inspection, repair or maintenance is carried out.

Fuel

Fuel storage shall comply with the requirements of AS 1940 and any other local requirements for the storage of fuel and leakage prevention.

Fuel tanks and filling facilities associated with flammable fuel shall not be installed:

- a) In the vicinity of high-temperature surfaces or equipment that may emit arcs, sparks or hot particles; or
- b) In such a position that spilled or leaking fuel could fall on high-temperature surfaces or equipment.

Note: This requirement is not intended to prohibit properly designed engine-generator sets with integral fuel tanks.

Fuel storage

Minor fuel storage shall be in accordance with Table 1. Local authorities might have additional requirements for the storage and prevention of leakage of large supplies of fuel and should be consulted.

Where the storage capacity is above that listed in Table 1 reference shall be made to AS 1940.

The class of liquid is defined in AS 1940. Petrol (both leaded and unleaded) and LPG are typically class Flammable PG1. Diesel fuel is typically class Combustible C1.

Table 1: Minor Storage

LOCATION	CLASS OF LIQUID (litres)	
	Flammable PG1	Combustible C1
Within a residential dwelling of any type	5	50
In a garage attached to a dwelling with a 60/60/60 FRL rating separation wall	25	100
Outdoors or in a shed or garage, separated from the dwelling or any other building by 1 m of space	100	500
Outdoors, uncovered, or in a shed or garage, separated from the dwelling or any other structure or boundary by either 3 m of space or a 180/180/180 FRL rating separation wall.	250	500

Note: AS 1530.4 gives fire resistance level (FRL) rating of structures.

Information for Emergency Services

A sketch shall be prominently displayed in, or immediately adjacent to, the main LV switchboard indicating the location, in relation to the main LV switchboard, of:

- a) The emergency de-energisation procedure; and
- b) The battery bank and fuel tanks, unless they are immediately adjacent to the LV switchboard.

Signs

Signs shall be indelible. They shall be legible from a distance of 2 m except where otherwise stated, and shall comply with AS 1319.

Maintenance of Generating Sets

Maintenance of the engine and alternator, including routine maintenance requirements such as oil and filter changes and adjustments, tune-ups and overhauls, should be carried out in accordance with the manufacturer's instructions.

Generating set operation (including auto start and remote start, where fitted) should be checked at the completion of any engine maintenance.

Shutdown Procedure

Each installation shall have a 'shutdown procedure' sign, which need not comply with the requirements of Clause 1.5, displayed prominently in the equipment area. The sign shall include instructions for the following procedures:

- a) Emergency de-energisation procedure to isolate the system, including the location(s) of all isolation devices;

- b) Maintenance shutdown procedure, including the following:
 - i) Isolation of the battery bank by disconnecting battery fuses or opening battery circuit-breakers;
 - ii) Isolation of generating set and prevention of operation by automatic or remote start; and
 - iii) Isolation of the renewable power inputs.

System Documentation

The following documentation is to be provided:

- a) System manual. A manual complete with the following:
 - i) List of equipment supplied. A complete list of installed equipment, with model description and serial numbers for future reference.
 - ii) System performance estimate/guarantee. Including daily energy consumption for both a.c. and d.c. loads, design load energy requirement, maximum and surge power demand, an estimate of each renewable energy input, showing expected seasonal variation and an estimate of generator run time.
 - iii) Operating instructions: system and components. A short description of the function and operation of all installed equipment. More detailed information should be available from the manufacturers' documentation (see Item (x)).
 - iv) Shutdown and isolation procedure for emergency and maintenance. A copy of the shutdown procedure (see AS 4509.1).
 - v) Maintenance procedure and timetable. A maintenance checklist for the installed equipment (see Section 11).
 - vi) Commissioning records and installation checklist. A record of the initial system settings at the time of system installation and commissioning checklists for quality assurance.
 - vii) Warranty information. A statement of the system warranty period and limitation complete with period and limitation of supplied equipment warranties.
 - viii) Original energy usage estimate. A copy of the initial energy usage estimate supplied by the customer and used to design the stand-alone power system.
 - ix) System connection diagram. A diagram showing the electrical connection of the power system. In larger installations separate schematic (circuit) and unit wiring diagrams might be required.
 - x) Equipment manufacturers' documentation and handbooks. For all equipment supplied.

- b) Battery record logbook. A separate logbook for ongoing recording of battery operating parameters, such as battery voltage, ambient temperature and cell specific gravity, voltage and temperature.
- c) Generating set service logbook. A separate logbook to record periodic generating set maintenance.

WELDING POWER SOURCES

A power source (welding machine) is a device that supplies welding current and output characteristics that are suitable for arc welding or allied processes and include transformers, rectified transformers, inverters and electric motor generators that are connected to a 415 V supply and diesel or petrol motor generators.

The following is applicable to arc welding and allied process equipment designed for industrial and professional use. It sets out the safety requirements to reduce the possibility of electric shock and minimise associated hazards.

Allied processes are typically electric arc cutting and arc spraying.

General Visual Inspection

This requires an inspection by eye to verify that there is no visual damage to the welding machine or auxiliary equipment used in conjunction with its operation e.g. damage to the case, covers, doors and latches, switches and knobs, electrode holder, torches, wire feeders, and damage including burns and cuts etc to supply and welding leads.

Environment

Safe welding use generally depends on the environment category in which the welding power source is being used. Categories A and B are specifically designed and controlled where the risk of electric shock is low. In all other areas or where the working environment varies, it must be considered to be a Category C. Portable welding power sources must be considered Category C unless evidence is provided to the contrary. **Construction sites will in most instances be Category C.**

The categories are:

Category A environment

A Category A environment is an environment without increased hazard of electric shock. Category A environments are usually limited to carefully designed workstations.

Category B environment

A Category B environment is an environment with an increased hazard of electric shock. Category B environments include general fabrication activities, large workpieces, steel building structures, inside pressure vessels, processing tanks, storage tanks, conductive confined spaces and on board ships.

Whenever a welder works without an observer a Category B environment will automatically become a Category C environment, and will require the use of a voltage reduction device (VRD).

Category C environment

An environment where the risk of an electric shock or electrocution by arc welding is greatly increased due to the presence of water, be that from rain, splashing or partial submersion.

Note: In wet, moist or hot locations, humidity or perspiration considerably reduces the skin resistance of human bodies and the insulating properties of accessories and clothing.

An observer who is capable of responding correctly in an emergency shall be appointed to monitor the welder, the observer shall be trained in rescue and emergency procedures.

For manual metal arc welding or similar equipment, the power source needs to have an additional hazard reducing device, which shall be either a trigger switch that opens the welding circuit, unless it is held closed, or a VRD.

Hazard Reducing Device

A hazard reducing device shall reduce the electric shock hazard that can originate from no-load voltages exceeding the allowable rated no-load voltages.

Examples are a voltage-reducing device or an a.c. to d.c. switching device.

If the unreduced no-load voltage falls between the allowable rated no-load voltages, the hazard reducing device shall operate within 2 seconds.

If the values are exceeded, the hazard reducing device shall operate within 0.3 seconds. Refer Table (1).

Voltage Reducing Device

A voltage reducing device shall have automatically reduced the rated no-load voltage to a level not exceeding the prescribed values at the moment the resistance of the external welding circuit exceeds 200.

Conformity shall be checked by connecting a variable load resistor across the welding output connections of the welding power source. Voltage measurements are taken while the resistance is being increased. Refer Table (2).

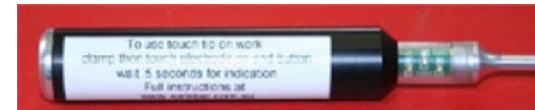


Externally fitted VRD

Switching Device for A.C. to D.C.

A switching device for a.c. to d.c. shall have automatically switched the rated a.c. no-load voltage to a rated d.c. no-load voltage not exceeding the prescribed values at the moment the resistance of the external welding circuit exceeds 200.

To test use a device such as the Welder OCV Level Test Pen below.



Connection of a Hazard-Reducing Device

The design shall be such that the operator cannot disconnect or by-pass the hazard-reducing device without the use of a tool.

Interference with Operation of a Hazard-Reducing Device

Remote controls, as specified by the manufacturer, and arc striking or arc stabilising devices of the welding power source shall not interfere with the proper functioning of the hazard-reducing device, i.e. no-load voltage limits shall not be exceeded.

Indication of Satisfactory Operation

A reliable device, e.g. a signal lamp, shall be provided which indicates that the hazard-reducing device is operating satisfactorily. Where a signal lamp is used, it shall light when the voltage has been reduced or changed to d.c.

To test use a device such as the VRD tester below.



Fail to a safe condition

If the hazard-reducing device fails to operate in accordance with clause 13 within 1 second, it should fail to a safe condition (e.g. switching to a reduced voltage condition).

Daily or pre-start checks are described. The operator should carry out daily or pre-start inspections, based on observation of indicators, to verify operation of the VRD before commencing work.

Routine verifications of the function of the VRD are described. A competent person, equipped with instruments capable of measuring voltage against time, is necessary for these tests.

VERIFICATION PROCEDURES

Safety

All personnel involved in the testing and operation of welding machines shall be made aware of the inherent hazards of the secondary circuit which may be at potentially harmful voltages. Routine safety inspections require connection of electrical testing instruments to parts of the secondary circuit of a welding machine. Verification of the operation of a VRD requires operation of the welding machine.

Test equipment shall be appropriately rated for the environmental conditions, maximum voltages and currents that the instrument could be subjected to during the inspection process.

Wherever possible the instructions of the original equipment manufacturer (OEM) shall be followed when verifying the performance of the VRD.

Record of Results

Results of the tests carried out should be kept in a suitable register.

Output

Rated no-load voltage (U_0)

Note: The electrical worker conducting the rated no-load voltage tests shall test all welding power sources to a Category C environment, unless the power source is in a fixed position within a controlled environment other than C, and at no time is it possible for the power source to operate under any other environmental conditions.

The rated no-load voltage at all possible settings shall not exceed the prescribed values summarised in Table 2.

Table 2 – Summary of Allowable Rated No-Load Voltages

WORKING CONDITIONS	RATED NO-LOAD VOLTAGE
Environment with a greatly increased hazard of electric shock Category C as per AS 1674.2	d.c. 113 V peak a.c. 35 V peak and 25 V r.m.s.
Environment with increased hazard of electric shock Category B	d.c. 113 V peak a.c. 68 V peak and 48 V r.m.s.
Environment without increased hazard of electric shock Category A	d.c. 113 V peak a.c. 113 V peak and 80 V r.m.s.
Mechanically held torches with increased protection for the operator	d.c. 141 V peak a.c. 141 V peak and 100 V r.m.s.

Welding power sources, which are electronically controlled, shall be:

- Designed to ensure that the output voltages given in table 2 cannot be exceeded should any fault occur in an electronic circuit; or
- Fitted with a protection system (hazard-reducing device) which switches off the voltage at the output terminals within 0.3 seconds and shall not be reset automatically.

If the no-load voltage is higher than these values, the welding power source shall be fitted with a hazard-reducing device.

Insulation Resistance

The insulation resistance shall be not less than the values given in Table 3 below.

Table 3 – Insulation Resistance

PARTS TO BE TESTED			MINIMUM INSULATION RESISTANCE (M Ω)
Input circuit (including control circuits connected to it)	to	Welding circuit (including control circuits connected to it)	5
All circuits	to	Exposed conductive parts	2.5
Welding circuit (including control circuits connected to it)	to	Any auxiliary circuit which operates at a voltage exceeding extra low voltage	10
Welding circuit (including control circuits connected to it)	to	Any auxiliary circuit which operates at a voltage not exceeding extra low voltage	1
Separate welding circuit	to	Separate welding circuit	1

Protection provided by the enclosure

The minimum degree of protection for welding power sources shall be IP21S for indoor and IP23 for welding power sources specifically designed for outdoor use.

Output connections – protection against unintentional contact

Welding output connections, with or without welding cables connected, shall be protected against unintentional contact by persons or by metal objects.

The following are examples of how such protection can be afforded:

- Any live part of a socket-outlet is recessed behind the plane of access openings; and
- A hinged cover or protective guard is provided.

Isolation of the input circuit and the welding circuit

The welding circuit shall be electrically isolated from the input circuit and from all other circuits having a voltage higher than the allowable no-load voltage by reinforced or double insulation or equivalent means. If another circuit is connected to the welding circuit, the power of the other circuit shall be supplied by an isolating transformer or equivalent means.

The welding circuit shall not be connected internally to the connecting means for the external protective conductor, the enclosure, frame or core of the welding power source, except, if necessary, by an interference suppression network or protection capacitor. The leakage current between the welding outlets and the protective conductor terminal shall not exceed 10 mA a.c. r.m.s.

Power supply

Welding power sources which are designed to operate from different supply voltages shall be fitted with one of the following:

- An internal voltage selection panel where the adjustment for the supply voltage is made by links. A marking shall indicate the arrangement of links for each supply voltage;
- An internal terminal box or panel in which the terminals are clearly marked with the supply voltages;
- A switch for tap selection which shall be fitted with an interlocking system which prevents the switch being moved to an incorrect position. The interlocking system shall be adjusted only by the use of a tool; and
- A system to automatically configure the welding power source in accordance with the supply voltage.

Note: Welding power sources may be fitted with an external indication of the supply voltage selected.

In the case of welding power sources with several supply connections, the points of connection not provided with covers which are secured by the use of a tool are tested with a voltage tester, using all possible supply connections and switch positions. The requirements are met if no voltage or only a voltage below 12 V is measured between the points of connection not provided with covers and between these points and the enclosure.

Input supply on/off switching device

Where an integral input supply on/off switching device (e.g. switch, contactor or circuitbreaker) is provided, this shall:

- Switch all ungrounded mains conductors;
- Plainly indicate whether the circuit is open or closed; and
- Either be rated as follows:
Voltage: not less than the values given on the rating plate,
Current: not less than the highest effective supply current as given on the rating plate; or
- Be suitable for this application.

Three-phase a.c. multi-operator welding transformer

All welding output connections intended to be connected to the workpiece shall have a common interconnection within the welding power source.

Welding output connections of the same phase shall all be marked the same as each other.

Marking

Connections designed specifically for attachment to the work piece or to the electrode shall be so identified.

For d.c. welding power sources, the polarity shall be clearly marked, either on the welding output connections or on the polarity selector. This requirement is not relevant for plasma cutting power sources.

Auxiliary power output

In the case of welding power sources designed to supply electrical power, e.g. for lighting or electric tools, these auxiliary circuits and accessories shall comply with the standards and regulations relating to the use of this equipment.

The welding circuit shall be electrically isolated and insulated from such supply circuits.

Near the output terminals or outlets of such power the available current, the voltage, the duty cycle (duty factor) if less than 100%, the frequency, the number of phases or d.c. and the status of the neutral (e.g. earthed or unearthed) as appropriate shall be clearly and indelibly marked.

Instructions and Markings

Rating plate

A clearly and indelibly marked rating plate shall be fixed securely to or printed on each welding power source.

Note: The purpose of the rating plate is to indicate to the user the electrical characteristics, which enables the comparison and correct selection of welding power sources. The marking shall be easily legible. It shall not be easy to remove the rating plate and it shall show no curling.

Description

The rating plate shall be divided into sections containing information and data for the:

- a) Identification;
- b) Welding output;
- c) Energy input; and
- d) Auxiliary power output, if applicable.

The dimensions of the rating plate are not specified and may be chosen freely.

It is permissible to separate the above sections from each other and affix them at locations more accessible or convenient for the user.

For welding power sources to be used for several welding processes or for rotating welding power sources, either one combined or several separate rating plate(s) may be used.

Note: Additional information may be given. Further useful information, e.g. class of insulation, pollution degree or power factor, may be given in technical literature supplied by the manufacturer.

Instructions

Each welding power source shall be delivered with instructions and markings.

The instructions shall include the following (as applicable):

- a) General description;
- b) Mass of the welding power source and its various parts and correct methods of handling them e.g. by fork-lift or crane, and precautions to be taken with gas cylinders, wire feeders;
- c) The meaning of indications, markings and graphical symbols;
- d) Information for selection and connection to the input supply e.g. suitable supply cables, connection devices or attachment plugs, including the fuse and/or circuit-breaker rating;
- e) Correct operational use relating to the welding power sources e.g. cooling requirements, location, control device, indicators, fuel type;
- f) Welding capability, static characteristic (drooping and/or flat), duty cycle (duty factor) limitations and explanation of thermal protection if relevant;
- g) Limitations of use relating to the degree of protection provided e.g. a welding power source with a degree of protection of IP21 is not suitable for use in rain;
- h) Basic guidelines regarding protection against personal hazards for operators and persons in the work area e.g. electric shock, fumes, gases, arc rays, hot metal, sparks and noise;
- i) Conditions under which extra precautions are to be observed when welding or cutting (e.g. environment with increased hazard of electric shock, flammable surroundings, flammable products, closed containers, elevated working positions);
- j) How to maintain the welding power source;
- k) Adequate circuit diagram together with a list of recommended spare parts in the case of special processes e.g. plasma cutting;
- l) Information for a circuit designed to supply electrical power at normal supply voltage e.g. for lighting or electric tools;

- m) Precautions against toppling over, if the welding power source shall be placed on tilted plane;
- n) Warning against the use of a welding power source for pipe thawing;
- o) Type (identification) of plasma cutting torches that are specified for use with the plasma cutting power source;
- p) Pressure, flow rate and type of plasma gas and if relevant, of cooling gas or cooling liquid; and
- q) Steps or range of the output current and the corresponding plasma gas as a set of values.

Other useful information may also be given, e.g. class of insulation, pollution degree, power factor.

Markings

Each welding power source shall be clearly and indelibly marked on or near the front panel or near the on/off switching device with the warning symbol combination:



Caution! Read operator's manual

This indicates that arc welding and plasma cutting can be injurious to the operator and persons in the work area and that the instructions shall be consulted before opening.

The following equivalent wording may be used:

Warning: Read instruction manuals before operating and servicing this equipment.

Internal insulation

Power sources designated Class I Protection, as designated by AS/NZS 3000, shall be connected to the power supply earth bonding system.

Power sources designated Class II Protection, as designated by AS/NZS 3000, do not require connection to the power supply earth bonding system.

Note: Where a power source has a Class II Protection, it shall show the double insulated symbol on its rating plate.

Control

The power source shall be controlled by a switch that is incorporated in its primary circuit. The switch shall have a designated OFF position and be mounted on or adjacent to the power source framework. Where the power source is connected to the supply by means of a power supply cord and plug, any switch mounted on the power source shall open all live conductors, including the neutral.

Connection to Electricity Supply

Power sources shall be connected to the electricity supply:

- a) Via an approved supply flexible cord with plug and socket; and
- b) By a licensed electrical worker, if the power source is permanently connected to the supply.

Power supply cords should be kept as short as possible.

Electrical wiring connecting a power source to an electricity supply, wiring connecting a frame of a power source to earth and any permanent wiring connected to terminals to which output leads are connected shall comply with the relevant requirements of AS/NZS 3000.

Earthing

Depending on the application, a licensed electrical worker shall ensure the frame of the power source is earthed in accordance with AS/NZS 3000 or is bonded to the power supply earth bonding system in accordance with AS/NZS 2790 for a generator.

INSPECTION AND MAINTENANCE – POWER SOURCE

Routine inspection and testing

An inspection of the power source, an insulation resistance test and an earthing resistance test shall be carried out:

- a) For transportable equipment, at least once every 3 months; and
- b) For fixed equipment, at least once every 12 months.

The owners of the machine shall keep a suitable record of the periodic tests and a system of tagging, including the date of the most recent inspection.

Note: A transportable power source is any equipment that is not permanently connected and fixed in the position in which it is operated.

Earthing

The resistance shall not exceed 1Ω between any metal of a power source, where such metal is required to be earthed, and:

- a) The earth terminal of a fixed power source; and
- b) The earth terminal of the associated plug of a transportable power source.

Note: Because of the dangers of stray output currents damaging fixed wiring, every 12 months the integrity of the fixed wiring should be inspected by a licensed electrical worker.

Repairs

Electrical work inside a welding power source shall be undertaken by a licensed electrical worker.

Accessories

Accessories equipment, including output leads, electrode holders, torches, wire feeders and the like shall be inspected at least monthly by a competent person to ensure that the equipment is in a safe and serviceable condition. Unsafe and unserviceable accessories shall not be used.

ITEMS TO BE VISUALLY INSPECTED	COMPLETED		
	Y	N	N/A
Rating Plate			
Clearly & Indelibly Marked			
Identification			
Model Number			
Serial Number			
Welding Output			
Energy Input			
Auxiliary Power Output			
<input type="checkbox"/> Symbol for B, C Environments			
Rated No-Load Voltage			
Double Insulation Symbol for Class II Equipment <input type="checkbox"/>			
IP Rating			
Instruction Manual			
Markings			
Caution! Read Operators Manual or Warning Symbol			
Accessories - visually inspect welding leads, hand piece			

ITEMS TO BE TESTED	COMPLETED		
	Y	N	N/A
Control Switch Double Pole			
Insulation Resistance			
Input Circuit to Welding Circuit $5M\Omega$			
All Circuits to Exposed Conductive Parts $2.5M\Omega$			
Welding Circuit to Aux Circuits Exceeding Extra Low Voltage $10M\Omega$			
Welding Circuit to Aux Circuits Not Exceeding Extra Low Voltage $1M\Omega$			
Separate Welding Circuit to Separate Welding Circuit $1M\Omega$			
Earthing Resistance of any Metal Required to be Earthed and the Earth Terminal Less Than 1Ω			
Operation of VRD - (use VRD tester)			
Test Readings of all Tests Performed Must be Recorded and Kept on Site for Audit Purposes			

PROCEDURES FOR SAFELY ENERGISING OR ISOLATING ELECTRICAL EQUIPMENT

- 1) Prior to Energising;
- 2) Energising procedure - main switchboard and sub-boards;
- 3) Energisation procedure - mechanical or other services switchboards;
- 4) Danger tag isolation procedure; and
- 5) Procedures for switching on circuits at sub-boards.

Attachments

- 1) Energisation Procedure Notification
- 2) Equipment Tag Register
- 3) Signage 'EQUIPMENT IN SERVICE'
- 4) Signage 'LIVE EQUIPMENT UNDER COMMISSIONING'
- 5) Signage 'DANGER - AUTHORISED PERSONNEL ONLY - DO NOT ENTER'
- 6) Sample 'DANGER OUT OF SERVICE TAG'
- 7) Sample 'DANGER DO NOT OPERATE TAG'

Note: All signs and tags are to be made of durable material e.g. laminated. Out of Service tags must be uniquely numbered for safety and audit purposes.

Prior to and following energising

- 1) Where construction work is incomplete and may impact on the integrity of the electrical installation, an assessment is required to be carried out by the electrical contractor to assess the mechanical protection that may be required for additional protection of electrical equipment, including cabling that may be damaged due to the ongoing construction activities.

This process must be documented and should state who conducted the assessment, what was identified (if none, state 'no additional requirements'), what additional control measures were required, what de-rating factors have occurred on the installation, who is signing off the installation to state that it still complies with the requirements of Australian Standards.

- 2) Each contractor associated with energising electrical services and following these procedures must have an energising team with a minimum number of 2, and at least one current level 2 First Aider as part of the energising team with CPR refresher within the 12-month period as per the requirements of the First Aid Certificate.

Consideration should be given to having a de-fibrillation unit available on site should the need arise. The First Aider must be trained in its use.

- 3) Any employee associated with the energising team is to be inducted in these procedures prior to any energising taking place.

- 4) Where the energising team is separated and in different areas (not in close proximity) each separate group shall include a First Aider.
- 5) The First Aider/s should have direct contact with first aid facility or provided with quick response mechanism to emergency services.
- 6) All members of the energising and commissioning team shall be holders of a current (E) Electricians Licence issued by the ESV Victoria. (Apprentice electricians may observe the commissioning.)
- 7) All inspections and tests to be performed and recorded (visual inspection, continuity of the earthing system, insulation resistance, polarity, correct circuit connections, verification of impedance (earth fault-loop impedance), operation of RCDs).

Energising procedure main switchboard

- 1) Cable identification, including a full visual inspection of all cabling that originate from the switchboard must be performed prior to being energised. All cables to be appropriately terminated at both ends, and marked for ease of identification. Where it can't be appropriately terminated, the cable to be removed from the switchboard cubicle.
- 2) Where a junction box has been fitted to the end of a cable, any cable insulation is to be stripped off prior to being put in a connector, this cable is not to be connected to supply, including the neutral and earth. The circuit breaker number and switchboard number is to be clearly and legibly marked on the junction box lid.
- 3) Carry out relevant inspections and tests as required by AS/NZS 3000 Wiring Rules and AS/NZS 3017 Electrical installations - Verification guidelines.
- 4) A switchboard manufacturer's document for compliance to Australian Standards AS/NZS 3439 for the main switchboard to be provided.
- 5) Fill out Certificate of Electrical Safety for Prescribed Electrical Installation Work and obtain services of electrical inspector.
- 6) Principal electrical contractor to provide a completed 'Energisation Procedure Notification' (Attachment 1) of intent to commence testing/commissioning to workplace occupier and any site HSR whose designated work group is affected by the testing/commissioning process, at least 48 hours prior to commencement.
- 7) Safety procedures implemented
The immediate area around the switchboard is to be barricaded off where it is located in a hall or open areas to prevent ingress by other trades during the initial testing and 'first time' energising of the switchboard. In a main switchboard room, the room is to be complete including lockable doors. Main switch(es) opened, padlocks and 'Out of Service' danger tags (Attachment 6) applied. Keys controlled by nominated persons.
Isolations logged (refer form 'Equipment Tag Register', Attachment 2)

- 8) Switchboard doors, mains cabling and room to be appropriately signposted with 'In -Service' (Attachment 3), Commissioning (Attachment 4), and 'Danger-Authorised Personnel Only - Do not Enter'(Attachment 5) prior to energising.
- 9) Main switchboard now ready for energisation.
- 10) Prescribed Certificate to be submitted to Energy Safe Victoria.

Energising procedure sub-boards

- 1) Cable identification, including a full visual inspection of all cabling that originate from the switchboard must be performed prior to any sub-circuits being energised. All cables to be appropriately terminated at both ends, and marked for ease of identification. Where it can't be appropriately terminated, the cable to be removed from the switchboard cubicle.
- 2) Where a junction box has been fitted to the end of a cable, any cable insulation is to be stripped off prior to being put in a connector, this cable is not to be connected to supply, including the neutral and earth. The circuit breaker number and switchboard number is to be clearly and legibly marked on the junction box lid.
- 3) Carry out relevant inspections and tests as required by AS/NZS 3000 Wiring Rules and AS/NZS 3017 Electrical installations - Verification guidelines.
- 4) A switchboard manufacturers' compliant to Australian Standards AS/NZS 3439 document for the switchboard to be provided.
- 5) Fill out Certificate of Electrical Safety for Prescribed Electrical Installation Work or Non-Prescribed Certificate as required, and obtain the services of an electrical inspector (if prescribed work).
- 6) Principal electrical contractor to provide a completed 'Energisation Procedure Notification' (Attachment 1) of intent to commence testing/commissioning to workplace occupier and any site HSR whose designated work group is affected by the testing/commissioning process, at least 48 hours prior to commencement.
- 7) Safety procedures implemented
The immediate area around the switchboard is to be barricaded off where it is located in a hall or open areas to prevent ingress by other trades during the initial testing and 'first time' energising of the switchboard. In a switchboard room, the room is to be complete including lockable doors.
Main isolating switch(es) opened, padlocks and equipment danger tags (Attachment 6) applied. Keys controlled by nominated persons.
Isolations logged (refer form 'Equipment Tag Register', Attachment 2)
- 8) All equipment to have 'in service' (Attachment 3) and 'Commissioning' (Attachment 4) signposted prior to energising.
- 9) Sub-switchboard now ready for energisation.

- 10) No sub-board to be energised until Items 2 and 3 of 'PROCEDURES FOR SWITCHING ON CIRCUITS AT SUB BOARDS' are completed.
- 11) Prescribe/Non-Prescribed Certificate to be submitted to Energy Safe Victoria.

Mechanical or other services – switchboards

- 1) Cable identification, including a full visual inspection of all cabling that originate from the switchboard must be performed prior to any sub-circuits being energised. All cables to be appropriately terminated at both ends, and marked for ease of identification. Where it can't be appropriately terminated, the cable to be removed from the switchboard cubicle.
- 2) Where a junction box has been fitted to the end of a cable, any cable insulation is to be stripped off prior to being put in a connector, this cable is not to be connected to supply, including the neutral and earth. The circuit breaker number and switchboard number is to be clearly and legibly marked on the junction box lid.
- 3) Carry out relevant inspections and tests as required by AS/NZS 3000 Wiring Rules and AS/NZS 3017 Electrical installations - Verification guidelines.
- 4) Fill out certificate of Electrical Safety for Prescribed Electrical Installation Work or Non-Prescribed Certificate as required, and obtains the services of an electrical inspector (if prescribed work).
- 5) Electrical contractor to provide a completed 'Energisation Procedure Notification' (Attachment 1) of intent to commence testing/commissioning to workplace occupier, principal electrical contractor and any site HSR whose designated work group is affected by the testing/commissioning process, at least 48 hours prior to commencement.
- 6) Safety procedures implemented
The immediate area around the switchboard is to be barricaded off where it is located in a hall or open areas to prevent ingress by other trades during the initial testing and 'first time' energising of the switchboard. In a switchboard room, the room is to be complete including lockable doors.
Carry out all necessary inspections and tests on the circuit/equipment to make certain that such may be operated without danger to persons or equipment. Main switch(es) opened, padlocks and 'Out of Service Tags' (Attachment 6) applied. Keys controlled by nominated persons.
Isolations logged, (Refer form 'Equipment Tag Register', Attachment 2)
- 7) A switchboard manufacturer's document for compliance to Australian Standards AS/NZS 3439 for the switchboard to be provided.
- 8) Functional/operational test(s) CBs, RCD(s), isolators, contactors, relays, etc completed. Mechanical or other services electrical contractors to submit test results to principal contractor as required.

- 9) Mechanical or other services electrical contractor to complete and issue 'Energisation Procedure Notification' (Attachment 1) form, advising works complete and requesting power.
- 10) No sub-board supply to be closed by main Electrical Contractor until 'Energisation Procedure Notification' (Attachment 1) form received from Mechanical or other services electrical contractor.
- 11) All equipment to have 'in service' (Attachment 3) and 'Commissioning' (Attachment 4) signposted prior to energising.
- 12) Mechanical or other services switchboard ready for energisation.
- 13) Prescribed/Non-Prescribed Certificate to be submitted to Energy Safe Victoria.

Danger tag isolation procedure

This procedure shall be implemented when working on or near:

- a) Equipment and circuits in service.
- b) Equipment and circuits being repaired or modified.
- c) Equipment and circuits being commissioned and tested after installation.

Note 1: On or near is defined as being within a distance of 500mm of exposed energised equipment (See AS/NZS 4836).

Note 2: Cables being installed with other energised cables - Clause 1.5.11.4 AS/NZS 3000 - protection shall be provided against injury or property damage because of any harmful effects of voltage that may be induced or otherwise occur in unused conductors. Disconnected, redundant or unused conductors associated with conductors that remain connected shall be terminated and protected at both ends in the same manner as is required for live conductors.

- 1) When a circuit or equipment has been isolated to enable work to be carried out on or adjacent to such equipment, an 'Out of Service Tag' (Attachment 6) and lock is to be attached, signed and dated by the Company Authorised officer.
- 2) It is of utmost importance to note that the 'Out of Service Tag' (Attachment 6) and lock bearing the employee Company Authorised Officer's signature is attached prior to any company employee attaching their 'Danger Do Not Operate Tags' (Attachment 7), irrespective of any other tags that may be attached.
- 3) A circuit is not to be accepted as isolated unless a company 'Out of Service Tag' (Attachment 6) and lock is attached signed and dated, and verification of the de-energisation status has been ascertained. Test on a known live source - test equipment - test on a known live source.
- 4) A log of all equipment (Attachment 2) isolated, tags and locks in use on the project is to be maintained by the Company Authorised Officer.
- 5) All employees must attach their own 'Danger Do Not Operate Tags' (Attachment 7) and locks prior to their commencement of work on the relevant equipment.

Note: A personal lock must not be able to be opened by anyone else apart from the worker it has been issued to. A reserve key shall be kept on site in a locked box under the control of the electrical supervisor.

- 6) No switch may be operated whilst a danger tag is attached.
- 7) A danger tag must only be removed by the person whose signature appears on it. A person must only remove their own personal lock (except in circumstances where the person is unavailable due to absence, illness or other causes).

Should this situation arise the company project supervisor and company safety representative may remove the tag and lock (the ETU OH&S Rep must be consulted in relation to this issue) after ensuring compliance with the following:

- a) They shall fully acquaint themselves with the reasons for the tag and lock being attached.
 - b) They shall carry out all necessary inspections and tests on the circuit/equipment to make certain that such may be operated without danger to persons or equipment.
 - c) They shall ensure that all personnel associated with the work are informed of their actions.
 - d) They shall ensure that the person whose tag and lock was removed via this process is fully informed of this action immediately upon their return.
- 8) Only approved tags (whether out of service or do not operate) (Attachments 6&7) in good condition are to be used. Tags with erasures and alterations are not permitted.
 - 9) Do not operate/Out of Service tags are to be securely fixed to the operating handle or isolated device of the equipment so there is no risk of them being accidentally dislodged or of an operator being able to operate the equipment without seeing the tags.

Procedures for switching on circuits at sub-boards

- 1) The foreman/leading hand supervising the area to control access to subboards.
- 2) Cable identification, including a full visual inspection of all cabling that originate from the switchboard must be performed prior to any sub-circuits being energised. Carry out and record relevant inspections and tests as required by AS/NZS 3000 Wiring Rules and AS/NZS 3017 Electrical installations - Verification guidelines. All cables to be appropriately terminated at both ends, and marked for ease of identification.
- 3) Where a junction box has been fitted to the end of a cable, any cable insulation is to be stripped off prior to being put in a connector, this cable is not to be connected to supply, including the neutral and earth. The circuit breaker number and switchboard number is to be clearly and legibly marked on the junction box lid.

- 4) Schedule noting which circuits are energised or otherwise must be included in switchboard.
- 5) Only leading hands/foreman in control of area to energise circuits.
- 6) All circuits to be treated as energised when sub-board energised.
- 7) People working in the area where circuits are to be connected to supply and energised must be consulted prior to this occurring.
- 8) Foreman/Area leading hand only to authorise power to sub-boards after checking safe to do.

**ATTACHMENT 1
ENERGISING PROCEDURE NOTIFICATION**

Contractor Name:.....
(Requesting Energisation)

Contact Details:.....

REC Number:.....

Responsible Person:.....

Contact Phone Number:.....

Area:.....

Switchboard Destination:.....

Requested Date of Energisation:
(2 days notice required)

Equipment Description:

Electrical Safety Tests Completed:Date:___/___/___
(Attach copies of Certificates of Electrical Safety)

Equipment OK For Energisation: Date:___/___/___

ISSUED TO:

Name of responsible person:.....

Position:

COMPANY AUTHORISATION:

Name:.....

Signature:.....Date:___/___/___

Note: Where the Energisation Procedure is being completed by the Main Electrical Contractor, the Issued To: Section is to be completed by the Principal Building Contractor.

**ATTACHMENT 2
EQUIPMENT TAG REGISTER**

CIRCUIT READY TO BE ISOLATED				CIRCUIT READY FOR ENERGISATION		
Padlock number	Out of service tag number	Tagging office sign on	Date isolated	Switchboard, circuit and purpose of isolation	Tagging office sign on	Date isolation removed

ATTACHMENT 3



ATTACHMENT 4



ATTACHMENT 5



ATTACHMENT 6 – SAMPLE OUT OF SERVICE CARDS



ATTACHMENT 7 – SAMPLE DO NOT OPERATE CARD



SUPERVISION GUIDELINES FOR APPRENTICES WORKING ON ELECTRICAL INSTALLATIONS

**ENERGY SAFE VICTORIA
October 2007**

CABLE TRAY INSTALLATION LADDER, TRAY & DUCT, LADDER, TRAY SUSPENSION BRACKETS, FIXINGS.	FIRST YEAR DIRECT SECOND YEAR GENERAL
CONDUIT INSTALLATION CONDUIT, CONDUIT FITTINGS (J/BOXES, BENDS, ETC).	THIRD YEAR GENERAL FOURTH YEAR BROAD
ROUGH-IN LIGHT & POWER CATENARY WIRE/FIXINGS, BUILDING WIRE, TPS CABLES & TIES, PLUG BASES, STUD BRACKETS, TPS CABLE DRESSING (Not accessible to contact with electricity supply)	FIRST YEAR DIRECT SECOND YEAR DIRECT THIRD YEAR GENERAL FOURTH YEAR BROAD
SUBMAIN INSTALLATION CABLE PULLING, FIXINGS. (Not accessible to contact with electricity supply)	FIRST YEAR DIRECT SECOND YEAR DIRECT THIRD YEAR GENERAL FOURTH YEAR BROAD
MAINS INSTALLATION CABLE PULLING, MAIN EARTH, MAIN EARTH ELECTRODE, FIXINGS. BUSDUCT. (Not accessible to contact with electricity supply)	FIRST YEAR DIRECT SECOND YEAR DIRECT THIRD YEAR GENERAL FOURTH YEAR BROAD
DISTRIBUTION BOARD INSTALLATION INSTALL SWITCHBOARD, LUGS, GLANDS, ALL TERMINATIONS (INCLUDING SUB CIRCUITS), FIXINGS, SERVICE PILLARS, TAKE OFF BOXES. (Not accessible to contact with electricity supply)	FIRST YEAR DIRECT SECOND YEAR DIRECT THIRD YEAR DIRECT FOURTH YEAR GENERAL
MAIN SWITCHBOARD INSTALLATION INSTALL SWITCHBOARD, LUGS, GLANDS, ALL TERMINATIONS (INCLUDING SUB CIRCUITS), FIXINGS. (Not accessible to contact with electricity supply)	FIRST YEAR DIRECT SECOND YEAR DIRECT THIRD YEAR DIRECT FOURTH YEAR GENERAL
LIGHTFITTING AND BAKELITE INSTALLATION LIGHTS, FIXINGS, SUPPORTS, TRUNKING, SUSPENSIONS, TUBES & LAMPS, SOCKET OUTLETS, SWITCH PLUGS, MOUNTING BLOCKS, PLASTER BRACKETS. (Not accessible to contact with electricity supply)	FIRST YEAR DIRECT SECOND YEAR DIRECT THIRD YEAR GENERAL FOURTH YEAR BROAD

<p>TESTING</p> <p>TESTING OF INSTALLATION FOR COMPLIANCE, LABELLING, PREPARATION OF D/B LEGENDS. (Not accessible to contact with electricity supply)</p>	<p>FIRST YEAR DIRECT SECOND YEAR DIRECT THIRD YEAR DIRECT FOURTH YEAR GENERAL</p>
<p>FAULT FINDING (Accessible to contact with electricity supply)</p> <p>During the fault finding process, the supervising electrician must demonstrate to the apprentice the correct procedures for fault finding.</p> <p>Note 1 - the 3rd year apprentice in the immediate presence of the supervising electrician can carry out basic fault finding task e.g. on single phase light and power circuits and apparatus.</p> <p>Note 2 - the 4th year apprentice can carry out basic fault finding activities. In the immediate presence of the supervising electrician the 4th year apprentice can carry out more advanced fault finding task on power and control circuits and equipment.</p>	<p>FIRST YEAR NOT PERMISSABLE SECOND YEAR NOT PERMISSABLE THIRD YEAR DIRECT (see Note 1) FOURTH YEAR (see Note 2)</p>
<p>CONFIRMATION OF ISOLATION</p> <p>*The supervising electrician is responsible for the isolation of the installation.</p> <p>During the isolation process the supervising electrician must demonstrate to the apprentice the correct testing procedures for electrical isolation. After isolation, the supervising electrician is to ensure the apprentice carries out the testing procedures to confirm isolation, under direct supervision, before work commences.</p>	<p>FIRST YEAR NOT PERMISSABLE* SECOND YEAR NOT PERMISSABLE* THIRD YEAR NOT PERMISSABLE* FOURTH YEAR DIRECT</p>

Direct Supervision

This means the electrician is to work with the apprentice, constantly reviewing the work practices and standard of the apprentice's work. The electrician shall be readily available in the immediate area, within audible range (earshot) and where possible within visual contact of the apprentice.

General Supervision

This means the apprentice does not require constant attendance of the on-site supervising electrician but requires face-to-face contact on site during the day with the supervising electrician to check on the work being performed and to provide the apprentice with additional instructions and assistance.

As part of general supervision, the supervising electrician shall provide the apprentice with instruction and direction for the tasks being performed with progressive checks and tests being made during the work being undertaken.

Broad Supervision

This means the apprentice does not require constant attendance of the on-site supervising electrician but requires face-to-face contact with the supervising electrician on site to check on the apprentice and the work being carried out by the apprentice.

As part of broad supervision, the supervising electrician shall provide the apprentice with instruction and direction for the tasks being performed with checks and tests being made prior to commissioning and/or energising of circuit(s) and or apparatus/ equipment.

Accessible to contact with electricity supply

This means that the person is in a position where they can personally make contact with live electrical equipment and wiring including making contact via tools or conductive material with live electrical components.

Application of these guidelines

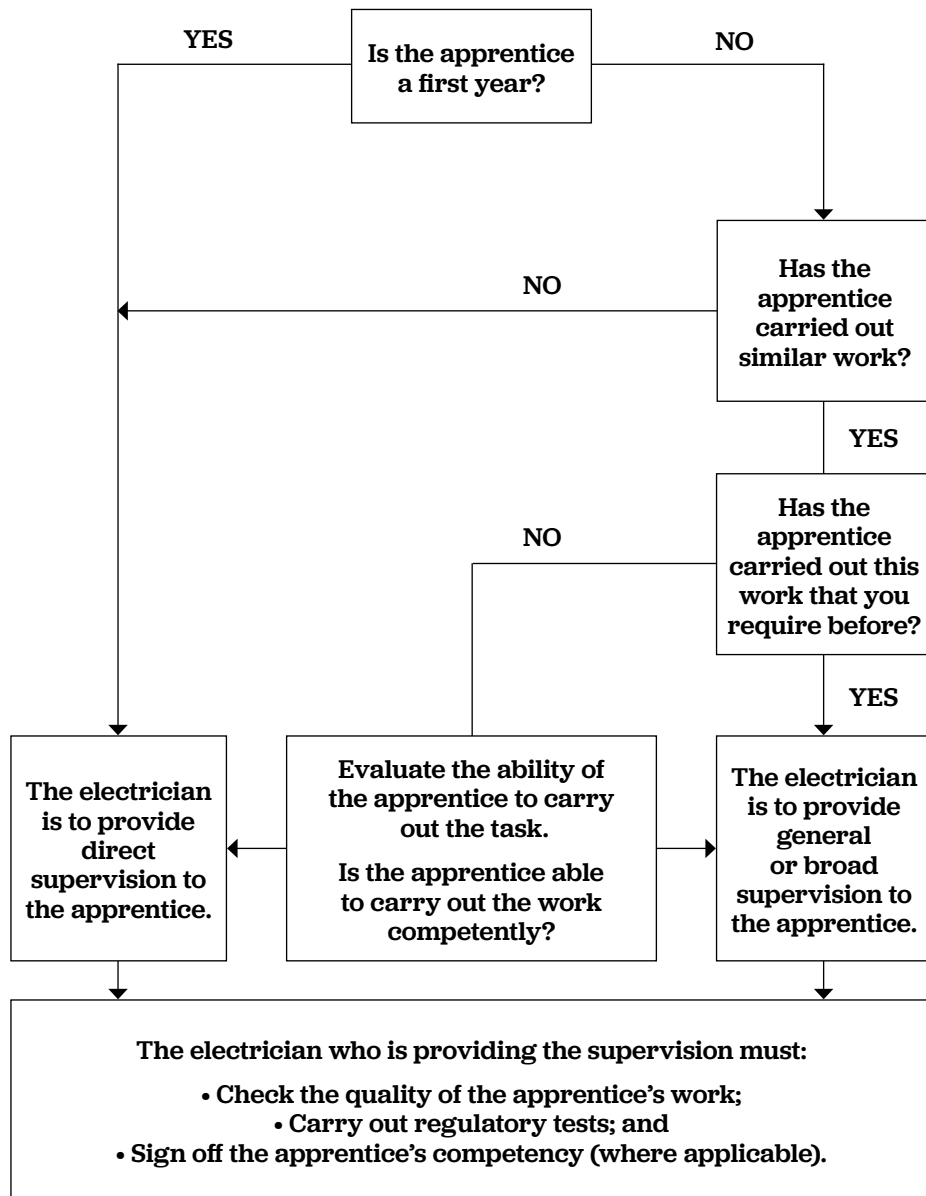
The above guidelines have been developed to assist electricians and electrical contractors in providing supervision to apprentice electricians during their on the job training. The guidelines reflect the intent of 'effective supervision' as defined in the Electricity Safety (Installations) Regulations 1999 and assist with the compliance of the Electrical Safety Act.

Note: Supervision practice - the goal of supervision should be to progressively diminish from direct to broad in the fourth year off the apprenticeship with the exception on conducting the activities of fault finding and confirmation for isolation. This condition is subject to successful completion of all trade school subjects by the apprentice.

Not covered by these guidelines

The Occupational Health and Safety Act 2004 places a duty on employers to provide such supervision to employees as necessary to enable the employees to perform their work in a manner that is safe and without risks to health. The use of the above guidelines in no way removes or limits the employer's duty under OH&S legislation.

**GUIDE TO SITE SUPERVISION OF APPRENTICES
BY THE SUPERVISING ELECTRICIAN**



PART 4: ELECTRICAL SAFETY CONSTRUCTION

CONSTRUCTION WIRING

Electrical installations on construction sites are required to meet three requirements:

- 1) All construction wiring must comply with the provisions of the Wiring Rules (AS/NZS 3000);
- 2) Additionally construction wiring must comply with AS/NZS 3012;
- 3) In Victoria there are the requirements of the Industry Standard for Electrical Installations on Construction Sites.

Construction wiring requirements are intended to protect persons, livestock and property from electric shock, fire and physical injury hazards that may arise from an electrical installation that is used with reasonable care and with due regard to the intended purpose of the electrical installation.

Australian Standard AS/NZS 3012 applies to electrical installations associated with construction and demolition sites which include:

- a) Building work, excavation work, compressed air work and diving work;
- b) parts of buildings which undergo structural alterations, such as extensions, major repairs or demolition, to the extent that the work necessitates the provision of a temporary electrical installation;
- c) Work on or in connection with the construction or maintenance of roads, airfields or airstrips, civil engineering works or bridges, or of the permanent way of a railway or tramway;
- d) Dredging or salvaging work;
- e) The laying, lining or maintenance of pipes or cables;
- f) Earthmoving work carried out with equipment requiring the use of other than manual power;
- g) Any work in which explosives are used;
- h) Site offices, cloakrooms, meeting rooms, dormitories, canteens, toilets, appliances and other facilities provided during any work referred to in (a) to (g); and
- i) Land clearing in preparation for any work referred to in (a) to (g).

Temporary Wiring Competency

Electrical contractors in the construction industry should appropriately train and educate their employees in the temporary wiring competency. WorkSafe Victoria and Energy Safe Victoria endorsed the development of an industry training package that is designed specifically for licensed electrical trades personnel who select, wire, install, maintain and remove construction wiring and associated electrical equipment or who test and tag portable electrical equipment as designated to comply under AS/NZS 3012.

Installation Methods

All wiring systems shall be selected and installed so as to minimise damage to the sheath and insulation of cables and insulated conductors and their connections during installation, use and maintenance.

The radius of every bend in a wiring system shall be such that conductors and cables shall not suffer damage.

Where a conductor or a cable is not resting on a continuous surface it shall be supported by suitable means at appropriate intervals in such a manner that the conductor or cable does not suffer damage by its own weight.

Every cable or conductor used as fixed wiring shall be supported in such a way that it is not exposed to undue mechanical strain and so that there is no appreciable mechanical strain on the connections of the conductors, account being taken of mechanical strain imposed by the supported weight of the cable or conductor itself.

A flexible wiring system shall be installed so that excessive tensile and torsional stresses to the conductors and connections are avoided.

Wiring systems shall be installed in accordance with the generally accepted principles of safe and sound practice using methods that will protect the electrical installation against mechanical or electrical failure under ordinary use, wear and tear, and any abnormal conditions which may reasonably be anticipated.

Where a wiring system is not resting on a continuous surface it shall be supported by suitable means, where necessary the wiring system shall be fixed in position by suitable clips, saddles or clamps or by means which will not damage the wiring system and which will not be affected by the wiring system material or any external influences.

Cable Selection

There are many factors to consider when selecting the appropriate sized cable for the installation and not just maximum demand.

AS/NZS 3008.1.1 sets out a method of cable selection for those types of electrical cables and methods of installation that are in common use at working voltages up to and including 0.6/1 kV at 50 Hz a.c.

De-Rating Factors

Section 3.5 of AS/NZS 3008.1 specifies that the current carrying capacity of a cable will be affected by the presence of certain external influences as detailed in Clauses 3.5.2 to 3.5.8. Under such conditions the current carrying capacity provided in Tables 3 to 21 shall be corrected by the application of an appropriate rating factor or factors obtained from tables 22 to 28.

Effect of ambient temperature

The current-carrying capacities given in the tables of AS/NZS3008.1.1 are based on a consistent ambient air temperature of 40°C and an ambient soil temperature of 25°C. Where other ambient temperatures apply, the appropriate rating factors shall be as given in Table 27 of AS/NZS3008.1.1.

Effect of direct sunlight

Current-carrying capacities are given in Tables 15, 20 and 21 of AS/NZS3008.1.1 for flexible cables and aerial cables exposed to direct sunlight. For other types of cable installed in locations exposed to direct solar radiation it will be necessary to make some provision for the effects of the increased heating. This may be achieved by one of the following means:

- a) Provision of a shield, screen or enclosure which allows for the natural ventilation of the cable; and
- b) Reduction of the current-carrying capacity of the cable by an appropriate amount in accordance with the higher air temperature.

As a rule-of-thumb alternative to any recommendation from a cable manufacturer, a correction factor obtained from Table 27(1) for a temperature 20°C higher than the ambient air temperature may be applied.

Voltage Drop

Where long runs of construction wiring are installed, the likelihood of voltage drop must be considered.

Unless an electrical installation is specifically designed to operate under reduced voltage conditions, the voltage drop between the point of supply and any point of the electrical installation shall not exceed 5% of the nominal voltage at the point of supply, instances have occurred under short circuit conditions, where the protective device has not operated because of excessive voltage drop caused by the impedance of long circuits.

Where a switchboard is to be installed primarily to supply a designated piece of equipment, e.g. a swing stage, false car, welder or a compressor, the installation must be specifically designed for that load.

There is now an agreed position between the industry and the regulator, that in these circumstances that for voltage drop calculations purposes a maximum Vd of 2% of the nominal supply voltage is allowable for the installation from the consumer terminals to the switchboard and then a maximum Vd of 3% from the switchboard to the consuming device.

A proper assessment of all the following factors should result in an optimum economic design of the electrical installation:

- a) Calculation of the maximum demand of the installation; AS/NZS 3000 - Table C2;
- b) Type of electrical load;
- c) Type of supply - number of phases;
- d) Method of installation;
- e) Cable sizing of the various circuits - mains, sub-mains, final sub-circuits;
- f) Conductor parameters - milli-volt per amp-metre; and
- g) Provision for future additional loading.

The minimum cable size will be the smallest cable that satisfies the following factors:

- **Current Carrying Capacity** - Dependant upon the method of installation and the presence of external influences, such as thermal insulation, underground etc.
- **Voltage Drop** - Dependant upon the impedance of the cable, the magnitude of the load current and load power factor.

The cable selection procedures set out in Section 2 of AS/NZS 3008.1.1 details the guidelines to be followed to determine the minimum size of cable required to satisfy a particular installation condition.

Determination of minimum cable size based on voltage drop:

- a) Determine the current requirements of the circuit (I).
- b) Determine the circuit route length (L).
- c) Determine the maximum voltage drop permitted on the circuit run (Vd).
- d) Determine the voltage drop (Vc) in millivolts per ampere metre (mV/A.m).
- e) Refer to the tables of voltage drop (mV/A.m) for the different cable types, using Tables 40 through to 50 in AS/NZS 3008.1.1

Note: To convert single-phase voltage drop (mV/A.m) values, multiply the single-phase values by 0.866. To convert three-phase values to single-phase values, multiply the three-phase values by 1.155.

Then using Tables 22 through to 26(2) of AS/NZS 3008.1.1 determine the method of cable installation to be used, and if the method of installation requires the application of a derating factor, then divide the value of the determined current requirement of the circuit by the derating factor.

Then determine any environmental conditions that may affect the cable installation using Tables 27 through to 29 and where applicable divide the value of the current determined in step (b) by the derating factor.

EXAMPLE 1: SUSPENDED SCAFFOLD (SWINGSTAGE)

Where a maximum circuit route length is the determining factor:

$$\text{For a 3 phase installation } V_c = \frac{1000 \times V_d}{I \times L}$$

$$\text{For a 1 phase installation } V_c = \frac{1000 \times V_d}{I \times L \times 1.155}$$

A swingstage comprising of 2 x 6.5A single phase electric winch motors is to be installed.

From the designated switchboard socket-outlet to the winch motor terminals is a maximum distance of 87m, with a nominal supply voltage of 240V a.c. at the consumer terminals, the maximum allowable voltage drop of 3% from the switchboard socket-outlet to the winch motor terminals is 7.2V a.c.

$$V_c = \frac{1000 \times V_d}{I \times L \times 1.155} \quad V_c = \frac{1000 \times 7.2V \text{ a.c.}}{(2 \times 6.5A) \times 87m \times 1.155} \quad V_c = \frac{7200}{1,306.305}$$

$$V_c = 5.511 \text{ mV/Am}$$

Using AS/NZS 3008 Table 47 V90 10mm² = 4.38 mV/Am

The minimum size cable able to be used to supply this swingstage over 87m is 10mm².

EXAMPLE 2

Where the cable type and size is the determining factor

$$\text{For a 3 phase installation } L = \frac{1000 \times V_d}{I \times V_c}$$

$$\text{For a 1 phase installation } L = \frac{1000 \times V_d}{I \times (V_c \times 1.155)}$$

A 4mm² 2 core and earth V75 flexible cable is to be used to supply an arc welder that has a current rating of 12.5Amps and is to be supplied from a designated switchboard, with a nominal supply voltage of 240V a.c. at the consumer terminals, the maximum allowable voltage drop of 3% from the switchboard socket-outlet to the welding machine's terminals is 7.2V a.c.

Using AS/NZS 3008 Table 47 V75 4mm² = 10.4mV/Am

$$L = \frac{1000 \times V_d}{I \times (V_c \times 1.155)} \quad L = \frac{1000 \times 7.2V_{ac}}{12.5 \times (10.4mV/Am \times 1.155)} \quad L = \frac{7200}{150.15}$$

$$L = 47.95$$

The maximum allowable length is 48m.

EXAMPLE 3

Where a maximum circuit route length is the determining factor:

$$\text{For a 3 phase installation } V_c = \frac{1000 \times V_d}{I \times L}$$

$$\text{For a 1 phase installation } V_c = \frac{1000 \times V_d}{I \times L \times 1.155}$$

A false car comprising of 1 x 7A single phase electric winch motors is to be installed.

From the designated switchboard socket-outlet to the winch motor terminals is a maximum distance of 125m, with a nominal supply voltage of 240V a.c. at the consumer terminals, the maximum allowable voltage drop of 3% from the switchboard socket-outlet to the winch motor terminals is 7.2V a.c.

$$V_c = \frac{1000 \times V_d}{I \times L \times 1.155} \quad V_c = \frac{1000 \times 7.2V_{ac}}{7 \times 125mtrs \times 1.155} \quad V_c = \frac{7200}{1,010.625}$$

$$V_c = 7.124 \text{ mV/Am}$$

Using AS/NZS 3008 Table 47 V90 10mm² = 4.38 mV/Am

The minimum size cable able to be used to supply this false car is 10mm².

EXAMPLE 4

Where a maximum circuit route length is the determining factor:

$$\text{For a 3 phase installation } V_c = \frac{1000 \times V_d}{I \times L}$$

$$\text{For a 1 phase installation } V_c = \frac{1000 \times V_d}{I \times L \times 1.155}$$

A false car comprising of 1 x 4.6A three phase electric winch motors is to be installed.

From the designated switchboard socket-outlet to the winch motor terminals is a maximum distance of 125m, with a nominal supply voltage of 415V a.c. at the consumer terminals, the maximum allowable voltage drop of 3% from the switchboard socket-outlet to the winch motor terminals is 12.45V a.c.

$$V_c = \frac{1000 \times V_d}{I \times L \times 1.155} \quad V_c = \frac{1000 \times 12.45V_{ac}}{4.6 \times 125m} \quad V_c = \frac{12450}{575}$$

$$V_c = 21.652 \text{ mV/Am} \quad \text{Using AS/NZS 3008 Table 47 V90} \\ 2.5 \text{ mm}^2 = 15.2 \text{ mV/Am}$$

A 2.5mm² cable is the smallest size able to supply this false car over the route length of 125m.

EXAMPLE 5

Where a maximum circuit route length is the determining factor:

$$\text{For a 3 phase installation } V_c = \frac{1000 \times V_d}{I \times L}$$

$$\text{For a 1 phase installation } V_c = \frac{1000 \times V_d}{I \times L \times 1.155}$$

A site office without permanently installed heating or cooling and comprising of 3 x 10A double GPOs, 2 x 10A single GPOs and 2 x double fluorescent lights.

Using Table C2 Maximum Demand - Non-Domestic Electrical Installations column 3 Factories, shops, stores, business premises, schools and churches.

Equipment Result	Load Group	Calculation	
Lighting	A	2 x Double 36w Fluro 4x36w+(4x5w Ballast)	
		$\frac{164w}{240V} = 0.68$	0.68A
GPOs (8x outlets)	B (1)	1000w+(7x750w)	
		$\frac{5250w}{240V} = 21.88A$	21.88A

Total Maximum Demand 22.56A

Note: For the purpose of determining maximum demand, a multiple combination socket-outlet shall be regarded as the same number of points as the number of integral socket-outlets in the combination.

The site office is to be supplied from a distribution board that is a total route length away of 35m; the cable is to be bundled with 4 other circuits and installed on a catenary wire in direct sunlight.

Using AS/NZS 3008.1 Table 22 Derating Factors for Bunched Circuits of Single-Core or Multicore Cables in air or in wiring Enclosures, Column 2-3 Row 1 Bunched in air and number of circuits 5 = Derating factor of 0.70.

Apply the rating factor of 0.70 to the total maximum demand of 22.56A.

$$\frac{22.56A}{0.70} = 32.23A$$

From the distribution board to the point of attachment on the site office is a distance of 35m, with a nominal supply voltage of 240V a.c. at the consumer terminals the maximum allowable voltage drop of 3% from the distribution board to the site office is 7.2V a.c.

$$V_c = \frac{1000 \times V_d}{I \times L \times 1.155} \quad V_c = \frac{1000 \times 7.2V \text{ a.c.}}{32.23 \times 35m \times 1.155} \quad V_c = \frac{7200}{1302.90}$$

$$V_c = 5.53 \text{ mV/Am}$$

Using AS/NZS 3008 Table 42 V90 10mm² = 4.05 mV/Am.

EXAMPLE 6

Where the cable type and size is the determining factor:

$$\text{For a 3 phase installation } L = \frac{1000 \times V_d}{I \times V_c}$$

$$\text{For a 1 phase installation } L = \frac{1000 \times V_d}{I \times (V_c \times 1.155)}$$

A 6mm² V90 - 2 core and earth is to be used to supply a transportable toilet block without permanently installed heating or cooling and comprising of 1x 10A double GPO, 1x 15A GPO, 2x double fluorescent lights and 1x 40w exhaust fan from a distribution board, with a nominal supply voltage of 240 V a.c. at the consumer terminals, the maximum allowable voltage drop of 3% from the switch board to the toilet block is 7.2V a.c. The cable will be bundled with 3 other circuits and installed on a catenary in direct sunlight.

Using Table C2 Maximum Demand - Non-Domestic Electrical Installations column 3 Factories, shops, stores, business premises, schools and churches.

Equipment Result	Load Group	Calculation	
Lighting	A	$\frac{2 \times \text{Double } 36\text{w Fluro}}{4 \times 36\text{w} + (4 \times 5\text{w Ballast})}$	
		$\frac{164\text{w}}{240\text{V}} = 0.68$	0.68A
GPOs 10A	B(I)	$1000\text{w} + (1 \times 750\text{w})$	
		$\frac{1750\text{w}}{240\text{V}} = 7.29\text{A}$	7.29A
GPOs 15A	B(III)	$1 \times 15\text{A} = 15\text{A}$	15A
Exhaust fan	D	$\frac{40\text{w}}{240\text{V}} = 0.17\text{A}$	0.17A

Total Maximum Demand 23.14A

Note: For the purpose of determining maximum demand, a multiple combination socket-outlet shall be regarded as the same number of points as the number of integral socket-outlets in the combination.

Using AS/NZS 3008 Table 22 Derating Factors for Bunched Circuits of Single-Core or Multicore Cables in air or in wiring Enclosures, Column 2-3 Row 1 Bunched in air and number of circuits 4= Derating factor of 0.72.

Apply the rating factor of 0.72 to the total maximum demand of 23.14A.

$$\frac{23.14\text{A}}{0.72} = 32.14\text{A}$$

Using AS/NZS 3008 Table 42 V90 $6\text{mm}^2 = 6.8\text{mV/Am}$.

$$L = I \times (V_c \times 1.155) \quad L = 32.14 \times (6.8\text{mV/Am} \times 1.155) \quad L = 252.43$$

$L = 28.52\text{mtr}$ The maximum allowable length is 28.52mtr.

EXAMPLE 7

Where the cable type and size is the determining factor:

$$\text{For a 3 phase installation} \quad L = \frac{1000 \times V_d}{I \times V_c}$$

$$\text{For a 1 phase installation} \quad L = \frac{1000 \times V_d}{I \times (V_c \times 1.155)}$$

A 10mm^2 V90 2 core and earth cable is to be used to supply a transportable site shed with permanently installed heating or cooling and consisting of 11x 10A double GPOs, 2x 10A single GPOs, 5x double fluorescent lights and 2x 15A reverse cycle air-conditioners from a distribution board, with a nominal supply voltage of 240V a.c. at the consumer terminals, the maximum allowable voltage drop of 3% from the switch board to the site shed is 7.2V a.c. The cable will be installed in heavy duty conduit in the ground with 3 other circuits that will be spaced 30mm apart.

Using Table C2 Maximum Demand - Non-Domestic Electrical Installations column 3 Factories, shops, stores, business premises, schools and churches.

Equipment Result	Load Group	Calculation	
Lighting	A	$\frac{5 \times \text{Double } 36\text{w Fluro}}{10 \times 36\text{w} + (10 \times 5\text{w Ballast})}$	
		$\frac{1800\text{w}}{240\text{V}} = 7.5\text{A}$	7.5A
GPOs 10A	B(II)	$1000\text{w} + (23 \times 100\text{w})$	
		$\frac{3300\text{w}}{240\text{V}} = 13.75\text{A}$	13.75A
Air-conditioners	C	$15\text{A} + (15 \times 0.75) = 26.25$	26.25A

Total Maximum Demand 47.5A

Note: For the purpose of determining maximum demand, a multiple combination socket-outlet shall be regarded as the same number of points as the number of integral socket-outlets in the combination.

Using AS/NZS 3008 Table 26(2) Derating Factors for Groups of Circuits of Single Core or Multicore Cables Installed in Underground Wiring Enclosures - Multicore Cables Enclosed Separately or More Than One Single-Core Cable Per Wiring Enclosure, Column 3, number of circuits 4= Derating factor of 0.85

Apply the rating factor of 0.85 to the total maximum demand of 47.5A.

$$\frac{47.5\text{A}}{0.85} = 55.88\text{A}$$

Using AS/NZS 3008 Table 42 V90 $10\text{mm}^2 = 4.05\text{mV/Am}$.

$$L = I \times (V_c \times 1.155) \quad L = 55.88 \times (4.05\text{mV/Am} \times 1.155) \quad L = 261.39$$

$$L = 27.54\text{m}$$

The maximum allowable length is 27.54m.

Installation of Construction Wiring

Clauses 2.5.1, 2.5.2, 2.5.3, 2.5.4 & 2.5.5 of AS/NZS 3012 specify the types of cables to be used and fixing requirements. These clauses require in part:

2.5.1 Cables and fittings

Cables and fittings used in construction wiring shall comply with the requirements of AS/NZS 3000.

Note: *Trailing cables used for surface wiring should comply with the requirements of AS/NZS 2802.*

2.5.2 Installation of cables

Cables shall be installed in accordance with AS/NZS 3000 except as varied in Clauses 2.5.3 to 2.5.6. Construction wiring shall not be tied, bundled or grouped with permanent wiring.

2.5.3 Protection against mechanical damage

A risk assessment should be undertaken, prior to the installation of cables or whenever change occurs, as to the likelihood of the cables being exposed to mechanical damage.

2.5.4 Marking

Construction wiring shall be readily distinguishable from permanent wiring by using cable of a different colour or by attaching iridescent yellow tape spaced at intervals not exceeding 5m and stamped with the words 'construction wiring'.

2.5.5 Use of unarmoured cables

Unarmoured cables shall not be installed on metallic roofs or similar structures unless suitably protected against mechanical damage.

Construction wiring is required to be fixed so as to eliminate excessive sag and to afford adequate support.

AS/NZS 3000 states in 3.9.3.1:

Wiring systems shall be supported by suitable means, in accordance with clause 3.3.2.8.

3.3.2.8. Wiring systems shall be selected and installed so as to minimise damage to the cable insulation, sheathing and connections during installation, operation and maintenance.

- a) *Provisions of supports, continuous or at appropriate intervals suitable for the mass of the cable.*
- b) *Use of suitable fixings for the cable size and type that hold the cables in position without damage.*

- c) *Use of suitable connections for the cable size and type that reduce mechanical strain at joints and terminations.*
- (d) *Attention to minimum bending radius limits of cables.*
- (e) *Provision of flexibility to accommodate any movement or tension stresses.*

Elimination of excessive sag applies to vertical runs as much as horizontal runs - the requirement is that the wiring be adequately supported.

Cablings Run on Catenary

AS/NZS 3000 3.13 Cables supported by a catenary states:

- Cables supported by means of a catenary shall be stranded or flexible cables affording double insulation or the equivalent of double insulation; and
- Cables and catenary supports installed out-of-doors shall be suitable for exposure to direct sunlight.

At no time should the number of cables supported by a catenary wire exceed 6 cables.

Construction wiring is not allowed to be installed on the same catenary wire as permanent wiring. This constitutes a hazard under Occupational Health and Safety as the construction wiring is mixed with the permanent wiring and is not readily distinguishable when bunched or tied together.

On sites where permanent wiring exists together with construction wiring for construction purposes, the construction wiring must be clearly identified.

Clause 3.4 of the Industry Standard requires:

3.4 Clear Identification of Construction Wiring

Construction wiring for consumers mains, sub-mains, and sub-circuits should be readily distinguishable from permanent wiring by using cable of a different colour, or by attaching iridescent yellow tape stamped with the words - 'construction wiring'.

The tape should be spaced at intervals not exceeding 5 metres.

AS/NZS 3000 3.13.2 Catenary Supports - A catenary shall:

- a) provide uniform support;
- b) consist of material equally resistant to corrosion or deterioration;
- c) be effectively fixed at each end;
- d) be capable of withstanding mechanical stresses likely to occur, in particular those due to wind or ice; and
- e) be mounted sufficiently high above the ground to prevent danger to persons or livestock, or damage to the cable being supported.

A catenary may form part of a cable, in which case it should be installed in accordance with the manufacturer's instructions.

AS/NZS 3000 3.13.3 Clearances

Cables supported by a catenary wire shall maintain the following clearances:

- a) in an outdoor location, as specified in clause 3.12.3 for a neutral screened cable; and
- b) in an indoor location, not less than 100 mm from any moving parts or parts of equipment operating at an elevated temperature.

Minimum Clearance for Low-Voltage Cable Supported by Catenary

- 4.6m - over areas used by vehicles.
- 3.0m - over areas not used by vehicles.
- 2.7m - over roofs used for traffic or resort.
- 0.5m - over other roofs and structures.
- 1.0m - from buildings; horizontal clearance from walls etc.
- 2.0m - from clothes lines, radio and television aerials, counterpoise or stay wires.
- 0.6m - from telecommunication lines.
- 3.0m - above swimming pools.
- 4.5m - above areas where sailing craft, or irrigation pipes are used.

Furthermore, in relation to cables run over areas used by vehicles, overhead wiring should be positioned to avoid crossing roadways or access ways where cranes, high loads or heavy machinery may travel.

Where it is not possible to avoid access ways, an effective means shall be provided to minimise the risk of vehicular contact with the aerial wiring system.

This condition may be satisfied by the placement of flagged catenary wires or cables of suitable material across the access way:

- a) 6m on either side of the overhead wiring; and
- b) 0.6m below the lowest point of the overhead electrical cables or lower.

Mechanical Protection

All parts of an electrical installation shall be designed to be adequately protected against damage that might reasonably be expected from environmental and other external influences.

Damage from such influences may include mechanical injury and damage due to exposure to weather, water, flora, fauna, seismic activity, excessive dampness, corrosive fumes, galvanic action, accumulation of dust, steam, oil, temperature, explosive atmospheres, vibration or any other influence to which the electrical installation may be exposed under the conditions of its use.

Wiring enclosures which form part of wiring systems shall be installed in accordance with safe and sound practice and provide adequate protection.

A risk assessment should be undertaken prior to the installation of cables or whenever a change occurs, as to the likelihood of the cables being exposed to mechanical damage.

AS/NZS 3012 2.5.3 The following are some examples of situations where cables may require mechanical protection:

- a) Cables run within 2.5m of the floor or ground level;
- b) Cables run on exterior surfaces and in close proximity to scaffolding;
- c) Cables supplying switchboards and final subcircuits to equipment located on formwork decks;
- d) Cables run on perimeter construction fencing;
- e) Cables slung under a concrete ceiling slab more than 150mm away from the juncture of the ceiling slab and a wall or beam which would otherwise provide protection;
- f) Cables coming in close proximity to unearthed metal structures being installed as part of the construction process (i.e. sheet metal ducts, hydraulic piping, etc);
- g) Cables run across the top of relocatable structures, storage containers, shipping containers or the like;
- h) Cables run across or over metallic roofs or edges; and
- i) Cables run in adverse environments.

In relation to construction wiring, where the risk assessment identifies a risk of damage to cables, and the cables cannot be relocated to an alternative position, they must be protected by a suitable enclosure or barrier not less effective than:

- a) Medium-duty rigid PVC conduit;
- b) Heavy-duty corrugated conduit;
- c) Flexible electrical hose;
- d) Armoured cable; or
- e) Other means that provide equivalent protection against mechanical damage.

Where wiring enclosures are run vertically, adequate provision shall be made for the support of the enclosed cables. Cable supports shall be provided at intervals not exceeding 8m or as recommended by the cable manufacturer.

Switchboards

The design of switchboards for use on construction sites should not only take into account the specific requirements of isolation, RCD protection and rating of socket-outlets but should also take into account the mechanical protection. The mechanical protection aspects that switchboards may require are often due to the very nature of construction activities and the likelihood of the damage that may occur to the switchboard during the construction phase of the project.

Switchboard Design

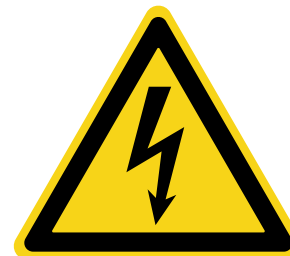
All supply switchboards for construction sites shall comply with:

- Designed and constructed to comply with AS 3439.4;
- Robust construction and materials to withstand mechanical damage from environment or other external influences that may be expected at the location;
- Enclosure shall provide a minimum degree of protection IP23;
- Live parts shall be effectively protected at all times against direct contact by persons operating equipment located on the switchboard, including the connection or disconnection of plugs in socket-outlets;
- If the switchboard is provided with a socket-outlet, means such as an insulated or covered tie bar, shall provide anchorage for outside cables or flexible cords and cables and prevent strain at the connections or terminations;
- Have, at the bottom of the enclosure, a means for the passage of flexible cords that will prevent mechanical damage to the cords;
- Fitted with a lockable cover for circuit breakers and RCDs, which does not prevent access to main switches, and main isolating switches. This provision also applies to relocatable structures;
- Mounted securely (this mounting may be on a secure portable stand); and
- Incorporate insulated stands for the support of cables and flexible extension cords, or for those not mounted on a pole or permanent structure, have an insulated stand fixed adjacent the supply switchboard. Where provided with a door or lid to maintain degree of protection, the door or lid shall:
 - Require the use of a tool for removal;
 - Be fitted with a door with a locking facility for security purposes, one which will not damage the cables when closed fitted with a facility for locking;
 - Be provided with means to retain the door in the open position when it is required to be kept open for the purpose of conducting electrical work on the switchboard fitted with a means of retention in the open position;
 - If the switchboard is provided with a socket-outlet, be provided with a clearly visible and legible sign on the external surface stating: 'KEEP CLOSED: RUN ALL LEADS THROUGH BOTTOM'; and
 - Be kept closed except when access is required.
- Isolating switches to be provided with a device for securing the switch in the open position so that it requires a deliberate action to engage or disengage it.
- Where there is more than one switchboard on the site, marking shall be provided, by means of numbers, letters or both, to distinguish one switchboard from another.

- All isolating switches shall be marked as required by AS/NZS 3000 and as follows:
 - 'MAIN SWITCH': on main switchboards.
 - 'DISTRIBUTION BOARD ISOLATING SWITCH': on distribution boards.
 - 'ISOLATING SWITCH AFTER HOURS SUPPLY: DO NOT SWITCH OFF': for circuits supplying electrical equipment operating out of normal working hours.Letters used for marking shall be not less than 6mm high and of a contrasting colour to the background material.
- Switchboards shall be marked to indicate the presence of live parts.

Such marking shall be as follows:

Where access to live parts is required, the following symbolic electric shock risk sign shall be displayed in locations where additional attention is required to be given to the removal of covers and the like.



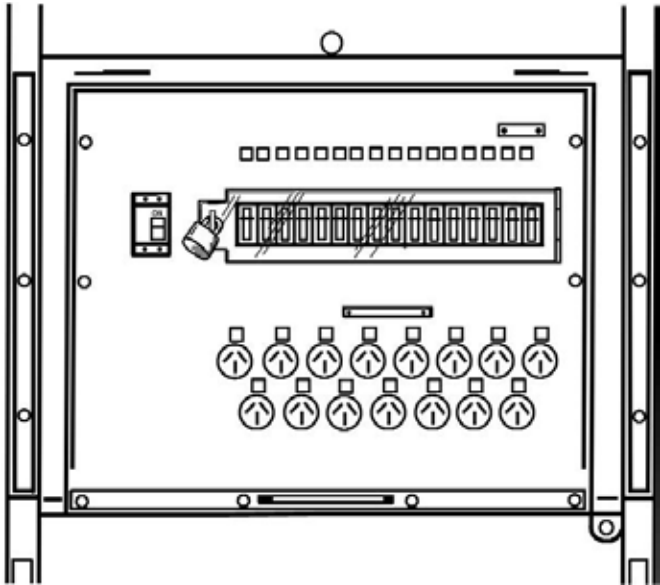
In addition, a DANGER sign as illustrated below, with an additional message of appropriate wording, should be conspicuously displayed on the enclosure of the ASSEMBLY to alert persons to the hazard.



- All switchboards to be fitted with at least one 15 A single phase, socket-outlet.

Generalised example of a typical switchboard appropriate for a commercial construction site

Note: that a tie bar, insulated stand, door, signage and means of passage for flexible cords have been omitted from this illustration for the sake of clarity.



**RECOMMENDED FORMAT
CHECKLIST FOR CONNECTION OF SWITCHBOARDS**

Checked by : (PRINT NAME) Date :/...../.....
 Electrician's licence number :
 Signed :
 Switchboard location :
 Switchboard identification (Numbers/Letters) :

CHECK	YES	NO
A lockable cover over RCDs and circuit breakers		
All socket-outlets wired for correct polarity		
All switching works correctly		
All cabling is in good condition externally and internally		
All socket-outlets are marked		
Tie bar is installed and insulated		
Main isolator is installed outside of the lockable cover		
RCD for power		
At least one 15 Amp outlet is installed		
All labelling and circuit identification on switchboard as well as marking on all socket-outlets		
Check hinge on door to ensure in good working condition and can only be removed by the use of a tool		
Door has a locking facility		
Test points for the lighting RCDs installed RCD for lights if required		
Tighten all connections		
Check for weatherproofing of board		
Pole fillers in place		
Has the switchboard been fitted with a lead stand?		
Has the switchboard been fitted to the floor?		

Provision of Double Pole Switches

Clause 3.7 of the Industry Standard requires:

3.7 Double Pole Switches

Double pole switches must be used on every socket-outlet installed on portable equipment designed to be supplied by a flexible extension cord.

All switches, including light switches, on transportable structures must be double poled.

Note: Double pole switches require all live conductors, including active and neutral conductors, to be switched.

Note: Some commercially available socket-outlets incorporating RCDs employ single pole switching only. If contemplating installing such a socket-outlet in (for example) a relocatable structure, this type is unsuitable as it does not employ the required double pole switching. These types of RCDs are only suitable for attachment to permanent wiring.

Security of Switchboards after Hours

The power circuits of construction installations are required to be secured after working hours.

To prevent unauthorised access and the risk of electrocution or fire, the principle contractor or nominated persons should ensure that all power circuits are secured upon completion of the work shift, and/or when the site is unattended. This need not apply to security lighting and essential equipment, or to locked relocatable structures.

Protection of Final Sub-Circuits

All final sub-circuits of a construction installation must be protected by a circuit breaker, in addition to RCD protection.

Every final sub circuit shall be protected by a fixed over current circuit breaker, except that final sub circuits exceeding 50 Amps may be protected with HRC (high rupturing capacity) fuses.

AS/NZS 3012 specifically prohibits the use of rewirable fuses to protect final sub-circuits.

AS/NZS 3000 requires the identification of every circuit breaker protecting a final sub-circuit, relative to the circuit being protected. This is to enable final sub-circuits to be energised or de-energised as required by direct reference to the relevant circuit breakers, without an ad hoc 'trial and error' approach.

Residual Current Devices (RCDs)

An RCD is defined as a device intended to isolate supply to protected circuits, socket-outlets or electrical equipment in the event of a current flow to earth which exceeds a predetermined value.

RCDs are rated by three parameters:

- 1) The nominal full load current rating;
- 2) The trip current, that is, the earth leakage current required to trip the unit; and
- 3) The maximum trip time at the rated trip current.

AS/NZS 3190 classifies RCDs according to the rated tripping current, as follows:

Type I	Up to 10mA
Type II	Greater than 10mA up to 30mA
Type III	Greater than 30mA, up to 300mA - without selective tripping time delay
Type IV	Greater than 30mA. Up to 300mA - with selective tripping time delay (type S)

Manufacturers are required to mark on the RCD information regarding rating and application - this information is also given in manufacturers' catalogues. The required information is given below:

- Rated voltage;
- Rated load current in amperes;
- Rated frequency, or alternatively - or a.c. if the rated frequency is 50Hz;
- Rated residual (tripping) current $I_{\Delta n}$.
- Number of supply conductor turns required to be passed through the core (if the RCD is of the type where supply conductors are required to be passed through the core).
- The word 'TEST' or the letter 'T' adjacent to or on the test facility (e.g. test button) and the word 'RESET' adjacent to or on the reset button, if used.
- If an RCD has a conditional short-circuit current rating:
 - a) of 3kA with a short circuit protective device (SCPD), it shall be marked Inc - 3kA plus the SCPD details; or
 - b) over 3kA and also passes the short-time through-current withstand test detailed in clause 8.13 without an SCPD in circuit, no marking is required and the SCPD details may be given in the manufacturer's data.

This marking does not apply to a portable RCD.

- Indication of open and closed positions at the place of operation. The symbols 'O' and 'T' may be used.
- The symbol S (S in a square) for Type IV RCDs.

Australian Standard AS/NZS 3190 - specifies the maximum trip time requirements for RCDs for different applications, when subject to leakage currents of various multiples of the rated trip current (I n). Examples are summarised in the table below:

TEST CURRENT	RCD TYPE			
	I	II and III	IV	
	TRIPPING TIME, mS			
	MAXIMUM		MAXIMUM	MINIMUM
NO TRIP				
TRIP	40	300	130	500
FAST TRIP	40	40	50	150

Every final sub-circuit shall be protected by an RCD with a rated tripping current not greater than 30mA. This includes lighting, socket-outlets, and relocatable structures. This requirement need not apply to final sub-circuits supplying equipment where safe mechanical operation is at risk, such as for cranes or personnel lifts.

For an RCD to correctly monitor and react to earth leakage currents, it is essential that a protected circuit neutral is earthed only 'upstream', on the supply side of the RCD.

Note 1: The ETU recommendation does not allow for MCB/RCDs to be used as main switches as all RCDs are required to be behind a locked door. This requires a separate accessible main switch to be provided. All RCDs need to be reset only by a licensed electrician.

Location of Switchboards in relation to Flexible Cord Length

The location of a switchboard should be considered in relation to the maximum length of flexible cords.

In multi-level buildings switchboards shall be positioned in a manner which eliminates the need for flexible cords or cables to be run between levels.

RESTRICTIONS ON FLEXIBLE CORDS (INCLUDING TOTAL IN-LINE LENGTH OF MULTIPLE CORDS)			
Rating of Flexible Cable	Maximum Rated Current of Type C Protective Cord	Minimum Cross Sectional Area of Circuit Breaker	Maximum Length of Flexible Cable
A	A	mm ²	m
10	20	1.0	25
	20	1.5	35
15	20	1.5	25
	32	1.5	25
	32	2.5	40
20	32	2.5	30
	32	4.0	50

Note: Lengths quoted for flexible cords are taken from AS/NZS 3199 and are based on a voltage drop of 5% of 230 V at rated current and on short circuit (i.e. fault) protection requirements.

Recognising that flexible cords are likely to be supplied from the switchboard, consideration must be given to the maximum length of flexible cords permitted. This may necessitate the installation of an additional distribution board to supply flexible cords for work to be carried out beyond a given distance from the switchboard.

INITIAL VERIFICATION OF ELECTRICAL INSTALLATIONS

Wiring, irrespective of whether it's permanent wiring or construction wiring, must in the first instance comply with the provisions of AS/NZS 3000. Construction wiring, as well as complying with AS/NZS 3000, also has the additional requirements of AS/NZS 3012 and the Industry Standard for Electrical Installations on Construction Sites to be complied with.

Documented records of all inspections and tests shall be kept on site for audit or made available for audit on the next working day - Section 3.10 AS/NZS 3012:2011.

Verification of an Electrical Installation (Inspection & Testing)

When an electrical installation is complete there are certain requirements that must be completed prior to the installation being connected to supply.

Note: Extracts from AS/NZS 3000:2007 & AS/NZS 3017:2007

These standards describe tests for both situations where the supply is connected and where it is not connected. Preference has been given to tests where the supply is not connected, as this would minimise the risk of electric shock. However, testing with the supply connected may also be conducted and some alternative test methods are included in AS/NZS 3017:2007. In these situations, greater care must be exercised to avoid direct or indirect contact with live parts or the energising of exposed conductive parts.

Whether testing with supply disconnected or connected, the following precautions shall be followed:

- a) Treat equipment as being energised until proven otherwise.
- b) Follow safe working practices as outlined in AS/NZS 4836.
- c) Understand the correct use of the equipment to be used and its rating.
- d) Check that the equipment being used, including any test leads, probes or clips:
 - i) Is suitable for the voltage being tested;
 - ii) Is in good working order and calibrated; and
 - iii) Has no damaged parts with which contact could be dangerous.

The provisions of Section 8 of AS/NZS 3000:2007 represent the minimum standard of inspection and testing that must be achieved to satisfy the fundamental safety principles of Part 1 of the Standard in relation to verification of an installation.

Prior to placing an electrical installation, or any part thereof, in service following construction, alteration, addition or repair thereof, it shall be verified, as far as practicable, that the installation is safe to energise and will operate correctly in accordance with the requirements of the Standard.

To confirm that the requirements of the Standard have been met, after completion and before being placed in service, the installation shall be:

- a) inspected as far as is practicable; and
- b) tested in accordance with Clause 8.3 of AS/NZS 3000:2007.

Precautions shall be taken to ensure the safety of persons and to avoid damage to property and the electrical installation equipment during inspection and testing.

Where the electrical installation is an alteration, addition or repair to an existing electrical installation, it shall be verified that the alteration, addition or repair complies with the Standard and does not impair the safety of the existing electrical installation.

Exception: Certain types of test, such as those involving thermal properties and operation, may be carried out after the electrical installation has been placed in service.

Periodic inspection and testing of electrical installations shall be performed in accordance with the requirements of:

- i) the regulatory authority; or
- ii) the owner or occupier of the premises.

Recommended periodic testing arrangements are set out in AS/NZS 3019.

Visual Inspection

A visual inspection shall be made when work on an electrical installation has been completed in order to verify that the work complies with the requirements of the Standard.

The visual inspection shall be carried out before, or in association with, testing and should, where practicable, be made before the relevant part of the electrical installation is placed in service.

Where the visual inspection of a part of the electrical installation is not practicable at the completion of the work, e.g. not accessible because of enclosure in the building structure, consideration should be given to inspecting that part during the course of the installation.

In relation to what should be visually inspected, a ready reckoner has been provided as a guide to what should be looked at.

READY RECKONER - VISUAL INSPECTION INSTALLATION			
ITEMS TO BE VISUALLY INSPECTED	COMPLETED		
	Y	N	N/A
A) GENERAL			
i) Basic protection (protection against direct contact with live parts), e.g. insulation and enclosure.			
ii) Fault protection (protection against indirect contact with exposed conductive parts), e.g. by the use of double insulation or isolating transformers.			
iii) Protection against hazardous parts, e.g. enclosure, guarding or screening of flammable materials, hot surfaces and parts that may cause physical injury.			
iv) Protection against spread of fire, e.g. penetration of fire barriers.			
v) General condition of the electrical equipment, e.g. signs of damage that could impair safe operation, disconnection of unused electrical equipment.			
B) CONSUMERS MAINS			
i) Current carrying capacity.			
ii) Voltage drop - e.g. size of conductors.			
iii) Underground installation conditions, e.g. enclosure, depth of burial, mechanical protection.			
iv) Aerial installation conditions.			
v) Connection of wiring.			
vi) Protection against external influences.			
C) SWITCHBOARDS			
i) Location, e.g. access and egress.			
ii) Protective devices, e.g. overload and residual current rating, fault current rating.			
iii) Isolating devices, e.g. main switches.			
iv) Connecting devices, e.g. neutral bars, earth bars and active links.			
v) Connection and fixing of wiring and switchgear.			
vi) Identification and labelling of electrical equipment.			
vii) Protection against external influences.			
D) WIRING SYSTEMS			
i) Conductor size, e.g. current-carrying capacity and voltage drop.			
ii) Identification of cable cores.			
iii) Adequate support and fixing.			
iv) Connections and enclosures.			
v) Particular installation conditions, e.g. underground, aerial, emergency systems			

vi) Segregation from other services and electrical installations.			
vii) Protection against external influences, e.g. enclosure.			
E) ELECTRICAL EQUIPMENT			
i) Isolation and switching devices for protection against injury from mechanical movement devices and motors.			
ii) Isolation and switching devices for protection against thermal effects e.g. motors, room heaters, water heaters.			
iii) Switching devices for particular electrical equipment, e.g. socket-outlets, water heaters.			
iv) Particular installation conditions, e.g. locations affected by water, explosive atmospheres, extra-low voltage, high voltage.			
v) Compliance with required Standard.			
vi) Connection, support and fixing.			
vii) Protection against external influences.			
F) EARTHING			
i) MEN connection.			
ii) Earth electrode.			
iii) Earthing conductors, e.g. size, identification.			
iv) Equipotential bonding conductors, e.g. size, identification.			
vi) Protection against external influences.			
vii) Connection to earthing arrangements for other systems.			
viii) Creation of earthed situation that may require earthing of additional electrical equipment.			

Testing

AS/NZS 3000 sets out the test methods required to ensure that a low-voltage electrical installation is safe to be connected to supply.

Following a visual inspection of the electrical installation, testing is required to be carried out to verify that the electrical installation complies with the requirements of the 'Wiring Rules', and that the installation is safe for its intended use.

Currently there are four mandatory tests with the provision of two additional tests. On construction sites the use of RCDs on final sub-circuits is mandatory. As such, the provision for RCD testing is then mandatory as they are required to be installed and so must be tested to verify that they are performing as required. The other additional test, earth fault loop impedance, verifies that the protective device will function where there is a fault to earth. This test is performed on an energised installation which tests not only the impedance of the installation but also the impedance of the network asset.

The following tests are to be carried out on the electrical installation:

Mandatory tests prior to supply being connected:

- Continuity of the earthing system;
- Insulation resistance;
- Polarity; and
- Correct circuit connections.

Tests after supply has been connected:

- Operation of residual current devices (RCDs); and
- Verification of impedance required for automatic disconnection of supply (earth fault-loop impedance).

If the electrical installation fails a test, that test and any preceding tests that may have been influenced by the fault indicated shall be repeated after the fault has been rectified.

AS/NZS 3017 - *Electrical Installations - Testing and Inspection Guidelines*, provides practical guidance on how the testing is required to be performed to meet the provisions of the 'Wiring rules'.

Continuity of the earthing system

Verification to prove the continuity of the earthing system (earth resistance of the main earthing conductor, protective earthing conductors and bonding conductors) are necessary to ensure that the earthing system has been installed in a manner that will cause circuit protective devices to operate if there is a fault between live parts, other than the neutral, and the mass of earth.

An effective earthing system will ensure that exposed conductive parts of electrical equipment do not reach dangerous voltages when such faults occur.

Verification is to be conducted by testing the installation.

The resistance of protective earthing conductors shall be:

- Low enough to permit the passage of current necessary to operate the overcurrent protective device; and
- Consistent with the length, cross-sectional area and type of conductor material, e.g. for a 100m length of 2.5mm² copper conductor, a resistance of 0.8 could be expected.

The resistance of the main earthing conductor or any equipotential bonding conductor shall be not more than 0.5.

Note: Appendix B of AS/NZS 3000 describes the maximum allowable resistance of the protective earthing conductor associated with any particular circuit depends on the type and rating of the protective device and the impedance of the live conductors that comprise the circuit.

To obtain the resistance value of the protective earthing conductor use a quality ohmmeter (see diagram for procedure) and compare this value with the *maximum* allowable resistance as tabulated below. For the full table, go to Table 3.2 AS/NZS 3017.

PROTECTIVE DEVICE RATING	CONDUCTOR SIZE		CIRCUIT BREAKERS			FUSES
			Type B	Type C	Type D	
			Disconnection Times 0.4 sec			
A	Active mm ²	Earth mm ²				
			Maximum Final Subcircuit Earth Conductor Resistance			
6	1	1	3.08	1.65	1.00	3.69
10	1.5	1.5	1.85	1.00	0.60	2.06
16	2.5	2.5	1.16	0.62	0.37	1.00
20	2.5	2.5	0.93	0.50	0.30	0.68
25	4	2.5	1.07	0.57	0.34	0.76
32	4	2.5	0.72	0.38	0.23	0.51
40	6	2.5	0.66	0.35	0.21	0.44
50	10	4	0.54	0.29	0.17	0.34
63	16	6	0.44	0.23	0.14	0.26

Test – Continuity Of The Earthing System (Supply Is Not Connected)

Test Equipment

- A multimeter set to ohms.
- Insulated copper conductor of suitable length (long lead).

Test Procedure

- 1) Ensure that the electricity supply is not connected;
- 2) Connect an insulated copper conductor of suitable length (long lead) to one terminal of the ohmmeter;
- 3) Connect a standard length test lead to the other terminal of the ohmmeter (short lead);
- 4) Connect the two leads together, and 'zero' the multimeter or, if this is not possible, record the resistance of the test leads;

- 5) Disconnect the water pipe equipotential bonding conductor and the water heater earthing conductor (if applicable). Care must be taken that there are no parallel earth paths when conducting this test, i.e. the earthing system must not be connected to either the water or gas pipes; and
- 6) Disconnect the MEN link from the main neutral link and connect it to the long lead (i.e. long lead now connected to the earth bar).

Main Earthing Conductor/Equipotential Bonding Conductor

Connect the short lead to the earth electrode and measure the earth resistance of the main earthing conductor. Connect the short lead to the equipotential bonding conductor and measure the earth resistance of the bonding conductor. In both cases the resistance shall not exceed 0.5 ohms for either the main earthing conductor or the equipotential bonding conductor.

Earth Continuity Test

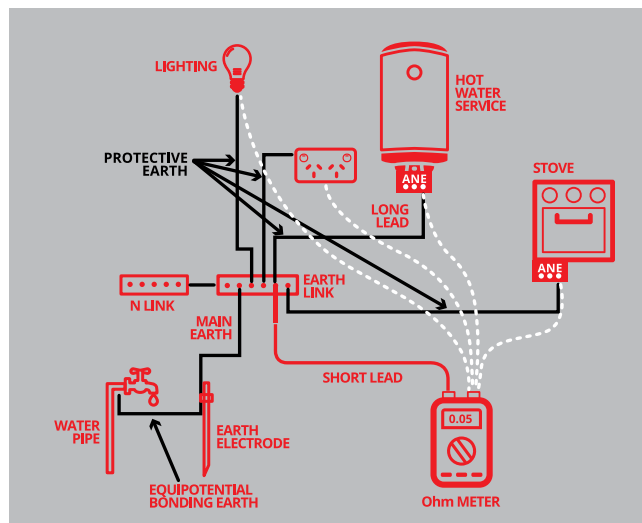
Using the long lead and zeroed multimeter, measure, for each circuit, the earth conductor resistance from the circuit extremity to the switchboard.

Confirm the measured values are less than those values specified on the preceding page for each sub-circuit.

This test is applicable to all circuits, including socket-outlet circuits, lighting circuits and fixed equipment (e.g. water heater supply) circuits.

- 7) Re-connect the MEN link to the main neutral link.
- 8) Re-connect the water pipe equipotential bonding conductor.

Inspection – Protective Earthing Resistance



Test – Insulation Resistance

An insulation resistance test is required to ensure that the insulation resistance between all live conductors (active and neutral) and earth or, as the case may be, all live parts and earth is adequate to ensure the integrity of the insulation. This is to prevent:

- a) Electric shock from inadvertent contact;
- b) Fire hazards from short-circuits; and
- c) Equipment damage.

The integrity of the insulation is stressed by applying a direct current at 500V.

Where surge protective devices (SPDs) or other equipment are likely to influence the verification test or be damaged, such equipment shall be disconnected before carrying out the insulation resistance test.

Where it is not reasonably practicable to disconnect such equipment (e.g. in case of fixed socket-outlets incorporating an SPD), the test voltage for the particular circuit may be reduced to 250V d.c. The insulation resistance must be not less than 1MΩ.

Note: It is envisaged that on construction sites that there would be no valid reason why it is not reasonably practicable to disconnect surge protection and/or RCD protection from the installation so that the test voltage would be 500V with an insulation resistance not less than 1MΩ.

The insulation resistance tester used shall be able to maintain its terminal voltage when measuring a resistance of 1MΩ on the 500V range or 10MΩ on the 1000V range.

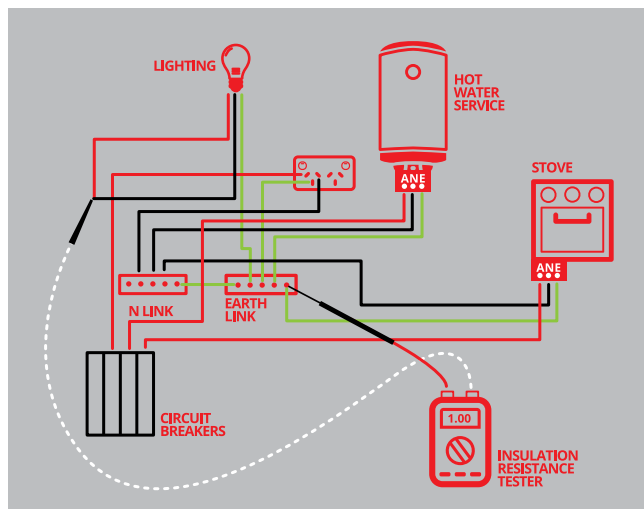
Note: Care may be required with the application of the insulation resistance test to electronic equipment and surge protective devices to prevent damage to the devices.

The insulation resistance between live and earthed parts of an electrical installation or parts is to be not less than 1MΩ.

The value of 1MΩ may be obtained with appliances disconnected.

The value of 1MΩ may be reduced to 0.01MΩ for sheathed heating elements of appliances.

Insulation Resistance Test



Testing Sequence

- 1) Ensure that supply is not connected.
- 2) Connect meter test lead to earth link.
- 3) Disconnect the active and corresponding neutral from the circuit breaker and neutral link.
- 4) Connect the neutral and active conductors together.
- 5) Where necessary disconnect the appliance.
- 6) Test the A/N with megohmmeter.
- 7) Reading to be not less than 1 megohm (sheathed heating elements can be not less than 0.01 megohm).

Note: if the circuit contain electronic dimmers ensure that you follow the manufacturer's specifications for testing of the installation.

Test – Polarity

Polarity testing is to prevent:

- a) The transposition of active and neutral conductors of the consumers mains or sub-mains, with an MEN connection at an outbuilding, resulting in the electrical installation earthing system becoming energised;
- b) Combinations of incorrect active, neutral and earthing conductor connections resulting in the exposed conductive parts of the electrical installation becoming energised; and

- c) The connection of switches or protective devices in neutral conductors, resulting in parts of appliances, such as heating elements and lamp holders, remaining energised when the switches are in the 'OFF' position.

Testing will ensure that all active, neutral and protective earthing conductors in the electrical installation are correctly connected to the corresponding terminals of electrical equipment.

Correct circuit connections

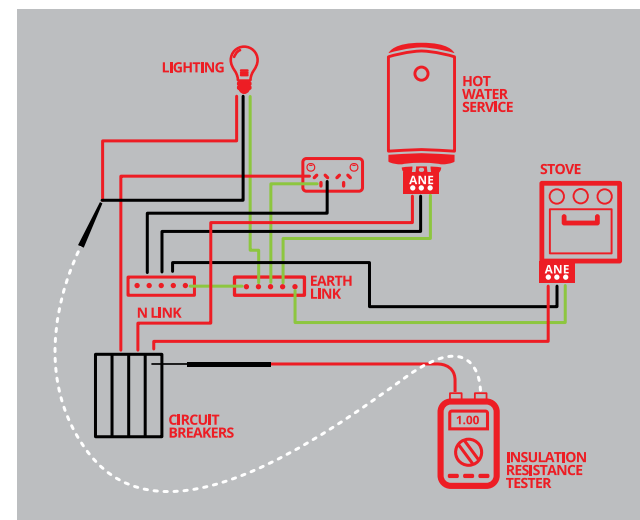
Tests for correct circuit connections are necessary to ensure the following:

- a) Protective earthing conductors do not normally carry current; and
- b) No short circuit exists, because a short-circuit current flowing between live conductors and through part of the earthing system can cause considerable fire damage or personal injury, particularly in high current locations.

Testing will ensure that the active, neutral and protective earthing conductors of each circuit are correctly connected.

Note: Testing must ensure that no ring circuits exist. See the following page for test procedure.

Ring Circuits



Test procedure

- 1) Ensure that supply is not connected.
- 2) Disconnect and join the active and corresponding neutral conductors.
- 3) Using a megohmmeter with test voltage set on 500V, connect one lead to the active/neutral junction, and the other lead to each circuit active and neutral in turn and test.

No interconnections should be found.

Correct Circuit Connections

Objective

Tests for correct circuit connections are necessary to ensure the following:

- a) Protective earthing conductors do not carry current in non-fault conditions; and
- b) No short-circuit exists, because a short-circuit current flowing between live conductors and through part of the earthing system can cause considerable fire damage or personal injury, particularly in high current locations.

Requirements

The active, neutral and protective earthing conductors of each circuit shall be correctly connected so that:

- a) There is no short-circuit between the conductors;
NOTE: Any MEN or earth sheath return connection is not considered as a short-circuit.
- b) There is no transposition of conductors that could result in the earthing system and any exposed conductive parts of the electrical installation becoming energised; and
- c) There is no interconnection of conductors between different circuits.

Test procedures

Testing should confirm that any resistance measured between the active and neutral conductors of a circuit is consistent with the load. For example, on a socket-outlet circuit with no connected equipment a high resistance (approximately infinity) should be expected; whereas on a 230 V, 4.8 kW water heater circuit, a resistance of about 11 should be expected.

The tests illustrated in figures 3.15, 3.16, 3.17, 3.18 and 3.19 show recommended methods of testing for correct circuit connections which require the use of an ohmmeter. Some tests require the use of resistors of known values.

Other methods may be applied, for example:

- a) An interconnected neutral can be detected by removing the circuit neutral at the switchboard and proving that no connection to neutral exists at the equipment;
- b) Using a clip-on ammeter over the energised circuit conductors to verify that with all circuit equipment operating, the equivalent active load current is also passing through the correct circuit neutral; or
- c) With only one circuit energised and equipment operational, an incorrect or interconnected active can be detected by using a voltage indicator to confirm that the load side of protective devices on other circuits are not energised from the circuit under test.

TEST – Operation of residual current devices (RCDs)

The function of the RCD shall be verified by the operation of the integral test device, and by the use of special test equipment. Testing of the RCD shall be performed using a trip in time; an RCD tester can be used for this purpose.

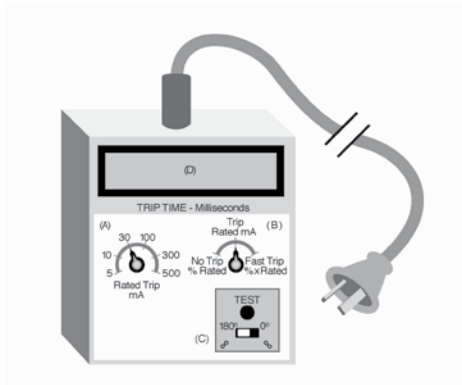
Tests shall be performed on each final subcircuit protected by an RCD to verify that the RCD operates to disconnect the designated circuit.

Testing of RCDs is performed to ensure that the RCD operates and that the RCD disconnects the supply.

The RCD test maximum tripping times are as follows:

TEST CURRENT	RCD TYPE			
	I	II and III	IV	
	TRIPPING TIME, mS			
	MAXIMUM		MINIMUM	MAXIMUM
NO TRIP				
TRIP	40	300	130	500
FAST TRIP	40	40	50	150

Results are required to be recorded on appropriate form. A typical recording form has been provided two pages on..



A typical example of an RCD tester

How to Use an RCD Tester

The three-pin plug is connected to a socket-output protected by the RCD. A typical example of an RCD tester is provided on the previous page.

Two selector switches are provided:

- a) RCD Rated Trip Current (mA); and
- b) Test Current Level:
 - Half Rated (No Trip)
 - Rated (Trip)
 - 5 x Rated (Fast Trip).

A selector switch (C) may be provided for reverse phase relationship, to test polarity sensitive RCDs.

A digital display (D) indicates the trip time in milliseconds.

RCD Testing Procedure:

- 1) Connect the tester lead to a socket-outlet protected by the RCD.
- 2) Set the Trip Current Selector to the rated trip current of the RCD.
- 3) Set the Test Current Selector.
- 4) Set the RCD ON.
- 5) Press the TEST button of the tester and note the trip time in milliseconds.

This test to be carried out at 0° and 180° respectively with the Trip Current selector set to:

- 1) Half Rated Trip Current.
- 2) Rated Trip Current.
- 3) 5 times Rated Trip Current.

This means that a total of 6 tests are required for each RCD.

MONTHLY TEST OF RESIDUAL CURRENT DEVICES (RCDs)

Company Name:

Site/Project Name or Location:

Tested tripping time of RCDs (using RCD tester)
(Fast trip for type 1, 2 or 3 must be less than 40 ms)

RCD type and location	Nominal Trip Current mA	Test results to include both reverse phase relationship readings in milliseconds (ms)						Action taken for unsatisfactory results
		X 1/2 No Trip Time		X 1 Trip Time		X 5 Fast Trip Time		
		0°	180°	0°	180°	0°	180°	
NAME OF LICENCE HOLDER CONDUCTING TESTS:								
Wiring Licence No: Date:								
Signature:								

Test – Verification of Impedance (Earth fault-loop impedance)

The path followed by fault current as the result of a low impedance occurring between the phase conductor and earthed metal is called the earth fault-loop. Current is driven through the loop impedance by the supply voltage.

The fault-loop impedance measurement tests not only the electrical installation but also that of the network asset. This means that it measures the impedance of the entire LV installation including that of the distribution network all the way back to the substation.

The impedance required for automatic disconnection of supply shall be verified by one of the measurement methods as detailed over page.

The earth fault-loop impedance of each circuit is measured in order to verify that the protective device will operate to disconnect an earth-fault current within the time and touch voltage requirements.

NOTES:

- 1) The earth fault-loop impedance test can only be made when the electrical installation has been energised.
- 2) If an RCD operates during the test, the test result is considered satisfactory.

- 3) Further information on the maximum earth fault-loop impedance is contained in AS/NZS 3000 Appendix B.

This requirement is deemed to be satisfied if when tested in the earth fault-loop impedance does not exceed the specified value in table 3.2 of AS/NZS 3017.

Test – Fault-Loop Impedance (supply is connected)

Note: Earth continuity and resistance tests should be carried out on protective earthing conductors before measuring the earth fault-loop impedance.

Method of measurement

- Supply is available;
- The impedance required for disconnection should be measured using an instrument that has a facility for measuring and indicating low values of impedance; and
- The MEN link is to be left intact.

Measurements can be made as follows:

Obtain the fault-loop impedance of each sub circuit using a quality fault-loop impedance meter (refer to manufacturers instructions on how to use the device). Compare the measured fault-loop impedance value with the maximum value provided at Appendix B, Table B4.1 of the Wiring Rules.

NOTES:

- 1) If the application of a fault-loop impedance test onto an RCD protected sub circuit results in the RCD operating, then:
 - The earth resistance and continuity test requirements are considered to be satisfied; and
 - The fault-loop impedance value need not be considered further.
- 2) If the value measured is GREATER than the allowable maximum, then the following steps must be performed:
 - Check the MEN connection, active, neutral and earth conductor/equipment connections are all solidly made; and
 - Repeat the fault-loop impedance test.

If the fault-loop impedance values exceed the requirements of the Wiring Rules, then perform an earth continuity measurement and confirm results.

Repeat the fault-loop impedance test.

If the fault-loop impedance values do not satisfy the requirements of Table B4.1 then you must contact the supply authority advising them of the discrepancy.

Remember that the measurement includes the impedance of the network asset as well.

PERIODIC VERIFICATION – TESTING OF ELECTRICAL EQUIPMENT

All electrical tools and equipment are required to be inspected and tested to ensure that they are safe to use prior to first use and thereafter at regular intervals.

The industry standard requires that, following initial verification, the electrical installation shall be retested at intervals of 6 months and that results of the inspection will be recorded.

TIME PERIODS						
1	2	3	4	5	6	7
Environment	Relocatable construction premises, Class 1 (earthed conductive parts) and Class II (double insulated) electrical equipment		Residual current devices (RCDs)			
	Relocatable construction premises, fixed and transportable equipment and construction wiring including switchboards	Portable equipment	Pushbutton test (by user)		Operating time (RCD tester)	
Portable			Non-portable fixed	Portable	Non-portable fixed	
Construction and demolition sites	6 months	3 months	After connection to a socket or before connection of equipment, and at least once every day in use.	1 month	3 months	12 months

Inspection and Testing Requirements

All plant, including portable electrical equipment and flexible electrical cords, shall be visually inspected for wear and mechanical damage, and tested in accordance with AS/NZS 3760 for earth continuity and insulation resistance.

The industry standard specifies that inspection and testing should be undertaken by a licensed electrician or electrician supervised (ES or L while being used on the site.

Tested portable electrical equipment and flexible electrical cords shall be tagged, and all test results shall be recorded in a book kept for the purpose, and records kept on site or made available for audit. The tag is to be non-metallic, non-reusable and durable.

Three aspects of recording of inspection/test results are required to be followed:

- Every item of equipment is to be allocated and marked with a unique identifying plant number;
- The results of inspections and tests recorded in a book kept for the purpose; and
- The equipment fitted with an appropriate tag to indicate compliance or non-compliance with test requirements.

The tag, which may be colour-coded to identify the period in which the test was performed is to include:

- a) The name of the person or company who performed the tests; and
- b) The test or inspection date, and may also include a re-test date.

Appendix F of AS/NZS 3012, provides details on appropriate tag colour-coding periods, is shown below:

Appendix F Testing Schedule (Informative)

This Appendix gives a recommended colour coding schedule for tags on tested equipment. The tag should indicate, by its colour, the period in which the test was performed in accordance with the following schedule:

- a) **Red** **December - February**
- b) **Green** **March - May**
- c) **Blue** **June - August**
- d) **Yellow** **September - November**

Note: Some construction sites will not allow the use of equipment on sites unless the tag colour readily indicates the required retest date in accordance with Table 3 (AS 3012). The colours above apply to 3-monthly requirements.

Where the book is not kept on the site, arrangements should be such that the book can be produced to an inspector or elected HSR within 24 hours of the request.

The details recorded shall include the following:

- a) Date of inspection;
- b) Plant number of the item inspected;
- c) Licence number of the inspecting electrician; and
- d) Any repairs required as a result of the inspection.

Where in-service inspection or testing identifies equipment which fails to comply with the criteria given, the equipment shall be appropriately labelled to indicate that the equipment requires remedial action and warn against further use, and withdrawn from service.

Typical LogBook Layout

A typical logbook layout for periodic inspection of plant and equipment is illustrated below (note that full page has been abbreviated).

COMPANY NAME			
Periodic Inspection of Plant and Equipment			
Site/Project Name or Location:.....			
Owner of Plant/Equipment:			
Plant Number	Description	Inspection/Test Results	Repairs Required Action Taken

Date: Name of Licence Holder Conducting Test:

Wiring Licence No: Signature:

Note 1: This layout is suitable for inspection/testing of multiple items. Where single items need to be inspected/tested at one time, an alternative arrangement may be suitable, e.g. landscaped page (page laid out sideways) with additional columns for Date/Licence No./Name/Signature on each line, for each item inspected/tested.

Following initial verification of the installation, periodic verification is required on the construction sites in relation to not only the electrical installation but also portable tools and equipment used on site.

Records of inspection and retesting should be kept on site and be made available on request.

TESTING & TAGGING OF ELECTRICAL EQUIPMENT

Testing and tagging of electrical equipment is a scheduled maintenance inspection and test of electrical equipment to ensure that the equipment is safe to use. The tag confirms that the inspection and tests have been performed and the date when the inspection took place or the retest date for the next inspection.

The OH&S Act 2004 requires the employer to ensure that plant is maintained. Testing and tagging of electrical equipment fulfils that requirement.

Testing of electrical equipment (electrical plant, portable electrical equipment, appliances and flexible extension leads) is also required by the Electricity Safety Act (1998) and Electricity Safety (Installations) Regulations 1999. Other applicable documentation includes AS/NZS 3012 Electrical installations - construction and demolition sites, AS/NZS 3760 In-service inspection and testing of electrical equipment, and WorkSafe's Industry Standard for electrical installations on construction sites (2011 Ed 3).

The inspection, testing and any repairs must be undertaken by a Competent Person (note 1) prior to its first use and thereafter depending on the work environment from 1 month to 5 years (monthly for hired equipment on construction sites, 3 months in construction, 6 months in factories and whether it's liable to damage between 12 months and 5 years. See AS/NZS 3012 re construction and AS/NZS 3760 for other areas).

A Person, who is the Person in charge of the premises (note 2), must ensure that the Competent Person has acquired through training, qualifications, experience or a combination of these, the knowledge and skill enabling that Person, to perform the task required correctly.

Note 1: Competent Person - A licensed electrician, as defined by the Electricity Safety Act (1998) and the Industry Standard (2011). An electrician must complete at least 7000 hours' training to complete their apprenticeship. Some persons are undertaking training that only delivers a fraction of the above training hours e.g. an 8-hour training course.

Note 2: Person in charge of the premises - A person in charge of the premises is the employer, as defined in the OH&S Act (2004).

Common law also states 'the employer's obligation is':

- To provide proper and safe plant and appliances (e.g. Tag & Test);
- To ensure that there is a safe system for conducting the work; and
- Engage competent staff (e.g. licensed electricians).

Emergency Evacuation Lighting Inspection & Maintenance

The periodic inspection and maintenance procedures which are necessary to ensure that that emergency evacuation lighting systems are in a state of readiness for operation at all times is set out in AS/NZS2293.2:1995. It applies to central and single-point emergency lighting systems, as defined in AS/NZS2293.1.

Maintenance records

A logbook in a durable hard-bound cover, or an alternative system approved by the regulatory authority, shall be provided for the recording of maintenance information.

The following details shall be entered:

- a) All details which are required to be logged in accordance with Section 2 or Section 3, as appropriate.
- b) Any corrective action taken.
- c) The names of persons responsible for carrying out the maintenance work and the date the work was completed.

The logbook or alternative records system shall be kept on the premises at all times, or at such other location as may be approved by the regulatory authority.

Emergency evacuation battery back-up lighting (which includes internally illuminated signs) shall be inspected at intervals of:

- 6 monthly intervals - operate for a minimum of 90 minutes at not less than 20lux; and
- 12 month intervals - same as 6 months plus lamps are to be cleaned.

LIFT WORK ON CONSTRUCTION SITES

In March 2015 WorkSafe Victoria release edition 1 of A handbook for workplaces: Lift work on Construction Projects. This handbook provides advice for employers, employees, health and safety representatives (HSRs), and anyone who has a role in health and safety about controlling risks associated with the installation or refurbishment of lifts (lift work) on construction projects.

Where a lift contractor is undertaking work for a principal contractor who is an employer, the principal contractor's employer duty referred to above extends to the lift contractor and their employees, for matters over which the principal contractor has control, or would have had control except for an agreement with the lift contractor to the contrary.

Safe Work Method Statement (SWMS)

Some lift work tasks are 'high risk construction work' (see OH&S Regulation 5.1.3) and must not be performed if there is a risk to any person arising from the work unless:

- Safe work method statement (SWMS) is prepared for the work before work commences; and
- The work is performed in accordance with the SWMS.

High risk construction work in relation to lift work, includes any tasks:

- Where a person could fall more than two metres;
- On or near energised electrical installations or services;
- Where there is any movement of powered mobile plant;
- Involving demolition; and
- Involving a confined space.

The SWMS must:

- Identify the type of high-risk construction work associated with the task;
- State the hazards and risks arising from the work;
- Describe how the risks will be controlled; and
- Describe how risk controls will be put in place.

The SWMS should be in a format and use language that is easy for people doing the lift work and their supervisors to understand and be readily available on site.

High risk work licences

A person must not do any high-risk work (HRW) unless they hold the appropriate HRW licence. An employer must not allow an employee to do any HRW unless the employee holds an appropriate HRW licence in relation to that work.

However, there are some exceptions to this. For example, an unlicensed trainee may perform the HRW for the purpose of obtaining the licence while under the direct supervision of an appropriate HRW licence holder.

Suspended Work Platforms

Lift companies use suspended work platforms in the installation of lift shaft equipment during lift work.

A suspended work platform (SWP) can be:

- An engineered purpose designed work platform (e.g. false car) supported by a temporary hoisting system (this SWP is removed prior to commissioning the lift); or
- The lift's permanent car (non-operational configuration) supported by a temporary hoisting system or alternatively, by the lift car's permanent fully functioning hoisting system. The car enclosure need not be fully assembled to be used as a SWP.

Note: HRW (rigging) licencing requirements apply when a SWP is to be supported by a temporary hoisting system. This is because the SWP meets the OH&S legislation definition of a suspended scaffold.

The lift car ceases to be a SWP when the lift is complete and the lift equipment is configured for normal lift operations.

Note: People doing lift work will continue to use the top of the lift car as a work platform to undertake various activities during the life of the lift. Consider retaining the edge protection to assist in the control of fall risks for persons undertaking future works from the top of the car.

Note: Entrapment hazards exist where a person can be crushed between the SWP or its fixtures, equipment or materials thereon and the suspension point or other fixtures at the top of the shaft.

Temporary hoists

Only hoists, including temporary hoists, purpose designed to lift or suspend people must be used so far as is reasonably practicable to support SWPs.

The rated capacity of the temporary hoist should not be less than the load to be suspended. The load includes the weight of the SWP, the maximum weight allowed to be carried by the SWP and the weight of any hoisting equipment mounted on the SWP. When selecting the temporary hoist also consider any potential dynamic loading that could be experienced by the hoist.

Due to the torque characteristics of electric motors, each temporary electric hoist should be fitted with a device to limit the load exerted on the hoisting system by the torque of the motor. The load-limiting device should be set at no more than 110 per cent of the hoist's rated capacity.

Braking systems

Each SWP should have:

- A brake on the hoisting system to hold the platform during normal operation; and
- An independent and redundant braking system or systems (emergency brake) to hold the SWP if the hoisting or suspension system fails.

Note: A redundant braking system is a brake that will stop and hold the SWP in the event of failure of the other braking system.

The emergency brake should automatically activate to stop and hold the platform in slack rope or in free-fall situations. If the emergency brake can also detect over-speed, it should be set to activate in over-speed situations.

Emergency brakes fitted to some SWP rely solely on the safety gear locking onto the lift guide rails to provide slack rope and/or free fall braking. In this configuration, ensure emergency braking is not compromised by the rail guides or safety gear leaving the lift guide rails.

Preventing the SWP from accidentally driving off the guide rails may be achieved by fitting a:

- Tamperproof electro-mechanical system to shut down the hoist; or
- Mechanical stop.

Before using the SWP, fit and adjust the safety gear so that it operates correctly. If the lift car's permanent emergency braking system is used, the governor, the governor rope and other attachments to the safety gear should also be fitted, adjusted and verified for effectiveness.

Upper travel limit

To reduce the risk from SWPs being accidentally driven into entrapment hazards at the top of the lift shaft the SWP should be fitted with a mechanism to automatically stop the upward motion of the SWP at the upper travel limit.

Administrative controls (e.g. training and systems of work) must only be used to stop the SWP at the upper travel limit when it is not reasonably practicable to fit an engineering control to stop the SWP.

Suspension points

Any suspension point intended to be used to suspend loads within the lift shaft should be designed by an engineer to be suitable for the specific application. This includes any permanent structural steel beams or temporary beams used to suspend loads. The designed rated capacity of each suspension point should be marked on or adjacent to the suspension point.

If the SWP suspension point is an anchorage cast into concrete it should be a fabricated anchorage system with built-in embedment plates, or equivalent, and designed to mechanically engage with the concrete reinforcing elements.

There should be:

- Detailed engineering design for the anchorage fitting and all required reinforcing elements;
- A quality control process to ensure correct anchorage fabrication; and
- A visual indicator on the anchorage to show end users that specified embedded depth has been achieved.

During the manufacture of the concrete element, there should be a verification process to check the SWP anchorage has been installed as per design specifications.

This process should include written verification by a competent person that the:

- Correct elements, including anchorage fittings and reinforcement, were installed in accordance with design and shop drawings immediately prior to concrete pouring (verification may include photographs); and
- Concrete has achieved the required strength.

Ensure the anchorage installer (e.g. concrete element manufacturer or the formwork contractor when cast on site) who will actually install the anchorage, is provided with installation and verification requirements. The principal contractor should obtain the verification documentation from the anchorage installer. The lift contractor should obtain from the principal contractor a copy of the verification documentation before the specific suspension point is used.

Where the above verification documentation is not available, the suspension point should be proof tested to its rated capacity.

Where a SWP suspension point relies on bolted or welded connections, ensure:

- Any support bolts in tension, extend through the supporting slab or structure and have lock nuts which are readily accessible for inspection purposes;
- Structural integrity does not rely on welds in tension; and
- An engineer independent from the original design verifies the design.

Note: Suspension points that rely on drilled-in expanding or chemical type anchors used in tension should not be used to support SWP or other types of suspended scaffolds. They can be used to mount general lifting points.

If drilled-in or chemical type anchors are used in tension, the load carrying capacity of the general lifting point should be proof tested to 125 per cent of its rated capacity.

Where available, any testing requirements from the bolt manufacturer should also be considered.

SWP installation sign-off

Prior to handing over a SWP for lift work, the SWP should be inspected and signed off by the person responsible for setting up the emergency braking systems and by the person responsible for rigging the hoisting system.

The inspection and sign-off process should include verification that the hoist, control system and braking systems are working correctly and should involve the emergency brakes being adjusted and tested for correct operation.

The sign-off document should contain information on the type of suspension system used and how the emergency braking for slack rope and free fall (also over speed - if fitted) are achieved.

Licensing for Lift Shaft Rigging

Many of the rigging tasks undertaken during lift work are 'high risk work' and require the appropriate HRW rigging licence (as specified in schedule 3 of the OH&S Regulations).

Basic rigging licence

The holder of a basic rigging licence can perform most HRW rigging tasks, associated with lift work, including:

- Steel erection (e.g. guide rails and supporting structures);
- setting up hoists, except for self-climbing hoists and hoists with jibs;
- moving plant and equipment; and
- rigging tasks associated with the assembly of the lift car.

Intermediate rigging licence

The rigging of load equalising gear (e.g. pulley, spreader bar or temporary support beam) requires at least an intermediate rigging licence.

Advanced rigging licence

HRW associated with the suspension of a suspended scaffold, including rigging the temporary hoist to the SWP or suspension point and the setup of the secondary protective device, requires an advanced rigging licence.

Note: The holder of an advanced scaffolding licence can also install a suspended scaffold providing no equalising gear is required.

Also note the installation, set-up and commissioning of SWP safety gear or lift braking systems needs to be undertaken by a competent person. The installer does not require an HRW licence.

Load rating of work platforms

Any work platform used for the lift installation should be designed for one of the following live load requirements:

- The minimum duty capacity shall be equivalent to light duty scaffolding (2.2 KN total and a point load of 1.2 KN); and
- Alternatively for lift car roofs and false cars (two point loads, each of 1KN over an area of 0.2 x0.2 metres, 2KN total), or
- For the 'special duty' live load (exceeding the minimum duty loads above) required for any specific application, including loads imposed by more than 2 persons, additional material and equipment.

A notice stating the maximum rated total load and maximum rated point load should be displayed on the SWP.

Platform edge protection

To prevent people working on lifts falling from the SWP, if a falls risk exists, passive fall protection must be provided, so far as is reasonably practicable.

Passive fall protection should be in the form of physical edge protection that meets or exceeds the performance requirements of any of the following Australian Standards:

- AS 1576.1 - 2010, Scaffolding - General Requirements;
- AS 1576.4 - 2013, Scaffold - Suspended Scaffolding; and
- AS 1657 - 2013, Fixed platforms, walkways, stairways and ladders - Design, construction and installation.

Verification of the design and installation of the base connection and support structure to withstand the loads that could be imposed via the guardrail should be obtained.

Note: Where the edge protection is fitted to a lift car, a copy should be included with the design and safety information provided to the person being supplied with the lift.

Edge protection should be installed as close to the edge of the platform as practicable to prevent persons from standing between the protection and the unprotected edge. The top of edge protection should extend at least 900mm above the adjacent surface on which a person could stand and be fit for purpose.

Emergency response planning

Before undertaking lift work, a lift contractor must ensure that emergency procedures are established to, so far as is reasonably practicable to enable the rescue of an employee in the event of a fall and provision of first aid to the employee who has fallen. The emergency procedures must be able to be carried out immediately after the fall.

Any risks associated with carrying out the emergency procedures must be eliminated, so far as is reasonably practicable. If it is not reasonably practicable to eliminate these risks, they must be reduced, so far as is reasonably practicable.

The lift contractor should document the above emergency procedures in an emergency response plan (ERP) that is applicable to the lift work.

The ERP should also contain information on how other foreseeable emergencies in the shaft or lift machinery spaces will be addressed, such as:

- Rescue of trapped workers (include injured or ill workers);
- Loss of electric power or hoist failures on SWPs;
- Fires, smoke or flooding;
- Treatment of injuries and illness; and
- Evacuation of injured or ill workers.

The ERP should reflect the types of works to be undertaken and the installation methods. If a generic ERP is used it should be reviewed and modified as necessary to reflect the actual site environment.

The principal contractor and the lift contractor should coordinate and cooperate with each other to ensure the lift work ERP integrates with the principal contractor's overall site ERP.

The lift ERP should be regularly reviewed and, if necessary, modified to ensure the ERP remains effective for the duration of the work.

Information, instruction, training and supervision

If the lift contractor is an employer it must provide its employees and contractors with information, instruction, training or supervision as is necessary to enable them to perform their work in a way that is safe and without risks to health. It must also monitor the health of employees doing the lift work and the conditions at any workplace under their management and control, so far as is reasonably practicable.

Site supervision should include ensuring people doing lift work are complying with SWMS and the contractor's other safe systems of work and when non-compliance is observed stopping and reviewing the work practices.

Lift work occurs in areas generally not accessible to non-lift contractor workers. In these areas, people doing lift work are often unable to be monitored by general site supervisory staff nor can other site workers see them. If the people doing lift work become trapped, injured or incapacitated it is unlikely that people doing general work on the site would become aware of the lift worker's need for assistance.

Therefore, the lift contractor should effectively monitor their on-site lift workers to ensure that the emergency procedure can be implemented as necessary or to provide other assistance if required.

If a lift worker cannot be observed by another lift worker (e.g. in line of sight from a SWP in another shaft) or is not visible to general site workers, the worker should be effectively monitored by other effective means.

While communications devices allow lift workers to maintain verbal contact with other site workers or off-site supervisors and to request assistance they may not be an effective monitoring system by themselves. When using communication devices as part of the worker monitoring system, ensure:

- The devices are appropriate for the task;
- They are not be effected or degraded by local conditions;
- They do not interfere with other site communications systems; and
- Workers are trained in the monitoring protocols, including contact between onsite workers is regular and frequent.

If a lift worker is trapped, and incapacitated on the SWP (e.g. the machine space of an MRL type lift) and rescue from above or below is not readily possible, another worker should be on the SWP to implement the emergency procedure.

A second worker may not be required if there is a readily available emergency method to remotely lower the SWP.

Lift shaft fall prevention

In addition to the risks of falls from the SWP, persons working in, and in close proximity to, lift shafts can be exposed to the risk of a fall. All fall risks must be controlled, so far as is reasonably practicable. In particular, the OH&S Regulations impose specific duties where persons are exposed to the risk of a fall of more than 2 metres.

Typical examples of activities with possible fall risks include:

- Installing the SWP;
- Accessing and egressing the SWP;
- Rigging activities within shaft;

- Installing temporary and permanent power and lighting;
- Installing lift and associated gear;
- Inspecting works; and
- Shaft access points at floor landings.

These fall risks must be controlled in accordance with the prevention of falls hierarchy of risk control. Where the fall risk cannot be eliminated reduce the fall risk by using physical edge protection (e.g. guardrails) where reasonably practicable, prior to considering the use of a harness system.

Further guidance of controlling the risk of falls may be found in WorkSafe's Compliance Code - Prevention of falls in general construction available at worksafe.vic.gov.au.

Accessing pits

Lift workers should be able to safely access and exit the lift pit. Access to the pit should preferably be through a door or opening at the base of the pit.

Where reasonably practicable and preferably, at the time when buildings are being designed or constructed, pit floor access doors or hatches should be provided, particularly when a lift pit depth is more than 2 metres. The architect in consultation with the lift equipment designer should determine the location, size and security locking arrangements of any pit access doorway.

During major lift or building refurbishment, consideration should be given to installing pit base access doors or openings, where practicable.

Where a pit access is not from the bottom of the shaft the risks of workers falling from any height, including less than 2 metres, while accessing or egressing the pit should be effectively controlled.

Construction lighting

Lift workers need to have adequate general, task and evacuation lighting to undertake lift work safely, and to access and egress each workstation, including in an emergency. Workstations (e.g. SWP, lift pit and machinery spaces) should be fitted with both evacuation lighting and lighting to at least general lighting levels.

Additional artificial lighting should be installed in the shaft when lighting levels specified for general lighting or emergency lighting in AS/NZS 3012 Electrical installations on construction and demolitions sites are not achieved by either natural or artificial lighting sources outside the shaft.

Lighting should be installed to meet all the requirements of AS/NZS 3000 - Wiring Rules and AS/NZS 3012 - Electrical installations on construction and demolitions sites.

Where the lift shaft permanent lighting is used as construction lighting, it should be progressively energised as work progresses up the shaft.

Welding

All welding, including tack welds, should only be undertaken by competent persons. Where the welds are load bearing (e.g. welded joints in lift support structure) the welder should be competent to weld to the requirements of AS/NZS 1554: Structural steel welding.

When welding the risk of debris and other materials, either on the false car or within the shaft, igniting from welding sparks or slag, should be managed. A suitable in-service fire extinguisher should be at the welding site to allow any fire to be rapidly extinguished. After completing the welding, verify that no material on the car or at the bottom of the shaft is mouldering.

Lift workers must have and use appropriate personnel protective equipment (PPE) during welding operations to prevent welding flash and burns. This applies not only to the worker doing the welding but to other workers in the immediate vicinity. PPE could include:

- Welding gloves;
- Welding face shields;
- Fire resistant clothing (long sleeve shirts and trousers); and
- Protective footwear.

Note: Fire resistant clothing is available in many fabrics, including cotton, wool, leather, Kevlar and Proban. These fabrics provide different levels of fire protection, and are suitable under different conditions. Read the manufacturer's instructions for use to ensure the clothing provides the appropriate level of protection.

Working on or near live electrical equipment

Any lift work undertaken on or near energised electrical installations is high-risk construction work and a SWMS must be developed for the work and followed.

Where the electrical equipment operates at voltages less than 50Volts AC or 120volts ripple-free DC, include in the SWMS the risk of electric shock is controlled by use of extra-low voltage.

Electricity safety laws also apply when electrical installation work is undertaken as part of lift work, including Section 43 (4) of the Electricity Safety Act 1998, that states:

'A person carrying out electrical installation work must ensure that:

- a) All electrical circuits or electrical equipment handled in the course of that work are disconnected from the electricity supply; or*
- b) Adequate precautions are taken to prevent electric shock or other injury in the handling of electrical circuits or electrical equipment in the course of that work.'*

Where reasonably practicable, disconnect the electricity supply from circuits and equipment (isolation) and describe in the SWMS how isolation is achieved and how it will be maintained during the electrical work. When the electricity supply is not isolated, including for electrical fault-finding, the SWMS must describe the safety measures to be implemented to control the risks of electric shock.

Guidance on isolation and safety measures can be found in AS/NZS 4836 - Safe work on low-voltage electrical installations.

LIGHTING

The principal contractor has management and control of the construction site and therefore a primary obligation to ensure that there is sufficient lighting to allow workers to evacuate from the site in the event of an emergency. Unlike a finished building, construction sites often have construction material, electrical equipment, mobile plant and other obstacles.

On sites where there is insufficient natural lighting, evacuation lighting shall be provided by installing battery powered emergency lighting and illuminated exit signs.

AS/NZS 3012 Electrical installations on construction sites and demolition sites, clause 2.7.3, sets out that a minimum light level of 20lx be provided for a minimum of 1 hour following the loss of normal lighting. This lighting level is an average light reading over the sites designated evacuation route.

Evacuation lighting must be inspected and electrically re-tested every 6 months, including a discharge test to ensure the evacuation lighting maintains its 20lx average for at least 1 hour after the loss of normal light.

Records of testing should be kept on site or made available on request.

Worksite Lighting Considerations

Where there is inadequate natural light, artificial lighting in work areas should be sufficient to allow the work to be performed safely. Individual, or task lights, may be used to improve the intensity of light in these areas if the natural or artificial lighting is insufficient.

Where work or amenities areas do not have natural daylight, sufficient battery powered evacuation lighting should be installed to allow safe exit from those areas in the event of emergency. The battery-powered emergency lights should operate automatically during a loss of power supply to the normal lighting in the area and be designed to operate for a minimum of 1 hour following loss of supply.

Festoon lighting is restricted to underground use and then only with certain requirements.

Access Lighting

As mentioned above, where there is inadequate natural light, artificial lighting in work areas should be sufficient to allow the work to be performed safely. This includes access and egress from work areas. Emergency evacuation lighting is installed to provide sufficient lighting during an emergency, access lighting is required for access to all work locations.

Task-specific lighting is required where the task requires a higher intensity of light for the worker to be able to perform the task in a safe manner. Task lighting can therefore be plugged in where access lighting must be wired so that if this lighting should fail then the emergency lighting will turn on. This will ensure that access lighting is less likely to be tampered with or removed as the workers move to other areas.

Australian Standard AS/NZS 1680.2.4 requires that the maintenance illumination level required in walkways and access areas be **not less than 40 lux**. A higher illuminance on relevant surfaces may be required depending on the degree of hazard.

The definition of maintained illuminance is:

The defined level below which the average illuminance on any surface is not allowed to fall. It is the minimum illuminance at which maintenance operations, such as replacing lamps and cleaning the luminaires, windows, rooflights and room surfaces are to be carried out.

Emergency Lighting on Construction Sites

Emergency evacuation lighting, when required, shall be sufficient to allow safe egress from the site. Emergency evacuation lighting must either be on the same circuit as access lighting or such other means to ensure that where there is a loss of supply to the access lighting then the emergency lights will function.

As a minimum requirement, sufficient battery-powered lighting shall be installed in stairways and passageways and adjacent to switchboards to allow safe access to and egress from the area if there is insufficient natural lighting. Battery powered lighting shall have sufficient capacity to operate for 90 minutes if there is a loss of supply to the normal lighting in the area.

Although the Industry Standard and the Code of Practice refer to a time period of 1 hour, AS/NZS 2293.1 refers to a period of 90 minutes being the in-service test requirements. AS/NZS 2293.1 is called up in the Building Code of Australia as being a mandatory document, which then takes precedence over both the Industry Standard and the Code of Practice. The minimum illumination level should be not less than 20 lux.

Emergency evacuation lighting in the stairwell must be installed in such a manner that each flight of stairs, including the associated landings, receives direct light. This means that the emergency evacuation fitting will be located directly over the landing in the stairwell where the stairwell is entered from the floor.

Guidance on appropriate spacings for luminaires can be found in AS/NZS 2293.1.

Measurement of luminance

This information is provided to give clarity about the process of measurement; it is not expected that the electrical worker will be required to undertake the measurement. It should be left to a competent person with the appropriately calibrated equipment to undertake this assessment.

Measurement of the illuminance obtained with an electric lighting system should either be made after dark, or with daylight excluded from the interior. For new lighting systems and existing systems where group lamp replacement has been made, the lamps should be aged by operation for at least 100 hours for discharge lamps (including fluorescent lamps) and 10 hours for incandescent lamps.

Measurements of illuminance shall be made in a horizontal plane at floor level for a grid of points uniformly distributed within the interior. The interval between the measurement points, in longitudinal and transverse directions, shall be as near to equal as is practicable, but shall be not more than 1m. The selected measurement grid shall differ from the luminaire spacing, in all directions.

Note: The objective is to avoid the coincidence of measuring points with luminaire locations.

Where illuminance measurements are made to verify values resulting from design calculations, the grid points used shall be those adopted in the design.

Irrespective of the measurement grid adopted, the first row of measurement points shall be as close as practicable to, but not less than, 1.0m from the wall. However, for narrow corridors or the like, less than or equal to 2.0m in width, illuminance measurements shall be made for a single row of points down the centre-line of the space.

For spaces having a floor area of less than 4 m², a single illuminance reading may be taken as near as practicable to the centre of the area.

For large areas of buildings where the design is of a consistent or repetitive basis, measurements need not be conducted for the entire space, provided that a representative area, comprising at least 20% of the total, is measured.

Emergency Exit Signs on Construction Sites

Emergency exit signs must not be positioned more than 1 metre above or 2 metres in front of an exit. If the evacuation route turns, or does not lead directly to an emergency exit, then the exit direction arrow signs that point towards the emergency exit must be installed at each change of direction.

Emergency exit signs must be of the internally illuminated battery backup type so they are visible through smoke.

Externally illuminated exit signs may be suitable only if there is appropriate means for automatically exhausting or excluding smoke. Exposure to open air does not meet this requirement.

AS/NZS 3012 specifies requirements in relation to control and protection of lighting circuits, including the provision, when required, for emergency evacuation lighting.

Light fittings connected on construction sites are required to be supplied from:

- A final subcircuit of construction wiring, provided with over-current protection and additional RCD protection;
- Permanent wiring, provided with additional RCD; or
- A stand-alone power source.

It is recommended that lighting circuits be provided with their own RCDs to avoid cumulative leakage from power circuits causing unwanted tripping. This would also prevent nuisance tripping causing the general access lighting to turn off and the emergency evacuation lighting to function.

Directional arrows on internally illuminated exit signs are required to be positioned in hallways to clearly indicate the direction to the emergency exit. This requirement need not apply where the hallways lead to emergency exits and do not branch off to other areas where they lead to a dead end.

Battery-powered evacuation lighting, including internally illuminated exit signs shall operate for a minimum of one hour following loss of supply. Evacuation lighting should be subjected to a discharge test every 6 months, and results recorded and kept on site, or made available for audit.

Given the type of work activity on a construction site and the generally fragile nature of lighting fittings, there is an increased likelihood of accidental damage. It is essential that luminaires be adequately guarded to protect them from such damage. Light fittings are required to be provided with guards made from impact resistant material e.g. wire cages, poly carbonate material.

Attention is drawn to the AS/NZS 2293 series of standards, which set out requirements for the lighting necessary to alleviate panic and to permit safe evacuation of the building occupants should this be required in the event of loss of the normal lighting.

Task Lighting

Australian Standard AS 1680, Lighting and Visual Environment, provides valuable information for workplace lighting and should be considered when lighting workstations.

Lighting levels where people work should be sufficient to allow the work to be performed safely and without straining to see. Individual, or task lights, improve the intensity of light in these areas and is excess to that of access lighting.

The lighting provided should improve the visual environment and be free from glare including reflective glare, flicker and stroboscopic effect which would distract attention from the task area.

The values of maintenance illuminance represent the lowest value of the average illuminance over the task area or throughout the interior, which should apply at any time during the life of the lighting system. The task area should be taken as that area within the space where the required tasks may be performed. The physical boundaries of the task area will vary depending on the shape of the space, the nature of the task, and the layout and type of equipment required to perform the task.

On building construction sites (interior) the maintenance illuminance measured in lux for task lighting which is usually provided by portable luminaires is not less than 160 lux. The illuminance should be provided on the plane of the task over the whole working area. Illuminance may be reduced if the task requires little perception of detail or is carried out for a short period. Additional local lighting or higher levels of general lighting may be needed for more difficult visual tasks.

Glare Hazard of Lamps

Of significant concern is the selection of lighting systems not only installed in the workplace but also used as task lighting. Many of the lights selected are inappropriate for the task and the environment in which we work.

Not only is there sometimes an issue in relation to the generation of heat which can burn a worker and damage wiring but also the intensity of the light which causes glare and can potentially damage a persons eyesight given certain circumstances. Task lights should be of adequate strength to do the work required but also need to take into account the OH&S concerns.

LED lights have a place in construction and may perform a better function than halogen lights. Issues relating to glare may still have to be considered.

Glare: the discomfort or impairment of vision experienced when parts of the field of view (e.g. lamps, luminaires) are excessively bright in relation to the general surroundings.

Note: *The degrees of discomfort or impairment of vision that can be anticipated in any given situation may be described or measured respectively as 'discomfort glare' and 'disability glare'.*

Halogen lamps are often used mounted on stands to provide local task lighting. Care must be taken in the positioning of such lamps to avoid hazardous glare or dazzle, which can result in other workers being placed at risk through momentary loss of vision.

Such lamps should be shielded where necessary to avoid dazzling other workers or persons passing the workplace. In particular, if the surrounding area is relatively dull in ambient light terms, the reaction of the eye to the bright light may result in brief loss of effective vision once the brightly lit area is passed.

More serious is the effect of sudden exposure to very bright light - such as halogen lamps - at close range. 'Red eye' form of optic irritation caused by the rupture of small blood vessels in the eye, can result from such sudden exposure.

This constitutes a risk that must be addressed under OH&S requirements.

Further, Clause 2.7.7 of AS/NZS 3012 requires:

2.7.7 Portable luminaries

Portable luminaries shall be provided with the following:

- a) **A minimum degree of protection IP2X in accordance with AS 60529;**
- b) **A mechanical guard for the lamp; and**
- c) **Adequate stability.**

Restricted Installation of Suspended Luminaries

AS/NZS 3000:2007 Clause 4.5.2 reads in part and requires:

4.5.2.1 Lamps, luminaries and their associated ancillary gear shall be so installed as not to cause undue temperature rise, ignition or deterioration of the materials:

- a) **on which they are mounted; or**
- b) **that they illuminate.**

Luminaries shall:

- i) Be suitable for the highest temperature to which they are likely to be subjected by external influences; and
- ii) Be installed in accordance with the manufacturer's instructions, taking account of the highest rating of lamp to be used.

In relation to suspending luminaries AS 3000 1991 Clause 4.10 requires in part:

4.10 Suspended Lamp Holders and Luminaries a lamp holder or luminaire, suspended other than by means of a rigid pendent, shall be connected by means of a flexible cord or flexible cable.

Therefore, all suspended luminaries must be connected by a flexible cable with the exception of a fixed pendent.

ELECTRICAL INSTALLATION – GENERATING SETS TO AS/NZS3010 & AS/NZS2790

This section provides information in relation to the set up, inspection and testing of generating sets. Generating sets can also incorporate welding circuits as part of their configuration.

Generating sets can be either those that provide supply to tools and equipment or those that provide supply to a fixed electrical installation, or a combination of both.

There are various Australian Standards that provide information in relation to the set up, inspection and testing of generating sets and associated equipment.

Portable Generators To The Principles Of AS 2790

AS/NZS 3012 requires portable generators driven by internal combustion engines to comply with the principles of AS 2790 - electricity generating sets - transportable (up to 25 kW) where the generator only provides supply to tools and equipment.

Where the generator provides supply to a fixed installation it will be in accordance with AS/NZS 3010 (Electrical installations - generating sets) (covered later).

In Victoria, the Industry Standard for Electrical Installations on Construction Sites requires that socket-outlets mounted on generators are to be protected by an residual current device (RCD) with a maximum rated tripping current not exceeding 30mA.

Earth and bonding connections

The industry standard requires where a generator set supplies portable tools and equipment, the manufacturer or supplier of the generator must provide information regarding relevant earth and bonding connections. This information must be displayed prominently on the generator.

In order for the RCD to function correctly, the generator frame must be bonded to an earth electrode if there is no internal link (equipotential bond) between the neutral output and the metallic frame of the generator and the earth pin on the socket-outlet .

Equipotential Bond

Equipotential means equal potential at all points. In relation to the generator the following parts shall be in effective electrical contact with each other:

- a) The engine frame;
- b) The generator frame;
- c) All external metal enclosing electrical equipment or wiring;
- d) The 'earth' terminals of all outlet plug-sockets and any earth leakage device;
- e) The main frame terminal (marked 'FRAME'); and
- f) The main winding, only as specified in Clause 6.1.9 of AS 2790-1989.

The 'earth' point of any electronic circuitry may need to be connected to the above items.

The diagram (Figure 1) on the next page shows the equipotential connections.

AS 2790-1989 Clause 6.1.9 requires connections between main winding(s) and the frame shall be as follows:

- a) Single-phase winding (without earth-leakage protection). The winding shall not be connected to the frame.
- b) Single-phase winding connected to a current-operated (core balance) earth-leakage device complying with AS 3190. The input neutral terminal of the device shall be connected to the earth terminal of the device (where that terminal exists) or to a frame terminal (see Figure 1).

Note: This should be the only connection between the winding and the frame.

- c) Three-phase winding (star-connected). The star point shall be connected to the frame via a removable connection or link.
- d) Two-phase winding (or single-phase centre-tapped winding). The neutral or centre-tap shall be connected to the frame via a removable connection or link.

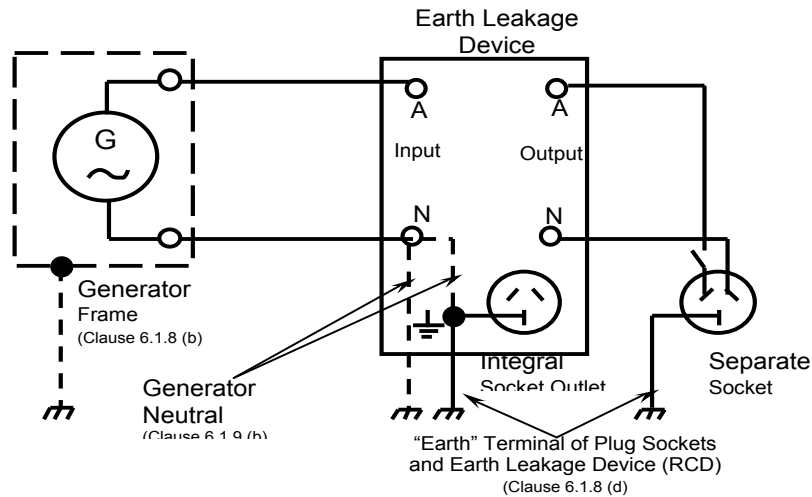



Figure 1 AS 2790

Information to be Supplied

As indicated before, when a generator set supplies portable tools and equipment, the manufacturer or supplier of the generator must provide information regarding relevant earth and bonding connections. This information must be displayed prominently on the generator.

The following information to be indelibly and legibly marked on a generating set:

- a) The name of the manufacturer of the set;
- b) The model number and serial number of the set;
- c) The type of fuel or fuel-oil mixture;
- d) Rated output in watts or kilowatts at a stated power factor;
- e) The voltage and frequency;
- f) Output terminal markings (unless all outputs are plug-sockets);
- g) The frame terminal: Symbol  or 'FRAME';
- h) On a set intended for undercover or weather protected usage, the words 'NOT WEATHERPROOF';

- i) On a set intended for outdoor use without further protection, the IP classification of its electrical equipment; and
- j) A warning as follows: **THE OUTPUT OF THIS GENERATING SET IS POTENTIALLY LETHAL. THE SET SHOULD NOT BE CONNECTED TO A FIXED ELECTRICAL INSTALLATION EXCEPT BY AN APPROPRIATELY LICENSED PERSON.**

In addition to the warning detailed in (J) above, the following warnings shall be either:

- a) marked on a generating set in accordance with Clause 9.1; or
- b) provided in documents supplied with a generating set.

The warnings need not be phrased as set out below but should convey the same sense:

- i) DO NOT OPERATE IN A HAZARDOUS LOCATION, e.g. WHERE THERE MAY BE A RISK OF EXPLOSION OF PETROL FUMES, LEAKING GAS OR EXPLOSIVE DUSTS;
- ii) DO NOT OPERATE IN A CONFINED AREA WHERE EXHAUST GASES, SMOKE OR FUMES COULD REACH DANGEROUS CONCENTRATIONS; and
- iii) DO NOT REFUEL WHILE ENGINE IS RUNNING.

Additionally each generating set shall be supplied with a technical manual that provides comprehensive instructions concerning installation, operation and maintenance procedures.

A generating set shall be supplied with a technical manual that provides comprehensive instructions concerning installation, operation and maintenance procedures.

Design and Construction

Electrical components, accessories and wiring shall be protected against ingress of objects, dust and water insofar as such might occur in normal use.

The enclosure of electrical equipment of a generating set shall have a minimum classification of IP22 in accordance with AS 1939 or, for the generator, with AS 1359.20.

The enclosure of electrical equipment of a generating set intended for outdoor use without further protection from the weather shall have a minimum classification of IP23.

Inspection and Testing

Notwithstanding any additional requirements that may be required by the manufacturer, importer, supplier or hirer of the generator, the following testing regime applies to generators. Where the generator has additional facilities installed such as a welding circuit, additional tests will need to be performed - see section on welders.

Inspection and tests are required on:

- Equipotential (earthing) facilities;
- Connections between windings and frame;
- Ratings - see Information to be Supplied - previous page;
- Warnings - see Information to be Supplied - previous page; and
- Instructions - a supplied manual is available.

Where an RCD is used with, or connected to, a generator, the integrity of the connection between the generator windings and the equipotential bonding system on the generator (refer to Figure 1) shall be tested using an RCD tester.

This test may be performed in conjunction with the test for operating time of an RCD used with a portable generator.

Where an isolated winding generator (double pole switch, no RCD) is used, the continuity of the connection from the frame to the equipotential bonding system shall be tested. (See Figure 2.2, AS/NZS 3012.)

RCDs installed on portable generators are required to:

- a) Be operated by means of their in-built test facility (push-button); and
- b) Be subject to an imbalance of current not less than the rated residual current and shall trip in a time not exceeding that specified in AS 3190.

All RCDs should be tested for tripping current and time by a licensed electrician each calendar month while being used on a construction site.

TESTING OF RCDs	
Test Current	Type (II)
100% rated tripping current	300*
500% rated tripping current	40*

*Maximum tripping time in ms

Type (II) 10-30mA minimum requirement to protect final sub-circuits and hand held equipment on construction sites.

Periodic Inspection and Testing

The time frames specified for inspection and testing is required to be in accordance with periods specified in Australian Standards and from the manufacturer's specifications in relation to maintenance.

Australian Standard AS/NZS 3760 - In-service inspection and testing of electrical equipment specifies some of the inspections, tests and time periods in relation to periodic inspection.

AS/NZS 3012 specifies some of the inspections, tests and time periods in relation to periodic inspection for tools and equipment used on construction sites.

The inspections and tests required under AS/NZS 3012 shall be recorded. Tested RCDs shall be tagged and all test results should be recorded and kept on site or be available for audit.

DE-ENERGISATION PROCEDURE FOR DEMOLITION WORKS

All workers are to work under the belief that any cable in a demolition area is 'LIVE', and they are to be treated as such. Any cable not required is to be removed.

Scenarios for building demolition can be broken down into three typical categories.

- 1) Complete demolition of the entire single/multiple building where the permanent electrical installation is disconnected from supply for the entire worksite;
- 2) Complete demolition of a stand-alone building or structure, which is as part of a multiple building complex (e.g. schools, hospitals); and
- 3) Partial demolition of a building, possibly as part of refurbishment of an area within a building (e.g. shopping centres, multistorey) where the other parts of the building are still occupied. Energised permanent wiring may still run through the demolition area. Where this occurs, a separate on-site procedure is required to be developed.

The use of these de-energising procedures should be dependant on the type and category of demolition work that best fits the site situation.

Scenario 1

Note: Construction wiring may still be located on the demolition site. Such wiring is marked with 'construction wiring' tape.

Complete demolition of the entire single/multiple building where the permanent electrical installation is disconnected from supply for the entire worksite.

The following is a recommended procedure to control the de-energisation of the demolition area:

- 1) The area of demolition is to be defined & established with the head contractor in conjunction with the demolition contractor and electrical contractor(s);

- 2) An investigation is required to be conducted to identify any overhead and underground services that may be impacted upon by the demolition and associated activities (dial 1100 before you dig);
- 3) All electrical circuits within the demolition area to be identified as far as possible and checked with existing drawings;
- 4) When the electrical distribution business has isolated the main incoming supply to the main switchboard from the street connection (point of supply), the incoming mains are to be positively tested by an electrician (not using a volt stick) and disconnected from or cut off above the main switchboard. This cable will be completely removed or appropriately terminated in a junction box. An isolation sticker will then be attached to the main switchboard and an entry detailing the disconnection will be recorded in a switchboard isolation logbook;
- 5) All distribution boards including all mechanical, lift, fire switchboards within the demolition area are to be tested to confirm their de-energisation status; and
- 6) When the demolition area has been completely isolated and tested a letter of clearance and a copy of the isolation log shall be provided to the demolition contractor, the head contractor and the relevant HSR(s).

No demolition works affecting any part of the electrical installation shall commence until the sign off letter and isolation log has been received from all electrical contractors involved in the testing and isolation of the demolition area.

Volt sticks should not be used to test a circuit for de-energisation.

Scenario 2

Note: Construction wiring may still be located on the demolition site. Such wiring is marked with 'construction wiring' tape.

Complete demolition of a stand-alone building or structure, which is as part of a multiple building complex (e.g. schools, hospitals).

Note: Disconnection and removal of circuits from switchboards/load may be achieved, if it is safe to do so, by cutting cables off where they enter the switchboard/load.

The following is a recommended procedure to control the de-energisation of the demolition area.

- 1) The area of demolition is to be defined & established with the head contractor in conjunction with the demolition contractor and electrical contractor(s);
- 2) An investigation is required to be conducted to identify any overhead or underground services that may be impacted upon by the demolition and associated activities (dial 1100 before you dig);
- 3) All electrical circuits within the demolition area to be identified as far as possible and checked with existing drawings;

- 4) All cables (mains, sub mains and final sub-circuits) providing power into the demolition area are to be disconnected and removed from the supplying switchboard and from the load or distribution board. The mains or sub-mains are to be removed or appropriately terminated at both ends. An isolation sticker will then be attached to the distribution board and an entry detailing the disconnection will be recorded in a switchboard isolation logbook;
- 5) All distribution boards within the demolition area are to be tested (as per 4 above);
- 6) All mechanical, lift, fire switchboards etc, are to be tested (as per 4 above);
- 7) All electrical take off boxes and major electrical equipment is to be tested, cables are to be disconnected and removed from the equipment and an isolation sticker affixed to the equipment; and
- 8) When the demolition area has been completely isolated and tested, letters of clearance from each REC, and a copy of the isolation log shall be provided to the demolition contractor, the head contractor and the relevant HSR(s).

No demolition works affecting any part of the electrical installation shall commence until the sign-off letter and isolation log has been received from all electrical contractors involved in the testing and isolation of the demolition area.

Volt sticks should not be used to test a circuit for de-energisation.

Scenario 3

Note: Construction wiring may still be located on the demolition site. Such wiring is marked with 'construction wiring' tape.

Partial demolition of a building on site, possibly as part of refurbishment of an area within a building (e.g. shopping centres, multistorey) where the other parts of the building are still occupied. Energised permanent wiring may still run through the demolition area. Where this occurs, a separate on-site procedure is required to be developed. A staged demolition may be necessary before a letter of clearance can be provided.

Note: Disconnection and removal of circuits from switchboards/load may be achieved, if it is safe to do so, by cutting cables off where they enter the switchboard/load.

The following is a recommended procedure for control of de-energisation for the demolition area.

- 1) The area of demolition is to be defined & established with the head contractor, demolition contractor and electrical contractor(s);
- 2) An investigation is required to be conducted to identify any overhead or underground services that may be impacted upon by the demolition and associated activities (dial 1100 before you dig);
- 3) All electrical circuits within the demolition area to be identified as far as possible and checked with existing drawings;

- 4) Equipment and switchboards that are outside the demolition area but are supplied from within the demolition area are to be re-supplied from an alternative power supply before demolition works commence. Where this is not possible, the cabling is required to be suitably mechanically protected against any construction activity that may damage the cable and signposted as 'LIVE';
- 5) Cabling supplying power to the demolition area are to be disconnected and removed from the supply switchboard or if unable to be disconnected or removed the cable must to be appropriately terminated, provided with suitable mechanical protection and labelled along its length at intervals not exceeding 5 metres;
- 6) All cables, which includes data, phone and fire alarm cables, cable ducts, cable trays and conduits traversing the demolition area which cannot be disconnected and removed are to be provided with suitable mechanical protection and sign posted as 'LIVE'. If the installation's main earth wire passes through the demolition area suitable mechanical protection is to be provided to ensure that the cable is not damaged or removed during the demolition process;
- 7) At the edge of the demolition area all cables, which includes data, phone and fire alarm cables, cable ducts, cable trays and conduits are to be cut off and have a physical separation of at least 300mm to enable visual identification of isolation;
- 8) All cut off electrical cables crossing into the demolition area are to be terminated in a junction box at least 300mm outside of the demolition area. All cabling irrespective of whether it is phone, fire alarm or power is to be considered 'live' and appropriately terminated;
- 9) Where applicable, when the electrical distribution business has isolated the main incoming supply to the main switchboard from the point of supply, the incoming mains are to be positively tested by a licensed electrician (not using a volt stick) and cut off above the main switchboard. This cable will be removed or appropriately terminated and labelled, in a junction box. An isolation sticker will then be attached to the main switchboard and an entry detailing the disconnection will be recorded in a Switchboard isolation logbook;
- 10) All distribution boards within the demolition area are to be tested. Incoming sub-mains and outgoing circuits are to be cut off and when complete isolation stickers are to be fixed to the boards and the isolations logged;
- 11) All mechanical, lift, fire switchboards etc. within the demolition area, are to be tested before incoming sub-mains cables are to be cut off and an isolation sticker is to be fixed to the switchboard. (These isolations are to be performed and logged by the relevant electrical sub contractor);
- 12) All electrical take off boxes and major electrical equipment are to be tested, cables cut off and an isolation sticker affixed to the equipment. Other electrical equipment including power outlets and light fittings are to be tested and have isolation stickers affixed;

- 13) Any electrical equipment/cable that is identified as still being energised are to be traced back to the source of supply outside of the demolition area, isolated, and cut off or terminated in a junction box outside of the demolition area; All conductors, including neutrals and earth wires are to be tested and terminated.
- 14) There is no such thing as a 'DEAD' cable, it is either 'live' (with suitable mechanical protection and identified) or it's removed;
- 15) Non-electrical trades shall not cut electrical cables. A licensed electrician is to be on stand by at all times for use by the demolition contractor whenever cables are encountered. If cables are found, they shall be disconnected as per the ETU Energisation Procedure and then cut off and isolated from supply as detailed above in point 6. This section will not apply in unsafe areas of the site where demolition is being performed by powered plant such as demolition hammers, excavators or similar;
- 16) When the demolition area has been completely isolated and tested letters of clearance from each relevant REC, and a copy of the isolation log shall be provided to the demolition contractor, the head contractor and relevant HSR(s).

No demolition works affecting any part of the electrical installation shall commence until the sign-off letter and isolation log has been received from all electrical contractors involved in the testing and isolation of the demolition area.

Volt sticks should not be used to test a circuit for de-energisation.

PROCEDURES FOR SAFELY ENERGISING OR ISOLATING CONSTRUCTION WIRING AND ASSOCIATED ELECTRICAL EQUIPMENT

The following describes the recommended process for safely energising or isolating construction wiring and associated electrical equipment:

- 1) Prior to energising;
- 2) Energising procedure - main switchboard, sub-boards;
- 3) Energisation procedure - electrical equipment and other services switchboards;
- 4) Danger tag isolation procedure; and
- 5) Procedures for switching on circuits at sub-boards.

Attachments

- 1) Energisation Procedure Notification;
- 2) Sample 'Equipment Danger Tag'; and
- 3) Sample 'Personal Danger Tag'.

Note: All signs and tags are to be made of durable material e.g. laminated. Equipment Danger tags must be uniquely numbered for safety and audit purposes.

Prior To Energising

- 1) Ensure that the installation is compliant with AS/NZS 3000, AS/NZS 3012 and the Industry Standard for Electrical Installations Building and Construction Sites;
- 2) Each contractor associated with energising electrical services and following these procedures must have at least 2 current level 2 First Aiders as part of the energising crew with CPR refresher within the 12-month period as per the requirements of the First Aid Certificate;
- 3) Any employee associated with the energising team is to be inducted in these procedures prior to any energising taking place;
- 4) Minimum of team should be no less than 2;
- 5) The First Aider should have direct contact with first aid facility or provided with quick response mechanism to emergency services;
- 6) All test equipment to be calibrated at least once every calendar year; and
- 7) All members of the energising and commissioning team shall be holders of a current 'Electrical Installations on Construction and Demolition Sites' Accreditation Card. This requirement does not apply to apprentices.

Energising Procedure Main Switchboard

- 1) Carry out relevant inspections and tests as required by AS/NZS 3000 Wiring Rules and AS/NZS 3017 Electrical installations - Testing guidelines;
- 2) A switchboard manufacturers' compliant to Australian Standards AS/NZS 3439 document for the main switchboard to be provided;
- 3) Fill out Certificate of Electrical Safety for Prescribed Electrical Installation Work and obtain services of Electrical Inspector;
- 4) **Safety procedures implemented:**
The immediate area around the switchboard is to be barricaded off where it is located in a hall or open areas to prevent ingress by other trades during the initial testing and 'first time' energising of the switchboard.
Main switch(es) opened, padlocks and equipment danger tags (Attachment 2) applied. Keys controlled by nominated persons;
- 5) Prescribed certificate to be submitted to Office of the Chief Electrical Inspector; and
- 6) Main switchboard now ready for energisation.

Energising Procedure Sub-Boards

- 1) Carry out relevant inspections and tests as required by AS/NZS 3000 Wiring Rules and AS/NZS 3017 Electrical installations - Testing guidelines;
- 2) A switchboard manufacturers' compliant to Australian Standards AS/NZS 3439 document for the switchboard to be provided;

- 3) Fill out Certificate of Electrical Safety (Non-Prescribed Certificate);
- 4) **Safety procedures implemented:**
Distribution board isolating switch opened, padlocks and equipment danger tags (Attachment 2) applied. Keys controlled by accredited construction wiring persons. Locks on switchboards, not to be CL001 key type;
- 5) Non-Prescribed Certificate to be submitted to Office of the Chief Electrical Inspector; and
- 6) Sub-switchboard now ready for energisation.

Electrical Equipment And Other Services – Switchboards

- 1) Carry out relevant inspections and tests as required by AS/NZS 3000 Wiring Rules and AS/NZS 3017 Electrical installations - Testing guidelines;
- 2) Fill out certificate of Electrical Safety (Non-Prescribed Certificate); and
- 3) **Safety procedures implemented:**
Carry out all necessary inspections and tests on the circuit/equipment to make certain that such may be operated without danger to persons or equipment. Main switch(es) opened, padlocks and 'Equipment Danger Tags' (Attachment 2) applied. Keys controlled by nominated persons;
- 4) A switchboard manufacturers' compliant to Australian Standards AS/NZS 3439 document for the switchboard to be provided;
- 5) Functional/operational test(s) CBs, RCD(s), isolators, contactors, relays, etc completed. Mechanical or other services electrical contractors to submit test results to principal contractor as required;
- 6) Non-Prescribed Certificate to be submitted to Office of the Chief Electrical Inspector;
- 7) Electrical equipment or other services switchboard ready for energisation; and
- 8) No sub-board supply to be closed by main electrical contractor until 'Energisation Procedure Notification' (Attachment 1) form received from other services electrical contractor. The electrical contractor and the ETU site representative must be notified at least 48 hours prior to supply being required.

Danger Tag Isolation Procedure

This procedure shall be implemented when working on or near:

- equipment and circuits in service;
 - equipment and circuits being repaired or modified; and
 - equipment and circuits being commissioned and tested after installation.
- 1) When a circuit or equipment has been isolated, an 'Equipment Isolation Tag' (Attachment 2) and lock is to be attached, signed and dated by the construction wiring electrician.

A circuit is not to be accepted as isolated unless a company 'Equipment Isolated Tag' (Attachment 2) and lock or a 'Personal Danger Tag' (Attachment 3) and lock is attached signed and dated; and

- 2) It is of utmost importance to note that a 'Personal Danger Tag' (Attachment 3) and lock bearing the construction wiring electrician's signature is attached prior to any work commencing on the isolated equipment. Each person working on the equipment must attach their own tag and lock, irrespective of how many other tags and locks may be attached.

Note: A personal lock must not be able to be opened by anyone else apart from the worker it has been issued to. A reserve key shall be kept on site in a locked box under the control of the electrical supervisor;

- 3) No switch may be operated whilst a danger tag is attached;
- 4) A danger tag must only be removed by the person whose signature appears on it. The person it has been issued to can only remove a personal lock (except in circumstances where the person is unavailable due to absence, illness or other causes).

Should this situation arise the company project supervisor and elected ETU safety representative may remove the tag and lock after ensuring compliance with the following:

- a) They shall fully acquaint themselves with the reasons for the tag and lock being attached;
 - b) They shall carry out all necessary inspections and tests on the circuit/equipment to make certain that such may be operated without danger to persons or equipment;
 - c) They shall ensure that all personnel associated with the work are informed of their actions; and
 - d) They shall ensure that the person whose tag and lock was removed via this process is fully informed of this action immediately upon their return.
- 5) Only approved danger tags whether equipment or personal (Attachments 2 & 3) in good condition are to be used. Tags with erasures and alterations are not permitted; and
 - 6) Danger tags are to be securely fixed to the operating handle or isolated device of the equipment so there is no risk of them being accidentally dislodged or of an operator being able to operate the equipment without seeing the tags.

Procedures For Switching On Circuits At Sub-Boards

- 1) Cable identification, including a full visual inspection of all cabling that originate from the switchboard must be performed prior to any sub-circuits being energised. Carry out relevant inspections and tests as required by AS/NZS 3000 Wiring Rules and AS/NZS 3017 Electrical installations - Testing guidelines. All cables to be appropriately terminated at both ends, and marked for ease of identification;

- 2) Where a junction box has been fitted to the end of a cable, any cable insulation is to be stripped off prior to being put in a connector, this cable is not to be connected to supply, including the neutral and earth. The circuit breaker number and switchboard number is to be clearly and legibly marked on the junction box lid; and
- 3) Schedule must be included in switchboard.

ATTACHMENT 1 ENERGISING PROCEDURE NOTIFICATION

CONTRACTOR NAME
(Requesting Energisation)

CONTACT DETAILS

REC No.....

RESPONSIBLE PERSON.....

CONTACT PHONE No.....

AREA.....

SWITCHBOARD DESTINATION

REQUESTED DATE OF ENERGISATION.....
(2 Days' Notice Required)

EQUIPMENT DESCRIPTION.....
.....
.....

ELECTRICAL SAFETY TESTS COMPLETED..... (Date).....
(Attach copies of Certificates of Electrical Safety)

EQUIPMENT OK FOR ENERGISATION..... (Date).....

ISSUED TO:

NAME OF RESPONSIBLE PERSON

POSITION.....

COMPANY AUTHORISATION.....

(Name).....(Signature).....(Date)

**ATTACHMENT 2
SAMPLE EQUIPMENT CARDS**



**ATTACHMENT 3
SAMPLE EQUIPMENT CARDS**



LOCKING OUT / TAGGING OUT, ISOLATION OF PLANT

(WorkSafe Guidance Note GUIO151/01/06.11)

Background

Failure to shut down, de-energise or isolate energy sources on plant during maintenance and non-production tasks puts workers at risk of death or injury. In Victoria, 45 workplace deaths involved moving parts of plant between 2000 and 2010.

Plant must be isolated before any work is carried out. Isolation means energy is prevented from entering the plant and all stored energy is de-energised.

Recommended procedures for isolating plant should include:

- Identifying energy sources, operating controls and isolation points;
- controlling potential hazards caused by isolation (e.g. exposure to hazardous substances including: asbestos, falls from heights, burns and asphyxiation). Other hazards can include the way the work is structured (e.g. working alone or in an isolated area of the workplace);
- Developing isolation procedures for each task on each item of plant. Regularly review these procedures;
- Consulting health and safety representatives and workers (including contractors and labour hire workers). If required, engage suitably qualified people who have knowledge and expertise in isolating plant;
- Providing information, instruction and training to all worker; and
- Ensuring workers are supervised by a person with appropriate knowledge of the plant and its isolation procedures. This person should ensure isolation procedures are performed correctly and safely.

Develop isolation procedures

Employers should develop an isolation procedure prior to any work commencing on plant.

Identify energy sources and controls

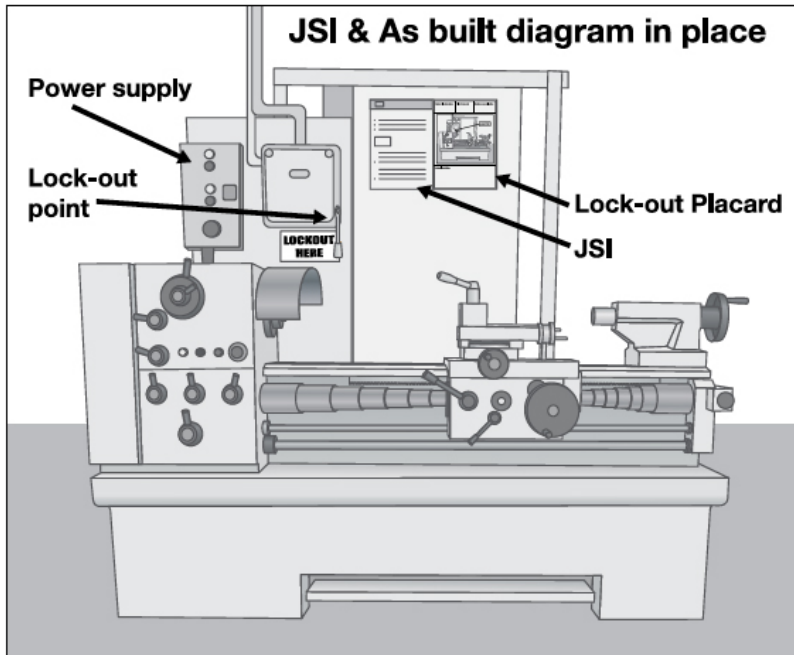
Identify the plant's energy sources, operating controls, switches or panels that may reactivate it. Energy sources include electricity (e.g. mains, solar, generator), fuels, heat, steam, fluids under pressure (e.g. water, air, hydraulic oil), stored energy (e.g. batteries, springs, flywheels, accumulators, capacitors), gravity, radiation and pneumatic.

The 'as built' or 'installation' diagrams can help identify energy sources and isolation points. The plant designer or installer should provide these diagrams. If they are not provided, they should be developed by your employer (see Picture 1 on the next page).

Identify isolation points

The plant should be designed with clearly marked and identifiable isolation points. It should be clear what each point is isolating (e.g. electrical isolators may only isolate control circuits. This is not an adequate level of isolation).

Note: Emergency stopping devices are not isolation points and must not be used for isolating plant. They bring the plant to a stop but do not isolate or de-energise energy and cannot be locked out.



Picture 1: An isolation diagram can help identify energy sources and isolation points. In this illustration the isolation diagram is placed above the machine next to the Job Safety Instruction (JSI) for easy reference for the workers.

Steps to isolate plant

Employers should ensure these steps are included in their isolation of plant procedures. Each step should be completed before work begins.

1) Shut down plant

Shutting down plant may require single or multiple energy sources to be shut down, sometimes in a certain order.

Ensure the plant operator is aware work is being conducted. Workers are typically injured when plant operators are unaware the plant is being worked on.

2) Isolate energy sources

All energy sources should be isolated. Some plant will have multiple control stations or independent electricity sources. Some machinery will require electrical circuits, connecting equipment and circuit protection devices to be de-energised.

3) De-energise stored energy

Energy may still be stored, even after energy sources have been isolated. Stored energy includes static, kinetic (e.g. rotational motion) and potential (e.g. due to the plant's position).

Stored energy can be released by earthing to the ground, allowing the plant to complete its motion (particularly after breakdown). Stored energy can be contained by preventing movement through blocking, wedging or propping the part. Ensure blocks, wedges or props are designed for this task and can only be removed by a deliberate release action.

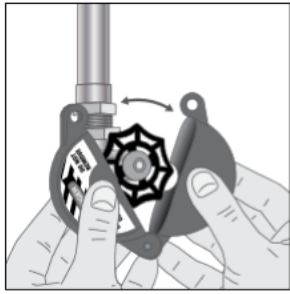
Consider negative pressure used to activate some types of plant. This pressure will need to be equalised to prevent hazardous substances being released into the work area.

4. Lock out isolation points - personal danger locks

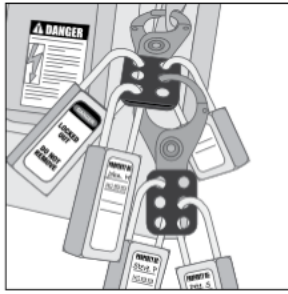
Locking out isolation points prevents them being reactivated. Lockouts are designed for use on many different items of plant such as circuit breakers, fuses and valves (see Picture 2).

When locking out plant, employers should ensure:

- There is one lock fitted for each person performing maintenance or non-production tasks. If there is more than one isolation point, each person will require sufficient locks to lock out each isolation point;
- There is a lock for each worker attached to isolation points that need to be isolated by more than one worker. This should be identified in the isolation;
- Locks are kept on until the work is finished or the work is passed on to another worker;
- Multiple locks at each point are avoided by using a lock box (see Picture 4). This means each lockout point has one lock and the key for the lock is placed in a box. Each person working on the plant places their lock on the lock box. This prevents access to the key to unlock the plant while the lock is still attached to the lock box; and
- There is only one key for each lock, apart from a master key that should be given to a responsible person and stored in a secure location for emergencies only. However, if a worker has multiple locks assigned to them, they can hold one key for all locks procedure (see Picture 3).



Picture 2: Locking out isolation points, such as this valve, prevents the isolation point from being reactivated.



Picture 3: A lock is attached for each worker performing maintenance or non-production tasks.



Picture 4: A lock box avoids multiple locks at each point.



Picture 5: A personal danger tag advises who to contact about the work and warns that operating the plant could put the worker's health and safety at risk.

5) Lock out isolation points - out of service locks

An out of service lock should be applied to plant that will be worked on across more than one shift or day.

If out of service locks are used, a supervisor or a nominated worker should be responsible for placing and removing them onto all required isolation points.

These locks should be clearly identifiable as out of service locks and remain on until it is safe to remove them or the work is complete. This should be included in the isolation procedure.

6) Tag out

If you can tag out, you can lock out first. Tagging is not a lock or a form of isolation. It is a warning identifying who to contact.

Two types of tags are used - personal danger tags (see Picture 5) and out of service tags.

Personal danger tags are red and white. They warn workers that someone is working on the plant. These tags should only be attached after the plant has been locked out and must be in clearly visible areas.

Out of service tags are yellow and black. They are used when plant is out of operation. If these tags are placed on plant with isolated energy sources, they should only be done when it is locked in the safe (off) position.

7) Confirm isolation

Confirm all isolation steps have been carried out effectively and all energy is prevented from entering, removed or restrained. Employers should ensure:

- Identification errors are avoided (e.g. correct isolator is selected);
- The isolator is in the safe position; and
- All stored energy is dissipated or restrained.

8) Test for zero energy

Test that isolation of energy sources has been successful. A combination of tests can be applied to each situation. This should include different ways of operating the plant such as control stations or remote computers.

Testing should be done using appropriate equipment and by someone who is suitably qualified and understands the plant, energy sources, energy principles and isolation procedures.

9) Changing shifts or crews

If work is being taken over by the next shift or another crew, a handover should occur. This involves discussing the stage the work is at and changing over locks and personal danger tags.

10) A worker should not remove another worker's locks and tags

The only worker who should remove personal danger locks and tags is the person who put them in place.

A procedure should be available which first considers all options to allow the person who placed the lock and tag to personally remove them, consider emergencies and/or if the worker is unable to remove the lock.

If the worker can not remove the lock and tag, the employer should ensure:

- A senior person is accountable for the lock and tag;
- The situation is assessed to be safe before removing the lock and tag;
- Ensure the removal is validated and signed off by 2 or more people.

11) Reactivate isolated plant

Isolation procedures should include tasks for reactivating plant.

Employers should ensure reactivating procedures include at least the following steps:

- i) All workers have finished their work and are aware the plant is being prepared for reactivation;
- ii) All workers are a safe distance away from any hazardous area of the plant;
- iii) Blocks, wedges and props used to prevent parts from moving are safely removed (this will release energy);
- iv) Guarding is replaced;
- v) Locks and tags have been removed by the workers who placed them;
- vi) Sensory guarding is reactivated and tested to ensure it is functional;
- vii) Emergency devices are reactivated and tested (e.g. stop buttons and pedals); and
- viii) Workers understand the method and order energy will be restored to each isolated point.

Plant can be safely used again only after all these tasks have been performed.

PART 5: HEIGHT SAFETY & WORK PLATFORMS

Working at heights and preferred method for preventing falls

WORKING AT HEIGHTS

Working at heights is a significant problem not only in the electrical industry but in many industries. Electrical workers in the past have not necessarily selected the most appropriate form of work platform when working aloft. Many electrical workers select ladders as a work platform from which to work, but do not understand the limitations that have been placed on the ladder by the designers and manufacturers of the product.

Ladders are primarily designed as a means of access and egress from the work area and for a step ladder a person must maintain 3 points of contact i.e. at least one hand on the ladder.

Many workers have died from falls, in some cases from falls from ladders. The distances in some instances have only been 2 metres.

Working at height itself became such a concern in Victoria, that legislation was developed in relation to prescribing what must be done when a person is required to work at a height of 2 metres or more.

The Occupational Health and Safety Regulations 2007, has specific provisions for controlling the risk of falling when working at heights, which are based on a prescribed hierarchy of controls.

Where there is a risk of a person falling 2 metres or more the following should be assessed for practicability before considering what is the most practicable working platform.

- 1) **Is it practicable to bring the work task including moving to and from the task to be performed on the ground where a person would fall to the same level or on a solid construction.**

(A solid construction means an area that has a surface that is capable of supporting any people and material that may be on it and has sufficient barriers around its perimeter and any open penetrations where there may be an unprotected edge with a void, gap or space greater than 300mm (e.g. skylights, stairwells) to prevent a fall from the area to a different level and has an even and negotiable surface and gradient and a safe means of access and egress.)

- 2) **If it is not practicable to do step 1 above, or part thereof, and a risk of a fall still remains, the risk of a fall must be controlled so far as it is practicable by using a passive fall prevention device.**

(A passive fall prevention device means material or equipment, or a combination of material and equipment that is designed for the purpose of preventing a fall and that, after initial installation, does not require any ongoing adjustment, alteration or operation by any person to ensure the integrity of the device to perform its function such as a temporary work platform, roof safety mesh or guard railing.)

A temporary work platform means:

- A fixed, mobile or suspended scaffold;
- An elevating work platform (scissor lift, cherry picker, boom lift etc);
- A work box supported and suspended by a crane, hoist, forklift truck or other form of mechanical plant;
- Building maintenance equipment including a building maintenance unit;
- A portable or mobile fabricated platform such as a step platform; or
- Any other temporary platform that provides a working area for the duration of work carried out at height that is designed to prevent a fall.

- 3) **If it is still not practicable to do 1. or 2. above or part thereof and a risk of a fall still remains, the risk of a fall must be controlled so far as it is practicable by using a work positioning system.**

A work positioning system means:

- An industrial rope access system (meaning a system designed for the purpose of carrying out work on a building or structure by a person and consists of (a) equipment that enables a person to manually lower or raise themselves in a harness or seat supported by one or more fibre ropes and (b) equipment used to anchor the ropes);
- A drainers hoist;
- A travel restraint system (a travel restraint system means equipment that is worn by or attached to a person and is designed for the purpose of physically restraining a person from reaching an unprotected edge or elevated surface from which they may fall); or
- Any other equipment, other than a temporary work platform that enables a person to be positioned and safely supported at a work location for the duration of the task being undertaken at height.

- 4) **If it is still not practicable to do 1. 2. or 3. above or part thereof and a risk of a fall still remains, the risk of a fall must be controlled so far as it is practicable by putting in place a fall injury prevention system.**

(A fall injury prevention system means equipment or material or a combination of equipment and material that is designed to arrest the fall of a person such as an industrial safety net, catch platform or safety harness system [other than a travel restraint system]).

5) **If it is still not practicable to do 1. 2. 3. or 4. above or part thereof and a risk of a fall still remains, the risk of a fall must be controlled so far as it is practicable by ensuring that:**

- A fixed or portable ladder is used in accordance with the following guidelines; or
- An administrative control is implemented.

(An administrative control means a system of work or work procedures which eliminate or reduce the risk of a fall.)

Practicable means practicable having regard to:

- a) The severity of the hazard or risk in question;
- b) The state of knowledge about the hazard or risk and any ways of removing or mitigating that hazard or risk;
- c) The availability and suitability of ways to remove or mitigate that hazard or risk; and
- d) The cost of removing or mitigating that hazard or risk.

Where a fixed or portable ladder is used as the practicable control measure to control the risk of a fall, the ladder must be appropriate for the task to be undertaken and appropriate for the duration of the task and is set up in the correct manner. The following guidelines 'Ladder Safety' give further explanation and example.

Whichever control measure(s) are used the employer must ensure employees using the control measure and any equipment or material are provided with information and instruction and are appropriately trained and competent in the use of the control measure. In the use of some equipment, workers will need to be trained and deemed competent to the level of a National Certificate of Competency to use, alter, erect, dismantle, maintain or operate the plant or equipment or associated safety equipment, such as harnesses.

Where control measures from items 2, 3, 4 or 5 above are used to control the risk of a fall employers must ensure that emergency procedures are established before the task is undertaken. The emergency procedures must, so far as is practicable, enable the rescue of a person in the event of a fall as soon as possible after the emergency situation arises and that any risk including a non-fall risk, e.g. an electric shock, crushing, musculoskeletal disorder associated with the carrying out of the emergency procedure is eliminated or is reduced so far as is practicable.

Safe use of ladders

Persons using ladders should not:

- Handle or use ladders where it is possible for the worker or the ladder to make contact with power lines;
- Use metal or metal reinforced ladders when working on live electrical installations or where an electrical risk exists;

- Set up the ladder in places, such as driveways and doorways, where a person or vehicle could hit it without appropriate safeguards such as the erecting of a barrier or locking the door shut;
- Use a stepladder near the edge of an open floor, penetration, or on scaffolding or an EWP to gain extra height;
- Over-reach (the worker's belt buckle should remain within the ladder stiles throughout the work);
- Use any power (air, hydraulic, electric or battery) equipment or tool specifically designed to be operated with two hands and which may require the operator to brace themselves against the high level of torque exerted by the tool e.g. concrete cutting saw, angle grinder, power saw, large impact drill, impact/jack hammer;
- Carry out work such as arc welding or oxy cutting unless step platforms or other temporary work platforms are not feasible and the task is of short duration and a safe work procedure is followed;
- Use tools requiring the use of both hands and dynamic movement such as axes and crowbars;
- Use tools which require a high degree of leverage type force which, if released, may cause the user to over balance or fall from the ladder such as stillsons or pinch bars;
- Work over other people or allow anyone else to be on the ladder at the same time;
- Stand higher than the second tread below the top plate of any stepladder. Short ladders shall not be spliced together to make long ladders; and
- Ladders shall never be used in the horizontal position as scaffolds or work platforms unless designed specifically for that purpose.

Dos and don'ts for ladder use

- Do **NOT** stand on the top platform or first step down from the top of a regular stepladder as you have **NO support**.
- Use both hands when climbing or descending ladders.
- Persons using ladders should wear fully enclosed slip resistant footwear at all times on the ladder.
- Metal ladders should never be used near electrical wiring or where there is the potential for electrical shock or electrocution.
- Only one person at a time may use or work from a single ladder.
- Always face the ladder when ascending or descending it.
- Only a 'trestle ladder' shall be used to support a plank upon which a person has to work.

Ladders shall not be joined together to form a longer ladder unless the longer ladder conforms with the strength and rigidity requirements.

A ladder shall not be used as a guy, brace, tom, strut, beam, skid, or for any use other than its correct use as a ladder.

When there is significant traffic on ladders used for building work, separate ladders for ascent and descent should be provided, designated and used.

Step ladder usage

A person may carry out light duty work that requires the simultaneous release of both hands from a stepladder under the following circumstances:

- Where the stepladder will be used only in the fully opened position;
- The height at which a person is supported for working is limited to accessing the ceiling or soffit of the floor above which the stepladder is positioned, or be restricted to 2.0m elsewhere;
- The person carrying out the work and the stepladder will remain stable throughout the intended work;
- The person had the use of both hands to grip the stepladder when ascending and descending (tools to be carried in a belt or passed up by others);
- The person does not work from above the third step from the top of the stepladder;
- The nature of the work allows the person to lean forward towards the stepladder;
- Where the work involves hand tools:
 - the tools are used as intended to be used in their normal operating position;
 - their use does not negate guarding or other safety features on the tools;
 - all tools are supported by the person undertaking the task, e.g. in a tool belt or tool bag, and are not supported from the stepladder unless designed for the purpose;
 - the tools, and the manner in which they are used, do not cause the centre of gravity of the person operating them to be shifted from the stable position of leaning towards the stepladders; and
 - the tools are relatively lightweight, battery operated and free of cords or hoses.
- The nature of the work, and the position of the stepladder, does not require the person to overstretch; and
- The work does not cause fatigue - it is of short-term duration and conducted in an ergonomic manner.

An inability to comply with any of the above requirements would indicate that a stepladder is inappropriate for the work in hand and it should be replaced by a more suitable work platform.

Inspection of ladders

All ladders shall be inspected at least once every 12 months by an appropriately trained person.

Any ladder which has been damaged or which is found to contain defects will be removed from service and labelled to prevent use.

Maintenance

Ladders shall be maintained in good condition and free from structural defects.

Rung and treat joints shall be tight and fittings securely attached. Pulleys and other moving parts shall be lubricated where necessary. Frayed or worn ropes shall be replaced immediately.

Note: On the following pages is a jointly developed ETU/NECA safe work method statement for working at heights and ladder use.

OVERHEAD POWERLINES (NO GO ZONE)

No Go Zones for working near overhead powerlines apply throughout Victoria to:

- The operation of cranes, concrete placing booms and excavating equipment;
- The operation of elevating work platforms; and
- The erection of scaffolds.

They do not apply to workers in, or engaged by companies of, the Victorian electricity supply industry as they are covered by separate specific safety guidelines.

The new rules are endorsed by the Energy Safe Victoria, the electricity industry, key construction industry, unions, the Victorian Crane Association and WorkSafe.

For cranes, concrete placing booms, excavating equipment and elevating work platforms, there are specified zones around power lines where a spotter is required.

Spotter (Safety Observer)

A 'spotter' is a safety observer who is competent for the sole task of observing and warning against the unsafe approach to overhead power lines and other electrical apparatus.

Task-specific industry training for spotters is available and is required before any spotting work is commenced.

The requirements for a competent spotter:

- The spotter must hold a valid ticket or certificate of competency for the piece of plant being spotted for.
- The spotter's sole task is observing and warning against the unsafe approach of the plant and/or load to overhead power lines or other electrical apparatus.
- The spotter must also hold a current Level 2 First Aid qualification.

Obtaining a Permit and Working Safely

Special provisions apply when working within the No Go Zones. These are:

- Notify the power authority before commencing work.
- Obtain written permission from the power authority.

- DO NOT commence work until a pre-start/job meeting and a risk assessment have been completed.

Since the inception of the No Go Zone provisions incidents involving contact with overhead power lines has significantly reduced. In July 2004 the provisions of the No Go Zone was increased to include underground assets. These new guidelines also provide further explanation to the provisions that currently relate to overhead electrical assets.

There is also new terminology that is used in the document titled 'Framework for Undertaking Work Near Overhead and Underground Assets'. This can have an impact on how and what plant is used in and around assets.

Envelope

The space encapsulating a plant item, including attachments such as rotating/ flashing lights or radio aerials and is categorised as:

Design: the space encapsulating all possible movements of the plant and any load attached under maximum reach.

Operating: the area encompassing the movement of plant and any load under controlled and managed circumstances or encompassing engineering solutions controlling the movement of plant and its load.

Transit: the area encompassing the normal height and width of a vehicle or plant when travelling to or from a worksite.

No Go Zone

The area surrounding:

- **Overhead** electricity cables on poles anywhere above or within 3000mm to the side and below overhead power lines in the case of power lines up to and including 66Kv and 8000mm in the case of voltages above 66Kv (tower lines); or
- **Underground** services being 300mm for individuals and 500mm for plant or equipment or 3000mm of any underground assets registered under the Pipelines Act or an underground electricity cable with an in-service voltage of greater than 66Kv.

The following diagrams are excerpts from WorkSafe Victoria's 'Framework For Undertaking Work Near Overhead And Underground Assets'.

Diagram 1: Clearances from Overhead Electrical Cables

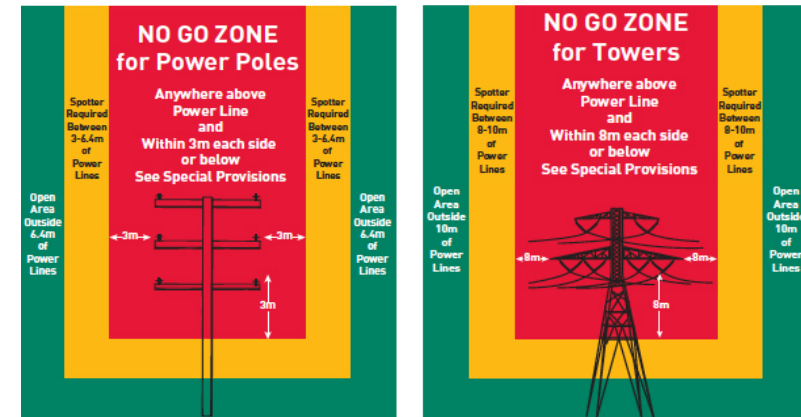


Diagram 2



Before starting work, you must determine:

- Your scope of work;
- If you are working near overhead or underground services; and
- If in undertaking this work, you will encroach into the No Go Zone clearances surrounding these services.

(This means you must consider what work you are going to do and how you will do it at the planning stage of a project. See Diagram 3.)

Diagram 3: FLOW CHART: Work Near Overhead or Underground Assets

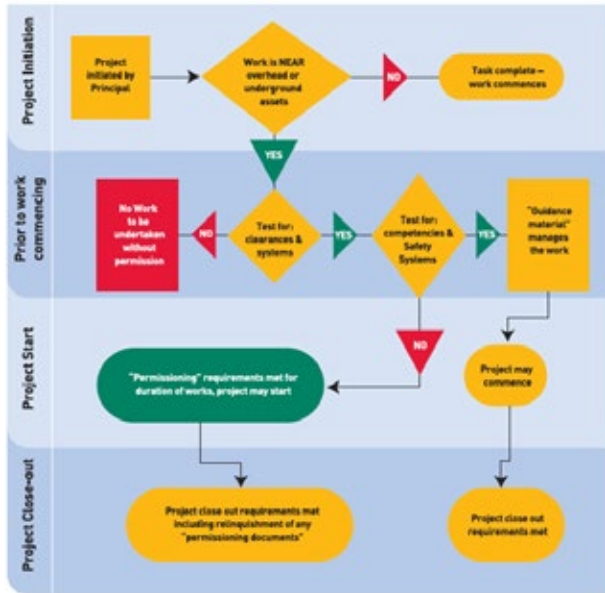


Diagram 4

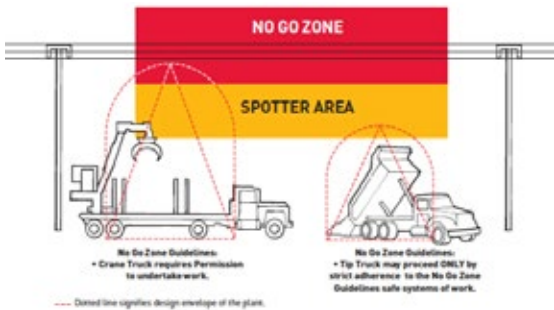
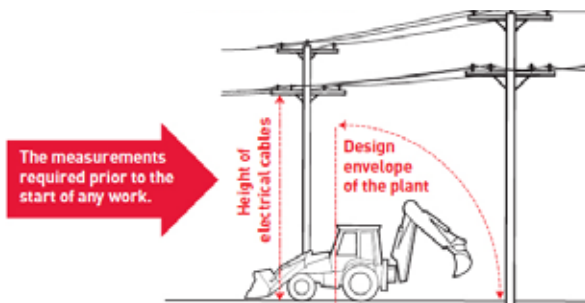


Diagram 5: Measurement required for each worksite



Types of assets and limits of approach

Types of overhead electrical & communications assets. Nominal voltage (TV) both alternating current and direct current	Minimum clearances for the design envelope of plant and equipment under these guidelines before permission is required. Permission will also be required where the conditions in Table B cannot be met.	Safety Controls required for the Deemed to Comply guideline provisions to take effect.
1. Insulated low voltage electricity conductors	500 mm	Training and safety systems
2. Uninsulated low voltage electricity conductors	1000 mm	Training and safety systems
3. High voltage electricity conductors up to and including 66kV	2000 mm	Training and safety systems
4. High voltage electricity conductors above 66kV	4400 mm	Training and safety systems
5. Communications cabling - broadband and telephony	300 mm	Training and safety systems

TYPES OF UNDERGROUND ASSETS <small>(Note: The owners of assets registered with the Gas Before You Dig service and covered by this guide require an enquiry through this free service and the compliance with any alerts they issue with information regarding the asset.)</small>	Minimum clearances for individuals (A), and the operating envelope of plant and equipment (B) under the guidelines.(Refer to Table B)	Safety Controls required for the Deemed to Comply guideline provisions to take effect or where specific permission has been granted.
6. Assets listed under the Pipelines Act.	3000 mm	Must contact the Asset Owner for specific conditions
7. All electricity conductors greater than 66kV	3000 mm	Must contact the Asset Owner for specific conditions
8. All electricity conductors up to and including 66kV	300 mm (A), 500 mm (B)	See specific requirements in the underground guidelines
9. Telecommunications Cables	300 mm (A), 500 mm (B)	Must contact the Asset Owner for specific conditions
10. All gas pipelines other than 6 above	300 mm (A), 500 mm (B)	See specific requirements in the underground guidelines
11. Water, Drainage & Sewerage pipelines.	300 mm (A), 500 mm (B)	Must contact the Asset Owner for specific conditions

Guideline framework for working near overhead and underground assets - excluding electricity assets on towerlines

OPERATING ENVELOPE	OVERHEAD ELECTRICAL ASSETS			
	DESIGN ENVELOPE			
	OUTSIDE NEAR	SPOTTER ZONE	NO GO ZONE	
OUTSIDE NEAR	NO GUIDELINE REQUIREMENTS	SAFE SYSTEMS OF WORK	OUTSIDE TABLE A CLEARANCES	INSIDE TABLE A CLEARANCES
INSIDE SPOTTER OR NO GO ZONE	N/A	SAFE SYSTEMS OF WORK	SPOTTER & SAFE SYSTEMS OF WORK	DESIGNER, SPOTTER & SAFE SYSTEMS OF WORK *See Note

OPERATING ENVELOPE	UNDERGROUND ELECTRICAL ASSETS	
	DESIGN ENVELOPE	
	OUTSIDE NEAR	INSIDE NEAR, OUTSIDE TABLE A
OUTSIDE NEAR	NO GUIDELINE REQUIREMENTS	SAFE SYSTEMS OF WORK
INSIDE NEAR, OUTSIDE TABLE A	SAFE SYSTEMS OF WORK	SAFE SYSTEMS OF WORK
AT OR INSIDE TABLE A	SAFE SYSTEMS OF WORK	Permission Spotter & Safe Systems of Work *See Note

*Note: Separate Industry Sector guidelines may have been developed for work in this area.

For information regarding access to Tower Line easements, you must contact the Asset Owner. No work may be undertaken near a Tower Line without Permission from the Asset Owner.

- The Utility Safety Committee (USC) is responsible for endorsement of any guidelines and no work shall be undertaken without Industry Sector development and endorsement from the USC
- Consideration must be given to any lead being slung by the plant or equipment.

INDUSTRIAL FALL ARREST SYSTEMS AND TRAVEL RESTRAINT SYSTEMS

Industrial fall arrest systems include such equipment as harnesses, horizontal life lines, fall arrest devices, lanyards etc. Such devices should only be considered for use after an assessment has been made in accordance with the Occupational Health and Safety (Prevention of Falls) Regulations.

Australian Standard 1891.4 provides information on the selection, use and maintenance of industrial fall arrest devices.

Prior to any equipment being used there are certain aspects that must be considered.

This list is not exhaustive but highlights some of the major considerations before fall arrest equipment is used as part of the safe work procedure.

- Has the task been assessed in accordance with the OH&S (Prevention of Falls) Regulations?
- Has a safe work procedure been provided by the employer?
- Has a Job Safety Analysis (JSA) been performed to ensure that the task is safe to be performed in the particular environment? (see Work Procedural Requirements).
- Is the equipment suitable for the task being performed?
- Has the attachment point for the fall arrest system been specifically assessed to ensure that if a fall does occur that the attachment point has sufficient strength against the forces that may be applied?
- Has the worker been suitably instructed and trained in the selection, use, inspection and maintenance of the equipment?
- Has a rescue plan been developed to rescue the worker should a fall occur?
- Are the persons instigating the rescue plan in the advent of an emergency in place and trained to perform such a rescue?

Fall arrest systems shall be selected and assembled so that in the event of a fall the maximum force transmitted to the wearer's harness does not exceed 6kN.

Equipment must be tried on by potential users and checked for comfort and freedom of movement when working. Trials should include users being suspended in the harness, taking care that during such trial the possible onset of suspension trauma is allowed for. (See section on Suspension Trauma for more details on this issue.)

THE RISK OF SUSPENSION TRAUMA

An unseen patch of grease on the surface of the steel decking, a sharp cry, the clatter of a spanner on to the factory floor far below and a worker swings backwards and forwards in his or her harness out of reach of the structure. Although he/she jokes with relieved work mates as the search for suitable rescue gear begins, just minutes later relief turns to anxiety as they realise their mate has gone ominously quiet and still.

A great deal has been written about the hazards involved when working at heights and the need to prevent fall related injuries and deaths. Over the years these occurrences have been common in the construction industry including a potentially life threatening problem commonly known as 'suspension trauma'.

The Victorian Occupational Health and Safety Regulations 2007, provides a 'hierarchy of fall risk control' which must be followed. If work cannot be done on the ground or a solid structure, passive fall protective devices (e.g. scaffolds, guardrails or temporary work platforms) must be used wherever possible. If not, work positioning or fall injury prevention systems must be considered, with the use of portable ladders and administrative controls being the final options.

In construction work, it may be necessary to rely on either a work positioning system or a fall injury prevention system. Work positioning systems include rope access equipment that allows a worker's deliberate suspension in a harness for the time it takes to complete a task. Fall injury prevention systems on the other hand are designed to arrest a worker's fall and support him or her until rescued.

Unfortunately, use of work positioning or fall injury prevention systems can lead to a worker being affected by suspension trauma. If allowed to develop, suspension trauma can result in unconsciousness, followed by death.

Standing still for an extended period may cause a person to suddenly faint. This is because inactive leg muscles cause the blood to accumulate in the legs instead of being pumped around the body. The brain becomes deprived of its normal blood supply and the person faints. Falling into a horizontal position restores blood supply to the brain and the person recovers, usually without assistance.

A worker suspended in a safety harness, whether deliberately or following a fall, is in a similar situation except that the body is held in a near vertical position and the ability to keep moving is limited. The leg muscles become inactive and blood circulation is impaired.

A rope access system user is generally working in a controlled situation, with equipment and techniques designed to minimise the risk of suspension trauma. For example, the system may include foot stirrups, which allow the worker to flex his or her legs. It may be possible for the worker to push away from the structure from time to time to keep the leg muscles working to maintain blood circulation reducing the risk of suspension trauma.

The worker who has fallen and is left suspended and unable to get back on to the structure may be at greater risk. The worker may be unharmed, or could have suffered some injury either before or as a result of the fall. He or she may try to struggle back to the structure, but often there's nothing left to do but hang there, legs dangling, awaiting rescue.

The signs of suspension trauma may soon appear. The pulse rate will rise and the worker may feel faint. He or she will become pale, experience hot flushes, sweat and become breathless. Overseas studies have shown that unconsciousness can occur in as little as 3.5 minutes. The worker must be rescued without delay.

So, what can you do to avoid the risk of suspension trauma?

- Firstly, prevent falls. Use the hierarchy of fall risk control to avoid fall risk situations.
- Treat every suspended fall as a medical emergency. Fall victims are at great risk even if they initially seem all right, and minutes can save lives.
- Don't allow anyone to work unattended at height. A fall victim may become unconscious and unable to call for help.
- Have suitable rescue procedures and equipment in place.
- Practice safe emergency rescue procedures.
- Inform workers at risk, about keeping their legs moving to aid circulation whilst conscious and suspended in a harness.
- After rescue, administer first aid in accordance with the guidelines of the Australian Resuscitation Council.
- Loosen belts and tight clothing.
- Call for an ambulance
- Monitor airway, breathing and circulation.
- If unconscious, maintain a clear and open airway.

Working at height is an inherently risky business. Plan carefully, make sure you have the equipment and training required, rescue plan in place and be safe!

PART 1: SUSPENDED SCAFFOLD

The following information is taken from WorkSafe's 'What you need to know about Suspended Scaffolds February 2005'.

What is a suspended scaffold?

A suspended scaffold is defined in the Victorian Occupational Health & Safety Regulations as:

'...means a scaffold incorporating a suspended platform that is capable of being raised or lowered when in use.'

Common types of suspended scaffolds likely to be encountered in the construction industry include:

- **Swing stages** which have cradles supported by a single row of suspension ropes;
- **Double-rope** scaffolds, with cradles supported by 2 rows of suspension ropes;
- **Work cages** which are small cradles supported by one suspension rope only;

- **Boatswain's chairs** where the platform is a seat for one person; and
- **False cars** are specialised forms of suspended scaffolding, which are often used in the construction of lifts. Additional requirements for false cars are covered in Part 8 of this document.

Australian Standards that are to be required to be followed include AS/NZS 3000 - 'Wiring Rules' and AS/NZS 3012 - Electrical installations construction and demolition sites, along with those Australian Standards that relate to the different types of scaffold.

WorkSafe recommends that suppliers seeking to comply with these obligations should obtain and keep written confirmation that:

- The suspended scaffolding system has been designed in accordance with AS/NZS 1576.1 and AS 1576.4;
- Couplers supplied for use with suspended scaffolding have been designed, tested and marked in accordance with AS 1576.2; and
- Scaffolding hoists have been designed, manufactured and tested in accordance with AS 1418.2.

In particular, WorkSafe advises suppliers of the following:

- 1.1 The design of the powered scaffolding hoists being supplied must have been notified to WorkSafe Victoria or an equivalent interstate workplace safety authority.
- 1.2 All scaffolding hoists and secondary protective devices should have legible data plates bearing the following information:
 - type model identification;
 - serial number;
 - details of steel wire rope used with the hoist - nominal size, grade (quality), construction, and maximum length (where applicable);
 - classification of mechanism of the hoist;
 - rated capacity hoisting;
 - name or identification mark of the manufacturer of the hoist;
 - reeving requirements, where applicable; and
 - power supply requirements, where applicable.
- 1.3 The residual current device (RCD) for the cradle, should have a legible data label bearing the following information:
 - rating load in Amps;
 - residual tripping current (not exceeding 30 mA); and
 - power supply in Volts.

- 1.4 All hoisting controls must be labelled and, unless the function is obvious, the operational functions displayed. Labels should include:
- operation instructions;
 - emergency stop switch; and
 - up and down control.
- 1.5 The control box should be compatible with the operation of the specific type and model of hoist and, if multiple hoists are used, each hoist should have the same operating specifications.
- 1.6 The control box should be removable, unless an alternative method is used to isolate power to the cradle, for safety and security when the suspended scaffold is not in service.
- 1.7 Before each site delivery, each scaffolding hoist, each secondary protective device and each load-limiting device should have been inspected and subjected to an operational test in accordance with the recommendations given in AS/NZS 4576:
- undergo inspection and testing;
 - if an electrically powered scaffolding hoist, be fitted with a load-limiting device that will prevent the hoist from lifting more than 125% of its rated load; and
 - if a secondary protective device, be capable of preventing the cradle from falling due to a failure within the hoist.
- 1.8 Between hiring's of scaffolding equipment the supplier must ensure that all scaffolding components are inspected and maintained.
- 1.9 The supplier of the suspended scaffold must provide, for the users of the equipment, written operating and safe use instructions and the daily safety checklists.

Note: Adjusting the electrical overload is to be performed by a licensed electrician.

PART 2: SCAFFOLD VICINITY

The scaffold designers, erectors and operators need to take into consideration the areas around the suspended scaffold during design, erection and operation. The following particular areas of concern should be considered and addressed prior to work commencing on the erection or operation of the scaffold.

- 2.1 Where the scaffold is erected adjacent or over public space or adjoining property, there may be the need to provide specific controls (e.g. hoardings, catch platforms, barricades).
- 2.2 Where the possibility exists for other workers to enter the area below the suspended scaffold, specific controls may need to be provided (e.g. catch platforms, barricades, signs).

- 2.3 Power-lines are a major hazard and no part of the suspended scaffold including suspension and secondary ropes, which should be anchor, shall be closer than 4.6m to any power line. Refer to the Office of the Chief Electrical Inspector's **NO-GO-ZONE** rules for erecting scaffolding near overhead powerlines for more detailed information.

PART 3: INSTALLATION DESIGN

The scaffold designer needs ensure that any scaffolding configuration which they design, modify or allow to be modified is suitable for the location and the intended use of the equipment. The designer of the scaffold should consider the following to ensuring that during erection and when properly used it is not unsafe and a risk to health.

- 3.1 The building or structure to which the suspended scaffold is to be mounted must be capable of supporting the scaffold and all intended loads (dead, live and environmental loads). The supporting structure needs to be assessed by a competent person and a statement of assessment provided.
- Note:** This statement may be included in the design plan.
- 3.5 To operate correctly an adequate power supply must be available for electrically powered hoists, the Victorian Electricity Safety Legislation prohibits voltage drop that exceed 5% of the nominal supply voltage unless an electrical installation is specifically designed to operate under reduced voltage conditions.
- This requirement is for the entire installation, the flexible cord/cable for the suspended scaffold is only part of this 5%.
 - Additional information on the electrical requirements is provided in Part 5.

ETU Note: An agreed position has been reached with industry stakeholders in relation to proportional voltage drop. A voltage drop of 2% is permitted to the switchboard with the final 3% allocated to the length of flexible cord/cable down to the motor. Generally single phase motors with long runs will exceed the 3% permissible drop unless a large diameter cable is allocated. A 3-phase motor is a better alternative.

PART 4: SCAFFOLD ERECTION

The scaffold erector needs to ensure that nothing in the way which the suspended scaffold is erected is unsafe or a risk to the health of the scaffolder(s) or others and when installed and properly used is not unsafe or a risk to health of the operators or others.

- 4.1 The person carrying out or directly supervising of erection or modification work on any suspended scaffold must have either Advanced Certificate in Scaffolding or Rigging.

- 4.2 The person supervising the work must have a copy of the design plan, which specifies the rigging requirements including the number, size and positioning of the counterweights, prior to the erection or modification of the suspended scaffold.
- 4.3 Ensure that fall protection is in position at the building edge or the scaffolders are using safety harnesses with adequate anchorage points if working near an exposed edge.
- 4.4 To prevent injury to workers the area around the support rig should be restricted to only those workers engaged in assembling the scaffold.
- 4.5 To prevent injury to persons, from dropped cables, rigging components or tools, a sufficiently large area below the scaffold should be barricaded off to prevent access.
- 4.6 During erection, where there is no physical barrier at edge to prevent objects falling off the supporting structure or when work is occurring over the edge, a safety observer should be positioned, if necessary, to prevent people accessing the barricaded area below the scaffold.
- 4.7 Any counterweight should be manufactured for that purpose, labelled with its mass in kilograms, be placed directly on the needle or innermost support in the designed location, and secured in such a manner so as not to be displaced or removed without the use of a tool.
- 4.8 When used, traversing tracks should be fitted with through-bolted stops at the ends, to prevent any trolley from running off and each trolley must have a rated working load of at least 500kg.
- 4.9 The outboard end of a needle should never be lower than the inboard end.
- 4.10 The suspension rig must form a structure that is rigid and stable under working conditions.
- 4.11 Only the wire rope recommended by the manufacturer for the hoist shall be used, details of the wire rope construction can be located on the hoist data plate. The use of the wrong construction of wire rope in a scaffold hoist has resulted in sudden failure, with the rope severing in the hoist.
- 4.12 A secondary protective device shall be provided for each scaffolding hoist to operate on the suspension wire rope above the hoist or on a secondary wire rope. This device provides an emergency brake to hold the cradle if the hoist or wire rope within the hoist fails, some types may also prevent an over-speed descent.
- 4.13 It is essential that the secondary protective device's internal mechanism is adjusted for the size of wire rope fitted, as some devices are capable of using different sizes of wire rope.
- 4.14 If used, the secondary wire rope for any scaffolding hoist should be attached to the suspension rigging, at a point that is independent of the main suspension rope attachment.

- 4.15 All cradle components should be inspected, on site, prior to assembly and checked to ensure all locating pins and clips are fitted and in position.
- 4.16 A sign, clearly displaying the safe working load limit, in kilograms, should be fixed to the inside of each cradle.
- 4.17 The cradle should have guardrails, midrails and toe boards fitted; the working deck needs to be fixed, of a non-slip type and with adequate drainage holes. None of these components should have visible signs of mechanical damage (cracked or split welds, missing or broken decking, cut or bent guardrails, etc).
- 4.18 The finished suspended scaffold must conform to the design plan. Alterations due to installation conditions must be included on an amended plan. The designer or another competent person must review these variations and approve the modified plan before the scaffold is first used.
- 4.19 A competent person or the certificate holder responsible for erecting or altering the scaffold should supply a written statement that the scaffold is complete and safe for use before the scaffold is used for the first time and after every alteration.

PART 5: ELECTRICAL INSTALLATION

It is essential for safe operation of the suspended scaffold hoists and electrical protection devices to have an adequate power supply. The principal, electrical and scaffolding contractors should co-ordinate on the planning of the electrical installation to ensure appropriate voltage levels are provided.

- 5.1 This may include the positioning the power-board close to the scaffold, dedicated power circuits, larger sub-mains, alternative methods of positioning the power-board, etc.
- 5.2 To limit voltage drop the suspended flexible cord should:
 - not be of excessive length; or
 - if extra length is required, have larger size conductors to compensate.

Note: An electrician or electrical inspector can provide guidance in this matter.
- 5.3 The power supply for the suspended scaffold may need to be close to the scaffold, to limit the length of the flexible cord needed to descend to the platform; this will assist in limiting voltage drop.
- 5.4 The construction power-board should be designed so the removal of the suspension flexible cord from the socket-outlet requires a person to complete a deliberate act.
- 5.5 The suspended flexible cord should be supported in a manner that protects the cable from mechanical damage and prevents the cable from bending at a radius less than the manufacturer's minimum. If manufacturer's information is not available, AS/NZS 3000 gives the minimum internal radius as 6 times the cable diameter.
- 5.6 Any suspended flexible cord shall be the heavy-duty double insulated type and be able to support its own weight over the length of the drop.

- 5.7 The flexible cord must be supported in such a manner as to prevent the cradle from fouling or causing mechanical damage to the cable. The cable should be installed so that it is not pulled across the structure of the cradle.
- 5.8 The flexible cord must be long enough to allow the cradle to descend to the ground or a lower structure, for egress, in an emergency.
- 5.9 When in use the control box should be attached to the guardrail of the cradle on the side away from the working face.
- 5.10 The electrical cables installed in the cradle should not be excessive in length, to prevent mechanical damage occurring to the cables and to limit voltage drop.
- 5.11 Electrical cables from the control box to the hoists should be enclosed for protection from mechanical damage and securely attached to cradle. Additional mechanical protection may be required and is dependent on the work undertaken (e.g. demolition, grinding, abrasive blasting).
- 5.12 There should be a system that allows the suspended scaffold to be effectively isolated from the power supply when not in use, to prevent unauthorised operation; this may be located within a locked power-board or by the use of a readily removable control panel on the cradle.

PART 6: SCAFFOLD OPERATION

The employer of persons working in the suspended scaffold, prior to operating the equipment, should have procedures and safe systems of work in place to ensure that the equipment is not unsafe when properly used and persons are not exposed to risks to health.

- 6.1 A written statement that the scaffold is complete and safe for use must be supplied by a competent person or the certificate holder responsible for erecting or altering the scaffold, prior to operating the scaffold.
- 6.10 Where access and egress is not from the ground or a protected landing, safety harnesses and lanyards shall be provided and used when entering or leaving the cradle. During this procedure, safety harnesses shall be attached to suitable anchorage points on the main structure. The cradle should also be effectively secured to prevent movement.

PART 7: FALSE CARS

The suppliers, erectors and operators of false cars, used in lift installation, should comply with the following specific requirements for false cars in addition to the relevant general sections of this document.

- 7.1 Written rescue and recovery procedures for a person supported by a safety harness must be in place, prior to installation. These procedures should be available on site, distributed to all relevant persons and made available to all emergency services.

- 7.2 Unless the employer is granted an exemption, workers carrying out this work must hold or be directly supervising by a holder of an Advanced Certificate in Scaffolding or Rigging.
- 7.3 Lift shafts should have adequately light, guidance for lift shaft lighting is given in Part 6.3 & 6.4 of the Industry Standard for Electrical Installations on Construction Sites.
- 7.4 Emergency lighting shall be provided, for a minimum of 1 hour, to allow safe egress from the lift shaft upon loss of normal lighting.
- 7.5 Guidance for false-car wiring is given in Part 6.6 of the Industry Standard for Electrical Installations on Construction Sites.
- 7.6 The installer or other qualified person shall inspect and test the installation before the car is used for the first time. This procedure should be based on the requirements of AS/NZS 4431 Appendix B and include the false car, the hoisting system and safety gear.
- 7.7 Daily the operator should inspect the false car, the suspension systems and complete the manufacturer's checklist, prior to use.
- 7.8 The following should be tested to the manufacturer's specifications at 3-monthly intervals, the hoisting winch and the instantaneous safety devices.
- 7.9 Every 6 months after commissioning the safety gear should be tested the details of these tests procedures are outlined in Appendix B of AS/NZS 4431.
- 7.10 A written record of all maintenance, inspections and repairs should be signed by the individual(s) carrying out the procedures and kept on site for the life of the installation work.
- 7.11 An operational inspection and safety procedure should be attached to the platform.
- 7.12 A notice stating the safe working load in kilograms should be prominently displayed on the platform.
- 7.13 All ropes should be protected against damage for least 2m above the floor of the platform such protection should be removable for inspection.
- 7.14 The platform should be fitted with edge protection, where the gap between the edge of the platform and the face of the wall exceeds 225mm. Edge protection should include:
 - guardrail between 900mm and 1100mm;
 - toeboard at least 150mm high;
 - midrail approximately half way between the guardrail and toeboard;
 - vertical bars with a gap of no more than 450mm fitted between midrail and toeboard.

Where the possibility exists of persons accessing the area beneath the platform while work activities are being undertaken, the platform should be fitted with toeboards.

SAFETY CHECKLIST FOR SUSPENDED SCAFFOLDS

Ref.	SCAFFOLD ERECTORS	Tick		
		YES	N/A	NO
Part	SCAFFOLD ERECTION AND INSTALLATION			
ELECTRICAL INSTALLATION				
5:1	Has an adequate power supply been provided for the suspended scaffold?			
5:2	Has the voltage drop requirements for suspended flexible cable been taken into consideration?			
5:3	Is the construction power-board situated near the support rigging of the suspended scaffold?			
5:4	Can the suspended flexible cable be accidentally removed from the power-board?			
5:5	Has the suspended flexible cable been correctly secured to the support rigging and the cradle?			
5:6	Is the suspended flexible cord the correct type?			
5:7	Has the suspended cable adequate running clearance?			
5:8	Is the suspended cable of sufficient length?			
5:9	Is the control box attached to the outside guardrail?			
5:10	Are the electrical cables from the control box to each hoist, correctly installed?			
5:11	Are the cables from the control box to each hoist adequately protected from mechanical damage?			
HANDOVER OF SCAFFOLDS				
4:18	Has the completed or altered scaffold been inspected before being used for the first time?			
4:19	Has a written statement of completion been supplied?			
4:19	Has the user of the scaffold been supplied with all safe use information?			



PART 6:

CONFINED SPACES AND TRENCH WORK

CONFINED SPACE REQUIREMENTS

(The advice in this section includes requirements from the confined spaces part of the OH&S Regulations 2007)

A confined space is a place with a restricted means for entry or exit, where harmful gases, substances, lack of oxygen and other hazards increase the risk of injury to those entering the space.

In the construction industry confined spaces may be air-conditioning ducts, crawl spaces, pits, trenches, pipes, sewers or box beams.

Confined spaces may also involve entry into an environment where postural movement is severely restricted.

Under the confined spaces Part of the OH&S Regulations 2007 your employer is required to identify all hazards associated with work in a confined space. This must be done in consultation with workers and their elected HSRs.

All employees required to work in a confined space should receive full information, instruction and training in relation to hazards and risks and be inducted into the relevant SWMS for the confined space work.

Employers should assess the need for refresher training for their employees routinely engaged in confined space work.

Under the confined spaces part of the OH&S Regulations 2007 the employer must undertake the following in relation to work in a confined space:

- Eliminate or reduce hazardous substances or emissions from plant or services connected to the confined space;
- Isolate or de-energise plant or live services connected to the confined space;
- Ensure the confined space is purged of any contaminant;
- Ensure that pure oxygen or gas mixtures with oxygen in a concentration greater than 21% by volume are not used for purging or ventilation of any contaminant in the confined space;
- Ensure that the atmosphere of the space has a safe oxygen level or if that is not reasonably practicable, the employee must be provided with air-supplied respiratory protective equipment;

- Ensure that an employee is not exposed to an atmospheric concentration of a contaminant in the confined space above the exposure standard for that contaminant, or if that it is not reasonably practicable, the employee must be provided with air-supplied respiratory protective equipment or other appropriate respiratory protective equipment;
- If there is a likelihood of fire or explosion in a confined space, an employer must ensure that no source of ignition is introduced to the space;
- The employer must ensure that workers are not exposed to dangerous levels and concentrations of any flammable gas or vapour (refer to the Regulations for specific requirements);
- An employer must ensure that signs are erected in the immediate vicinity of a confined space (for the period for which work is performed) which identify the confined space and notify employees that they must not enter the confined space unless they have a confined space entry permit; and
- An employer must ensure that confined space control measures and risks in relation to work in a confined space are reviewed and revised:
 - a) after any incident occurs involving work in a confined space;
 - b) the risk control measures do not adequately control the risks; and
 - c) after receiving a request from an HSR.

CONFINED SPACE ENTRY PERMITS

In accordance with the confined spaces Part of the OH&S Regulations work in a confined space must include the implementation of a Confined Spaces Entry Permit containing the following control measures and requirements:

- Applies to one confined space only;
- Provide details of the confined space;
- Measures to control the confined space risks;
- Name(s) of employees permitted to enter the confined space;
- Period of time that the permit is in operation;
- Employer to retain each Confined Space Entry Permit 30 days from the date on which the permit ceases to be in operation;
- Continuous communication from outside the confined space between a person assigned by the employer, and the employee(s) in the confined space;
- Procedures in place to know when any employee is in the confined space;
- Procedures to ensure that all employees have exited a confined space on completion of work covered by the Confined Space Entry Permit;
- A written record of exit from confined space;

- Emergency procedures which include:
 - ensure emergency procedures can be initiated from outside the confined space;
 - the rescue of any employee from the confined space;
 - first aid provided to any employee in the confined space and after rescue from the confined space;
 - emergency procedures are rehearsed by the relevant employees;
 - quick and effective execution of emergency procedures after an emergency arises in a confined space; and
 - risks associated with the carrying out of the emergency procedures are eliminated or reduced so far as is reasonably practicable.
- Provision of air-supplied respiratory protective equipment if employee(s) carries out emergency procedures in a confined space which has an atmosphere that does not have a safe oxygen level or has a harmful level of any contaminant;
- Provision of all other necessary personal protective equipment used by employee(s) carrying out emergency procedures in a confined space. Employers to ensure compliance;
- Openings for the entry to and exit from a confined space are of adequate size to permit rescue operations and are not obstructed by fittings or plant. If that is not reasonably practicable an alternative safe means of entry to and exit from the space for rescue purposes to be provided;
- Plant provided for use in the emergency procedures to be maintained in a safe condition; and
- Relevant employees to be provided with information, instruction and training in all aspects of the confined space work including the permit requirements and emergency procedures.

SAFETY PRECAUTIONS IN TRENCHING OPERATIONS

Accidents involving excavations and trenches usually occur without warning. A collapse can occur in a fraction of a second, and without the correct safety precautions in place you could be seriously injured or killed.

Competent Person

For all trenches over 1.5 metres in depth, shafts over 2 metres in depth and all tunnels the following legal requirements apply:

- A 'notice of intention to commence operations in trenches, shafts, tunnels or other excavations'. This form should be filled out and forwarded by the authority, organisation or contractor actually carrying out the work and submit for approval the name of the person nominated to be the registered manager/supervisor of such a mine. This notice is to be received by the Victorian

WorkCover Authority's Principal Mining Inspector at least 3 days prior to commencement of works.

- The nominated competent person must be in control of the works at all times.
- All excavations should be made safe and be provided with a ground support system, soldier sets, close sheeting or steel shields.
- Wherever excavations or trenches exist where passers-by could accidentally stumble or fall into them; safety barriers, warning signs and suitable night lighting must be provided.
- A task specific job safety analysis (JSA) and work method statements must be developed including control measures for the safe use of all excavation plant & equipment. All workers must be inducted into the JSA and work method statements prior to commencing works.

Site Inspection

Before commencing excavations a site inspection must be carried out to determine the:

- Nature of the ground (soil, rock, re-filled type);
- Possibility of flooding from any water source;
- Proximity of previously dug excavations;
- Presence of static loads (such as buildings, structures);
- Proximity of dynamic loads such as traffic;
- Presence of hazardous-toxic material; and
- Moisture content of the soil.

Results of any test bores are usually available from the appropriate authorities. When they are not available, unsupported test excavations using a backhoe should be dug in doubtful areas to observe ground conditions and determine suitable ground support systems.

Daily Inspections

A daily checklist should be developed and used which covers the following safety requirements:

- The trench sides are not being undercut by the excavator bucket.
- The support systems are not being overstressed.
- The ground is not fretting or beginning to collapse into the trench.
- Tension cracks are not appearing along the trench top.
- The trench walls do not sag under the increased pressure of the excavator.
- The spoil heap is placed at least 500mm from edge of trench.
- Safe ladder access is provided into the trench.
- All workers are wearing safety helmets.

- The excavation is protected by para webbing, barricades, etc.
- Workers in the excavation are not exposed to fumes from machines.
- JSAs work method statements to be reviewed by all workers each day.

Placing The Spoil

During excavation the toe of a spoil heap should never be less than 500mm from the edge of the trench to ensure safe access along both sides of the trench. If a trench runs along sloping ground, the spoil should be placed on the down hill side.

If a spoil pile is very close to a trench, materials on the spoil pile may roll into the excavation. To prevent this, toe boards should protrude at least 300mm above the toe of the spoil pile.

Trenching – Environmental Concerns

With respect to minimising environmental harm through trenching construction and operation, see the new environment chapter near the start of this manual.

References

- Code of Practice - Safety Precautions in Trenching Operations, Number 8, 1 September 1998
- Mines Act 1958
- OH&S Act 2004



PART 7: HAZARDOUS SUBSTANCES AND DANGEROUS GOODS

HAZARDOUS SUBSTANCES

A hazardous substance means a substance that has the potential, through being used at work, to harm health and safety in the workplace. The criteria for identifying a hazardous substance are detailed from time to time in the National Occupational Health and Safety Commission's (NOHSC) Approved Criteria for Classification of Hazardous Substances (2004).

Hazardous substances can include the following:

- Paints, solvents, glues, sealants;
- Particle fibreboard, MDF, insulation material;
- Concrete, cements, cement finishes, concrete sealants, and some plasters;
- Grease, oils, fuels, asphalt/bitumen;
- Welding fumes produced or generated from a non-hazardous substance; and
- Other hazardous substances such as wood dust, silica and lead produced from grinding, cutting or sanding.

Material Safety Data Sheets

The employer must find out if a substance is classed as hazardous by obtaining a Material Safety Data Sheet (MSDS) for the substance from the manufacturer or importer.

- The manufacturer's MSDS must be obtained.
- Do not alter the MSDS in any way.
- If the MSDS is older than 5 years obtain the latest MSDS from the manufacturer.
- MSDS should be readily accessible to employees.
- An MSDS register should be accessible to First Aiders.

If the MSDS fails to provide sufficient technical information (e.g. does not identify the specific chemical entities) seek clarification from the manufacturer or expert advice from a qualified hygienist. This may include a reputable chemical data base.

Remember a MSDS does not tell you whether a product is safe for use. Chemical products which have been classified as hazardous must be properly assessed as to their suitability for application on site.

Risk Control

The hazardous substances part of the OH&S Regulations obliges employers/contractors to control the risks associated with hazardous substances at the employer's workplace by applying the Risk Control Hierarchy approach based on the criteria of reasonable practicability. The controls below are in priority order for selection:

- Eliminate the hazard;
- Substitute the substance with a substance that is less hazardous or a less hazardous form of the substance;
- Isolate employees from the source of exposure to the hazardous substance;
- Use Engineering Controls;
- Use Administrative Controls; and
- Provide appropriate personal protective equipment to employees.

In assessing whether elimination or substitution should apply, employers must consider the following:

- Some substances are prohibited and cannot be used (e.g. benzene, asbestos);
- There are also special requirements for some scheduled and/or carcinogenic substances (e.g. health surveillance, licence to use); and
- Some chemical products may be deemed as unacceptable because under normal conditions of use these products release highly toxic vapours, fumes or dust which exceed the Exposure Standard nominated in the MSDS.

In order to document the required control measures, it is good practice for employers, in consultation with workers and their elected HSRs, to develop an SWMS for hazardous chemical products which have been assessed as suitable for use.

Review of Risk Control Measures

Employer must ensure that measures implemented to control hazardous substances risks are reviewed and, if necessary, revised in the following circumstances:

- a) Before any change is made to systems of work that is likely to result in changes to hazardous substances risks;
- b) If an employer receives advice from a registered medical practitioner that adverse health effects have been identified by the health surveillance;
- c) After any incident occurs that involves a hazardous substance in the workplace;
- d) For any other reason, the risk control measures do not adequately control the risks; and
- e) After receiving a request from an HSR.

Atmospheric Monitoring

Employers must ensure that atmospheric monitoring is carried out if there is uncertainty (based on reasonable grounds) as to whether the Exposure Standard is, or may be, exceeded; or atmospheric monitoring is necessary to determine whether there is a risk to health.

Employers must ensure that an employee is not exposed to an atmospheric concentration of a hazardous substance supplied to, or generated at the workplace above the exposure standard for the substance or any of its ingredients.

Register of Hazardous Substances

A Register of Hazardous Substances must be kept at the workplace in accordance with following requirements:

- A list of the product names of the hazardous substances supplied to workplace;
- A copy of the MSDS for each of the hazardous substances supplied to the workplace;
- The Register is readily accessible to any employee who may be exposed to a hazardous substance. It is good OH&S practice to document all chemical products used in the workplace in the following tabulated form:
 - date of entry;
 - name of subcontractor;
 - name of product;
 - type of application or use;
 - quantity involved;
 - locations of chemical product on site;
 - availability of MSDS (Yes/No);
 - hazardous substance (Yes/No);
 - dangerous good (Yes/No); and
 - SWMS necessary for use (Yes/No).

DANGEROUS GOODS

Dangerous goods are classified on the basis of immediate physical or chemical effects, such as fire, explosion, corrosion and poisoning affecting people, the environment or property. Dangerous Goods used at the site may include:

- Explosives;
- Flammable liquids, such as unleaded petrol, kerosene, turpentine and flammable paints;
- Corrosives, such as hydrochloric acid;
- Oxy acetylene welding sets; and
- LPG.

Ensure there is an MSDS for each dangerous good. An MSDS should provide the following relevant information:

- The dangerous good class if applicable;
- The required correct personal protective equipment when either handling or using the goods;
- First aid provisions;
- Safe storage requirements;
- Emergency procedures in case of spills or fire.

Examples of control measures for dangerous goods commonly used on sites are as follows:

1) Flammable and combustible liquids

- Flammable liquids must be stored away from any ignition sources or sources of heat.
- Containers should be kept closed when not in use and secured when the site is unattended.
- All combustible materials should be removed from areas where flammable liquids are stored, used or decanted.
- Flammable liquids must be transferred in a safe manner with a dry chemical fire extinguisher available as the extinguishing agent.
- Ensure no personnel smokes cigarettes near flammable or combustible substances and display NO SMOKING signs where these are stored.
- Oily rags which can spontaneously combust in hot weather should not be left in piles.

2) Liquid petroleum gas (LPG)

- LPG cylinders must be kept in an upright position at all times and restrained from falling.
- Cylinder valves should be kept closed when not in use.
- Ensure LPG is not stored near ignition sources.
- Provide a dry chemical fire extinguisher as the extinguishing agent.
- LPG cylinders should never be turned upside down to freeze pipes.
- LPG cylinders should be stored in a well ventilated area away from combustible materials.
- Security should be provided for cylinders when the site is unattended.

3) Explosives

- Explosives must be kept in a locked receptacle.
- Discarded detonator boxes must not be left on the site.
- Excess explosives must not be left on an unattended site.
- An explosives licence must be obtained from WorkSafe to buy and discharge explosives.

Filling Portable Generators

Filling portable generators with petrol creates vapours that can be easily ignited by static electricity or other ignition sources. Workers can be seriously injured if petrol ignites.

Where it is not practicable to use mains power or a diesel generator, a petrol generator may be used.

When filling a portable generator observe the following measures:

- Use approved fuel containers and funnels to reduce the risk of generating static electricity while decanting petrol;
- Ensure suitable fire extinguishers are immediately accessible;
- Ensure portable generators are always placed on firm ground, in well-ventilated areas, away from heat and possible ignition sources;
- Do not fill generators inside a vehicle, trailer or plastic surface that prevents the discharge of static electricity;
- Ensure the container cap is replaced tightly on the filled generator before moving the generator; and
- Allow the motor to cool and ensure the generator is in an upright position in a well-ventilated space before transporting.



PART 8:

CONTROL OF HAZARDOUS DUSTS, FIBRES OTHER CONTAMINENTS

ASBESTOS

Asbestos is the general name used for a group of naturally occurring mineral silicate fibres. Use of this material has been either banned or restricted.

There are 3 types of asbestos

White Asbestos (Chrysotile)

Its fibres are curly and difficult to separate. They are white to grey in colour.

Brown Asbestos (Amosite)

It is a type of asbestos found most often in sprayed insulation materials.

Blue Asbestos (Crocidolite)

It will still be encountered in maintenance and removal work. Its fibres are straight and coloured dark blue.

In Australia, asbestos importation has been banned since the end of December 2003. In Victoria, as well as importation being banned, so has the use and re-use of asbestos. Significant quantities of asbestos remain in installations and exposure can still occur.

The **ill health effects** of exposure to asbestos arise from **breathing in**, and retention of, very **small fibres of asbestos**.

The finest asbestos fibres, with a diameter less than 8 millionths of a metre, penetrate deep into the lungs of exposed workers and are never removed. The longest of the fibres defy the body's normal defence and clearance mechanisms. Over time, the diseases caused by asbestos are:

- **Asbestosis**
Progressive scarring (fibrosis) of the lung, leading to pain, breathlessness, and eventually death. There is no known cure.
- **Lung cancer**
Tumours of the bronchial tubes and lungs, occurring up to 25 to 30 years after the first exposure, and normally fatal. The risk increases greatly in workers who smoke (although the relative risk contributed by asbestos for both smokers and non-smokers is similar).

- **Mesothelioma**
Is a cancer of the lining of the chest (pleura) or of the abdomen (peritoneum). This tumour thickens the lining and may eventually totally enclose the lung. This is painful and invariably fatal.
- **Other cancers**
Of the larynx, stomach, large intestine and possibly of ovary, breast, kidney and bone marrow.

These cancers and, in particular, mesothelioma, have been produced in humans and animals BY ALL FORMS OF ASBESTOS. Hence, they should be regarded as being equally hazardous. The scientific literature reports that mesothelioma have developed up to 25 to 30 years after exposure, even when that exposure has been minimal.

Other indications of asbestos exposure are:

- Pleural plaques patches of thickening of the lining of the chest wall and over the diaphragm; and
- Pleural effusion - collection of fluid within the chest but outside the lung.

Location of asbestos products

Asbestos in buildings is usually found in one of three forms:

- Sprayed asbestos (limpet asbestos);
- AC sheeting; and
- Lagging.

LOCATION OF ASBESTOS MATERIAL FOR THE ELECTRICAL INDUSTRY	
Material	Surface
Zelemite	Electrical backing board
Woven material	Cable sheath
Woven material	Spark arresters (within fuse holder)
Millboard	Electrical backing board insulation
Millboard	Electrical cabinet lining
Millboard	Air-conditioning eheat coils
Fibro cement sheeting	Electrical cabinet lining
Fibro cement sheeting	Spark arresters
Fibro cement sheeting	Electrical room lining
Fibro cement sheeting	Flash guards
Insulation	Fire door core
Insulation	Cable penetrators

Asbestos was also used widely in the lift industry. Asbestos-containing materials have been found in the:

- Motor room doors;
- Lift car and hall doors;
- Controllers;
- Lagging on motors and generators;
- Switchboards;
- Arc shields on high voltage/current circuits;
- Lift motor brake linings; and
- Door lock insulation.

This is not an exhaustive list, but is indicative of what may be encountered in a pre-1980s installation (in regard to electrical only).

Medical Examinations

It is recommended that any worker who may have been or will be exposed to asbestos should have a medical examination followed up by a complete medical examination once a year.

All medical examinations shall be conducted by union approved doctors and at the employer's expense. The medical examination should entail a clinical examination and pulmonary function tests with a statement of the worker's occupational and smoking history. X-rays should be kept to a maximum of once a year, but there should be no more than 3 years between x-rays.

If exposure occurs the worker should be issued with a letter outlining the exposure details and a copy of the letter is to be included in the medical records. Records of medical examinations are confidential and can only be revealed to the employer upon receipt of a release form signed by the patient. No medical details should be conveyed to the employer apart from a certificate indicating the fitness of the worker to perform the work in question.

A worker shall not be kept on asbestos-related work if, in the opinion of a medical officer, the worker has an asbestos-induced disease.

ETU And VTHC Policy Procedures On Asbestos In-Situ In Existing Occupied Workplaces

There is no safe known level of exposure to asbestos. No employee should be expected to work in any situation where they may potentially be exposed to levels of airborne asbestos fibre above 0.01 - the limit of detection.

- 1) In those premises where it is suspected that asbestos material exists, a comprehensive asbestos audit must be undertaken by an approved hygienist and not a removalist.

- 2) Having identified the presence of exposed asbestos material on the completion of the audit, management, in consultation with the HSR and/or safety committee, must make a commitment to undertake a program of removal. Asbestos encapsulation is only permitted as either a temporary procedure prior to removal or in situation where removal itself is not technically achievable.
- 3) Asbestos material which is found to be in a deteriorated condition or of a form where fibre release is probable - i.e. damaged pipe lagging or sprayed limpet asbestos - must be subject to immediate action. The following safety precautions must be undertaken.

All workers must be evacuated from the vicinity of the asbestos at a distance of at least 10 metres. This would automatically involve relocating the employees to another room if the building was not an open plan work environment. The distance may be greater than ten metres in these circumstances. It should be noted, however, that in situations where the asbestos may be subject to the air movement caused by a ducting system, the area to be evacuated would include the whole work area serviced by that system.

Quarantining of the contaminated work area pending asbestos removal at a later date (more than 48 hours following identification) would (a) involve the building of a proper enclosure in the case of friable material and (b) the application of an approved sealant (by an approved removalist properly protected) in the circumstances of localised damaged pipe asbestos lagging. In the latter instance the application of the sealant would not remove the quarantine status of the affected area. Significant section of damaged lagging would require an enclosure also. After repair or removal, an independent hygienist should certify the removal area is safe to re-occupy. As well as airborne monitoring and a visual inspection, the ETU recommends that swabs are taken to confirm that the area is safe for work to continue.

The construction of the enclosure should follow the Standard Specification for Asbestos Removal from Building and Construction Workplaces. Victorian Asbestos Removal Industry Consultative Committee 1992 (edition 2).

The building of the enclosure will not affect the requirements for the buffer nor permit return to work within the 10 metre zone.

- 4) Electrical workers are not asbestos removalists. When the presence of asbestos is confirmed in your workplace, it will be absolutely essential that any asbestos is removed by trained and qualified removalists only. The Occupational Health and Safety Unit of the Victorian Trades Hall Council have lists of fully qualified and trained asbestos removalists. These removalists will ensure that removal work is undertaken in accordance with all safety regulations and that asbestos is disposed of correctly. Don't accept any other removalist!


- 5) HSRs have a right to call in anyone to assist them with their duties (see Section 58(1) (f) of the Occupational Health and Safety Act 2004). The HSR can call in the Union to assist.

It is advisable that HSRs ensure that the employer only engage the services of specialists in the area of asbestos detection and sampling/testing.

For example, when you detect a substance at your workplace which you believe to be asbestos or contains asbestos, such as lagging around pipes, insulation, cement sheet, gaskets, you will require verification that it is actually asbestos.

This will involve the use of independent consultant who will test the material and may also perform air monitoring tests to check for airborne asbestos particles.

Contact the ETU or VTHC for assistance and advice on independent consultants.



Slater Gordon
Lawyers

**ASBESTOS EXPOSURE
REGISTRATION FORM**

This form should be completed if you believe you may have/have been exposed to asbestos. The information will be added to Slater & Gordon's extensive private database. Should you wish to claim compensation in the future due to an asbestos related disease this information may assist in making your claim more straight forward.

1. Name _____
 Address _____
 Telephone (home) _____ (work) _____
 (mobile) _____
 Date of birth: _____

2. **Where were you exposed to Asbestos?**
 Work Home Other

3. **Please give details of your exposure, for example, at work, the employer's name and your job etc. (or if exposure not known – work history):**

Employer: _____
 Address: _____
 Employment dates: _____
 Date(s) exposed: _____
 Job Title: _____
 Description/asbestos products/area: _____

ASBESTOS: OCCUPATIONAL HEALTH AND SAFETY REGULATIONS 2007

The Regulations impose responsibilities and duties on employers, occupiers, self-employed people and employees.

The Regulations prohibit the manufacture, supply, storage, transport, sale, use, re-use, installation and replacement of asbestos or asbestos-containing materials since the end of December 2003.

The Regulations cover asbestos usage in the following broad areas:

- In-situ asbestos, fixed or installed in buildings, structures, ships and plant;
- Demolition and refurbishment of buildings, structures, ships and plant with in-situ asbestos; and
- Asbestos processes which include asbestos removal and handling of articles containing asbestos, processes, resulting in airborne asbestos in excess of one half of the exposure standard, maintenance of plant used in any asbestos processes and laundering of asbestos contaminated personal protective equipment.

In these regulations where an obligation is placed on more than one person, each person must meet obligations to the extent of which they are capable.

The Victorian WorkCover Authority licenses all recognised asbestos removalists. The Victorian Trades Hall Council has a list of preferred asbestos removalists.

Meaning of exposure standards

Exposure Standards sets out the time weighted average fibre concentration in the air breathed by a worker calculated over an 8-hour working shift.

The exposure standard is 0.1 fibre/millilitre of air when measured in the breathing zone over a minimum period of 4 hours in accordance with the Membrane Filter Method.

The Union position is that there is no 'safe' level of exposure to asbestos as all forms of asbestos can cause cancer.

Regulation Requirements

OCCUPIERS

Identify, assess and control

- In the case of asbestos:
 - identify whether asbestos is present in the workplace;
 - identify any inaccessible areas that are likely to contain asbestos and either deem that asbestos is present or arrange for samples to be taken;
 - assess the risk of exposure of employees within specified time frames; and

- Where there is a risk of exposure, provide immediate control and also develop and implement a written plan of action to control the risk by removing, enclosing or encapsulating the asbestos.
- In the case of demolition and refurbishment of buildings, structures, ships and plant which contain asbestos-containing material, assess the risk to employees arising from the work before demolition and refurbishment, and control any risk using a hierarchy of control measures.

EMPLOYERS

Identify, assess and control

In the case of asbestos:

- Identify whether asbestos is present in the workplace;
- Assess the risk of exposure of employees within specified time frames; and
- Where there is a risk of exposure, provide immediate control and also develop and implement a written plan of action to control the risk, by removing, enclosing or encapsulating the asbestos.

Label

- That the presence and location of asbestos is clearly identified; and
- Where practicable, the identification is by labelling.

Control Exposure

Measures in fibres/millilitres:

- Eliminate, or where this is not practicable, reduce, so far as is practicable, the exposure of employees to asbestos; and
- Ensure that the exposure of employees to asbestos does not exceed the exposure standard (0.1 fibres/millilitre).

Provide Training

- Ensure employees are trained in the need for, and use and maintenance of, respiratory protective equipment and that the equipment is fitted and maintained in functional order where their use is required.
- Provide employees with appropriate training which will enable them to carry out their tasks in a safe manner and without risks to their health and safety, and to the health and safety of other employees.

Consult

- Consult with relevant employees and HSRs before action is taken to assess and control risks. Employees and health and safety representatives must also be consulted in relation to medical examinations.

EMPLOYEES

Personal Protective Equipment

- Wear protective clothing provided by the employer while working on an asbestos process.
- Wear respiratory protective equipment provided by the employer when the nature of the work requires that it be worn.
- Report any defect or malfunction in respiratory protective equipment required to be worn to the employer's representative.

Prohibition

The following activities are prohibited in regard to asbestos or asbestos-containing materials: manufacture, supply, storage, transport, sale, use, and re-use, installation and replacement of.

Workplace Strategy For Control Of Hazard

- A strategy to prevent work-related injury and illness must be aimed at modifying the workplace - controlling the hazard at source - rather than modifying, screening or excluding workers from the workplace.
- A survey by suitably qualified occupational hygienists should be undertaken to discover: where asbestos has been used; where it is likely to crumble or be disturbed; what state the asbestos is in; and where fibres are likely to be breathed in by workers. (It is not desirable to rely exclusively on measurement of airborne concentrations, as these are normally low, and their measurement takes the focus away from the essential point, which is the PRESENCE of asbestos and its LIKELIHOOD OF EMITTING AIRBORNE FIBRES.)
- A programme for the control of any asbestos identified should be implemented which will involve (depending on the results of the survey):
 - i) leaving the asbestos intact (but labelled) if it is in good condition and unlikely to be disturbed and unable to feed fibres into workers' breathing zones;
 - ii) encapsulating or deep sealing the asbestos, if it is in good condition and unlikely to be disturbed; and
 - iii) removal of the asbestos, if its surface is damaged or crumbling, or it is likely to be disturbed, e.g. by maintenance work.
- If the asbestos is left intact or sealed, there should be regular reviews of the state of the surface. It should also be labelled for future identification purposes.
- If exposure has been serious, regular medical checks should be arranged for all exposed workers.
- The employer should formally acknowledge in writing that workers have been exposed to asbestos in case diseases develop later and compensation claims are to be made.

Asbestos Waste disposal

The disposal of waste asbestos, whether from a workplace or household, is controlled by the Victorian Environment Protection Authority (EPA). In addition, EPA controls the transportation of waste asbestos when undertaken by a commercial contractor.

Under the Environment Protection (Prescribed Waste) Regulations 1998, asbestos from industrial origins (including commercial or trade activities) is a prescribed industrial waste. EPA regards any material containing more than 1% asbestos by volume as an asbestos-containing material.

When a commercial contractor (i.e. a licensed asbestos removalist) undertakes the removal of the asbestos from a domestic source, transport certificates and a permitted vehicle are required.

Asbestos must be disposed of only at a site licensed by EPA to accept waste asbestos. Persons intending to dispose of waste asbestos (both industrial and domestically sourced) should contact the disposal site operator to check whether the site is appropriately licensed to accept the waste. Licence conditions require waste asbestos to be handled and covered in such a manner that asbestos dust is not generated. This and the long-term security of the disposal operation are to be achieved by the following measures or equivalent practices.

To locate a transport and disposal facility for any prescribed wastes including asbestos, check the EPA website at <http://www.epa.vic.gov.au/waste/iwdb/default.asp>

Identification, management, handling and removal of asbestos in a workplace is regulated by the Victorian WorkCover Authority Control Plan:

- Division 5.
- Division 6.

SILICA DUST & SILICOSIS

Free crystalline silica is one of the most common minerals in the earth's crust. It is found in sand, many rocks such as granite, sandstone, flint and slate, and in some coal and metallic ores. The three most common forms are quartz, tridymite and cristobalite.

Silica from occupational sources is a major danger. Quartz and cristobalite are class 1 carcinogens (cancer-causing substance).

Many workplaces are not aware that common building products such as clay bricks, concrete, tiles and fibro cement products contain silica. Silica dust is usually created when such building products, sandstone or rocks are cut, drilled or worked on in a way that creates fine particles of silica in the air.

When workers inhale the crystalline dust, it may begin a process that results in full blown silicosis.

Silicosis is not a naturally occurring disease. Its development is directly associated with workplace exposure to silica dust. Workers who are most at risk include those engaged in tunnelling and excavation work, road building, demolition work and explosive blasting work, as well as those in slate, granite cutting and glass manufacturing industries, brick making and some manufacturing processes.

Legal standards

Silica is classified as a hazardous substance and is therefore regulated under the Occupational Health and Safety Regulations 2007, Part 4 Chapter 4.1 Hazardous Substances.

This means that the employer has the legal duty to identify the hazard and eliminate or control any risk, provide information and training, undertake atmospheric monitoring, maintain records and, in the case of chrystalline silica, carry out health surveillance.

On 1 January 2002, the use of materials containing more than 1% crystalline silica for abrasive blasting was prohibited in all Victorian workplaces. The prohibition was made under the Occupational Health and Safety (Hazardous Substances) Regulations 1999. This means materials such as silica sand: river sand, beach sand and other white sands must not be used for abrasive blasting.

Health effects of silica dust

Initial exposure to silica dust will cause irritation of the eyes, nose and throat like most other dusts. However, if excessive amounts of silica dust are breathed into the lungs over a period of time, it can cause damage to the lung tissue. Other than some breathlessness during exercise, the disease can remain free of symptoms for 10–20 years after exposure.

Silicosis, Acute silicosis and silicotuberculosis are all diseases caused by exposure to silica dust; silica dust can also cause or exacerbate chronic bronchitis, chronic airway obstruction and lung cancer.

The most common form of silicosis develops after long exposure to relatively low concentrations. Once the disease has begun, it will continue to progress even if the worker is removed from further exposure. There is no medical treatment for silicosis. People with silicosis are also at greater risk of developing lung cancer. In 1996 the International Agency for Research on Cancer classified crystalline silica dust as a human carcinogen (Group 1).

The size of the silica particles is important in causing the disease. Larger particles are usually prevented from reaching the lung's small air sacs, it is the smaller particles (less than five thousandths of a millimetre) that are the most dangerous.

The development of silicosis depends on a number of factors including the:

- Amount and kind of dust inhaled;
- Percentage of free silica in the dust;

- Form of silica;
- Size of the silica particles;
- Duration of exposure;
- Individual's natural body resistance; and
- Presence or absence of complicating factors (such as infection).

How is the disease detected?

Silicosis is difficult to detect in its early stages because of the absence of symptoms. Frequent dry coughing, shortness of breath, wheezing and increasing tiredness are possible early indicators.

There are three main methods of diagnosis:

- 1) Chest x-rays are the most reliable and the earliest means of detection. An x-ray can show the presence of fibrous tissue.
- 2) Work history is particularly useful in differentiating silicosis from other dust related diseases with similar symptoms and formation, such as asbestosis.
- 3) Lung function tests performed using a spirometer, assess the performance of the lungs.

How to control silica dust at work

The only effective protection against silicosis is to prevent silica dust in the air.

Under their obligations in the OH&S Act 2004, employers must take measures to ensure that workers are not exposed to silica dust. There a number of simple control measures that can be taken.

Substitution

Where possible, less toxic substances should be substituted for silica sand:

- Olivine and zircon sand should be used in moulds and cores in foundries.
- Metallic shot, slag products or grit should be used for abrasive blasting (it is now illegal to use sand for abrasive blasting).
- Alumina should be substituted for flint in china placing in pottery.
- In some building work, silica dust problems can be eliminated by using pre-built materials for plumbing and wiring.

Engineering Controls

Tools causing dust for example grinders and saws should be fitted with dust extraction devices. Where possible, dusty processes should be fully enclosed and have an exhaust hood attached. Where this is not possible a local ventilation system should be in place with hoses as close as possible to the head of cutting tools.

Use tools fitted with a water attachment to suppress dust. Spraying with water in processes such as grinding or drilling can reduce the amount of dust by as much as 75%.

Dust Extraction/Clean Up

The removal of residual dust generated by the work process must be done in a manner that will not make the dust airborne.

Regular vacuuming and wet sweeping of floors and machinery to remove settled dust is particularly important to stop dust being kicked back into the air. Work clothing should be vacuumed before removal. Under no circumstances should dry sweeping take place in areas where silica dust could be present.

Posters and signs warning of the presence of free silica should be prominently displayed.

Respiratory Protective Equipment

Unfortunately, for many jobs, some form of respiratory protection will be required. The type of respirator will depend on the amount of dust created by the process. Ensure the workers are thoroughly trained in the use and maintenance of respiratory protective devices. This training must be provided by an appropriately trained person before workers are required to use the PPE.

Where there is likely to be excessive dust, all other workers should be cleared from the area so as prevent any unnecessary exposure.

It is important that there be monitoring of silica dust levels generated by the activity. The results can then be used to establish effective control methods in work practices and ensure that they remain effective. It is important that an approved hygienist who can also provide advice on workplace control strategies do monitoring.

The National Occupational Health and Safety Commission (NOHSC) has revised the exposure standards for the three forms of crystalline silica, quartz, cristobalite and tridymite. The revised national exposure standards for the three forms are 0.1mg/m³ (time weighted average, 8 hours). (This is half the previous standard, which was 0.2mg/m³.)

However, exposure levels in settings like construction sites are highly variable and air sampling alone is not enough to indicate the health risks from airborne silica dust. Since silicosis is incurable, it needs to be prevented by avoiding inhalation of dust containing free crystalline silica. The basic goal of any safety program should be to prevent the formation and escape of dust.

It is very important that workers potentially exposed to silica dust have continual health monitoring to allow for early diagnosis. This may include a chest x-ray every 2 years.

SYNTHETIC MINERAL FIBRE (SMF)

SMF are fibres made from glass, rock or other materials. Common SMF products are rockwool, glasswool, fibreglass and ceramic fibre.

SMF are used for insulation, usually as batts, ceiling tiles, blankets, and loose wool.

SMF can cause dermatitis and irritation of the nose, eye and throat. They may also cause respiratory illness and ceramic fibres are possibly carcinogenic.

When using SMF products the following health and safety requirements should be observed:

- A Safe Work Method Statement should be developed for removal and/or installation tasks.
- All those required to work with SMF should receive full information, instruction and training in relation to hazards and risks and also be inducted into the relevant SWMS for the work concerned.

The SWMS should aim to eliminate the possibility of generating fibres and dust in the first place. However, where this is not practicable the SWMS should include the following controls:

- Respiratory protection (class P1 and P2);
- Cordoning off and designation of installation/removal areas with a 3 metre exclusion zone;
- Use of hand tools in preference to power tools or tools fitted with dust extraction;
- Eye protection, gloves and protective coveralls;
- Removal of contamination using an appropriate vacuum cleaner;
- Wetting loose SMF insulation materials prior to removal (where there is no electrical risk); and
- Proper disposal measures (plastic sealed bagged material). Where practicable all products to be delivered on site in a form (encapsulated, wrapped or painted with a PVA sealant) that minimises release of fibres and/or dust) and cutting and handling.

The requirements of the National Code of Practice for Synthetic Mineral Fibres should be followed.

MEDIUM-DENSITY FIBREBOARD (MDF) AND WOOD PRODUCTS

Wood dust is classified by the World Health Organization as causing cancer in humans.

Wood dust consists of small particles produced when wood is chipped, sawed, milled, shaped, planed, routed, drilled, turned or sanded. Typically, particles of wood dust are longer than they are broad or deep, and differ widely in size, varying from large (created during boring, chipping, sawing) to small (created during sanding).

The dust produced from hardwood tends to consist of smaller particles with a given method of production than for softwoods. The greatest amount of respirable (small enough to go deep into the lungs) particles are generated during sanding. Larger particles are caught in nasal hairs, mucous membrane, or in the tiny hairs (cilia) lining the air pipes.

In addition to containing particles of various sizes, dusts from various woods vary in composition of biologically active types of chemicals. Wood varieties have been classified in three groups on the basis of their biological effects:

- a) Poisonous or all allergenic;
- b) Biologically active; and
- c) Biologically inactive, or nearly so.

Exposure to wood dust can cause various symptoms. These vary depending on the composition of the wood, the preservatives used, any residue formaldehyde from adhesives added during processing and so on. These symptoms may lead to adverse health effects.

TIMBER/HAZARD	EFFECT	SYMPTOM
Boxwood sap or latex	Primary skin irritant, dermatitis	Skin irritation, eruption
Timbers usually with acrid smell, e.g. black bean	Cumulative contact dermatitis	Dermatitis, secondary infection
Oregon and green jarrah handling and splinters	Mechanical trauma, dermatitis	Dermatitis, secondary infection
Blackwood, eucalyptus, silky oak, jarrah, oregon, mulga, and shorea sap	Mucosal irritation	Rhinitis, sneezing, asthma, tight chest and coughing
Blackwood, stringy-bark	Pulmonary allergic and hypersensitivity reactions	Nasal inflammation, bronchial asthma
Ebony and some fungi	Pulmonary allergic and hypersensitivity reactions. 'wood trimmers disease' or 'farmer disease'.	Severe respiratory problems within 4 to 8 hours. Symptoms similar to flu. Repeated exposure leads to fibrosis of lungs.
Certain hardwoods such as beech and English oak are sensitisers	Sensitisation can cause allergic reactions	Skin rash or inflammation. Nasal inflammation, bronchial asthma
Western red cedar wood dust is a sensitiser and probable carcinogen	Pulmonary allergic and hypersensitivity reactions. Nasal and paranasal cancer (with long-term exposure)	Skin rash or inflammation. Nasal inflammation, bronchial asthma. Cancer from long term exposure may cause death
Oleander sap and latex is poisonous	Primary skin irritant, dermatitis	Skin irritation, eruption, poisoning

Health effects

- 1) Primary irritating effects: Skin symptoms from working with green wood (dermatitis due to direct action of wood on skin, inflammation of tissue due to splinters), sweating, coughing, hoarseness, irritation of eye membrane, excess watering of eyes, irritation of nose.
- 2) Allergic reaction effects: Asthma, inflammation of nasal mucous membrane, skin disorders (itching, follicular dermatitis, skin lesions and itching rash).
- 3) Toxic effects: Nausea, anorexia, vomiting, headaches, weakness, high fever, aching pains, nasal cancer, Hodgkin's disease, lung disorders and pulmonary fibrosis.

Note: The effects of exposure to wood dust listed above are for the dusts themselves. Glues, varnishes and binders used in the manufacture of certain timber products, e.g. custom wood, ply, chipboard are another issue.

Workplace controls

Occupational exposure to wood dusts should be considered as potentially carcinogenic (causing cancer), the concentration of any wood dust should be kept as low as possible. The WorkSafe exposure standard for hardwoods is 1mg/m³, and for soft woods 5mg/m³.

Control measures to be implemented

- 1) Contact supplier for more detailed information about the product and its handling. Request a material safety data sheet. If there is any doubt about the validity of the MSDS, obtain a data sheet from an independent source.
- 2) Make sure the machinery is fitted with properly designed and maintained dust extraction equipment and safety guards.
- 3) Wet down dusty areas with a fine spray. Keep area clean. Keep work and storage area well ventilated.
- 4) Use vacuum rather than sweeping to clean dusty areas.

Medium-Density Fibreboard (MDF)

MDF emission guidelines have been developed for total particulates, formaldehyde and opacity.

MDF consists of small wood fragments and sawdust, resin (usually urea-formaldehyde) and wax bonded together under high pressure to form a uniform manufactured board. It is commonly used for furniture, cabinetry, and door and window frames.

Health and safety issues

MDF can be dangerous to use if the correct safety precautions are not taken. MDF contains a substance called urea formaldehyde, which may be released from the material through cutting and sanding. Urea formaldehyde may cause irritation to the eyes and lungs.

Urea formaldehyde is always being slowly released from the surface of MDF. When painting it is good idea to coat the whole of the product in order to seal in the urea formaldehyde. Wax and oil finishes may be used as finishes but they are less effective at sealing in the urea formaldehyde

Recommended Control Measures

Where possible, MDF should be cut utilising equipment that does not generate dust. On construction sites the set up of a specific room to cut MDF is recommended. (A recommended format for a MDF cutting room is provided on the following page).

Where this is not possible the next most effective control measure is local exhaust ventilation. Proper ventilation is required when generating dust, and in conjunction with local exhaust ventilation, facemasks (P2 respirators) are needed when sanding or cutting MDF with machinery.

The dust produced when machining MDF is very dangerous. Masks and goggles should always be worn at all times. Due to the fact that MDF contains a great deal of glue the cutting edges of the tools will blunt very quickly.

Recommended Format For MDF Cutting Rooms

- 1) All employees involved in the handling and cutting of MDF material shall be inducted into the procedure. JSA required.
- 2) Protective equipment must be used at all times. Equipment to be used must be stated in JSA:
 - a) disposable overalls;
 - b) P2 cartridge filter respirator; and
 - c) eye and hearing protection.
- 3) Cutting of MDF shall be done in designated cutting room. The room shall consist of a built enclosure with a lockable door. Signage must be placed on doors in the area that will be affected.
- 4) Room shall have filtered ventilation.
- 5) Tools used in MDF cutting must be in good working order e.g. saws; vacuums must have dust collection bags.
- 6) Vacuums require triple filter systems and must be maintained on a regular basis.
- 7) Dust collected is to be double bagged, sealed and disposed of correctly.
- 8) Room must be cleaned daily.

LEGIONELLA

Legionnaires' disease is spread by the legionella micro-organisms that are present almost everywhere. Most require water at an appropriate temperature and nutrients to survive. The main group of micro-organisms are viruses, bacteria, fungi, algae, and protozoa.

A micro-organism that can cause serious infection in people is a bacterium of the Legionella genus, Legionella pneumophila. The infection is called Legionellosis. It can take two different forms, Legionnaires' disease or Pontiac fever.

Sources

Legionella bacteria may be found in such areas as:

- Cooling towers (air-conditioning systems including pipe work);
- Evaporative condensers;
- Spas;
- Showers;
- Potting mix;
- Fountains; and
- Nebulisers.

Risk from water sources

Legionella bacteria, when present in the biofilm (the slime on the surfaces that are contacting the water), are hazardous when they are in sufficient concentrations and are contained in the aerosol spray (airborne water particles less than 10 microns in diameter) from cooling towers.

Under appropriate conditions legionella can contaminate an air-conditioning unit or cooling tower:

- 1) Where the temperature is 20-55.C, the bacteria will multiply (most rapidly 30-43);
- 2) Nutrient levels are high (e.g. from corrosion which creates iron salts); and
- 3) There is an accumulation of organic material, sediments, and other microorganisms.

Disease

Pontiac fever is a milder form of the illness. It is a self-limited short duration, nonfatal ever. The incubation period is from 5 to 66 hours, and the attack rate is up to 95%. Symptoms include chills, headache, muscle pain, and other flu-like symptoms.

Legionnaires' disease is an illness characterised by pneumonia. The incubation period of the disease is from 2 to 10 days, and the attack rate is low.

Symptoms include an abrupt onset of high fever, non-productive cough, chills, headache and muscle pain.

Those that are most likely to be affected are:

- Those above 55 years of age;
- Males (males 2 to 3 times more likely);
- Heavy drinkers;
- Diabetics; and
- Smokers.

Legislation

There are a range of Victorian regulations that specifically seeks to limit the occurrence of Legionnaires' disease. This follows the occurrence of a large number of cases due to contaminated air-conditioning units.

These regulations, under the Health Act and the Building Act, place duties on land owners and business owners.

These regulations provide for the regular testing of cooling towers and put in place requirements should a high bacteria count be identified.

A high heterotrophic colony count (hcc), also called total bacterial count (tbc) is where the cooling tower system exceeds 100 000 colony forming units per millilitre (cfm/mL) of water.

These regulations require that a risk management plan be developed to address the risks associated with stagnant water, nutrient growth, poor water quality (including the presence of Legionella and high levels of micro-organisms) and the location of and access to the cooling tower. (Also see risk assessment document.)

Treatment

A responsible person must ensure that a cooling tower system is continuously treated with biocide to control growth of micro-organisms (including Legionella) and chemicals or agents to minimise scale, corrosion and fouling.

A cooling tower and its system is required to be disinfected, cleaned and re-disinfected immediately prior to initial start up following commissioning or a shut down greater than one month, and at intervals no longer than 6 months.

Monitoring

Tests for heterotrophic colony count must be done at least monthly. Legionella tests must be done between 1 and 13 weeks depending on the condition of and risk assessment of tower.

The results of bacteria tests (including Legionella) are generally not available for 10 days.

Action

Any test where the heterotrophic colony count exceeds 100 000 cfu/mL or where Legionella has been detected; the cooling tower must immediately be dosed with additional biocide.

An investigation should be undertaken to identify possible causes of the high count. This may include pump failure, or blockage in the biocide line. A water sample is to be taken between 2 and 4 days after the additional dose of biocide.

If the test returns positive, then the cooling tower is to be disinfected, cleaned and Redisinfectated. A further water sample is to be taken 2-4 days after.

Should the test again return positive, consideration should be given to closing the cooling tower until the problem has been remedied.

The ETU policy is that if a tower has more than 1 failure then the area is not to be entered until a positive result has been obtained.

In the case of Legionella, where 3 consecutive water samples are taken and all return positive, the responsible person must notify the Secretary of the Department of Health and Human Services immediately by phone and in writing within 3 days.

BIRD DROPPINGS

Hazard Alert: Workplace Health Bulletin New Zealand OSH 3910.14 No. 14, August 2002

Bird droppings, from large populations of roosting birds, may present a risk of disease to people. This alert provides advice on the precautions to take when cleaning up and disposing of bird droppings.

What causes the health risk?

The most serious risks arise from organisms that thrive in the droppings, feathers and nesting debris on ledges and in lofts.

External parasites may also become a problem when infested birds leave their roosts and nests. The parasites they leave behind can invade buildings and bite or irritate people's skin.

Some of the diseases that can be caused by the organisms in bird droppings are:

- **Bacterial:** e-coli; salmonella, listeriosis, campylobacter and psittacosis;
- **Fungal:** histoplasmosis, cryptococcosis, and candidiasis;
- **Viral:** meningitis and Newcastle disease; and
- **Parasitic/Protozoal:** toxoplasmosis and trichomoniasis.

There are many disease-causing organisms in our environment but because exposure is impossible to avoid, most humans develop resistance to these normal exposures.

The bacteria and parasites found in bird droppings can be (a) breathed in (b) ingested by eating contaminated food or (c) from eating with dirty hands. Infection is most likely; however, when dust containing massive amounts of the bacteria or parasites is inhaled-especially after a roost has been disturbed. Asthma-like reactions are also possible.

The risk of disease is greatly increased for people with weakened resistance i.e. those people who have existing conditions that compromise the body's defence systems, e.g.:

- Antibiotic therapy;
- Skin damage via injury or surgical trauma; and
- Chronic disease.

Where are bird droppings likely to be found?

Bird droppings are likely to be found by employees during the following types of work:

- Construction workers;
- Maintenance workers;
- People working in roof spaces; and
- Demolition workers.

Employers and employees need to be alert to these possible sources of exposure.

Precautions

- Employers should select workers whose immune status is high. Medical assistance may be needed to obtain a medical history - with attention to current diseases such as cancer, prolonged oral steroid therapy, pulmonary disease, diabetes mellitus and other conditions. (The employee's permission must be obtained first.)
- Avoid using chemicals. Chemical sterilisation of droppings before removal has not proven to be effective against all organisms (and may present another health hazard from chemical exposures).
- Dampen deposits of bird droppings with a gentle spray of water until sufficiently wet to prevent any dust becoming airborne. This may take several hours or more of repeated spraying to penetrate the mass of droppings completely.
Note: Strong jets of water may cause dust to become airborne and runoff may contaminate public areas.
- Seal off windows, doors and ventilation inlets to inhabited areas.
- Wear a high efficiency (HEPA) dust respirator, disposable gloves and overalls.
- On completion of the job treat the disposable gloves and overalls and respirator filters as contaminated waste and add them to the droppings for disposal.

- Double bag the droppings and disposables in heavy 3mm plastic bags and dispose in a landfill.
- Non-disposable work clothing and respirators should be removed, placed in a plastic bag, and sealed. These items must be disinfected in the bag before final cleaning and reuse.
- Shower after scrubbing boots.

Case histories

- 1) A 37-year-old mother of five contracted 'pigeon lung' from feral pigeons nesting outside her apartment. The family doctor said: 'The fire escape at the back would get pigeon debris on it and was cleaned regularly by the mother and one child at a time. That, we think, is why the mother had the most severe symptoms and died. The father, who did no cleaning, was unaffected.' The children are being treated for the illness.
- 2) The potential for infections (in this case histoplasmosis) to spread downwind is clearly illustrated by an outbreak that occurred when dry soil under a starling roost was bulldozed. People up to 1 mile away contracted histoplasmosis and the bulldozer operator died after a 7-week illness.

Failure to diagnose rare diseases (in this case cryptococcosis) can result in fatalities. A 46-year-old man developed a chronic neurologic syndrome after dismantling a steeple. He was treated for tuberculous meningitis and the symptoms went into remission. One year later he was hospitalised with chronic inflammation of the brain and diagnosed as having cryptococcal meningitis. By that late stage, treatment was unsuccessful and the man died.

POLYCHLORINATED BIPHENYL (PCB)

In February 2000 new legal requirements for dealing with polychlorinated biphenyls (PCBs) came into effect. These requirements directly affect the way that workers in the electrical trades do business when dealing with electrical equipment that contains, or may contain PCBs.

What are PCBs?

Polychlorinated biphenyl or PCB is any of a group of organic compounds originally widely used in industrial processes but later found to be dangerous environmental pollutants. PCBs have the chemical formula $C_{12}H_{10-n}Cl_n$ where 'n' is 1-10. They are a family of 209 congeners (chemicals with the same basic structure) where the biphenyl structure has chlorine atoms substituted for hydrogen atoms to varying degrees. Of the 209 different types of PCBs, 13 exhibit a dioxin-like toxicity. Their persistence in the environment corresponds to the degree of chlorination, and half-lives can vary from 10 days to 18 months.

Approximately 100 of these congeners are present in various technical mixtures of PCBs that were produced commercially in large quantities until the late 1970s.

Polychlorinated biphenyl is a fat-soluble, water-insoluble hydrocarbon containing chlorine. It is extremely stable, withstanding temperatures of up to 1,600°F (870°C), is fire-resistant, and has been used as a heat-transfer and insulating fluid in cooling systems and electrical equipment; it has also been used in sealants, rubber, paints, plastics, printing ink, and insecticides. PCBs have been used in electrical appliances, such as transformers and capacitors, hydraulic fluids, plasticisers and dye carriers. They are also generated and released into the environment as unintentional byproducts of chemical manufacturing and incineration. PCBs may range in appearance from clear oil to dark resin.

PCBs can enter the environment as a result of their manufacture, use and disposal; from accidental leaks during storage or transport, or from leaks or fires in products that contain PCBs. PCBs may also enter the environment from hazardous waste sites, illegal or improper disposal of industrial wastes and consumer products, and from burning some wastes in incinerators.

PCBs are capable of travelling long distances in air or water. Most PCBs will adhere to organic particles and sediments in the water bodies and will bind strongly to soil.

PCBs are not readily biodegradable.

Health effects of PCBs

PCBs are toxic to fish, killing them at higher doses and causing spawning failures at lower doses. Research also links PCBs to reproductive failure and suppression of the immune system in various wild animals, such as seals and mink.

Large numbers of people have been exposed to PCBs through food contamination. Consumption of PCB contaminated rice oil in Japan in 1968 and in Taiwan in 1979 caused pigmentation of nails and mucous membranes and swelling of the eyelids, along with fatigue, nausea, and vomiting.

Due to the persistence of PCBs in their mothers' bodies, children born up to 7 years after the Taiwan incident showed developmental delays and behavioural problems. Similarly, children of mothers who ate large amounts of contaminated fish from Lake Michigan showed poorer short-term memory function.

PCBs can enter the body in three ways:

- Absorption through the skin;
- Inhalation of PCB vapour (at room temperature, the vapour concentrations of PCBs are not significant); and
- Ingestion, if there is contamination of food or drink.

The likelihood of becoming sick from PCB exposure increases with the length of time and the amount of material that a person might come in contact with. The most commonly observed symptom in people exposed to high levels of PCBs is a condition known as chloracne. It is a severe, persistent acne-like rash due to repeated and prolonged contact of PCBs with skin. This condition has also occurred in people who have accidentally ingested PCBs orally. Very high exposure to PCBs may also cause liver damage and damage to the nervous system, resulting in numbness, weakness and tingling in the arms and legs. PCBs also suppress the human immune system and are listed as probable human carcinogens.

PCBs are classified persistent in the environment, where they accumulate in the food chain. Research has found that some animal species, such as young fish, are particularly sensitive to PCBs. PCBs in the Australian environment, and their subsequent presence in food, can also have serious effects on the export of Australia's agricultural products.

PCBs are amongst a broader group of harmful persistent organic pollutants (POPs) that are toxic, persist in the environment and animals, bioaccumulate through the food chain, and pose a risk of causing adverse effects to human health and the environment. Because of their physical characteristics, POPs are transported long distances and are often deposited in areas where they have never been used or produced.

PCBs may cause a wide range of harmful health effects in humans and animals, including skin complaints, cancer, liver damage, immune system suppression and damage to the nervous and reproductive systems. PCB contamination may cause mutations in plants, decline in some bird populations and reduced reproduction in sea mammals.

These concerns over the potential risks to health, food chain and environment led to a ban on the importation of PCBs in the 1970s.

The aims of the PCBs Management Plan are the phasing out, disposal and destruction of PCBs. Copies of the plan are available from the Department of the Environment and Heritage website (www.deh.gov.au/industry/chemicals/scheduledwaste/pcbs/index.html).

Restrictions on the importation of PCBs and PCB contaminated/containing equipment

The importation of PCBs and PCB contaminated/containing equipment to Australia has been banned.

Regulation 4AB under the Customs (Prohibited Imports) Regulations 1956 prohibits import of PCBs and other chlorinated biphenyls and goods containing these, without the written consent of the Minister for Justice and Customs. In practice, where a request to import prohibited PCBs is received, the Australian Customs Service will seek advice from the Department of the Environment and Heritage and the National Industrial Chemicals Notification and Assessment Scheme (NICNAS).

Identification of PCB containing equipment

Until the 1970s, PCBs were widely used in electrical equipment due to their insulating, fire resistance and dielectric properties. Electrical contractors will most likely encounter PCBs in capacitors in fluorescent light fittings, electric motors, ceiling fans and dishwashers, particularly in premises built before 1980.

A booklet, Identification of PCB containing Capacitors (ANZECC 1997), has been published to assist electricians identify PCB-containing equipment. The Department of Infrastructure also has a publication titled PCBs in Buildings, which provides an overview of PCB management in buildings. These publications provide details of handling and safety precautions.

PCB management

A National Management Plan provides guidance on the safe management and phaseout of PCBs, setting minimum standards for storage, handling, use and disposal of PCB-containing materials.

The use, sale, storage, handling, transport, treatment and disposal of PCBs are regulated by the Environment Protection Authority (EPA) under the Environment Protection Act 1970. An Order under Section 30D of the Act (the Order) establishes PCBs as notifiable chemicals and implements the National Management Plan through law.

The Order prohibits the storage, handling, use, sale or supply of PCBs, whether in use or as waste, without an approved Environment Improvement Plan (EIP) or the written consent of EPA.

Contravention of the Order is an offence under the Act and may attract significant penalties. Already this year, several cases of unlawful handling of PCBs have been investigated by EPA. Two of these cases have involved the transport of PCB-containing lighting capacitors by electrical contractors.

Currently there are no air quality environmental guidelines for PCBs. In 2000, the Australian and New Zealand Environment and Conservation Council (ANZECC) and the Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ) established trigger levels of 0.01-1.7 micrograms of PCBs (as Aroclor 1242 and Aroclor 1254) per litre of fresh water. No trigger levels were established for PCBs in marine water.

Consent from EPA

EPA Publication 693, Guidelines for the Management of Polychlorinated Biphenyls (PCBs), provides a summary of the requirements in Victoria, with particular reference to the Order and to EIPs for PCB management. These replace previous guidelines (EPA Publication 512).

Where an EIP has not been approved by EPA, a person who intends to transport PCBs must complete an application form, as reproduced in EPA Publication 693. This form must be submitted to EPA for approval. EPA will issue a consent number if sale or supply is approved. In seeking consent, information must be provided to EPA including the estimated PCB quantity and concentration. The EPA permit number of the transporter and EPA licence number of the intended destination should also be included when these are known.

Employers' Obligations

Electrical contractors encountering equipment that contains or may contain PCBs must deal with the PCBs according to the legislation. This means that if you store, handle, use or transport PCBs you must have an EIP for your activities and/or premises approved by EPA.

Waste PCBs must be securely sealed in a suitable container and transported on a vehicle permitted by EPA to carry PCB waste. As a prescribed industrial waste, a waste transport certificate must be completed for waste PCBs. If an approved EIP is not in place, an application for consent to supply the PCBs must be made to EPA and approval given before transport. Most PCB waste contractors have vehicles permitted to transport PCBs and will be able to provide waste transport certificates and assistance with application to EPA for consent to supply PCBs.

A list of the premises licensed to accept PCBs for treatment or disposal is available from the EPA website (www.epa.vic.gov.au) or from the EPA Information Centre.

Additional requirements apply to the occupiers of premises where PCBs are located. These include certain management and phase-out requirements for equipment containing PCBs which are consistent with the National Management Plan. There are also record keeping requirements, notification to EPA of PCBs over a certain quantity, and certificates of destruction or disposal. Electrical contractors may wish to make their clients aware of these legal obligations.

Applications for EIPs and consent for sale or supply should be made to EPA, Technical Support, GPO Box 4395QQ, Fax: (03) 9695 2692.

Cleaning up PCB spills and leaks

Where a significant spill (i.e. in excess of 500mL) to the environment has occurred, notify the appropriate state environment authority.

Transporting PCBs

Scheduled PCB material and waste must be transported in accordance with the Australian Dangerous Goods Code (ADG) and any other legislative requirements. All workers involved in the transport of PCB wastes should be fully informed of the hazards of PCBs and trained in the correct procedures required for the safe transport of these hazardous materials.

Further information

- 1) Identification of PCB-containing Capacitors (ANZECC 1997)
<http://www.environment.gov.au/epg/swm.html>
- 2) Department of Infrastructure Information Sheet Number 17: PCBs in Buildings
<http://www.doi.vic.gov.au>
- 3) Polychlorinated Biphenyls Management Plan (ANZECC 1996)
<http://www.environment.gov.au/epg/swm.html>
- 4) Variation of an Order Relating to Notifiable Chemicals. Victorian Government Gazette Special No. 5
<http://www.craftpress.com.au/gazette>
- 5) EPA Information Bulletin 693: Guidelines for the Management of Polychlorinated Biphenyls (PCBs)
<http://www.epa.vic.gov.au/industry>

HANDLING PROCEDURE FOR POLYCHLORINATED BIPHENYL PCB

Electrical workers encountering equipment that contains or may contain PCBs must follow these procedures:

- Eye protection must be worn, for overhead work a full face shield must be worn.
 - Wear gloves that are resistant to PCBs:
 - Nitrile gloves .011: 30 Min protection; or
 - Nitrile gloves .025: 4 hrs protection.
- Note:** Always consult manufactures specifications!
- Mid-arm gauntlets may also be required an assessment should be conducted on the job.
 - An application of a silicone based barrier cream used as per manufacturer's specifications will increase the resistance to PCB penetration.
 - Impervious disposable overalls such as "Tyvek" or similar chemical-resistant overalls must be worn.
 - Chemical resistant boots or overboots must be worn.
 - A twin cartridge respirator suitable for chlorinated vapours must be worn if PCB contaminated oil etc, is heated to above the ambient air temperature.

- After handling PCBs, even if gloves were worn, wash hands and face well in warm soapy water before eating - drinking etc.
- Any non-disposable equipment must be washed down with kerosene; the contaminated kerosene must be collected and disposed of as a PCB contaminant.
- All protective clothing, gloves - overalls etc. which have come in to contact with PCBs must be properly disposed of as contaminant and not reused.

Clean-up

The procedure detailed below should be followed if there are any leaks or spills of PCB-contaminated material.

Use an absorbent material such as kitty litter or diatomaceous earth to form a barrier and to soak up any PCB contaminant.

Non-porous surfaces should be cleaned with kerosene; the kerosene must be collected and disposed of as a PCB contaminant.

All porous material including protective clothing and damaged equipment which has been contaminated must be placed in a strong, sealed polyethylene bag, which is then placed into a sound sealable metal drum. An absorbent material should be packed around the PCB contaminated waste to absorb any leaks. The drum should then be sealed.

All drums must be adequately labelled 'PCB waste' together with the name of the equipment or material contained within each drum.

Storage

If PCBs cannot be transported immediately for disposal; all containers are to be stored in an area that prevents any discharge of PCBs into the environment; the area must be secure from unauthorised entry. The containers should be stored in a separate location, well away from any flammable liquids etc. PCB-containing material should be disposed of as soon as possible; however, if PCBs are to be stored for an extended period, they should be raised off the floor to avoid corrosion to the bottom of the container.

If 10kg or more of this waste requires storage or transportation, the state regulatory body must be notified of the quantity, location and type of material.

Transport and disposal

Transport requirements vary across states, Environmental authorities in each state or territory should be contacted to determine the correct transport and disposal requirements.

First aid

If PCB contaminant comes in to contact with the eyes, immediately wash it out with copious amounts of running water for at least 10 minutes. Occasionally lift the upper and lower eye lids to ensure complete irrigation of the eye. Obtain medical attention immediately.

If PCB contaminant comes in to contact with the skin, immediately remove all contaminated clothing. Wash the affected areas with warm soapy water. Do not use kerosene to remove PCB from your skin or clothing. Obtain medical treatment as soon as possible.

Note: Material safety data sheets must be consulted.

PART 9: NOISE

Noise is probably the most widespread and underestimated of industrial hazards.

All workers exposed to high noise levels run some risk of suffering permanent noise-induced hearing loss. Regulations in Victoria limit exposure to 85 decibels (A) averaged over 8 hours.

While some workers in especially noisy trades continue to suffer from serious occupational deafness, many more people at work suffer hearing loss in less acute form. This is still extremely distressing, both physically and socially.

Noise is sound energy vibrating through the air in waves, which are transmitted by the eardrum, through the bones of the middle ear to the hair-like nerve fibres (cilia) on the organ of the inner ear (cochlea).

The cilia transform the vibrations into nerve impulses, which are sent to the brain to be interpreted. The cilice is destroyed by excessive noise.

Exposure to excessive noise at work results in:

- Temporary hearing loss;
- Tinnitus (ringing in the ears);
- Permanent hearing loss;
- Stress and fatigue; and
- Increase in incident rates due to communication problems.

MEASUREMENT

There are three characteristics of noise:

1) AMPLITUDE OR INTENSITY

A decibel (dB) scale is logarithmic, not linear. An increase in 3 dB is double the intensity, while an increase of 10 dB is ten times the intensity.

2) FREQUENCY

Frequency, or pitch, is the number of vibrations per second (Hertz - Hz).

3) NOISE VARIES OVER TIME

Noise levels are rarely constant. The dose of noise over an average working period essentially determines the level of damage incurred. Leq (equivalent continuous noise level) measures this dose. Integrating sound level meters measure Leq automatically.

- Noise exposure standard
- 85 dB(A) 'averaged' over 8 hours [commonly referred to as LAeq.8h 85 dB(A)] ; or a peak noise level of 140 dB(C) (linear).

Exposure to noise must be measured at the worker's ear without any hearing protectors.

REGULATIONS

The objective of Victorian the Occupational Health and Safety Regulations 2007, Part 3.2 Noise is to ensure that the exposure of employees to noise in the workplace is controlled so as to reduce the incidence and severity of hearing loss resulting from excessive exposure to noise.

The regulations place requirements on:

Designers

Must take noise emission and exposure into account and design plant so that its sound power level is as low as practicable.

Manufacturers

Must ensure that new plant is constructed so that its sound power level is as low as practicable. If the plant, when properly used, may exceed the exposure standard, then the manufacturer must determine its sound power level and provide this information.

Importers and Suppliers

Must provide information on the sound power level of the plant.

Employers

Must ensure that, as far as practicable, the design and construction of a new workplace and new plant to be used in the workplace prevents employees from being exposed to noise levels in excess of the exposure standard, by implementing the following risk control measures in the following order:

- a) Eliminate the source of the noise;
- b) If not practicable to eliminate the source, reduce exposure by substituting quieter plant or processes, or by using engineering controls; and
- c) If workers are still exposed to noise exceeding the exposure standard after the employer has complied with (b), then reducing their exposure by the use of administrative controls.

If workers are still exposed to noise exceeding the exposure standard after the employer has complied with (b) & (c), then reducing their exposure so that it does not exceed the standard by providing hearing protectors.

All employers are required to identify, assess and control the risk of noise-induced hearing loss, in consultation with HSRs and employees, and to provide specific information to employees. Employers are also required to produce a written noise plan.

Employees

An employee must, to the extent they are capable, use control measures in accordance with training, once that training has been provided. This does include the wearing of hearing protection.

If the employer provides hearing protectors, then the employer must clearly identify by signs, labelling of machines, etc where and when hearing protectors are to be worn.

WHAT DO THE REGULATIONS REQUIRE?

The Occupational Health and Safety Regulations 2007, Part 3.2 Noise, requires employers to identify if there is a risk to employees from exposure to noise. Further, employers must identify if an employee's exposure to noise is likely to exceed the exposure standard of LAeq,8h 85 dB(A) and peak noise 140 dB (Linear).

LAeq,8h represents the noise levels averaged over an 8-hour working day. All employers are to carry out a noise assessment to determine whether their employees are at risk of hearing loss from exposure to excessive noise.

DETERMINATION OF EXPOSURE TO NOISE

- 1) Where there is uncertainty (based on reasonable grounds) as to whether the noise exposure standard is or may be exceeded, then the employer **MUST** carry out a determination of a worker's exposure.
- 2) In considering whether the exposure standard is or may be exceeded, the employer must not take into account the effect of any hearing protectors the employee may be using.
- 3) A determination:
 - a) Must take into account;
 - i) the level of the noise;
 - ii) the duration of exposure;
 - iii) plant and other sources of noise at the workplace;
 - iv) systems of work; and
 - v) any other relevant factors.
 - b) Must **NOT** take into account the effect of any hearing protectors the employee may be using.

RECORD OF DETERMINATION

The employer must make a written record of the determination that describes the matters that have been taken account and the results. The employer must keep this record for as long as it is applicable, and must make it accessible to the HSR of each DWG, and to any employees to which it applies.

WHAT DOES NOISE ASSESSMENT ACHIEVE?

Noise assessment enables employers to:

- Identify employees whose exposure to noise may exceed the exposure standard;
- Identify employees whose exposure to noise may need to be assessed more thoroughly;
- Recognise loud noise areas, tasks and processes in their workplace;
- Recognise situations where immediate controls such as simple engineering or 'quick fix' solutions can be implemented, or where hearing protection devices are needed as an interim measure; and
- Provide information to the person(s) who carry out an assessment.

WHO SHOULD CONDUCT THE NOISE ASSESSMENT?

The employer or someone else nominated by the employer can conduct the noise assessment. The person does not need specialised skills to undertake noise assessment. People who understand the work processes, as well as any relevant health and safety representatives should accompany the person(s) undertaking noise assessment. The employer must consult with relevant employees and their health and safety representatives when carrying out noise identification.

HOW SHOULD THE NOISE ASSESSMENT BE CONDUCTED?

A walk through survey of the workplace together with a review of relevant information (such as past noise assessment reports).

One noise assessment could cover the entire workplace, if it is small. If the workplace is large it may be best to divide it into areas for survey by plant, location, activities, processes or jobs. Employees without fixed locations such as maintenance personnel, cleaners and contractors are to be included. Risks from the use of portable equipment such as hand held drills and wood chippers must also be considered in the noise identification.

The key stages of noise assessment are:

- Establish the employee's workstation(s) or work area(s) during the shift.
- Estimate the noise levels at the employee's ear position during normal operating conditions. Answering questions in the Risk Identification Checklist will assist to estimate noise levels, for example:

- Recognising if there is difficulty in communication between 2 people at 1 metre distance apart (as a rule of thumb, if the speaker must raise his/her voice or the listener has difficulty understanding what is being said, the sound level may exceed 85 dB(A)).
- Obtaining results of past noise measurements or assessments.
- Determining if noise in any part of the workplace is as loud as or louder than 85 decibels.
- Reviewing noise data from manufacturers, importers or suppliers on items of plant.

An employer must review a noise assessment:

- If there are circumstances that indicate that the results of the assessment are no longer applicable;
- At any time when reasonably requested by the health and safety representative; or
- At least every 5 years.

ACQUISITION OF PLANT

An employer who proposes to acquire plant for use in the workplace must have regard to the sound power level of the plant in order to ensure, so far as is practicable, that employees will not be exposed to noise that exceeds the exposure standard.

HEARING TESTS

In order to control an employee's exposure to noise, an employer required to provide for periodic audiometric testing of their employee: within 3 months after their employee commences work and then at least every 2 years.

Audiometric Tests should be conducted in accordance with AS/NZS 1269.4 Occupational noise management, Part 4: Auditory assessment.

AS/NZS 1269.4, CLAUSE 7.4, REFERENCE AUDIOMETRY

Prerequisites: Reference audiometry shall be immediately preceded by a period of quiet (noise exposure which is unlikely to produce temporary threshold shift) of not less than 16 hours.

The results must be made available to each worker and aggregate results to the HSRs for the DWGs.

- In circumstances where worker's 2 consecutive audiometric tests indicate certain level of hearing loss, then the employer must organise and pay for an audiological examination.

INFORMATION AND TRAINING

The employer must provide their employees with information, instruction and training about the health effects associated with exposure to noise, the need for controls and the nature and purpose of audiometric testing.

PART 10: MANUAL HANDLING

(The advice in this section includes requirements from the Manual Handling Part of the OH&S Regulations 2007).

Manual handling means using your own strength to lift, move or support objects rather than using machinery or equipment to bear the load.

Some of the injuries resulting from poor manual handling include back injury, muscle sprains and strains, abdominal hernias and chronic pain. Many of these injuries are not felt straight away but develop over some time into more or less continuous pain.

HAZARDOUS MOVEMENTS AND POSTURE

Not all manual handling tasks are hazardous. The ones that can lead to problems include those in the following table:

TASK	EXAMPLES
Handling unstable, unbalanced or difficult to grasp loads	Handling reo sheets Handling long lengths of timber
Difficult repetitive or sustained use of force	Using a nail gun
Repetitive or sustained awkward posture (even if no load is being handled)	Working on plasterboard ceiling
Repetitive or sustained movement	Bricklaying
Application of high force	Lifting heavy loads
Exposure to sustained vibration	Using jackhammer, pneumatic drill

EXAMPLES OF CONTROL MEASURES

All tasks must be assessed for risk of injury and a SWMS should be developed. Risk control measures should consider:

CONTROL MEASURE	EXAMPLES
Eliminate the task if possible	Not manually lifting or carrying awkward dead weights such as cement blocks and cement bags
Change the workplace layout or environmental conditions	Placing materials at waist level rather than at floor level so they are easier to pick up
	Eliminating the need to push or pull objects up steep ramp. Providing good lighting and work areas free of obstacles with plenty of room to move
Change systems of work	Timing and placement the frequency of handling and to avoid double handling
	Team handling to reduce forces, postures on one person
Change the object	Changing the load so it is easier to handle (e.g. 20kg cement bags) Using tools that are light and have good grips and supports
Use mechanical aids	Using crane, forklifts, trolleys, chain blocks, pipehorses, hoists and similar aids to move loads
Information training and instruction	Ensuring workers understand risks and know how to use proper manual handling techniques and equipment

OCCUPATIONAL HEALTH AND SAFETY REGULATIONS 2007

Under the Manual Handling Part of the OH&S Regulations employers must, so far as is reasonably practicable, identify any task undertaken involving hazardous manual handling.

This hazard identification can be undertaken for a class of tasks rather than for individual tasks as long as the risk is properly and accurately identified.

Employers must ensure that the risk of a musculoskeletal disorder associated with a hazardous manual handling task is eliminated so far as is reasonably practicable.

If it is not reasonably practicable to eliminate the risk of a musculoskeletal disorder associated with a hazardous manual handling task, an employer must reduce that risk so by:

- a) Altering:
 - the workplace layout;
 - the workplace environment; or

- the systems of work.

- b) Changing the objects used in the task; and
- c) Using mechanical aids.

Only as a last resort can there be a sole reliance on information, instruction or training to control the risk.

In determining measures to control risk of musculoskeletal injuries, the following factors must be addressed:

- postures;
- movements;
- forces;
- duration and frequency of the task; and
- environmental conditions including heat, cold and vibration.

An employer must ensure that manual handling risk control measures are reviewed and, if necessary, revised:

- a) Before any alteration is made to objects used in a workplace or to systems of work;
- b) Before an object is used for another purpose than that for which it was designed - if that increases the risk;
- c) If new or additional information about hazardous manual handling becomes available to the employer;
- d) If an occurrence of a musculoskeletal disorder in a workplace is reported;
- e) After any manual handling incident in which person required immediate treatment as an in-patient in a hospital;
- f) If, for any other reason, the risk control measures do not adequately control the risk; and
- g) After receiving a request from an HSR.

SIMPLE RULES FOR MANUAL HANDLING

- Avoid the need to lift heavy weights - use of mechanical aids or 2 or more trained people.
- Squat down to the load; don't bend the body over to lift.
- Keep the back upright and straight - use the leg muscles to lift.
- Don't lift objects that are out of comfortable reach.
- Avoid reaching out to objects that cannot be handled close to the body.
- Avoid twisting - turn the feet not the hips or shoulders.
- Ensure that carry paths are clear of all obstacles.



PART 11:

PERSONAL PROTECTIVE EQUIPMENT

When risks to health or safety cannot be controlled by other means the employer must provide appropriate personal protective equipment (PPE) to all employees exposed to risk.

PPE includes the following:

HARD HATS

Must be worn at all times unless it can be clearly established through a documented risk assessment, that there are no risks of head injuries from either falling objects or collision with fixed objects, tools or plant.

SAFETY FOOTWEAR

All personnel on site must wear safety footwear conforming to the relevant standard - AS/NZS 2210: 2010 Occupational protective footwear - Guide to selection, use and care

HEARING PROTECTION

Ear-plugs/ear-muffs must be worn in designated areas and wherever high noise levels are present e.g. jack hammer, grinders, explosive powered tools, pile driving, cutting metal, drilling masonry.

EYE PROTECTION

Safety glasses or goggles are compulsory in designated eye protection areas and when using power or machine tools and pressure equipment. Face shields should be worn when handling acids and chemicals.

Suitable welding goggles must be worn for gas welding and cutting. Welding helmets must be worn for electric arc welding. Welding screens should be used to protect the eyes of other persons from welding flashes.

RESPIRATORY PROTECTION

Approved face masks or respirators fitted with the appropriate filter should be worn when exposed to hazardous chemical vapours, fumes, dust or fibres. Employers must provide the correct type of respirator, train employees in fitting the devices and ensure that respirators are properly maintained and replaced as required.

The Material Safety Data Sheets or the hazardous substance(s) involved will provide accurate information on the selection of respirators.

INDIVIDUAL FALL PROTECTION EQUIPMENT (IFPE)

IFPE includes safety harnesses, lanyards, shock absorbers and inertia reels. Correctly connected harnesses must be used in boom-type elevating work platform (EWPs) and crane-lifted workboxes. In all other cases, they should only be used when safe/protected work platforms are not practicable. This equipment should not be used unless workers have been fully trained.

SKIN PROTECTION

Appropriate gloves, coveralls, boots and face shields should be worn to prevent skin absorption when handling hazardous liquids such as chemicals, epoxies, solvents, acids and wet concrete. (MSDSs will provide accurate information on glove selection.) Gloves should be worn when handling objects such as sheet metal, wire cables etc.

UV RADIATION

Hazard ID

Exposure to solar ultraviolet radiation (UVR) causes eye damage and is also the main cause of skin cancer in Australia. Solar UVR is carcinogenic to humans.

Employees who work outdoors for all or part of the day are at risk of skin cancer. All skin types can be damaged by exposure to solar UVR. Damage can be permanent and irreversible and increases with each exposure.

Outdoor workers, both full time and part time, have a higher than average risk of basal cell carcinoma (BCC) and squamous cell carcinoma (SCC) because they spend long periods of time working in the sun, all year round, over many years of working life.

Occupational health and safety legislation in each state/territory provides an established framework through which to implement sun protection programs and policy.

The Radiation Protection Standard for Occupational Exposure to Ultraviolet Radiation 2006 encourages UVR exposures to be less than that required to obtain observable biological effects. Outdoor workers without adequate protection may exceed the exposure limits set out in the standard.

Preventing occupational disease is a national health and safety priority action area. Workplaces facilitate access to high risk and difficult to reach groups.

Workplaces offer opportunities to implement changes to workplace environments that have ongoing and long-lasting effects.

Legal responsibilities

OH&S legislation has a clear objective of preventing illness and injury at work.

All employers should protect employees by providing a safe working environment that is free from health risks. This includes taking proper steps to reduce the known health risks associated with occupational exposure to solar UVR for employees who work outdoors.

Employees also have a duty of care of their own health and safety to cooperate with employers' efforts to improve health and safety. To work safely in the sun, employees should follow workplace sun protection policies and practices, attend training and use supplied protective equipment as instructed.

Risk assessment

A risk assessment can be used to identify both employees who have a high risk of exposure to solar UVR as well as work situations where exposure occurs. The risk assessment should examine factors such as:

- The geographical location of the job;
- The time of the year when outdoor work occurs;
- The time of the day when outdoor work occurs;
- The pattern and length of exposure;
- The availability and use of sun protection control measures;
- The presence of reflective surfaces;
- The presence of photosensitising substances;
- Extended vehicle usage; and
- The presence of artificial sources of UVR such as arc welding and ultraviolet lamps.

Risk controls

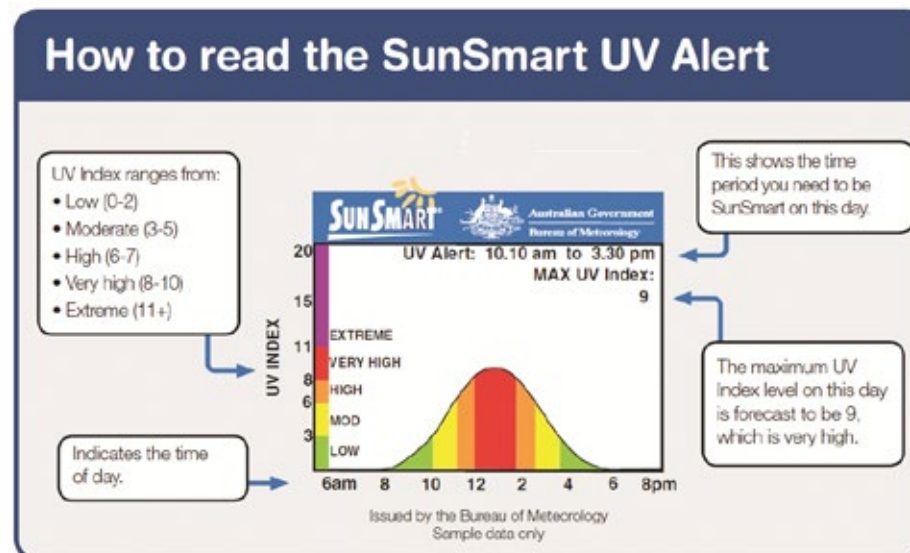
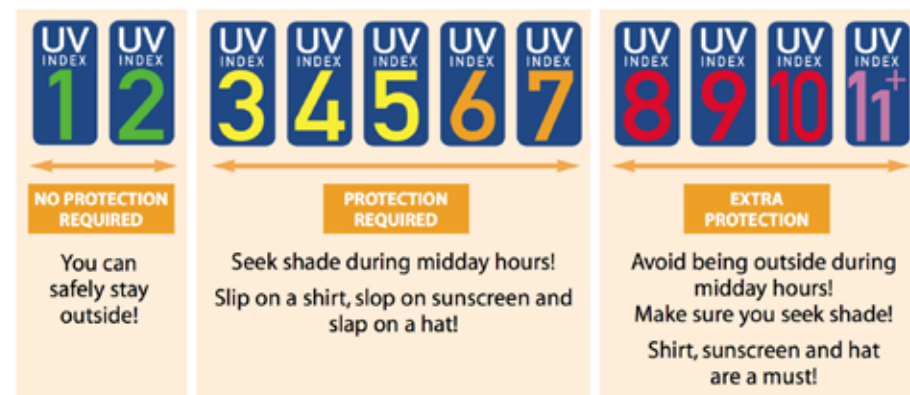
Once the risk has been assessed employers, employees and employee representatives should work together to make changes to minimise risk. Strategies to reduce risk may include:

- Increasing the amount of shade provided and used in the workplace;
- Modifying reflective surfaces;
- Considering applying clear or tinted films to side windows of vehicles;
- Rescheduling outdoor work programs;
- Rotating employees so the same person is not always in the sun;
- Using the SunSmart UV Alert* for your region to inform workers on a daily basis when to use sun protection; and

- Providing personal protection such as sun-protective work clothing, sun protective hats, SPF 30+ sunscreen and sunglasses.

*The SunSmart UV Alert is based on the Global Solar UV Index, a rating system adopted from the World Health Organization. It indicates the amount of solar UVR reaching the earth's surface. The higher the number, the greater the potential for skin damage.

Employers should provide supervision to ensure correct use and compliance with control measures. Where monitoring reveals non-compliance, it should be managed using the organisation's standard disciplinary procedures. When sun protection control measures have been implemented they should be monitored and reviewed on a regular basis, or at least every 2 years.



Sun protection policy and training

A sun protection policy should be developed to document why and how the solar UVR risk is to be managed by the workplace. This should include details of training and education to promote both the sun protection control measures and safe work practices required.

Cancer Council Victoria's SunSmart Program offers a range of education services for workplaces. Contact SunSmart on (03) 9635 5148 for more information.

Health surveillance and skin cancer

OH&S legislation requires employers to monitor the health of employees. In regard to skin cancer, this involves encouraging employees to examine their own skin.

To enable employees to effectively examine their own skin, employers should provide employees with appropriate self-examination information including:

- The need to check their own skin;
- The importance of becoming familiar with how their skin normally looks;
- How often they should examine their skin;
- Tips on how to examine their skin;
- What to look for when examining their skin; and
- What to do if a suspicious spot is noticed.



PART 12:

FURTHER GUIDANCE

THE ENVIRONMENT AND YOUR WORKPLACE

This section considers environmental matters that may arise at your work site and offers suggestions on how some of these may be addressed. Even small techniques can reduce costs and actions can reduce social, economic and environmental costs for your employer.

As you would be aware, many health and safety impacts also have environmental impacts. Our environment sustains our very existence; therefore, we get direct benefit through preserving it. Our natural environment has been deteriorating at an unsustainable rate and, as responsible citizens, we can be aware of the impact that we are having on the environment in our work and in our personal lives.

Environmental risks

Prior to work commencing on some sites, environmental risks such as soil contaminations may need to be addressed. It is also possible that through undertaking our work, we can have environmental impacts. This may occur through creating pollution and waste and over using resources.

Work sites may generate or have pre-existing pollution. Types of pollution can include:

- solid or liquid;
- air contaminants;
- noise;
- water; and
- soil.

The environment and work sites

Some worksites may already consider environmental issues. This is commonly the case when a site requires an Environmental Protection Authority (EPA) licence, or the employer is a large company that incorporates sustainability as a core operating principle. It may also simply be that the company wants to reduce costs.

Different kinds of waste which may be found at your work sites could include:

- light globes;
- asbestos;

- electrical wiring;
- plastic or wooden wire wheels;
- chemicals including diesel fuel;
- pallets;
- vegetation;
- animal, such as defecation;
- cardboard; and
- plastic.

Wastes created on construction and demolition sites

- The construction and demolition industries generate over one-third of all waste going to landfill. Over 75% of this waste is clean excavated material, concrete, bricks and timber. This waste is not an inevitable part of a project but a significant opportunity to increase a project's efficiency and profitability.
- These waste materials, regardless of whether they are recycled or sent to landfill, represent costs to your employer. In addition to the obvious waste disposal and transport costs, there are further hidden costs such as the value of lost raw materials and the value-added cost from labour and energy. Minimising this waste is an opportunity to increase profits for employers and to demonstrate that the company is a good corporate citizen. There are waste minimisation opportunities in residential, civil and commercial projects.

What you as an electrical worker can do

- minimise construction and demolition waste where possible;
- measure cable lengths accurately;
- measure conduit, cable tray and ductwork accurately;
- install timers or sensors on lighting and climate control systems;
- replace incandescent lamps with compact fluorescent lamps, switch off lights;
- machines and computers when not in use;
- reuse materials used in construction, engineering and manufacturing;
- close windows and doors when climate control is used;
- negate other work practices that may use excessive electrical energy; and
- give advice on energy efficient machines and appliances (star ratings).

As electrical workers, we can be in a position to advise others how they can contribute to a more sustainable work lifestyle. Industries are slowly recognising the economic, safety and business benefits of diverting wastes and minimising resource consumption.

Waste minimisation

There are important reasons to minimise waste:

- Waste minimisation helps reduce toxic runoff and site contamination that could have long-term effects on the property once building has finished.
- Re-using and recycling may save money e.g. through reduced material and waste disposal costs, through income received for salvaged building materials, or through savings by not having to buy additional materials.
- Recycling and re-using helps to slow the filling up of landfills, reduces the cost of mining raw materials, slows the depletion of resources, and provides employment.
- In future, building permits may require owners to reduce the amount of waste produced during building construction or demolition.

When considering waste produced on site, principles that can be employed (in order) include:

- avoid;
- reduce;
- reuse; and
- recycle.

Steps that can be taken to reduce waste include:

- use materials that can be re-used, recycled or returned to the supplier if undamaged;
- have separate bins or piles for waste that can be recycled, re-used or returned to suppliers if not used (insulation, cladding and timber are examples);
- use recycled materials or materials with recycled content;
- use materials that don't produce dusts or pollutants that can harm human health or the environment;
- use materials that are durable (so they won't need to be replaced very often or at all during the life of the building); materials will at least have to meet current or future Building Code's durability requirements;
- store materials carefully so they won't get damaged; if necessary, keep them covered;
- keep the building site tidy; this reduces the risk of materials being damaged, as well as making the site safer and easier to work in;
- have a central location for cutting and storing off-cuts; if you need a short piece of material there may be a bit right there;
- re-use formwork, scaffolding, crates and pallets;
- order only as much of a material as you need, rather than adding extra for wastage; and
- ask suppliers to reduce packaging if possible.

Recycling fluorescent tubes

Fluorescent tubes should not be placed in a general waste collection bins because, if broken, they expose you and your co-workers to unsafe levels of mercury. Even if they are placed intact into a bin, they can get broken at landfill and the mercury will get released into the environment. In March 2008, a globe recycling facility opened in Campbellfield, Victoria. Details of this recycling facility are provided in the useful links section at the end of this chapter. Bins can be ordered and delivered with prices including pick up. Incandescent light globes are being phased out by the Australian Government, import restrictions began in November 2008.

Protection of the environment: environment and resource efficiency plans (EREP)

The Victorian Government introduced a scheme which requires certain sites to prepare and implement a plan which will reduce water and energy consumption and reduce waste. This scheme commenced on 1 January 2008 as required by the Environment Protection (Amendment) Act 2000. Sites which are required to develop plans are commercial and industrial sites that use more than 100TJ of energy and/or 120mL of water in a financial year. Each site that exceeds one or more thresholds must register with the EPA, prepare a plan, implement actions with a payback period of three year or less, and report on their performance annually. EREP Regulations were made and came into effect on 1 January 2008. Businesses can voluntarily opt into this scheme which includes free training to assist in the implementation of energy efficiency measures.

Safeguards and recommendations to prevent or minimise the environmental impacts at work sites

Prior to the granting of licence approval for particular projects, a management plan may have been prepared which outlines an array of preventative measures that can be taken through design, pre-construction, construction and operation phases. You may see a number of measures taken at your workplace to avoid or reduce environmental impacts. Safeguards could include:

Geology & soil

- Keep open areas of excavations to a minimum during construction.
- Installation of temporary structures, such as silt fences and covers to stockpiles so as to prevent off-site movement of sediment.
- Cease work or implement further suppression measures, if excessive fugitive dust emissions are observed.
- Use of water to minimise dust generation and movement at active earthwork areas.
- Divert surface water runoff from areas upstream around the site to minimise the volume of water entering construction areas.

- Minimise traffic movement in construction zones and dedicated parking areas.
- Storage of materials such as treatment chemicals and fuels in bunded tanks on site to collect minimum of 110% of storage capacity.
- Ongoing monitoring on pipelines etc to check for leaks, spills etc.

Surface water and hydrology

- Implementation of erosion controls during construction to avoid sediment runoff so that no material is discharged off site.
- Immediate clean up of accidental spills of soil or other materials and appropriate disposal in accordance with relevant guidelines.
- Cessation of affected construction activities in the event of flooding.
- Provision of containment for potentially contaminated stormwater, through storage area to prevent discharge off-site.

Traffic and transportation

- Identify preferred roads for transporting construction materials, equipment and components.
- Designated access routes for equipment and material transportation to the construction site.
- Site layout to include suitable parking, loading and unloading.

Noise & vibration

- Regular inspection and maintenance of construction equipment.
- Planning of work to avoid simultaneous noisy activities.
- Use of equipment of proper size and capacity.
- Implementing noise control measures around noisy activities and equipment.
- Test equipment during commissioning phases to ensure that all equipment operates at the specified sound levels.
- Continue noise monitoring to ensure compliance with the maximum allowable noise emission.

Vegetation & fauna

- Locate drains/trenches etc away from sensitive root zones.
- Protect remnant vegetation, particularly trees with trunk guards and perimeter fencing.
- Limit heavy vehicle movements from within the root zone and do not park near trees to prevent soil compaction.
- Remove sensitive vegetation prior to construction commencing and return to the site once construction is completed.

Energy & greenhouse

- Throttle down or switch off idle construction equipment.
- Switch off engines of trucks while waiting to access sites and while being loaded or unloaded.
- Ensure equipment is properly maintained to ensure efficient energy consumption.
- Use recycled materials and recycle materials where feasible.
- Source materials from local suppliers.

Useful links

Prescribed industrial waste database:

<http://www.epa.vic.gov.au/waste/iwdb/default.asp>

EREP detail including exemptions: www.epa.vic.gov.au/erep

HEAT, COLD AND INCLEMENT WEATHER

Heat and cold stress areas

Heat, cold or inclement weather may be specifically dealt with by enterprise bargaining agreements (EBA) or company policies. Consult your EBA or company policy to see if nominated temperature action points have been specified.

For example, the Victorian Contracting EBA (Construction Work) provides heat clauses that allow for workers to be relocated on-site to a shaded or air-conditioned area when the temperature reaches 32 degrees. The EBA also provides for work to cease at 35 degrees (with pay) unless there are air-conditioned work areas with amenities available on site. Temperature is measured from the nearest Bureau of Meteorology weather station.

Where an EBA or a company policy does not deal with heat, cold or inclement weather the following information can be utilised as the basis for development of an agreed OH&S company policy in consultation with management.

Alternate controls

In areas that are consistently and necessarily hot or cold, such as foundries, or bakeries, or cold rooms, control has to rest on personal protective clothing, work breaks and attention to personal needs of workers.

In hot areas, protective clothing can be worn as protection against radiant heat (e.g. leather aprons), and clothing, such as pre-frozen ice jackets, are available to generally reduce temperature. When protective clothing is necessary it should fit loosely and have large openings at the bottom to encourage the flow of air over the skin.

Clothing can have a significant effect on sweating, which is the body's principal means of dissipating heat. Since the sweat has to evaporate for the body to lose heat, tightfitting clothes that prevent evaporation are dangerous to wear under conditions of heat stress.

Cotton is the preferred fabric since it has high vapour permeability. By contrast, nylon has low vapour permeability and is not recommended. Woollen fabrics are useful when one is exposed to high radiant heat such as from a furnace. Under these conditions, bulky aprons or special reflective clothing can also help.

In cold areas, good, warm clothing is the only defence – donkey jackets, long-johns, under trousers, thick socks, gloves or mittens. Thermally-insulated suits, based on designs developed for Arctic and Antarctic conditions are needed for cold store work.

All such required protective clothing should be provided and maintained by the employer, since it is the employer who requires the worker to work in such special conditions.

How can heat and cold be controlled?

The range of thermal comfort for workers has been found to be 18°C to 26°C. Control of heat and cold should aim to lower or raise working temperatures to within this range. Measures that are available include:

- insulation;
- ventilation;
- isolation;
- shielding of the source of the operator;
- job modification and work rotation; and
- protective clothing.

For indoor workers, the most desirable working environment is one which is air-conditioned and temperature-controlled, both are becoming increasingly common in new factories. Short of air-conditioning, there can be:

- insulation or shielding of sources of heat, e.g. boilers, engines, ovens;
- roof and wall insulation of working area to protect from the heat and sun;
- ducting of hot exhausts to outside; and
- installation of fans or ventilators to increase air movement.

For outdoor workers, there can be air-conditioned vehicles and rest areas, and shaded areas provided by tents and tarpaulins.

Roof and wall insulation can also protect against cold, although again the desired optimum is air-conditioning.

Working in seasonal heat

Seasonal heat conditions occur mainly during the summer months for both indoor and outdoor workers. These basic climatic conditions can be made worse if, for example, workers are working under a hot tin roof, for long periods in open sunlight, or in conditions where protective clothing or equipment are needed, such as industry conditions or in exposure to chemical fumes.

Safety problems, which have occurred during conditions of transient heat stress, include:

- reduced ability to concentrate and increase of accidents;
- aggravation of discomfort in use of protective clothing and equipment, and development of unsafe conditions;
- aggravation of effects of other hazards, e.g. noise;
- aggravation of pre-existing illnesses, e.g. heart disease; and
- heat exhaustion.

These are all short-term effects. There are no known long-term effects from transient (seasonal) spells of hot working conditions.

Measurement of heat

A dry bulb (DB) (i.e. ordinary) thermometer is adequate to measure air temperature. If one is not available, or if the working conditions are not easy to monitor (e.g. a mail deliverer on rounds), then temperatures broadcast in weather reports from the nearest radio station are the next best thing.

The dry bulb thermometer records only one aspect of hot conditions, and ignores humidity, air movement and other factors.

The most important feature of hot work conditions is air temperature and this is also widely understood and easily measured. If special conditions are present, e.g. high humidity in tropical area, then hot work agreements and standards need to take this into account and a wet bulb globe thermometer (WBGT) may make measurement. The WBGT measures heat and air movement (breeze) and humidity.

The ordinary, dry bulb thermometer provides an adequate measure of seasonally hot conditions. In some instances unions have negotiated that the hourly temperature announcements from certain designated radio stations provide an adequate measure of the hot conditions. However, it is best and most accurate to have the temperature measured as close to the work site as possible.

Regulations

There are NO legal limits to the temperatures, which an employer can impose on workers in Australia. However, all states and the Commonwealth have Occupational Health and Safety Acts which impose a duty of care on the employer to take all practicable steps to protect the health and safety at work of their employees.

The recognised Standard for office work is:

- Australian Standard 1668 Part 2: Mechanical ventilation for acceptable indoor air quality, which provides that the temperature should be maintained in the range of 18-30°C.
- Australian Standards 2375.

Additionally, there are provisions in some awards for upper limits.

Code of practice for workplaces

The Victorian Code of Practice for Workplaces includes some provisions that can be used to protect workers from heat stress. These could be useful in developing policies if your award does not mention this issue.

- 44) A supply of drinking water is required to be available in the workplace. The water should be cooling, clean and palatable. The facility is required to be separate from sanitary and hand washing facilities.
- 45) Where a connection to a water supply is not possible, supply may be provided by other means such as a flask, cooled drink dispenser or waterbag. The most appropriate method should be selected.
- 46) At least one drinking point should be provided for every 40 employees or part of forty employees. The drinking points should be placed where they will service the most people requiring them. Employers should provide additional cool water drinks to prevent risks associated with thermal stress. In such cases the drinking points should be placed near the hot or strenuous work stations.
- 47) The distance of travel to a drinking point should not exceed 30 metres. In a large workplace such as a warehouse where a small number of people may be employed, it is reasonable to extend the distance of travel.
- 48) The workplace environment should be maintained within a temperature range to protect employees from thermal stress.
- 49) Ventilation, mechanical cooling methods and/or work practices should be arranged to counteract excessive heat.
- 52) The erection of a shelter, tent or windbreak or provisions of suitable clothing should protect outdoor workers from the extremes of weather.

Controlling the hazard from seasonal heat health and safety effects

Increasing heat has been found to correlate with the number of accidents, as hot conditions make it more difficult to concentrate. This is a clear example of the work environment being the major factor in an incident, rather than blaming the worker. The prevention of work related injuries and illnesses due to seasonal heat stress must be aimed at modifying the workplace. It needs to be made clear that there is no acclimatisation to seasonal heat. Accidents can occur where there is constant exposure, e.g. foundries or other factors such as being normally warmer in a region, (e.g. Northern Victoria).

Unions should negotiate Seasonal Heat Agreements that give priority to the elimination of the effects of seasonal heat through the provision of air-conditioning in the workplace or in work vehicles. Unions should aim to get agreement on the procedures that will apply before the temperature rises, rather than relying on stop gap measures and spontaneous actions.

Workplace temperatures should be kept below 30°C:

- air-conditioning, air circulating fans, or good ventilation;
- insulating or shielding sources of heat in the workplace;
- insulating the roofs and walls of the workplace;
- ducting hot exhausts outside the workplace; and
- providing air-conditioned work vehicles.

These should be included in any Enterprise (Certified) Agreement.

Workplace strategy for control of hazard

The strategy for dealing with seasonal extremes rests on:

- monitoring;
- preventative measures; and
- administrative controls.

Heat discomfort is often felt and 30°C (although it may be felt before this) and all efforts should be taken by employers to keep temperatures below this level or to provide conditions for outdoor workers that help reduce the effects of seasonal hot conditions where the temperature exceeds 30°C.

- All new indoor work areas should be temperature controlled, where practicable, by air-conditioning.
- In existing indoor work areas, efforts should be made to control the effects of seasonally hot conditions by measures including:
 - installing air-conditioning;
 - insulating heat sources;
 - installing safe roof and wall insulation; and
 - external ducting of hot exhausts.

In both indoor and outdoor work areas measures that may be taken should include:

- Providing air-conditioned rest rooms;
- Changing the rate of work (e.g. taking longer to do jobs);
- Providing lighter, alternative work;
- Use of air-circulating fans; and
- Provision of constant supplies of cool drinking water.

For outdoor work:

- A system of work that does not have people working in the sun or outside during the hottest part of the day;
- Use of shade cloths;
- Air-conditioned vehicles and rest areas; and
- Protective clothing that also gives adequate ventilation.

By either wet bulb or dry bulb measure, where temperature at work exceeds 30°C, workers should be allowed to take regular, paid rest breaks to allow their bodies to recover some degree of thermal equilibrium. Rest breaks should be introduced and modified by local negotiation to suit local conditions and meet individual requirements.

The following table provides a basis for the negotiation of agreed rest breaks for times when the temperature at work exceeds 30°C. It is presented only as a basis for negotiation: local variations could be needed for specific workplaces.

DURATION OF PAID REST BREAKS WITHIN EACH HOUR WHEN THE TEMPERATURE REACHES AND/OR EXCEEDS TEMPERATURES SHOWN	TEMPERATURE
15 minutes	30°C
30 minutes	32°C
45 minutes	34°C
60 minutes	36°C

No one (except emergency personnel) should work in temperatures exceeding 50°C DB or 32°C WBGT for heavy work.

The above information is based on VTHC Health and Safety Bulletin: 'Working in Heat Part 1 - Seasonal Heat', May 1989.

Working in the cold

Working in extreme cold conditions is a hazard, with many thousands of workers exposed to cold in environments such as outdoor work in winter months, freezer plants, meat packing houses and cold storage facilities.

The body's response to cold

The human body produces its own heat from chemical energy (breaking down food and building up molecules in all tissues) and may lose heat to a cool environment.

When the human body is exposed to a cold environment, two major types of physiological adjustments are brought into play in an attempt to maintain thermal equilibrium, i.e. minimise heat loss.

First, the body attempts to maintain its temperature by decreasing heat loss from the skin. This conservation of heat is accomplished largely through a constriction of the blood vessels in the skin and underlying tissues (vasoconstriction) and a corresponding reduction in the plasma volume reaching the skin. This reduction in peripheral blood flow significantly reduces the amount of convective heat loss occurring from the body. A reduction in surface area by changes in posture, such as 'hunching up the body', also assists in reducing heat loss.

The second major physiological effect from cold environmental conditions is an increase in the metabolic heat production rate. Metabolic heat production can be increased significantly both by voluntary movements, such as exercise and the performance of work, and by the onset of shivering.

Through shivering, it is possible to increase the metabolic rate of heat production 5 to 7 times for short periods of time. Shivering, however, is a relatively inefficient mechanism for increasing heat production when compared with that resulting from active muscular work.

Increased oxygen consumption, indicative of an increase in metabolism, may be as high as 3 to 5 times the normal resting rate during cold exposure, primarily because of shivering, increased voluntary movement caused by discomfort, and non-shivering thermogenesis. Non-shivering thermogenesis is a defence mechanism that goes into action as a consequence of prolonged continuous exposure to cold environmental conditions.

Health effects of exposure to extreme cold

Exposure to cold environmental conditions can result in a number of disorders:

1) INCREASED INCIDENCE OF ARTHRITIS, RHEUMATISM AND BRONCHITIS: MUSCLE/TISSUE DAMAGE

These conditions are commonly associated with the cold. When working in clothing that is also damp with rain, body heat is lost even faster. Muscles and soft tissue are susceptible to damage when used in cold conditions.

2) DECREASE IN DEXTERITY AND SENSITIVITY

As hands and feet become cold, stiff, numb, and painful, a worker cannot perform manual tasks with as much dexterity or skill. Shivering also makes it difficult to perform work skilfully or accurately.

3) INCREASE IN ACCIDENT RATES

Factors listed above promote an increased rate of incidents. Research has found that incident rates increase as the temperature falls below 19°C.

4) HYPOTHERMIA

Hypothermia is one of the most serious hazards of exposure to cold working conditions. This is the progressive lowering of the body's core temperature from 37°C to 30°C or below, where unconsciousness, followed by death usually occurs. Most cases of hypothermia occur in air temperatures between 1°C and 10°C, although the body can lose significant heat in air temperatures as high as 18°C or water temperatures as high as 22°C. Body heat is lost much faster when wet, either as a result of perspiration or inclement weather.

During activity, the body increases its metabolic heat production. This heat production drops by as much as one half, when the body becomes inactive. Uncontrollable shivering followed by hypothermia is likely to result. The body's physiological response, designed to minimise heat loss becomes ineffective when the body's core temperature drops below 30°C.

5) FROSTBITE

Another frequently encountered and potentially dangerous disorder is frostbite. Frostbite normally occurs during exposure to temperatures well below freezing and is the result of actual freezing of the tissues in the affected area of the body, whether it be the face following exposure to a cold wind or an extremity, such as hand or foot, following prolonged exposure to cold environmental conditions. Damage resulting from freezing can range from mild, superficial tissue damage to massive tissue damage and gangrene. During treatment, the frostbitten tissue should be gently warmed (by placing affected part near source of warmth) and not exposed to further cold.

6) TRENCHFOOT AND IMMERSION FOOT

Immersion foot is a condition that results after prolonged exposure of the foot to moisture. It generally occurs at air temperatures above freezing point. The injury is primarily due to spasms of the blood vessels, which stop blood circulating to the foot. In contrast to frostbite, the skin and blood vessels are not damaged. The damage occurs to muscles and nerves. Gangrene may develop.

Trench foot is similar to immersion foot, but results from prolonged exposure to moisture at or near freezing point.

7) REPRODUCTIVE DISORDERS

The brain of an early developing foetus is vulnerable to severe disturbances as a result of its mother suffering hypothermia.

Monitoring of cold stress

Air movement and temperature are the major environmental factors to be monitored in respect of cold working conditions.

The combined effect of wind and low temperature can produce a condition known as 'wind chill', in which cooling or freezing of exposed flesh increases rapidly as wind velocity increases.

A temperature reading should be taken in the workplace and the Bureau of Meteorology contacted to get the average wind speed for your area. Using these readings and the chart on the next page, calculate the wind-chill factor for your workplace.

Work should cease if the wind-chill factor is, or is below:

WIND-CHILL TABLE FOR MEASURING THE COOLING EFFECT OF WIND ON EXPOSED SKIN (SIPLE-PASSELL FORMULAE)															
Temp °C	6	8	10	12	14	16	18	20	22	24	26	28	30	32	Knots
	11	15	18	22	26	30	33	37	41	44	48	52	56	59	Kph
16	11	10	9	8	7	6	6	5	4	4	4	3	3	3	
15	10	9	7	6	5	5	4	3	3	2	2	2	1	1	
14	9	7	6	5	4	3	2	2	1	1	0	0	0	-1	
13	8	6	4	3	2	1	1	0	-1	-1	-1	-2	-2	-2	
12	6	4	3	2	1	0	-1	-2	-2	-3	-3	-4	-4	-4	
11	5	3	2	0	-1	-2	-3	-3	-4	-4	-5	-5	-6	-6	
10	4	2	0	-1	-2	-3	-4	-5	-6	-6	-7	-7	-7	-8	
9	2	0	-1	-3	-4	-5	-6	-7	-7	-8	-8	-9	-9	-10	
8	1	-1	-3	-4	-5	-7	-7	-8	-9	-10	-10	-11	-11	-11	
WIND-CHILL TABLE FOR MEASURING THE COOLING EFFECT OF WIND ON EXPOSED SKIN (SIPLE-PASSELL FORMULAE)															
7	0	-2	-4	-6	-7	-8	-9	-10	-11	-11	-12	-12	-13	-13	
6	-1	-4	-6	-7	-9	-10	-11	-12	-12	-13	-14	-14	-14	-15	
5	-3	-5	-7	-9	-10	-11	-12	-13	-14	-15	-15	-16	-16	-17	
4	-4	-6	-8	-10	-12	-13	-14	-15	-16	-16	-17	-17	-18	-18	
3	-5	-8	-10	-12	-13	-14	-16	-16	-17	-18	-19	-19	-20	-20	
2	-6	-9	-11	-13	-15	-16	-17	-18	-19	-20	-20	-21	-21	-22	
1	-8	-11	-13	-15	-16	-18	-19	-20	-21	-21	-22	-23	-23	-24	
0	-9	-12	-14	-16	-18	-19	-20	-21	-22	-23	-24	-24	-25	-25	
-1	-10	-13	-16	-18	-19	-21	-22	-23	-24	-25	-26	-26	-27	-27	
-2	-12	-15	-17	-19	-21	-22	-24	-25	-26	-27	-27	-28	-29	-29	
-3	-13	-16	-18	-21	-22	-24	-25	-26	-27	-28	-29	-30	-30	-31	
-4	-14	-17	-20	-22	-24	-25	-27	-28	-29	-30	-31	-31	-32	-33	
-5	-15	-19	-21	-24	-25	-27	-28	-30	-31	-32	-32	-33	-34	-34	

Strategy for dealing with cold working environments

The following is a suggested strategy for dealing with a cold working environment:

- Effective, controllable heating of factories, etc.
- Outside work in cold weather to be sheltered, screened and warmed with hot air blowers if possible.
- If the environment cannot be effectively controlled, an appropriate work/rest regime should be implemented: for example, paid rest breaks of ten minutes per hour for temperatures between 9°C and 7°C, twenty minutes per hour for temperatures between 7°C and 4°C and 30 minutes per hour for temperatures between 4°C and 1°C.
- An air temperature of 1°C should be regarded as the minimum acceptable for normal work. When temperature reaches this point, workers should be stood by on full pay.
- Heated rest rooms or shelters should be provided so those workers may obtain temporary relief from the cold.
- Hot drinks should be provided.
- Proper education and close monitoring of new employees until they are accustomed to the work conditions, requirements for appropriate clothing and so forth.
- Protection of the extremities through the use of appropriate protective clothing, including gloves, insulated or vapour barrier boots, and face masks.
- To maintain manual dexterity, special provisions often must be made to keep the hands warm, such as the use of hot air jets, radiant heaters and appropriate types of gloves and mittens. Frequently, conductive heat loss from the hands to the surface of metal handles can be reduced by insulating coverings or by making them out of less conductive materials, such as wood.
- Protective clothing for use in cold conditions must be appropriate for the degree of cold and physical activity to be encountered. One method that is widely recommended is the ventilating, insulating and protective layering (VIP) method. The ventilating layer consists of cotton, waffle weave or fishnet type of underwear, not only providing for the trapping of body heat, but also providing the opportunity for moisture to escape. Wool, or some of the newer materials, such as fibrefill, is best used for the insulating layer, since these materials will retain their insulating value even when they become wet. The outer or protective layer can range from nylon to waterproof suits or ponchos. The main purpose of this layer is to protect the other layers from the elements and serve as a windbreak.

Inclement weather

It has already been stated that careful attention needs to be paid to work being undertaken in areas of high and low temperatures alike.

Weather conditions seriously affect the outdoor workplace and constant regard must be given to these effects and how they may make working conditions unsafe.

Wet, rain affected sites can be treacherous particularly for electrical workers. Not only do we have increased slip hazards, but also a greater risk of electric shock due to increased conductivity of damp clothing and materials. Never work in wet conditions. If your site is affected by water, seek alternate, dry work. If your employer can't provide any alternate work, you should be stood by on full pay until your workplace is again dry and safe.

High wind speeds are dangerous when working on open sites as debris and other building materials can become airborne or dislodged from buildings.

Workers on multi-storey buildings should be particularly mindful of work on such buildings and relocate to other safe work until winds subside and the workplace is safe. Always conduct thorough safety checks before recommencing work as electrical wires may have been brought down, ladders fallen and other materials and equipment dislodged.

Outdoor workers should also be provided with adequate protection from the sun. This could range from some good quality 'sun block' through to a wide brimmed hat. Clothing should always be suited to sun exposure ensuring that sensitive areas of the skin are adequately protected.

WORKPLACE BULLYING

Workplace bullying is covered by OH&S law. Workplace bullying is defined as repeated unreasonable behaviour directed towards an individual or a group of people, creating a risk to physical or psychological health and safety.

Unreasonable behaviour is behaviour that a reasonable person (having regard to all the circumstances) would expect to victimise, humiliate, undermine or threaten an individual or a group of people. Unreasonable behaviour could also involve using a system of work, e.g. a rostering system, to victimise, humiliate, undermine or threaten people.

Repeated behaviour means the same behaviour, or a series of behaviours that have a similar negative impact on health and safety. Some examples could include:

- verbal abuse, targeted sarcasm and public humiliation;
- excluding or isolating someone / alienation or the 'silent treatment';
- psychological harassment or regular threats of demotion or termination;
- interference with personal belongings or sabotage of a person's work;
- creating / spreading rumour to cause harm / bad mouthing;
- practical jokes / initiation practices;
- conduct designed to undermine a person's reputation;
- stalking (physical, phone or computer);
- threatening verbal or physical behaviour;
- repeatedly assigning meaningless tasks that are unrelated to the job;
- setting impossible assignments / being set up to fail;

- changing work rosters to cause on going inconvenience, or as punishment; and
- deliberately withholding information essential for effective work performance.

OH&S law requires employers to provide and maintain a workplace without risks to health and safety. This requirement extends to cover bullying. OH&S law also requires employees to take care of the health and safety of others in the workplace and prohibits any wilful action that risks another person's health and safety.

If you make a complaint about bullying you have the right to do so without suffering any detriment or victimisation. Witnesses, and others who act as support people, also have the right to do so without suffering detriment or victimisation.

WORKCOVER

Victorian workers are covered by WorkCover for workers compensation insurance.

Almost all Victorian companies are covered by the scheme; however, Commonwealth Government employees and a few nation-wide private companies are covered by Comcare.

Under WorkCover, if you are injured you are entitled to compensation that includes weekly payments, medical and like expenses. There is a possibility of claiming a lump sum payment and/or common law damages if you are left with a permanent injury.

What injuries or illnesses are covered?

WorkCover can be claimed for an injury arising out of, or in the course of your employment.

The definition of injury means any physical or mental injury, where employment is a 'significant contributing factor'. This includes aggravation, recurrence, acceleration or deterioration of a pre-existing injury covered by WorkCover.

Claiming compensation

An injured worker must report his/her injury within 30 days of becoming aware of it. Failure to do so may prevent you from claiming compensation.

Report an injury even if it does not require time off or medical treatment as this will help if the injury gets worse over time.

An injury must be reported in the Injury Report Book. If medical treatment or time off work is needed, then a WorkCover claim form must be completed and lodged with your employer, either in person or via registered post. Claim forms are available from the ETU, Slater & Gordon or from your local post office.

If time off work is needed, then your doctor needs to provide an initial WorkCover certificate which must be submitted together with the claim form. The worker must sign this initial certificate. This certificate is not required if only medical treatment is being claimed.

Your employer must sign and date the claim form. You should keep a copy of all documents given to your employer.

Claims procedure

Your employer must forward the claim onto the WorkCover insurer within 10 days of receiving it. The insurer must then make a decision to accept or reject the claim within 28 days of receiving it. This decision must be in writing.

Whilst waiting for the decision you may use accrued leave or Centrelink benefits.

An insurance investigator may contact you for an interview; however, you do not have to talk to investigators.

In most cases the WorkCover insurer will arrange a medical examination that you must attend in order to assist with its decision.

If the claim is for medical expenses only, there is no time limit for the insurer to make the decision. However, if it is not made within a reasonable time frame (e.g. 28 days), then contact the ETU or Slater & Gordon for assistance.

What if there is a dispute?

If the claim is rejected, or the decision is not made within the required time frame, then an appeal should be lodged with the Accident Compensation Conciliation Service. Contact the ETU for assistance. An appeal must be lodged within 60 days of the decision.

Refusal to pay Medical and like expenses may also be appealed at the ACCS.

Sometimes, the ACCS will refer a dispute on medical matters to a medical panel for determination. The findings of this panel are binding on all parties, so it's important to contact the ETU or Slater and Gordon for advice before agreeing to attend this panel.

What are my entitlements?

Weekly payments are based on pre injury average weekly earnings (PIAWE).

This is calculated by looking at the worker's ordinary time rate of pay for normal hours worked per week. The calculation includes regular overtime and shift allowance.

The first 13 weeks of payments are calculated at 95% of gross PIAWE and thereafter at 80% for up to 130 weeks. Certificates of Capacity must continue to be submitted every 28 days in order to receive weekly payments.

Further accident pay provisions exist under most ETU EBAs. Under these provisions the employer must make up the difference between the weekly payments and PIAWE.

A worker's right to compensation depends on the worker participating in a rehabilitation program and making a reasonable effort to participate in return to work plans. This RTW plan should be in writing, include the date of commencement and details of the offer of employment. Any decisions regarding participation should be made in full consultation with the treating doctor. If a worker is considered to be unreasonably refusing to participate in a RTW program, the insurer may terminate weekly payments.

Employers are obligated to provide suitable employment for up to 52 weeks.

If the worker returns to work on modified hours then he/she will be paid weekly payments for the hours not worked.

Medical and like expenses

An injured worker is entitled to treatment from the doctor of their choice and is not required to be treated by the company doctor. Medical and like expenses cover reasonable costs of treatment from doctors, specialists, medications, surgical procedures, hospital and rehabilitation services, personal and household services (e.g. home help, lawn mowing, physiotherapy, massage, osteopathic, chiropractic treatment, psychological treatment, and so on).

Lump sum claims

If the injury results in a permanent impairment a lump sum may be able to be claimed in addition to weekly payments.

A claim cannot be lodged until 12 months has passed from the date of injury unless the injury stabilises earlier.

If you believe that there is a permanent injury resulting from a WorkCover claim, then seek advice from Slater & Gordon lawyers.

Common law negligence claims

A common law claim for damages can be brought against an employer and/or a third party providing negligence or fault can be proved.

However, you can only bring such a claim if you are able to prove a 'serious injury' has been caused as a result of negligence or fault in the circumstances of the accident or system of work as caused by the employer or a third party.

A claim must be brought within 6 years of the injury.

To ensure that the worker's rights are protected, he/she should obtain advice from Slater and Gordon lawyers well before the expiry of six years, as the definition of 'serious injury' is broad.

TEST SHEETS

RCD PERIODIC INSPECTION LIST TEST OF RESIDUAL CURRENT DEVICES (RCD'S)									
Company Name:									
Site/Project Name or Location:									
Tested tripping time of RCDs (using RCD Tester) (FAST TRIP FOR TYPE 1, 2 OR 3 MUST BE LESS THAN 40 MS)									
RCD type and location	Nominal trip current mA	Test results to include both reverse phase relationship readings in milliseconds (ms)						Push button test	Action taken for unsatisfactory results
		X1/2 No Trip Time		X1 Trip Time		X5 Fast Trip Time			
		0.	180.	0.	180.	0.	180.		
		ms	ms	ms	ms	ms	ms		
Name of Licence Holder Conducting Tests:.....									
Electrical Licence No:..... Date:									
Signature:.....									

SAMPLE TEST SHEET

RECORD OF TEST RESULTS										
Switchboard Number:							Test Date:..... / ... /.....			
Location:							Licence Number:			
Tester's Name:										
Description of inspections performed:										
Mains or final subcircuit No.	Protective device rating		Conductor		Earth continuity main or protective	Insulation resistance	Polarity	Correct circuit connections	Earth fault-loop impedance	Remarks Pass/ Fail
	Type	Rating	Type A,N,E	mm ²						
Items requiring further action:										

NOTES

A series of horizontal dotted lines for writing notes.