

OzFlux Tower Safety Guidelines

PREFACE

The objective of these guidelines are to provide designers, manufacturers, employers, proprietors and operating personnel with safety specific information for the design, construction, operation and maintenance of research structures.

Installing equipment, and working on, towers, masts, and scaffolds is defined as “high-risk work” by Safe Work Australia. Such work is only to be undertaken by qualified personnel.

Employers and personnel have related specific duties – as highlighted in the supporting documentation listed below. This document is an overview of current best practice safety measures, highlighting that employers and operating personnel must follow procedures in the following:

Occupational Health and Safety Act 2004

State based OHS is currently undergoing harmonisation to a National system the model *Work Health and Safety Act*.

Australian and New Zealand Standards

AS/NZS 1891.1 Industrial Fall Arrest Systems and Devices: Harnesses and Ancillary Equipment

AS/NZS 1891.4 Industrial Fall Arrest Systems and Devices: Selection, Use and Maintenance

OHS Regulations 2007: Part 3.3 Prevention of Falls

Compliance Code: Prevention of Falls in the Construction Industry Sept 2008

WorkSafe Victoria’s

Prevention of Falls - Basic Steps to Preventing Falls from Heights 2005

Prevention of Falls - Ladders 2005 - AS 1892.5

Working safely in the general construction industry 2008

Tower Frame Scaffolds 2006

Industrial Rope Access 2006

Working Safely with Trees 2001

Acknowledgements

The National Safety Council of Australia, with editorial advice from Stuart Dempster.

Holmesglen Institute of Tafe, Industrial Skills Training Unit:

(a) Height Safety and (b) Tower Rescue.

A Guide to Rigging, 1997, West, D. (Ed.) Workcover NSW.

Dogging Training Manual, 1999, Fitzgerald C., and Fitzgerald M., Fitzgerald and Assoc, Morley, WA.

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Personnel: training and competency

Working safely requires the ability to competently follow safe work procedures.

Two tower rescue trained personnel are required when tower access takes place.

Personnel should hold current certification for:

Work Safely at Heights MNMG237A

Tower Rescue PUASAR001B

These need to be re-certified every 3 years, and rescue training every 6 months.

This must be documented.

Site Risk Control Measures

Sites shall reduce risk where reasonably practicable, use the following hierarchy of control, in order of preference:

1. Work on the ground or solid platform where possible.
2. The tower/mast and climbing/rescue equipment to be inspected before climbing. Rescue equipment needs to be placed at the base of tower for rapid deployment, along with first aid kit. See tower/equipment checklist attached. Climbing equipment must be in date, and rated for intended use.
3. All climber personal harness fitment to be checked by the designated safety officer before vertical work commences.
4. Work Positioning Systems: suitable full body harness; travel restraint system - DBI-SALA's Lad-Saf® flexible cable ladder safety system, double hooks (eg Petzl MGO), pole-straps, slings, locking carabiners; industrial rope access system.
5. Injury Prevention System – personal energy absorbers, rated rescue/climbing/caving helmet. Some first aid supplies to be carried by climbers (eg triangular bandages taped to inside of helmet).

STRUCTURES.

Towers and Masts are to be installed and annually inspected by suitably qualified riggers. Installation is to manufacturer's specifications.

All Guyed Masts & Towers

Daily check all structures before any work undertaken on site – check guy anchors for structural integrity in concrete/steel components, check guy wires for tension, swages/wire rope grips for correct grip (check nuts on grips tight), wire rope for rust or damage (pinched/kinked/frayed), turnbuckles are locked and not over extended, and mast/tower for correct alignment.

Climbing: As the access ladder is most often vertical there need to be an independent fall protection system. Climbers shall attach to the strongest members of the tower (eg the vertical chord rather than a ladder rung or cross bracing)

In tall forests & woodlands there is a significant risk of limbs/trees falling on guy wires. This can damage / fell a mast. An arborist can prune / remove dangerous trees / limbs.

Consider setting a maximum wind speed for safe access. Trees and limbs are more likely to fall. Different sites limits might be 10-30km/hr

Wind-Up (Telescoping) Masts. Winch cables should be rust free and neatly wound. When climbing or telescoping the mast body parts should be kept outside the internal mast until moving sections are bolted together or have a suitable bar inserted through the slots and holes of the locking plates. Do not climb above the first fixed section of tower until all sections are bolted together and all guy wires are correctly tensioned.

Hydraulic Poles -ensure solid guy Anchors, Jacking Plate Raft on Bracing Feet, Ladder AS 1892.5, Raise/Lower Tower in still conditions

Fixed (Butt Section) Masts Access ladder to be protected by Lad-Saf® flexible cable ladder safety system, or the use of a secondary climbing back up such as the use of double hooks.

Scaffold Towers Supplier's information is to include: the purpose for design; conditions required to ensure the system is safe and without risks to user health; a guide to safe working practices; duty of scaffold (light/medium/heavy) and max capacity (kg load); maximum height; secured ladder access to between 1:4 an 1:6 with a hinged trapdoor in working platform.

Rescue AS/NZS 1891

The rescue method must be considered and planned for.
Emergency procedures developed and documented.

This should include pre-prepared and tested communication/
access/ directions for emergency services to each site.

Rescue equipment should pre-rigged at tower base.
Ensure a second set of climbing gear has been checked and is
pre-rigged at the base of the tower.

The rescue rope needs to be longer than the tower height.

Treat suspension trauma as a crush injury.
Identify nearest hospital / medical treatment facility.
The first aid kit should be accessible and suitable.

Communication

Tower workers need to be in contact with the ground personnel at
all times. If two climbers are required to be on the tower
communication is vital throughout the task to ensure that each is
aware of the other's position at all times.

Emergency contact information should be on site, with all staff
aware of location.

Communication systems may include 2way radio, mobile phones,
satellite phones, epirb, spot.

Other personnel on ground

Toolbox meeting before work starts – so everyone understands
SWMS particulars.

Demarcate an exclusion zone around tower, ground staff to wear
helmets, hi-vis clothing.

One team member on the ground is responsible to keep any
unplanned visitors away.

Signage and fencing may be needed in public areas.

Personal Protective Equipment

To be inspected before each use & every six months by a competent person.

Helmet – a rated rescue, climbing or caving safety helmet.

Gloves – riggers gloves protect hands from sharp edges, cold, UV.

Boots – footwear that is supportive, comfortable, and has maximum grip and protection, AS 2210 Safety Footwear.

Eye Protection for Industrial Applications AS 1337, radiation damage from exposure to sun, physical damage from flying parts.

Self-Rescue Kit carried.

First Aid Kit – basic personal first aid – may include a triangular bandage taped to inside of helmet.

Clothing shall suit the environmental conditions – sun and heat exposure, cold, and rain

Whistle – a safety whistle is the last resort means of comms

All jewellery to be removed, and long hair restrained before climbing.

Environmental Exposure

It is essential for workers at heights to be healthy, alert, and in good condition. When working at an exposed site regular breaks are required to minimise exposure to elements.

In extreme environments work periods may be limited to short, focussed efforts, to avoid over exposure.

Both hyper- and hypo-thermia quickly effect bodily and mental functions, as such personnel need to watch out for each other, and make sure exposure to elements is minimized. Workers health and safety take priority over the job to be done.

In hot environments rehydration breaks, somewhere in the shade, are required regularly. It is advised not to climb when tower is wet, but on tall towers in SE rain can begin when already on tower.

Installation of Equipment on Tower

Secure all equipment/tools/haul bags to prevent dropping.

All equipment/tools over 8kg to be independently suspended using a separate line.

All tools secured with a line adequate to prevention dropping.

Work action plan for installation of / on towers

1. All researchers, contractors, & volunteers:

- a) Meet at start of day to discuss jobs to be done
- b) Conduct a SWMS, all to sign
- c) Must be suitably qualified and experienced
- d) Wear a hard hat / hi-vis clothing / required PPE

2. All tools / machinery:

- a) Suitable for the tasks allocated
- b) Inspected & properly maintained (with records)
- c) Vehicles cleaned down before entering the site and at the conclusion of the job

3. Site Conditions:

- a) Access may be dry weather only, with low soil moisture especially when off tracks
- b) Any access track damage to be repaired
- c) When excavation creates excess subsoil remove from site
- d) Topsoil to be stored for site/track repairs
- e) Remove excess concrete & building materials
- f) Uninstall of site to return site to original condition

Tower Inspection Checklist. To be documented for each use before leaving the ground

Is tower upright and true movement	Evidence of tower
Are the anchors secure	Are turnbuckles locked off
Are wire rope grips tight good condition	Are guy wires tight and in
Is there evidence of trespassers on site - check boundary fence condition	
Is there evidence of animals within the fenced enclosure	

Monash & CDU use an iPhone/iPad app that records site name, date, who visited, logger values etc.

Climbing Checklist

All climbing equipment to be rated for intended use and inspected before each tower ascent. All equipment needs records of use, transported and stored appropriately. Keep ropes/harnesses/slings clean, dry, and away from heat / acids / alkalis / organic solvents.

Have you established emergency procedures
Is there at least two sets of inspected climbing gear
Does all hardware function correctly
Manual check of rope – pass
Are personnel healthy, alert, and hydrated
Do personnel have appropriate PPE / clothing
Is the scope of work reasonable for time allowed
Does the climber have to drive afterwards
Is the rescue kit appropriate for the tower
Is the rescue kit pre-rigged at tower base
Are emergency contacts / first aid kit accessible
Are all tools / equipment securely fastened

Safe Work Method Statement

Employers' duties are: to ensure a SWMS is prepared before any high-risk work is carried out; that work is carried out according to the SWMS: and that a copy is documented.

The SWMS lists: the type of high-risk work to be done; states health and safety hazards, and risks arising from this work; describes how these risks will be controlled: and describes how the risk control measures will be put into place.

example only, blank copy attached last

Safe Work Method Statement		
For each site, prepared daily for any high risk work.		
Location	Whroo Nature Conservation Reserve -36.673233,145.029373	Date 25/12/11
High Risk Work Undertaken	Installation of Instrumentation on Research Tower	
Person Responsible	Darren Hocking	
All Personnel Onsite Sign In/ out print name / initial		
Darren Hocking		
Jason Beringer		
High Risk Tasks	Hazards / Risks	Control Measures
Climb Tower, working @ heights.	Falling.	Always use a two attachment point system, e.g. climbing use ladsaf If off ladder use scaffolding hooks, pole straps, or slings& locking carabiners.
	Pendulum into tower.	Keep attachment points close to body. With long slings or scaf hooks – keep attachment points as high as possible.
	Suspension trauma,	Pre-rig all rescue equipment for rapid deployment in case of required rescue. Practice rescues as per training. Call 000 for ambulance. Perform rescue asap, and place patient in sitting position curled up to minimise blood flow from legs to body (until help arrives).
	Exposure	Dress appropriately for given environmental conditions. Keep hydrated (carry water if required). Avoid working in windy & rainy weather.
	Tools &/or equipment restraint form dropping.	Use lanyards for all gear bags, heavy tools & equipment (2 point system) Keep people on ground informed & with helmets Create exclusion zone when heavy items being installed. "BELOW" call system if small object dropped – so those below don't look up.
Driving Home after tower work	Fatigue – driving after working at heights	Share driving (person who was up tower last might need a break) Take a break every 2 hours or as required.

Safe Work Method Statement Guide

SWMS is current best practice for safety in High Risk Work.

Aim: To plan structures and processes to eliminate / minimise risks for tower research.

Methods:

A. Communicate to all researchers, contractors, & volunteers on site the plan for work for the day, any high-risk work to be undertaken, hazards, risks, and control measures.

B. The Tasks Risks and Controls section to be filled in expected completion order.

Controls to be prioritised to preference of highest level of control:

1. Eliminate risks, eg access from ground where possible.
2. Reduce risks by: substituting action/procedure/technology with safer alternative; isolating people from the hazard eg barricade or fence; appropriate mechanical devices eg a fall arrest system.
3. Use administrative controls, such as change way work is done.
4. Provide appropriate Personal Protective Equipment.

C. Everyone on site to be briefed before commencing work, and to sign on to the SWMS to indicate an understanding of the process.

D. During the day, all work to follow the SWMS process, and everyone knows to stop if SWMS not being followed.

E. At end of day: review the process; suggest safer improvements; then sign out. The SWMS to be kept for the duration of the job, and in the case of any incident the SMWS must be retained.

In addition to the SWMS, a trip intentions form should list emergency contacts within your organization, nearest emergency services, nearest first aid support, emergency evacuation procedures, and insurance details. It may be required to list the approval for site access, cite owner contacts, site inductions, work permits.

