

Caving

Australian

Adventure Activity

Good Practice Guide

Guidance for horizontal and vertical caving.



**Outdoor Council
of Australia**

Representing the
Outdoor Sector Nationally

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The Outdoor Council of Australia and the Australian Adventure Activity Standard Steering Committee would respectfully like to acknowledge the Traditional Owners, their Elders past, present and emerging, for the important role Indigenous people continue to play in Australia and most especially on the land and waters used for outdoor activities and recreation.

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Foreword

“Adventure is worthwhile” – Aristotle

The Australian Adventure Activity Standard and Good Practice Guides are designed to ensure effective, responsible, sustainable and safe delivery of adventure activities to dependent participants. They can help people across the outdoor sector to develop appropriately managed adventure activities which enhance individuals and our communities, while protecting the environment and culturally significant places. In doing this, these documents can help ensure that people will continue to enjoy the benefits of adventure activities well into the future.

Best wishes for all your adventures.

The Australian Adventure Activity Standard Steering Committee.

Preface

About these documents

The **Australian Adventure Activity Standard (AAAS)** and related **Good Practice Guides (GPGs)** are a voluntary good-practice framework for safe and responsible planning and delivery of outdoor adventure activities with *dependent participants*.

The AAAS and related GPGs provide guidance on safety and other aspects of responsible activity delivery, such as respect for the environment, cultural heritage and other users. They are not a full legal compliance guide, nor are they a “how to” guide or field manual for outdoor activities. They do not provide guidance on providing a high-quality experience over and above safe and responsible delivery.

Activity *providers* are encouraged to obtain independent professional and legal advice in relation to their obligations and duties in delivering adventure activities and should reference the relevant laws to the area in which they intend to undertake the adventure activity.

Does the Standard and Good Practice Guides apply to me?

The AAAS and related GPGs are specifically designed to help activity *providers* who are conducting activities involving *dependent participants*, to provide a safe and responsible experience. It is for each *provider* to determine based on their own individual circumstances, if they are working with *dependent participants* or not.

A *dependent participant* is a person owed a duty of care by the activity *provider* who is reliant upon the *activity leaders* for supervision, guidance or instruction to support the person’s participation in an activity. For example, this often includes participants under the age of 18, participants lacking the ability to safely undertake the activity, or participants reasonably relying on the activity *provider* for their safety. The degree of dependence may vary during an activity.

Considerations for determining if a person is a *dependent participant* may include, but is not limited to:

- the foreseeable level of *competence* of the participant in the activity and the associated level of reliance this creates on the *activity leaders*
- the level of foreseeable self-reliance of the participant to reasonably manage their own safety
- the possible variation throughout the activity of the level of reliance
- the variation of the degree of dependence throughout the activity
- the individual context, nature and circumstances of the activity
- the relevant circumstances and particular facts relating to the responsibilities assumed by the *provider*.

An activity *provider* can be any organisation – business, community group, government agency, school or any other groups – that organises and leads adventure activities. Individuals can also be an activity *provider*, if they have the ultimate legal duty of care to participants. In general, ‘the Standard’ and GPGs relate to a provider as a ‘whole organisation’, rather than to ‘specific roles’ within the provider ‘organisation’.

Some providers may have their own standards or guidelines appropriate to their duty of care. It is recommended that these be reviewed periodically to ensure current duty of care expectations are met. ‘The Standard’ and GPGs may aid such reviews.

Are they legally binding?

The AAAS and GPGs are voluntary, not legal requirements. However, they may refer to specific laws and regulations which may be legally binding on activity *providers*.

While the AAAS and GPGs are voluntary, some *land managers* and other organisations may require compliance. This may be as a condition of obtaining a licence, permit or other permission, or some other condition (e.g. a contract).

Under Australian common law and relevant legislation, *providers* have a legal duty of care towards *dependent participants* in some circumstances. In broad terms, the legal duty requires *providers* to take reasonable care that their actions and omissions do not cause reasonably foreseeable injury to *dependent participants*.

The AAAS and GPGs are not legal advice, and they cannot answer whether a legal duty exists in specific circumstances. All adventure activity *providers* should check what legal requirements apply in their own situation and seek legal advice if at all in doubt.

Even in cases where participants are not dependent, other legal duties and obligations may arise. The AAAS and GPGs have not been developed for those contexts.

Structure of the Standard and Good Practice Guides

The AAAS (i.e. the Standard) has a related Core Good Practice Guide (Core GPG). They both include guidance that applies to all adventure activities. They set out recommendations for a common approach to risk management that can generally apply regardless of the specific activity being undertaken.

Individual activity Good Practice Guides include guidance on specific adventure activities.



For any given activity, (i) the AAAS (the Standard), (ii) the Core GPG and (iii) the activity Good Practice Guide that applies to that specific activity, should be consulted.

The AAAS and Core GPG cover only those activities specifically listed. While the AAAS and Core GPG may be useful in managing *risk* generally for other activities, they may not reflect good practice for such other activities.

Interpretation of the Standard and Good Practice Guides

The following words and phrases are used in all documents and have specific meanings:

- **Must:** used where a provision is mandatory, if the *provider* is to operate fully in accordance with AAAS or GPGs. (This is equivalent to the keyword “shall” used in other voluntary standards e.g. Standards Australia, other International Standards Organisations (ISO’s) etc.)
- **Should:** used where a provision is recommended, not mandatory. It indicates that the *provider* needs to consider their specific situation and decide for themselves whether it applies or is relevant.

- Can/cannot: indicates a possibility and capability.
- May/need not: indicates a permission or existence of an option.
- But are/is not limited to: used to indicate that a list is not definitive and additional items may need to be considered depending on the context.

The following formatting is used throughout:

- Defined words are in *italics*. They are defined in the Glossary.
- Examples are in smaller 9-point font.
- In document references are in underlined. References are to section heading titles.
- External web or Australian AAS & GPG document links are in dotted underline italic.

Creation

The AAAS and GPGs were developed with the input from a wide range of outdoors and adventure activity experts with extensive field experience. They draw on state and territory-specific standards previously in place across Australia. The development process included work by a range of technical expert working groups, as well as open consultation throughout the community of activity providers and other experts.

The Steering Committee wishes to thank all the Technical Working Group (TWG) members for their work and contributions.

The Steering Committee acknowledges all the State and Territory Governments for funding the creation of the first national adventure activity standard and set of good practice guides for the sector.

Further details of the creation of the AAAS and GPGs can be found at www.australianaas.org.au.

It is intended that the AAAS and GPGs will be regularly updated to reflect changing practice and better understanding over time. Updates will be noted on the website www.australianaas.org.au.

1 Introduction

1.1 Caving

Caving is entering and/or moving through an underground passage and/or cavern created by natural geological processes. The underground passages and/or caverns are called caves. A cave may have passages and/or caverns of varying sizes and complexity.

The common feature is the total absence of light and communication difficulty with the surface beyond the entrance of the cave. Other challenges involved in entering and/or moving through caves include a limited ability to see the terrain where the feet are to be placed, negotiation of vertical climbs or drops, tight *squeezes* and water hazards.

Caves can be sensitive environments. Further information on specific caves, can be obtained from relevant land managers and the Australian Speleological Federation (ASF).

Those introduced to caving should experience role modelling of the appropriate relevant procedures.

Caving activities are categorised in this Good Practice Guide (GPG) into three activity types: simple caving, horizontal caving and vertical caving.

1.2 Simple caving

A “*simple cave*” is a cave with the following attributes:

- caverns where light from an exit is always visible OR single caverns where progression to an exit is obvious by moving in either direction
- AND there are no water hazards requiring submersion, swimming or roof sniffing
- AND there is minimal risk of foul air
- AND where vertical caving is involved, it is limited to using only fixed ladders or staircases
- AND a *responsible person* with no caving experience would be able to lead a group out of the cave if the cave leader/instructor became incapacitated.

1.3 Horizontal caving

Horizontal caving is traversing through a cave where any fall safety required can be achieved by assistance (e.g. spotting). It may involve walking, scrambling, crawling through narrow or low spaces, fording pools or streams and climbing up or down short rock faces/rock piles. Water hazards such as moving water may be present. A wide range of assistance can be used.

Spotting is a support process provided by a person, or persons, who offer physical protection of the head and upper body of a person should they fall. (Note that this differs from helping to guide the hand and foot placement while clambering up or down obstacles, which is called “*marking*” in this GPG. *Marking* helps to prevent falls while *spotting* helps protects the person if they fall.)

Climbing while *horizontal caving* can occur on short steep slopes and may use *spotting* as the means of providing fall protection.

1.4 Vertical caving

Vertical caving is the descent, traversing and/or ascent of vertical or near vertical caves, where fall safety can only be achieved with a *belay system* due to the *fall height*.

It may involve the use of ropes, ladders and/or descending/ascending equipment to climb up, down or traverse vertical drops. *Vertical caving* can involve *single-pitch* or multi-pitch abseils and climbs, as well as sections of *horizontal caving* as described above.

Abseiling is descending vertical or near vertical natural surfaces using ropes and descending friction devices to manage the descent. It is also known as rappelling. *Abseiling* involves descending a rope by either walking backwards down a vertical or near vertical surface or lowering while free hanging.

Climbing is ascending, traversing or descending vertical or near vertical natural surfaces. For the purposes of this GPG climbing may also include ascending a fixed rope or using a ladder.

Climbing or *abseiling* without a means of an equipment based fall protection system is considered unacceptable, except for where a climber is within a reasonable *fall height* that either does not require protection or assistance (e.g. spotting) can be used.

1.5 Exclusions

Activities that are not covered by this Good Practice Guide are:

- unexplored caves
- *tourist/show caves*
- *artificial caving* such as man-made features such as drains, mines or tunnels
- *cave diving*
- water obstacles that involve breath holding (e.g. duck under, swimming underwater)
- extended stays (e.g. camping in caves).

1.6 Related activities

Abseiling and *climbing* related information is generally included in this Caving GPG. However, the Abseil and Climbing GPG is a recommended reading resource.

Where *bushwalking* occurs to access caves, then the [Bushwalking GPG](#) should be complied with.

Where *canyoning* occurs to access caves, then the [Canyoning GPG](#) should be complied with.

2 Management of risk

Refer [Core GPG - Management of Risk](#) provisions for risk management planning.

3 Planning

3.1 Activity plans

Activity plan considerations should include but are not limited to:

- aims and objectives of activity
- selection of suitable caves that are able to withstand repeated visits
- cave environment and hazards:
 - wet
 - dry
 - cave temperature
 - possible *foul air* hazards
 - possible transmission of diseases
 - potential for cave flooding
 - rock stability
- obstacles to overcome (e.g. horizontal caving sections, squeezes, single pitch or multi pitch vertical sections, water hazards)
- navigation difficulty
- access and remoteness of the cave system

- the leadership requirements including but not limited to:
 - supervision requirements specific to the site
 - competencies required by activity leaders
- relevant items listed in leadership sections
- toileting facilities and appropriate waste disposal options
- sustainability requirements and protection of cave features
- contacting sources of local knowledge
- participants involved including but not limited to:
 - group size
 - relevant items listed in participant sections
- obtaining further information on specific caves, which can be obtained from relevant land managers and the Australian Speleological Federation (ASF).

3.2 Emergency management planning

Also refer to [Core_GPG - Emergency management planning](#).

A non-participating contact should be used as part of the emergency management plan for all activities.

Emergency management plans must include:

- communication requirements with the surface in emergencies
- management of cavers trapped in *squeezes*
- guidance on *trigger points* for considering the possibility of harness hang syndrome occurring (refer [Appendix 5](#))
- appropriate actions to follow where harness hang syndrome is suspected, including but not limited to the relevant first aid treatment.

Events must be treated as an emergency where a person is hanging in a harness and is:

- unconscious or
- is unable to continue to progress either up or down for an extended period of time.

Activity leaders must be competent in using relevant rescue systems, and procedures must be practiced periodically.

4 Participants

4.1 Information provided to participants pre-activity

Pre-activity information provided to participants should communicate:

- expectations and activity conditions
- potential hazards and risks
- any necessary pre-requisite skills & knowledge to undertake the activity.

4.2 Participant restrictions

Pre-activity planning should consider whether a pre-activity assessment of prerequisite participants skills and knowledge is required.

When prerequisite participants skills and knowledge are required an appropriate pre-activity skills and knowledge assessment should be conducted.

Participant restrictions may include screening for:

- items listed in the [Core GPG - Participate restrictions](#) section
- a minimum age
- those that are socially, emotionally or psychologically unsuited
- those that experience claustrophobia
- those uncomfortable in water where *roof-sniffing* is required to progress through the cave
- individual body size restrictions if there is no practical alternate route for:
 - tight *squeezes* or
 - where a required length of reach is essential to overcome obstacles.

4.3 Participant health and wellbeing

Refer to the [Core GPG - Health and wellbeing of participants](#) and [Vulnerable participants](#) sections.

Potential measures to assist in providing positive participant experiences may include but are not limited to:

- providing caving as an option so it is challenge by choice
- providing a scaled level of experience to build participants level of skill, knowledge and experience
- providing real choice in terms of obstacles that are to be overcome within the cave (e.g. roof-sniffing)
- providing emotional support through a supportive environment and positive rapport
- reducing as much as practical any discomfort from the equipment used.

5 Environment

5.1 Caving environments and hazards

5.1.1 General cave environment

Environmental considerations for caving other than weather may include but is not limited to:

- the terrain (e.g. steep slopes, uneven or unstable footing, cliff edges etc.)
- the lack of natural light
- the lack of ability to communicate with the surface
- the temperature of the cave environment including air and water temperature
- possible *foul air*
- water hazards
- the potential for flooding
- navigation in complex cave systems
- sharp surfaces
- loose rock and unstable scree slopes
- sediments (e.g. stalactites, stalagmites, sand, mud)
- rockfalls and cave-ins
- erosion
- falls from height
- the fauna which is expected and/or protected (e.g. bats, snakes, spiders etc.)
- guano piles
- bone deposits
- historical, heritage and/or cultural items or materials (refer [Core GPG](#) and section [5.7 Environmental sustainability procedures](#) below)
- the type and location of flora expected (e.g. *tree roots*).

5.1.2 Darkness

Planning and procedures must address the following associated with operating in darkness:

- having personal light sources and appropriate backup sources
- route finding and navigation
- activity leader competence to eliminate possible disorientation and maintaining location awareness
- appropriate participant supervision to keep the group together
- possibility of personal injury.

Also see [7.4.3 Managing darkness](#).

5.1.3 Cave navigation

Planning and procedures must address:

- correct route finding and following an appropriate route
- navigation systems to maintain location awareness
- keeping the group together
- where necessary, suitable mapping of routes, hazards and exits.

Where caves involve multiple passages or challenging navigation, planning and procedures must include:

- use of appropriate navigational aids
- use of route finding and tracking aids (e.g. removeable reflective markers).

Also see [7.4.4 Progression through a cave](#).

5.1.4 Foul air

Planning and procedures must address the following associated with the potential for entering *foul air*:

- prior knowledge of cave system to identify actual or potential areas for *foul air* (see [Appendix 6](#))
- monitoring for signs of entering *foul air* (see [Appendix 6](#)).

Caves or sections with known *foul air* issues should not be used for dependent groups.

Refer to [Appendix 6 Foul air](#) and [7.4.7 Foul air](#).

5.1.5 Disease transmission

Planning and procedures must identify and address the potential for disease transmission:

- to humans (e.g. histoplasmosis, rabies related disease such as Australian Bat Lyssavirus (ABLV), water borne disease, etc.)
- from humans to animals and between animals (e.g. white nose syndrome (WNS)).

Also refer:

- leadership section [7.4.8 Preventing disease transmission](#)
- [5.5 Wildlife safety](#) section below.

5.1.6 Loose rock

Procedures must be developed prior to the activity, to manage any movement through areas of loose rock.

Also see [7.4.6 Falling objects](#).

5.2 Water hazards

5.2.1 Assessment of water hazards

Assessment of potential and/or current water hazards must consider:

- seasonal variation in water levels
- the ability to cross any water bodies or streams
- the temperature of the water
- the velocity of the water
- the possibility of water levels rising while in the cave
- what water levels allow *roof-sniffing* and/or create *traps*, *siphons*, *sumps* or *duck-unders*.

5.2.2 Rising water

The causes of rising water and fast flowing water hazards for the caves used must be identified and addressed in the risk management plan.

Considerations relating to rising water levels and fast flowing water hazards must include:

- where an exit has to be made against the water flow of an inflow cave
- understanding local catchment areas
- associated dangerous weather patterns or dam operations
- likely water rising rates for particular weather patterns and catchment surface conditions (e.g. snowmelt, rain in dry periods causing rapid water level changes, additional water entering an already saturated catchment area, etc.)
- the best weather and water level forecasting service available for area
- when to cancel due to water level concerns
- methods for monitoring water rising rates, water level indicators, and maximum safe water levels
- procedures for dealing with rising water levels including safe *waiting areas*, escape routes, and evacuation procedures.

5.2.3 Flooding

Cave areas known to be flooded must not be used.

Areas subject to current flood warnings should be avoided.

During rain, severe weather or thunderstorms or when they are forecast, areas likely to experience flooding should be avoided.

The crossing of swollen waterways or entering of floodwaters should be avoided.

5.2.4 Drinking water

Refer [Core GPG - Drinking water safety](#) section.

The safety of water within a cave system must be considered prior to use of the water as a drinking source.

Considerations relating to safety of water in a cave system for drinking must include:

- possible contamination of the catchment system (e.g. farm runoff, waterborne microorganisms such as *E.coli* or *Giardia* species).

5.3 Vertical caving

Vertical caving must consider all the items listed in the *horizontal caving* section along with the following items.

Safety considerations for *climbing* or *abseiling* include but are not limited to:

- stability of the rock surface

- stability of features (e.g. loose rocks)
- availability of *anchors* or natural features to use for *anchors*
- safety requirements for access and egress including the likelihood of a fall from height before and after participation.

Any approved modification or removal of natural surfaces must be approved by the land manager and undertaken by an appropriately competent person.

Any approved installation of permanent artificial *anchors* in natural surfaces must be approved by the land manager and undertaken by appropriately competent person.

5.4 Weather

5.4.1 Weather information

Weather information must be obtained from the Bureau of Meteorology or other appropriate reliable source.

The Bureau of Meteorology provides a range of services and for details refer to:

<http://www.bom.gov.au/weather-services/WeatherGuideLand.pdf>

5.4.2 Weather trigger points

Trigger points must be based on the relevant Bureau of Meteorology weather warnings and relevant actual weather conditions.

The risk management plan and emergency management plan should include guidance on *trigger points* and associated actions for:

- actual or forecast rain
- severe weather warnings
- severe thunderstorm warnings.

Actions for weather *trigger points* may include but are not limited to:

- cancellation of activity
- evacuating to a safe location
- avoidance of locations effected by tides or surf
- avoiding areas that have the potential for flooding
- preparations to avoid the risks associated with lightning.

5.4.3 Lightning

Whilst thunder is audible groups should avoid:

- cave entrances
- immersion in water.

5.5 Wildlife safety

Procedures should be in place to minimise the risks associated with wildlife that may be encountered.

The types of wildlife encounters that may need to be considered include but are not limited to:

- bats
- reptiles (e.g. snakes & lizards)
- birds
- invertebrates (e.g. spiders, scorpions, centipedes, ticks)
- mammals (e.g. wombats, Tasmania devils, possums, platypus, cats etc.).

Any handling of wildlife including bats must be completed by an appropriately competent person using gloves.

Procedures relating to bats must include:

- the possibility of contracting disease from bats or bat droppings (e.g. histoplasmosis, rabies etc.)
- any dead or dying bats not being handled.

Considerations in reducing the above wildlife encounters may include but are not limited to:

- briefing participants in how to respond to encounters
- conducting a site assessment before use
- using alternative locations if necessary.

Also refer:

- [5.1.5 Disease transmission](#) above
- leadership section [7.4.8 Preventing disease transmission](#).

5.6 Bushfire, prescribed fire and fire danger

Refer [Core GPG - Bush fire, prescribed fire and fire danger](#).

5.7 Environmental sustainability procedures

The Australian Speleological Federation (ASF) can provide information on current environmental issues (e.g. White Nose Syndrome) and has a minimum impact caving code.

5.7.1 Plan ahead and prepare

Planning ahead and preparing may include but is not limited to:

- understanding cave sensitive features
- being aware of the location of sensitive features in the cave
- developing plans to protect or avoid sensitive features
- identifying the best *anchor* points available in terms of safety and minimising impact
- pre-planning to reduce the need for unnecessary exploration
- choosing sites that are appropriate for the group size and composition.

5.7.2 Travel and stop on durable surfaces

Travelling in an area on durable surfaces may include but is not limited to:

- use established routes and defined paths
- monitor progress to stay on established routes
- actively managing groups to minimise impact
- move throughout caves slowly, deliberately and thoughtfully
- have procedures that ensure only robust surfaces are being used or touched
- move in way that avoids stirring up dust clouds
- minimise disturbance near streams, in entrances, or in muddy areas
- avoid touching, walking or crawling on cave deposits or features that may be damaged (e.g. drip holes, stream sediments, paleosols, crusts, flowstone, cave pearls, bone material, potential archaeological sites, cave fauna, speleothems, crystal weathering, evaporitic deposits, tree roots, soil cones, etc.)
- avoid touching cave walls and speleothems with bare hands because of the potential for contamination from skin oils
- use of boot washing stations or cleaning boots where required
- if necessary, to walk on flowstone remove muddied boots and/or clothing, use boot wash stations if provided and consider wearing alternative clean soft-soled footwear
- have procedures to monitor head placement to prevent accidental damage to formations

- not allowing mud fights
- the use of temporary edge protection when using ropes
- the installation of artificial *anchors* or equipment only being carried out with the permission of the Landowner or Land Manager
- no *camping* in caves.

5.7.3 Dispose of waste properly

Disposal of waste may include but is not limited to:

- all rubbish, food and food crumbs to be carried out and disposed of appropriately
- all food is eaten over a container to catch crumbs
- all human waste and hygiene products to be carried out in a suitable container and disposed of appropriately
- removal of any waste others have left.

5.7.4 Leave what you find

Leaving what you find may include but is not limited to:

- not excavating, disturbing or removing archaeological, historical, bone, fossil and cultural artefacts
- not interfering with any markers (e.g. survey markers)
- not interfering with any rock and cave decorations
- having procedures to prevent touching rock art
- having procedures to prevent introducing or transporting non-native species
- caving clothing, boots and relevant equipment is appropriately cleaned after every trip to minimise the spread of bacteria, fungi and non-native species
- not hiding items (e.g. snacks) as part of the activity for group members to “find”
- chemical light sticks being used with care so that there is no leakage of the chemicals from its container.

5.7.5 Minimise the impact of fires

Minimising the impact of fires or stoves must include:

- no fires being lit in a cave
- no smoking in a cave
- no use of stoves in a cave
- no use of flares in a cave
- no use of carbide lighting.

An alternative to using stoves should include carrying hot drinks in a thermos.

Minimising the impact of fires should include procedures to appropriately manage any use of items with a naked flame (e.g. butane lighter, candles).

5.7.6 Respect wildlife

Respecting wildlife must include but not limited to:

- not touching wildlife
- using indirect light and avoiding using direct light to view them
- talking quietly in areas where bats may be resting
- avoiding disturbing bats with camera flashes
- avoiding disturbances to wildlife habitats (e.g. webs, snares, nests, tree roots, organic debris, guano)
- understanding what wildlife that could be encountered so that procedures can be used to protect them and their habitat (e.g. nests).

5.7.7 Be considerate of your hosts and other visitors

Be considerate of your hosts and other visitors may include but is not limited to:

- seeking and gaining appropriate permissions to access sites
- following land manager or landowner instructions or requirements
- determining and complying with any traditional owner and cultural heritage requirements
- negotiating with other users regarding shared use of a site
- talking quietly.

Also refer [Core GPG – Environmental sustainability procedures](#).

6 Equipment and logistics

6.1 Equipment requirements

6.1.1 Caving equipment requirements

Helmets must be brimless and manufactured for use in the context of the activity. Refer [Appendix 2 Equipment related standards](#).

Risk management procedures must ensure adequate lighting and provision for managing any failure or reduced performance of a light source.

Each person must have:

- a primary light source
- a secondary light source available
- an appropriate helmet.

Primary light sources must be attached to the helmet.

Secondary light sources should be able to be attached to the helmet.

Secondary light sources must not be a chemical light stick.

Any handheld light sources should have a wrist strap.

Flares must not be used.

Groups must carry:

- a reasonable number of additional light sources determined by the risk management plan as a backup for both primary and secondary light source failures
- a watch for monitoring the time
- a cord or tape hand line, with a length determined by the risk management plan.

Groups must determine by the risk management plan what equipment they need to carry for:

- navigation
- first aid and rescue.

Example equipment lists can be found in [Appendix 1 Equipment](#).

Having light reduces caving risks. Those introduced to caving, should experience role modelling that entry into any cave requires each person to have 2 light sources. Primary and secondary light sources need to be suitable for moving through the cave.

The Australian Speleological Federation (ASF) has information and resources that can also provide equipment safety guidance.

6.1.2 General equipment requirements

Procedures must be in place to ensure appropriate clothing for the expected and foreseeable conditions is available.

Procedures must be in place to ensure appropriate footwear for the expected and foreseeable terrain is used.

Footwear and clothing must be fit for purpose.

Considerations for suitable footwear include:

- fully encloses and protects the foot
- provides adequate grip
- adequately secured to prevent slipping off.

Considerations for wearing gloves should include:

- protecting the person's hands
- protecting the cave environment
- gloves worn are lint free.

Example equipment lists can be found in Appendix 1.

6.1.3 Vertical caving equipment requirements

All equipment must be manufactured for use in the context of the activity. Refer [Appendix 2 Equipment related standards](#).

Such equipment may include:

- accessory cord
- artificial fixed *anchors* used
- ascending devices
- belay devices
- *connectors* (e.g. carabiners)
- *cow's tails* or personal anchor systems
- descending devices
- *dynamic rope*
- gloves
- harnesses
- helmets
- pulleys
- removable bolt plates
- slings
- *static rope*
- wire ladders and traces
- any other equipment that is part of the safety system used.

Gloves must be appropriate for the task and of a suitable fit.

Example equipment lists can be found in [Appendix 1 Equipment](#).

6.1.3.1 Rigid ladders

Rigid ladders must be appropriate for the task they are being used for.

Rigid portable ladders must meet the Australian Standard AS 1892.1:2018 Portable ladders: Performance and geometric requirements.

Rigid ladders must be fixed or secured appropriately to prevent movement.

6.1.3.2 Rescue and emergency equipment

Appropriate vertical rescue equipment must be readily accessible when *vertical caving*.

Vertical rescue equipment may include but is not limited to:

- ascending devices
- belay devices
- *connectors* (e.g. carabiners)
- *cow's tails* or personal *anchor systems*
- knife
- pulleys
- prusik loops
- rope long enough for the longest pitch
- slings.

An additional rope long enough to effect a rescue for the longest pitch must be available for rescue purposes.

Procedures must be in place to ensure appropriate emergency response equipment and a drinking water supply is available.

6.1.3.3 Cow's tail requirements

Cow's tails using static material for the tails must not be used as a fall arrest system. (For example, static material tails suitable for a restraint line, is not suitable for a fall arrest system which requires dynamic material to help absorb the impact of the fall.)

Considerations for cow's tails used during caving must include:

- the tails being made of appropriate dynamic material (e.g. dynamic rope of suitable diameter) that has an appropriate safe working load
- the two tails are of differing lengths
- the longest tail is of an appropriate length for the user to correctly operate (e.g. arm's length)
- where knots are used to construct the cow's tail:
 - they are appropriate knots and
 - the knots assist absorb the impact of fall (e.g. figure of eight or barrel knots) and
 - the knots are correctly dressed and if needed, has its movement around the connector restricted, so that the knot cannot slide and cause incorrectly load of the connector (e.g. slide over the carabiners gate).

6.2 Use of caving equipment

All equipment must be used with reference to the manufacturers instructions.

Training in the use of equipment used must be provided to activity leaders and participants.

An appropriate helmet for protection must be worn while caving.

Handheld torches must not be hung around neck; a wrist loop is to be used instead.

A procedure must be in place to determine when equipment is to be cleaned. (Also refer [5.7 Environmental sustainability procedures](#) and [5.1.5 Disease transmission](#).)

6.3 Use of vertical caving equipment

6.3.1 Vertical equipment use

Before use, the compatibility between and correct functioning of all equipment must be confirmed.

Where the manufacturers recommended usage for retirement purposes includes events that need to be tracked (e.g. number of falls), an appropriate record must be kept so retirement occurs within the manufacturers recommendation.

Harnesses must be worn so that all buckles and connections can be visually inspected at any time (i.e. worn on the outside of all clothing/overalls).

The risk assessment must assess if harnesses can be a sit harness or needs to be either an appropriate full body harness or a combination chest and sit harness.

An appropriate sit harness that has been manufactured and rated to an appropriate standard must be used.

Chest harnesses must only be used in combination with an appropriate sit harness that has been manufactured and rated to an appropriate standard.

Use of a full body harness or combination chest and sit harness should be considered:

- when inversion is likely
- when the security of a sit harness cannot be relied upon due to body shape of the person
- when the security of a sit harness cannot be relied upon if the person were to experience a pre-existing health, medical or personal condition episode (e.g. epilepsy)
- for the very young
- based on the expected length of time in harness and positioning (e.g. extended time periods at height).

6.3.2 Equipment loading

Equipment will have a *stated strength* that may or may not include a *safety factor*. The type of *stated strength* rating needs to be known before use to ensure equipment is safely loaded. (Refer [Appendix 3 Equipment load ratings](#) for more details).

Equipment with the *stated strength* providing the *Minimum Breaking Strength* (MBS) must have a suitable *safety factor* applied and a *Safe Working Load* (SWL) calculated.

Equipment with the *stated strength* providing the *Safe Working Load* (SWL) must only be loaded to the maximum of the *Safe Working Load* (SWL).

Reference to the manufacturers instructions must occur when determining a *safety factor* and/or *safe working load*.

The expected peak load and possible additional loads should a rescue be carried out must be considered when determining equipment loading.

6.3.2.1 Cow's tails loading

When using cow's tails, the systems and procedures used should ensure the fall factor involved is as low as practicable but not exceeding a fall factor of 1.0. (The persons harness attachment point should not be above the anchor point (e.g. a traverse-line should be established at waist height, not ankle height).)

The manufacturers recommended usage requirements of cow's tails, including regarding retirement must be followed.

When a cow's tail has been provider constructed (e.g. the activity provider constructs the cow's tails from suitable material) and the cow's tail:

- it is loaded by a fall that exceeds a fall factor of 1.0, the cow's tails dynamic materials must be retired and be replaced at the end of the activity
- is loaded by any fall, the knots should be appropriately relaxed and re-dressed at the completion of the activity or at the first safe opportunity. (This ensures as much force as possible from any subsequent fall is absorbed i.e. the cow's tails have as much dynamic absorption as possible.)

6.3.3 Connections

Connection methods, equipment and systems used must be periodically reviewed.

Considerations when determining connection methods, equipment and systems should include but are not limited to:

- the type of *anchor* or *anchors* being used
- the redundancy available should an *anchor* fail
- what needs to be attached to the harness (e.g. direct connection to rope or a descender device)
- the experience and context of who is completing the connection of the rope to the harness or descender device
- the availability of an activity leader to supervise or check the connection that is completed by a participant
- the conditions within the cave that effect equipment operation (e.g. mud).

6.3.4 Connectors and practices relating to use

Carabiners must be used so that no load is across the minor axis or gate.

Systems that have cyclical loads constantly applied or subject to vibration should be inspected at an appropriate frequency to confirm the correct system arrangement remains unchanged.

The type of *connector* used must be suitable for the task.

All connections must be checked by an activity leader.

The connection of devices (e.g. belay device, ascenders) must use either a *locking connector* or *auto-locking connector*.

Belay rope connections to a harness should use direct tie in with an appropriate knot.

6.3.5 Other equipment use considerations

Static rope must be used when using single rope technique (SRT).

Dynamic rope must be used for the belay rope.

A procedure regarding participant supplied equipment should be developed.

Where a participant supplies any personal *climbing* or *abseiling* equipment, this must comply with the above equipment requirements and equipment use sections and be serviceable.

Wearing gloves should be used when *abseiling*.

6.3.6 Rescue systems and rigging for rescue

Anchor systems and *belay systems* must be rigged for a timely and effective potential rescue.

Considerations in rigging systems for rescue must include but are not limited to:

- load direction
- load magnitude
- ability to lower the person
- ability to enable an activity leader to complete a *contact rescue*
- ability to raise the person.

6.4 Maintenance of equipment

All safety, rescue and *vertical caving* equipment must be checked that it is serviceable before each activity or before being used.

All equipment must be appropriately cleaned after use.

Considerations for cleaning equipment must include:

- removal of mud and grit from all equipment including ropes
- disease control specific methods including reducing the spread of White Nose Syndrome (WNS) fungus (refer www.caves.org.au/conservation for details).

Appropriate procedures must be in place for equipment inspections and determining the time periods between inspections.

Equipment and inspection records must conform with any legislative or regulatory requirements.

An equipment record should be maintained.

Where used, an equipment record should record but is not limited to the:

- item individual identifier
- age (e.g. date of manufacture)
- date of inspections
- recommended or maximum lifespan.

A retirement of equipment policy should be developed.

Considerations for a retirement of equipment policy may include but are not limited to:

- type of use
- frequency of use
- prevailing conditions when used
- actual deterioration, wear and tear
- extreme usage events or patterns (e.g. impacts, falls, 'catches')
- age
- years in service
- manufacturers recommendations.

6.5 Storage of equipment

Activity equipment must be stored in accordance with the manufacturers recommendations or instructions.

Where no manufacturers recommendations exist, considerations for storage of equipment may include but are not limited to:

- equipment is clean and dry
- the storage is free from harmful chemicals
- the storage is free from damp conditions
- the storage is free from environmental exposure including Ultraviolet (UV) light and avoids extremes of temperature
- the storage is free from interference of fauna or vermin.

7 Leadership

7.1 Naming conventions

The activity leader naming convention enables this Good Practice Guide to be related to [Core GPG - Leadership](#) requirements.

Collective noun

Activity leader is the collective noun for all the types of caving leaders, instructors and assistant caving leaders listed below.

Caving leaders

A caving leader has the competence to lead participants throughout the whole activity.

Caving leader can be specialised in *horizontal caving*, *single pitch vertical caving* and *multi-pitch vertical caving*.

Caving instructors

A caving instructor has the competence to instruct participants so that they may undertake the activity independently without supervision.

Caving instructors can be specialised in *single pitch vertical caving* and *multi-pitch vertical caving*. (Note that the minimum specialisation for instructors is *single pitch vertical caving*.)

Assistant caving leaders

An assistant caving leader has some but not all of the competencies of a *horizontal caving* leader, so can only lead participants through part of the activity under supervision of a caving leader or instructor.

Role clarification

It is important to clarify specific roles and competencies required to avoid the possibility of:

- an assistant caving leader leading a group when leader/instructor competencies are required
- an assistant caving leader or leader is leading a group when instructor competencies are required.

All activity leader competencies needed for a particular role must be clearly defined.

Relationship to Core GPG

The leadership naming conventions are:

- “single pitch vertical caving instructor”, “multi-pitch vertical caving instructor”, “single pitch vertical caving leader”, “multi-pitch vertical caving leader” and “*horizontal caving* leader” can be the equivalent to a Leader in Core GPG.
- “assistant caving leader” can be the equivalent to an Assistant Leader in Core GPG.

7.2 Competencies

7.2.1 Competencies overview

The AAAS and GPGs refers to units from the Sport, Fitness and Recreation Training Package for descriptive statements of the knowledge and skills required of activity leaders.

The Training Package units are used for the sole purpose of providing descriptions for the knowledge and skills required. It is not intended to imply or require that specific formal training, assessment or qualification is the only means of gaining or recognising knowledge and skills.

Activity providers can recognise activity leaders as having the ‘ability to apply knowledge and skills to achieve expected results’ (i.e. competencies) in a number of different ways as per Recognition of Competence in Core GPG.

The Training Package units listed can be found by searching for the units on the training.gov.au/Home/Tga website. The code provided with the unit name assists in this search.

7.2.2 Horizontal caving competencies

Horizontal caving competencies – see [Appendix A8.1](#)

Activity leaders must have the appropriate rescue competencies, and these skills must be practised periodically.

For activities that also involve *bushwalking* to the site, refer to the [Bushwalking GPG](#).

7.2.3 Vertical caving competencies

Single pitch *vertical caving* competencies – see [Appendix A8.2](#)

Multi-pitch *vertical caving* competencies – see [Appendix A8.3](#)

Activity leaders must have the appropriate rescue competencies, and these skills must be practised periodically.

For activities that also involve *bushwalking* to the site, refer to the [Bushwalking GPG](#).

7.2.4 Recognition of competence

Refer to considerations for recognition pathways outlined in [Core GPG – Recognition pathways](#).

7.3 Supervision

7.3.1 Overview

Appropriate supervision must be provided at all times during the activity.

7.3.2 Caving group size considerations

Considerations when determining group size must include:

- cave capacity (including land manager requirements)
- characteristics of the cave including tight spaces, temperature and water hazards
- the *vertical caving* safety systems required or being used
- ability to implement sustainability practices and protect features within the cave
- cave related legislation, regulation or land manager requirements
- the time allowed to enable all participants in the group to complete the activity is sufficient and realistic and does not compromise safety
- hazards to the caving environment
- assessment of remoteness and the time and distance involved to complete the activity
- considerations for determining group size outlined in [Core GPG](#).

7.3.3 Caving supervision considerations

Considerations for determining supervision requirements must include:

- characteristics of the cave including tight spaces, vertical sections and water hazards
- the *vertical caving* safety systems required or being used
- participant competence
- the number of participants
- supervision requirements of participants who are waiting to use *vertical caving* safety systems
- time for the activity leaders to allow all participants to undertake the activity being sufficient and realistic
- cave related legislation, regulation or land manager requirements
- general considerations for determining supervision requirements outlined in [Core GPG](#).

The supervision requirements and ratios for programs that train/teach participants to become leaders or instructors should be determined on a case-by-case basis, according to the progress of those participants towards being fully independent leaders or instructors themselves.

7.3.4 Simple caves recommended supervision

The supervision for *simple caves* must be determined on a case by case basis taking into account the above-mentioned considerations.

The recommended supervision for a *simple cave* is:

- a minimum of 1 caving leader/instructor and 1 assistant caving leader
- a ratio of no greater than 7 participants to 1 activity leader.

7.3.5 Horizontal caving recommended supervision

The supervision for *horizontal caving* must be determined on a case by case basis taking into account the above-mentioned considerations.

The recommended supervision for *horizontal caving* is:

- having a minimum of 2 activity leaders
- with a minimum of 1 caving leader and 1 assistant caving leader
- a maximum group size of 12 including activity leaders (i.e. ratio 5 participants to 1 activity leader).

7.3.6 Single and multi-pitch vertical caving recommended supervision

The supervision for single and multi-pitch *vertical caving* must be determined on a case-by-case basis taking into account the above-mentioned considerations.

The recommended supervision for pre-rigged *vertical caving* is:

- having a minimum of 2 vertical caving leaders/instructors
- a maximum group size of 10 including caving leaders/instructors (i.e. ratio 4 participants to 1 caving leader/instructor).

The recommended supervision for 'rig as you go' *vertical caving* is:

- having a minimum of 2 vertical caving leaders/instructors
- where there is a reduced ability for direct supervision during the activity a maximum group size of 8 including caving leaders/instructors (i.e. ratio 3 participants to 1 caving leader/instructor)
- otherwise a maximum group size of 10 including caving leaders/instructors (i.e. ratio 4 participants to 1 caving leader/instructor).

Abseiling and climbing system supervision

Recommended supervision is 1 x vertical caving leader/instructor to 1 x *belay system* in use.

Participants that are non-actively participating

Consideration must be given to the type of supervision participants require when *non-actively participating* (i.e. who are waiting to abseil or climb).

In cases where participants who are *non-actively participating in climbing, abseiling* or belaying require direct supervision, that supervision must be provided by an activity leader not providing direct supervision of an activity or by a *responsible person* as appropriate.

7.4 Managing caving activities

The Australian Speleological Federation (ASF) has information and resources that can also provide activity safety guidance.

7.4.1 Knowledge of site

The knowledge and experience of the activity site that activity leaders require before leading participants at that site, should be considered when allocating activity leader roles.

7.4.2 Activity information provided to caving participants

The required information to be given to participants must be determined prior to the activity.

Required information must be provided at the appropriate time before or during the activity.

Activity information that should be provided to participants includes but is not limited to:

- the plan for running the activity
- who is controlling the activity and who to ask for guidance
- relevant participant responsibilities
- strategies for conservation
- site specific hazards and risks
- the correct fitting of personal equipment and this is to be checked before use
- any appropriate technique(s) for the activity
- communications systems and requirements
- lost procedure
- toileting arrangements
- relevant permit conditions for entry
- any other relevant activity information or procedures.

7.4.3 Managing darkness

Light sources must be used while moving in darkness.

Also see [5.1.2 Darkness](#).

7.4.4 Progression through a cave

Procedures must be used to reduce the potential of:

- unanticipated changes in water levels impacting activity safety
- slippery surfaces related hazards and risks
- rock fall hazards and risks
- getting lost (also see [5.1.3 Cave navigation](#))
- group becoming separated
- water related hazards and risks (refer below [7.5 Water hazard management](#))
- falls from height hazards and risks (refer below [7.6 Falls from height management](#) and [7.7 Vertical caving management](#))
- damaging features in the cave
- equipment failure.

Considerations while progressing through a cave must include:

- selection of a route that best provides a suitable adventure for the participants while keeping within the accepted level of risk
- what alternative route options can be offered to participants to meet their individual abilities or requirements
- monitoring participants actions to avoid damaging features in the cave
- what warnings need to be provided regarding current hazards and risks
- what instruction is required to avoid or minimize current hazards and risks
- what alternative techniques that may be used to overcome obstacles or hazards and/or reduce risks (e.g. swimming rather than walking on slippery rock etc.)
- avoiding interference with animals
- the supervision required as participants encounter and/or use techniques to overcome obstacles or hazards
- what aids can be used to address risks (e.g. establishing traverse-lines etc.).

Procedures to manage progress must include:

- each person having visual contact with the person directly in front of them
- regularly monitoring the physical and psychological condition of the group
- maintaining control of the pace of the group
- regularly monitoring to ensuring all members are still with the group
- having a designated person as the last person of the group
- where appropriate having the group *marking* each other whenever necessary to reduce the possibility of falls.

7.4.5 Negotiating tight spaces

Factors to consider when negotiating tight spaces must include:

- the person's size in relation to the tight space
- correct and incorrect movement techniques
- equipment becoming snagged
- high water levels blocking access to air
- obstacles blocking the passage
- potential for participant panic
- activity leader inability to assist due to their size.

At least one activity leader must be able to negotiate the tight space to access the participant in an emergency.

Activity leader intervention must be possible, at all times during tight space activities (e.g. voice or physical contact).

Tight space activities should suit the abilities and size of participants and activity leaders.

Where the planned exit involves a challenging tight space there should be alternative options for exiting the cave.

Before entering tight spaces, equipment should be arranged to make it unlikely to snag.

For tight spaces that involve water, refer [7.5.1 Tight spaces involving water](#) below.

7.4.6 Falling objects

Procedures to minimise the possibility or impact of falling objects must include:

- ensuring appropriate helmets are worn as specified in the equipment section
- briefing participants on potential hazards and how to avoid dislodging objects
- briefing participants on how a group's and individual's exposure within potential fall areas is minimised
- supervision of participants while they are located above other people
- checking the site and *anchors* prior to use if *vertical caving*
- designating *waiting areas* that reduce the expose to falling objects if *vertical caving*.

Procedures to minimise the possibility or impact of falling objects may include where allowed, removal of loose objects that are likely to fall prior to running the activity.

Also see [5.1.6 Loose rock](#) and [7.4.9 Cave-ins and rockfall](#).

7.4.7 Foul air

Areas of *foul air* must not be entered except in exceptional circumstances.

Procedures must address the potential for entering *foul air*:

- monitoring for early signs of entering *foul air* (see [Appendix 6](#))
- monitoring to identify potential areas for *foul air* (see [Appendix 6](#))
- not using fires or stoves in caves
- caves with known issues are appropriately tested immediately prior to taking a group in using suitable equipment.

Also refer to [Appendix 6 Foul air](#).

7.4.8 Preventing disease transmission

Also refer:

- Environment [5.1.5 Disease transmission](#)
- Environment [5.5 Wildlife safety](#)
- Environmental sustainability procedures [5.7.6 Respect wildlife](#).

7.4.8.1 Animal to human disease prevention

Procedures to address the potential for people contracting diseases must include:

- not drinking water from sources that are possibly contaminated via the catchment system
- avoiding caves at times of year where inhaling histoplasmosis fungal spores are most likely (e.g. dry season)
- avoiding direct contact with bats and bat droppings
- avoiding water potentially contaminated with water borne infections, including wading or swimming in the water.

7.4.8.2 Human to animal disease prevention

Procedures to address the potential for animals contracting diseases may include:

- using appropriately cleaned equipment and clothing (refer [section 6.4](#))
- checking international visitor's footwear and clothing has been appropriately cleaned to reduce the potential spread of White Nose Syndrome
- wearing gloves while caving in sensitive areas.

7.4.9 Cave-ins and rockfall

Unstable areas in a cave with elevated risk of cave-ins or rockfalls must be avoided.

7.4.10 Other situations requiring management

An appropriate system of communication must be developed and used throughout the activity.

A plan must be in place to appropriately manage those with claustrophobia.

Those with pre-existing medical conditions (e.g. allergies, asthma, diabetes, etc.) must be monitored for the occurrence of the condition's symptoms.

Playing tricks on others must be strongly discouraged.

Other situations requiring management

- Refer below for [7.5 Water hazard management](#)
- Refer below for [7.6 Falls from height management](#)
- Refer below for [7.7 Vertical caving management](#).

7.5 Water hazard management

7.5.1 Tight spaces involving water

Movement involving dependent participants through tight spaces filled with water must:

- have an airspace to breath (i.e. the water level allows for *roof-sniffing*)
- not involve breath holding or full submersion (e.g. *duck-unders, sumps*).

7.5.2 Water activity information for participants

The information and requirements to be communicated for water hazards *may* include but are not limited to:

- information and requirements listed in [7.4.2 Caving activity information](#) above
- suitable information and instruction on hazard avoidance including but not limited to:
 - wading and/or swimming techniques suited to the route to be negotiated
 - ways to recognise hazards where appropriate.

7.5.3 Water activity management

Water activity management must include:

- addressing the hazards and risks (refer [Appendix 7 Water hazards and considerations](#))
- monitoring that water levels are within the maximum and/or minimum water level *trigger points*
- prior to entry monitoring weather conditions and where possible weather forecasts and warnings including flood and flash flood warnings where available
- consideration of:
 - the water temperature
 - the length of swims or wades
 - the overall amount of swimming or wading involved
 - the need for buoyancy aids (refer [Appendix A7.4 Buoyancy aids](#))
 - use of appropriate water activity management procedures (refer [Appendix 7 Water hazards and considerations](#))
- appropriate storage or management of ropes to avoid entanglement while in water
- consideration of hazards and risks and appropriate activity management procedures for:
 - crossing moving water (refer [Appendix A7.2 Crossing moving water](#))
 - jumping into water if it occurs (refer [Appendix A7.3 Jumping from height into water](#)).

7.6 Falls from height management

7.6.1 Falls from height considerations

Considerations for the likelihood of a fall from height should include but are not limited to:

- how close to the edge cavers are
- the slope of the surface being stood on
- the stability and grip (or slipperiness) of the surface being stood on
- obstacles that need to be negotiated
- abilities of participants including the ability to follow instructions.

Falls from height can be unprotected or protected. Protection can be achieved by using:

- an equipment-based fall safety system such as a *belay system* or *traverse-line*
- *spotting*.

7.6.2 Unprotected climbing

Unprotected climbing must only be used where the risk of a fall from height is acceptably low and this indicates the climb does not require the use of a fall protection system.

7.6.3 Fall protection systems

Considerations when determining the type of fall safety system used should include but are not limited to:

- the likelihood of falling
- the *fall height* involved
- the hazards within the *fall zone*
- whether the surface has holds on vertical, inclined and/or overhanging surfaces
- the body orientations of the person that the holds permit (e.g. if they fall the person's body orientation means they will land headfirst or horizontally on their back)
- the supervision required.

7.6.4 Spotting

Spotting is a support process provided by a person, or persons, who offer physical protection of the head and upper body of a person should they fall. *Spotting* may occur together with *marking*.

Where there is a risk of an unprotected fall from height and this is not appropriate, the use of *spotting* or an equipment-based fall protection system must be considered.

Where a risk of an unprotected fall from height and/or a risk of a fall from height protected by *spotting* is not appropriate, the use of an equipment-based fall protection system must be used.

7.6.5 Equipment based fall protection systems

An equipment-based fall protection system must be used where:

- unprotected *climbing* and/or *spotting* is not appropriate
- bridging gaps
- ladders are used to climb up or down, and involve a *fall height* where unprotected *climbing* is not appropriate.

Refer [6.1.3 Vertical caving equipment requirements](#) and [6.3 Use of vertical caving equipment](#).

7.6.6 Participants belaying or spotting

Considerations for when participants operate *belay systems* or *spotting* should include but are not limited to:

- participants are willing and capable
- appropriate training is provided
- the need for ongoing monitoring to ensure:
 - correct technique is used
 - attention to the task is maintained
 - equipment is used correctly
 - appropriate communication with the caver *climbing* or *abseiling*.

7.7 Vertical caving management

7.7.1 Vertical caving activity information provided to participants

Activity information that should be provided to participants *vertical caving* includes but is not limited to:

- the activity information listed above in section [7.4.2 Activity information provided to caving participants](#)
- specific risks for vertical situations
- the correct use of the belay or other fall protection systems.

7.7.2 Vertical caving falls from height

Also refer to [7.6.1 Falls from height considerations](#) section above.

To protect from a fall from height, procedures must include checking participant(s):

- equipment is correctly fitted before participants need to rely on a safety system
- correct attachment to the *belay system*, abseil system and/or other safety systems.

To reduce the potential for and/or severity of falls from height, procedures must include:

- ensuring ropes are of a sufficient length for the pitch and have a knot tied in the end located at the bottom of the abseil
- removal of unnecessary slack in *belay* or *anchor system* before use
- monitoring the correct use of *belay systems*
- monitoring attachment to *anchors* or *belay systems*
- monitoring *belay rope(s)* to keep them at the appropriate length
- monitoring *belay systems* to remove unnecessary slack in *belay ropes* as cavers progress
- providing appropriate instruction to mitigate risks caused by the stretch in *dynamic rope*
- designating what areas that are not to be entered
- designating *waiting areas*
- designating areas that can only be accessed when attached to the *belay system*
- checking correct attachment to the *belay system*, safety or other systems.

Bridging gaps

An appropriate fall protection system must be used when crossing significant open spaces/gaps.

7.7.3 Use of ladders and staircases

Fixed in-place ladders and staircases must be checked to verify that they are suitable to use.

Procedures should include managing the use of staircases and fixed ladders.

Ladders

Procedures should ensure only one person uses a ladder at a time.

Rigid ladders must be checked that they are fixed or secured appropriately to prevent movement.

The need for using a *belay system* while climbing ladders must be determined by an appropriate risk assessment on a case by case basis.

A *belay* must use when using wire ladders.

An appropriate briefing on avoiding hand and finger entrapment must be provided when using wire ladders.

7.7.4 Swinging falls

To reduce the potential for injury or damage to participants or equipment consideration should include but is not limited to the possibility of participants:

- taking a route on an angle that creates the potential for a pendulum swing if control is lost
- swinging or falling against or across hard, abrasive or sharp objects.

7.7.5 Entanglement and snags

Belay ropes should be monitored to keep them at the appropriate length and tension, to prevent the possibility of a slack rope becoming entangled or snagged.

To avoid entanglement in ropes and devices:

- long hair must be secured to stop it being able to be entangled
- loose jewellery (e.g. bracelets and necklaces) should be removed or secured
- loose clothing and drawstrings should be secured.

To avoid being caught or snagged, where there is such a risk:

- rings should be removed or taped over
- body piercings should be removed or taped over.

7.7.6 Anchors and the belay & activity systems

Anchors should be sufficient to withstand the loads likely to be experienced in a fall or during rescue.

All abseil ropes must have a knot tied in the end located at the bottom of the abseil.

Procedures to ensure that all systems function as intended must include:

- *anchor systems* are assessed as suitable to support the intended loads
- *anchor systems* and equipment are suitable for the activity, site and participants
- appropriate knots and connections are used
- regular inspection of all *anchors* and connections where practicable
- operating procedures and checks used will prevent unplanned disconnection of any part of the system
- checking attachment to and disconnections from the system during the activity.

Where a *belay system* requires a *belayer*, either the *belayer* must be:

- a competent *belayer*; or
- under direct supervision of an activity leader.

Also refer equipment section [6.3.6 Rescue systems and rigging for rescue](#).

7.7.7 Belay systems

Equipment and systems to affect a vertical rescue must be available.

At least one appropriate belay method must be used to protect a caver *abseiling* or *climbing*.

Appropriate communication systems (e.g. calls, whistles, radios, rope tugs) must be able to effectively communicate between the top and bottom of the pitch.

Belay methods include but are not limited to a *top belay system* and *bottom braking*. (For example, a *top belay system* for using ladders, *bottom braking* for single rope techniques for descending.)

A *top belay system* must be used for participants when ascending or descending ladders and ascending ropes.

Considerations for using a *top belay system* should include but are not limited to:

- any stretch in the *belay system* still allows it to effectively protect a fall
- appropriate communication between the top and bottom of the pitch
- the likelihood of the abseiler spinning and twisting the belay and abseil ropes together e.g. *free abseiling*, *abseiling over overhangs*.

Bottom braking must be used for participants when descending using single rope techniques (SRT).

When bottom braking is used the appropriate equipment must be used and correctly adjusted to ensure the descent speed is appropriate.

Refer section [7.7.10 Bottom braking](#) below for considerations for using *bottom braking*.

7.7.8 Traverse-lines

To protect from a fall from height, procedures when using a *traverse-line* should include but are not limited to:

- having attachment points easily accessible and in safe locations
- lines rigged above waist height
- monitoring so that lines remain above waist height
- avoiding the use of lanyards to protect vertical travel in conjunction with *traverse-lines*
- consideration of peak forces on cavers and equipment when:
 - establishing *traverse-line* angles and *anchors*
 - choosing the type of equipment used (e.g. static or dynamic material)
- methods for staying attached at change over points that still require protection (e.g. 'add protection before you subtract protection')
- checking *carabiner* use, locking and orientation
- the number of cavers using it at one time is appropriately limited
- a maximum of one caver between each intermediate *anchor* point.

7.7.9 Longer abseils

Considerations for longer abseils should include but are not limited to:

- appropriate communication systems (e.g. calls, whistles, radios) to enable effective communication between the top and bottom of the pitch
- use of an appropriate *belay system* that effectively protects a fall including checking if *bottom braking* is effective over the length of the abseil
- use of an appropriate descender device to handle the heat build-up over the length of the abseil
- issues caused by the weight of the rope(s)
- the time the abseiler will be suspended in a harness
- strategies to manage the varying amount of friction experienced over the length of the abseil.

7.7.10 Bottom braking

A *bottom braking* belay must be directly supervised by an activity leader.

Considerations for using *bottom braking* should include but are not limited to:

- that any stretch in the *belay system* still allows it to effectively protect a fall
- the appropriate equipment required to ensure the descent speed is appropriate
- the ability of the *belayer* to react in time to stop the abseiler
- the *belayer* having an appropriate location to operate the belay from, including but not limited to stable footing
- the *belayer's* competence or the ability to be appropriately supervised
- the activity aims, and objectives being suited to the participants
- any policy requirements of the organisation engaging the provider to deliver activity for its participants (e.g. education department policy)
- the appropriateness of the site
- the additional risks where abseilers are free hanging and/or negotiate overhangs and this is suited to the participants
- the ability of the *belayer* to communicate with the abseiler at all times
- the likelihood of objects falling on the *belayer*
- the ability of the *belayer* to see the abseiler at all times
- appropriate communication between the top and bottom of the pitch.

7.7.11 Abseiling in waterfalls or into water

Abseiling in vertical water flows (e.g. a flowing waterfall) must only occur where:

- is appropriate for the aims and objectives of the group
- an appropriate risk assessment has been completed
- the vertical water flow is such the abseiler is not impacted directly by the force of the water
- appropriate management procedures are used to address the risks created by the vertical water flow.

Abseiling directly into water must only occur where:

- an appropriate risk assessment has been completed
- appropriate management procedures are used to address the risks created by the water including its depth and if it is flowing water.

7.7.12 Multi-pitch activities on the same vertical section

This section refers to multi-pitch activities where to ascend, traverse or descend the same vertical section, progress is made by using more than one pitch and establishing *belay systems* mid route (e.g. on a ledge). In this situation, additional considerations are required that are not required when completing a series of single pitch sections that are separate from each other.

The appropriateness of activities involving multi-pitch caving where *belay systems* need to be established mid route on the same vertical section must be:

- determined on a case-by-case basis
- appropriate for the aims and objectives of the group.

A pre-activity check and ongoing monitoring must be used to confirm that the activity follows and uses the correct route and belay station locations.

Participant management practices should be used to prevent overcrowding at belay stations.

Participants should have:

- prior experience in the activity or the opportunity to undertake a single pitch of the activity, before being committed to completing a multi-pitch activity
- the competence in using basic skills to temporarily operate out of line of sight or communication of an activity leader.

Procedures must enable appropriate communication between groups at each *belay system*.

Additional pre-activity information should include but is not limited to the method of transferring from the activity *belay system* to a fixed *anchor* and back to the activity *belay system*.

7.7.13 Activity leader positioning

An activity leader with the appropriate rescue competencies must be positioned to affect a timely rescue if required.

An activity leader must be positioned to check the connection to safety systems prior to using the safety system.

There must be an activity leader positioned at the top and the bottom of vertical pitches.

An activity leader should where practicable, have contact with the abseiler(s) and/or climber(s) throughout the ascent or descent.

7.7.14 Communication

A system of clear & unambiguous verbal or non-verbal communications must be used to manage the activity.

Having line of sight and communication by sound should be used as the preferred means of supervising participants wherever possible.

Glossary

AAAS: Australian Adventure Activity Standard – See Preface for details.

Australian Speleological Federation (ASF): the national peak body that represents the interests of caving throughout Australia and internationally on the International Union of Speleology. Refer to www.caves.org.au

Abseiling: descending vertical or near vertical natural surfaces or artificial surfaces using ropes and descending friction devices to manage the descent. It is also known as rappelling.

Anchor: Any load bearing attachment to which any part of a *belay system* is attached.

Anchor system: a group of individual *anchors* to which any part of a *belay system* is attached.

Artificial cave: a manmade underground passage and/or cavern. For example, a mine, a drain.

Artificial caving: caving in an *artificial cave*.

Bad air: See *foul air*.

Belay System: The means by which the caver is protected from an uncontrolled fall or descent.

Belayer: A person that operates the *belay system*.

Bottom braking: The controlling of the descent of an abseiler, by a *belayer* located below the abseiler applying tension to the abseil rope.

Bushwalking: walking in natural areas.

Carabiner: (refer *connector*).

Camping: the use of a temporary site for overnight camping.

Canyoning: the descent, traversing and/or ascent of a canyon using a range of techniques.

Cave: an underground passage and/or cavern created by natural geological processes.

Caving: entering and/or moving through underground passages and/or caverns.

Cave diving: the use of breathing apparatus for caving underwater.

Climbing: ascending, traversing or descending vertical or near vertical natural surfaces or artificial surfaces.

CO: Carbon Monoxide. An odourless *foul air* gas that in high enough concentration can cause death.

CO₂: Carbon Dioxide. A naturally occurring odourless *foul air* gas that in high enough concentration can cause death.

Contact rescue: a rescue requiring an activity leader to manoeuvre to the person's actual location to physically assist them.

Connector(s): a metal device used to link components together. A *connector* may be:

- Non-locking: a *connector* that cannot be locked to prevent it opening.
- Locking: a *connector* that can be manually locked and unlocked to reduce the possibility of it opening
- Auto-locking: a *connector* that will automatically lock to prevent it from opening and requires two or more deliberate actions to unlock.

Cow's tail(s): two short lanyards with *connectors*, that are used to connect a safety harness to a fall protection system. As the lanyards or tails need to arrest falls, they are made of *dynamic* material (e.g. dynamic rope) that is manufactured for use in climbing and abseiling and should have a short and long tail (Refer section [6.1.3.3 Cow's tails](#)).

Duck-under: A constriction in a passage where water is at or close to the cave roof for a short distance, which requires a caver to become (more or less) fully submerged for a brief period before continuing. Also the act of going through a duck-under.

Dynamic rope: a specially constructed rope that is somewhat elastic under load. The elastic 'stretch' under load is what makes the rope 'dynamic'. (Also see static rope.)

Fall factor: is the ratio of the height of a fall (h) (measured before the rope or lanyard begins to stretch) and the rope or lanyard length available to absorb the energy of the fall (L). It is used as a representation of the severity of a fall when arrested by a *belay system*. It is calculated by (h) divided by (L).

Fall height: The vertical distance between the climber's or abseiler's lowest body element and the surface beneath.

Fall zone: The surface that can be hit by a climber or abseiler falling.

Foul air: any atmosphere which has a noticeable abnormal physiological effect on humans. Also known as 'Bad Air'.

GPGs: Good Practice Guide(s) – See Preface for details.

Harness hang syndrome: medical complications due to being suspended and motionless within a body harness for a prolonged period of time (5 to 30 minutes). (Refer [Appendix 5](#))

Horizontal caving: caving where any fall safety required can be achieved without using a *belay system*. It may involve walking, scrambling, crawling through narrow openings, fording pools or streams and climbing obstacles.

Karabiner: See *Carabiner*

Marking: helping to guide hand and foot placement while clambering up or down obstacles. (This differs from *spotting* as it helps to prevent falls while *spotting* is safety protection in the event of a fall.)

Minimum Breaking Strength (MBS): is the magnitude of a load that may permanently distort or damage equipment but not cause it to break. (Refer [Appendix 3 Equipment load ratings](#)).

Non-actively participating: waiting to but is not currently doing the activity.

Pitch: a section of a natural surface or artificial surface that requires no greater than one length of rope to ascend, traverse or descend. (Also see multi-pitch and *single-pitch*.)

Rappelling: see *abseiling*.

Responsible person: a *competent person* who is able to complete those delegated elements or tasks during an activity that do not require all of the activity-specific competence of a caving leader/instructor or assistant caving leader. (Refer [Core GPG – Framework for leadership roles](#) and [Responsible person role](#).)

Restraint line: is the line securing a person to a point of anchorage and is used to prevent a person from reaching a point from which he or she could fall.

Rock Climbing: ascending, traversing or descending vertical or near vertical natural surfaces. At times also used to describe *climbing* on artificial surfaces. (Also see *climbing*.)

Roof-sniffing: the act of edging along a small water-filled passage on your back, with only sufficient airspace for eyes and nose.

Safety Factor: the ratio between the *Minimum Breaking Strength* (MBS) and Safe Working Load (SWL) to provide a safety margin. It is expressed as a ratio, example 8:1. (Refer [Appendix 3 Equipment load ratings](#)).

Safe Working Load (SWL): is the magnitude of load that does not permanently distort, weaken, damage or break equipment and includes a safety margin. (Refer [Appendix 3 Equipment load ratings](#)).

Show Cave: refer *tourist cave*.

Simple cave: a *cave* with the following attributes:

- caverns where light from an exit is always visible OR single caverns where progression to an exit is obvious by moving in either direction
- AND there are no water hazards requiring submersion, swimming or roof sniffing
- AND there is minimal risk of foul air
- AND where vertical caving is involved, it is limited to using only fixed ladders or staircases
- AND a *responsible person* with no caving experience would be able to lead a group out of the cave if the cave leader/instructor became incapacitated.

Single-pitch: a section of a natural surface or artificial surface that requires no greater than one length of rope to ascend, traverse or descend.

Spotting: a support process provided by a person, or persons, who offer physical protection of the head and upper body of a person should they fall. (This differs from *marking* as *spotting* is safety protection in the event of a fall while *marking* helps to prevent falls.)

Stated strength: the magnitude of load that is either the *Minimum Breaking Strength* (MBS) or *Safe Working Load* (SWL) marked on equipment or listed in manufacturers literature. (Refer [Appendix 3 Equipment load ratings](#)).

Static rope: a specially constructed low stretch kernmantle rope, that has low elongation under load. The low elongation or 'stretch' under load is what makes the rope 'static'. (Also see *dynamic rope*.)

SRT: Single rope technique

Sump: a pool of water completely filling a submerged passage.

Squeezes: A small opening in a cave which is passable with effort.

Top belay: Belaying a caver from the top of a pitch.

Tourist Cave: an actively managed cave that typically allows regular tours by the general public that may be professionally guided or self-guided. A tourist cave has suitable infrastructure so that it requires little to no caving experience to enter. May include caves with regular open and closed times, constructed trails or stairs, being lighted during open times, handrails and other barriers for safety and protection of cave features. Also known as a show cave.

Traverse-line: A *belay system* secured in a generally horizontal direction to allow horizontal movement.

Trigger point: a particular circumstance or situation that causes an action to occur.

Vertical caving: caving that includes the descent, traversing and/or ascent of vertical or near vertical surfaces, where fall safety requires the use of a *belay system*. It may involve the use of ropes, ladders and/or descending/ascending equipment to climb up, down or traverse vertical drops.

Waiting areas: a location in which to wait prior to undertaking the activity, where it is reasonable for a person to not be required to use equipment to protect them from a fall from height.

White Nose Syndrome (WNS): a fungal disease that affects bats during winter hibernation. It has a very high mortality rate. Thorough cleaning of clothing, equipment and footwear is essential to prevent its spread and is a crucial consideration for overseas visitors. Refer www.caves.org.au/conservation for up to date details.

Appendices

Appendix 1 Equipment

The equipment required and the appropriate “type” of equipment used is dependent on the specific context of the activity.

A1.1 Caving equipment

Personal equipment

Equipment used for caving per person must include:

- appropriate helmet
- helmet mountable appropriate light source (e.g. LED battery headtorch) and batteries
- one spare light source
- appropriate footwear.

Other equipment used for caving may include but is not limited to:

- overalls
- other clothing appropriate for the environment and conditions
- gloves
- knee pads
- supply of water and food.
- personal thermal protection:
 - thermal clothing
 - wet suit
 - dry suit
 - beanie
 - gloves
 - booties
- lifejacket
- other buoyancy aids.

Group equipment

Safety equipment used for caving must include:

- two spare light source(s)
- a watch.

Safety equipment used for caving may include but is not limited to:

- whistle (that is suitable for water environments)
- a means of producing an open flame to test for *foul air*.

Other equipment used for caving may include but is not limited to:

- supply of water and food
- cave map
- route navigation equipment (e.g. removable reflective markers, removable string line etc.)
- swimming masks
- buoyancy aids
- toiletry aids.

A1.2 Vertical caving additional equipment

Additional equipment used for *vertical caving* may include but is not limited to:

- accessory cord
- artificial fixed *anchors* used
- ascending devices
- belay devices
- *connectors* (e.g. carabiners)
- *cow's tails* or personal *anchor systems*
- descending devices
- *dynamic rope*
- gloves
- harnesses
- helmets
- ladders
- pulleys
- removable bolt plates
- rescue equipment
- ropes – static and dynamic as appropriate
- rope protectors
- slings
- *static rope*
- whistle (for communications or emergency)
- wire ladders and traces
- any other equipment that is part of the safety system used.

Rescue equipment may include but is not limited to:

- additional rope long enough for the longest pitch
- accessory cord
- ascending devices
- belay device
- *connectors* (e.g. carabiners)
- *cow's tails* or personal *anchor systems*
- knife suitable for cutting ropes (preferably on a lanyard)
- pulleys
- prusik loops
- slings.

A1.3 General equipment

Specific general equipment may include but is not limited to:

Emergency/rescue

- documentation (see [Core GPG - Activity leader required documentation](#))
- emergency communication equipment (see [Core GPG -Emergency communication](#))
- first aid kit in waterproof storage (see [Core GPG - First aid equipment and medication](#))
- a waterproof method of storing and carrying documentation and communications equipment
- specific activity context equipment required
- emergency shelter where appropriate for the context
- emergency equipment to keep a person warm (e.g. mat, sleeping bag, space blankets) where appropriate for the context.

Activity Leaders

- communications equipment (standard communication rather than emergency communication where this differs) and spare batteries or backup “power banks”
- relevant maps and navigation information
- a waterproof method of storing equipment and carrying maps and navigation information
- compass and/or other navigation aids
- pen/pencil and blank writing paper
- watch or equipment suitable to tell and measure time for first aid purposes
- same as for participant.

Participant

- personal medications (including for asthma and anaphylaxis)
- personal hygiene requirements
- clothing appropriate to the weather conditions
- spare prescription glasses.

Group

- backpack to carry equipment
- toileting equipment to carry out waste
- toilet paper
- hand sanitiser
- water purification system
- repair kit
- food for duration plus spare
- rubbish bags
- multi-tool with knife
- sunscreen
- insect repellent
- first aid kit common content (see [Core GPG](#)).

Vertical caving activities

- small personal backpacks to carry personal equipment with suitable attachment for hauling/lowering
- inter-group communication equipment (e.g. whistle, portable two-way radios)

Appendix 2 Equipment related standards

Current as at 14 May 2019.

Equipment and the relevant standards that might apply may include:

- Accessory cord (EN 564)
- Braking devices (EN 15151-1, EN 15151-2)
- Carabiners or other connectors (EN 362, EN 12275, AS/NZS 1891.4 or ISO 10333-5)
- Descending devices (EN 341)
- Energy absorbing systems EN 958
- Frictional anchors EN 12276
- Helmets (EN 12492, UIAA 106)
- Harnesses (EN 358, EN 361, EN 813, EN 12277, AS/NZS 1891.4 or equivalent)
- Ladders (Rigid) (AS 1892.1:2018)
- Lanyards (EN 354)
- Rope clamps EN 567
- Rope – dynamic (EN 892)
- Rope – static (EN 1891, AS 4142.3, CI 1801)
- Personal fall protection equipment - anchor devices (EN 795)
- Pitons (EN 569)
- Pulleys (EN 12278)
- Slings (EN 566, AS 1353 (series) or AS/NZS 1891.4)

AS/NZS

- 1353 Flat synthetic-webbing slings Product specification
- 1891 Industrial fall-arrest systems and devices
- 1891.4 Part 4: Selection, use and maintenance
- 1892.1:2018 Portable ladders Performance and geometric requirements
- 2316.1—2009 Artificial climbing structures and challenge courses Part 1: Fixed and mobile artificial climbing and abseiling walls.
- 2512 Methods of testing protective helmets
- 2512.1 Part 1: Definitions and headforms

CI

- 1801 Low Stretch And Static Kernmantle Life Safety Rope

EN

- 341 Personal protective equipment against falls from a height—Descender devices
- 354 Personal protective equipment against falls from a height—Lanyards
- 358 Personal protective equipment for work positioning and prevention of falls from a height—Belts for work positioning and restraint and work positioning lanyards
- 361 Personal protective equipment against falls from a height—Full body harnesses
- 362 Personal protective equipment against falls from a height—Connectors
- 564 Mountaineering equipment—Accessory cord—Safety requirements and test methods
- 566 Mountaineering equipment—Slings—Safety requirements and test methods
- 567 Mountaineering equipment—Rope clamps—Safety requirements and test methods
- 569 Mountaineering equipment. Pitons. Safety requirements and test methods
- 795 Personal fall protection equipment. Anchor devices
- 813 Personal fall protection equipment—Sit harnesses
- 892 Mountaineering equipment—Dynamic mountaineering ropes—Safety requirements and test methods
- 958 Mountaineering equipment. Energy absorbing systems for use in klettersteig (via ferrata) climbing. Safety requirements and test methods
- 959 Mountaineering equipment. Rock anchors. Safety requirements and test methods
- 12275 Mountaineering equipment—Connectors—Safety requirements and test methods
- 12276 Mountaineering equipment. Frictional anchors. Safety requirements and test methods
- 12277 Mountaineering equipment—Harnesses—Safety requirements and test methods
- 12278 Mountaineering equipment—Pulleys—Safety requirements and test methods
- 12492 Mountaineering Equipment - Helmets For Mountaineers - Safety Requirements And Test Methods
- 15151-1 Mountaineering equipment. Braking devices. Braking devices with manually assisted locking, safety requirements and test methods
- 15151-2 Mountaineering equipment. Braking devices. Manual braking devices, safety requirements and test methods
- 1891 Personal protective equipment for the prevention of falls from a height—Low stretch kernmantel ropes

ISO

- 10333 Personal fall-arrest systems
- 10333-5 Part 5: Connectors with self-closing and self-locking gates

UIAA

- 106 Helmets

Appendix 3 Equipment load ratings

Refer Equipment section for equipment requirements and usage.

A3.1 Equipment loading introduction

Appropriate load safety margins are needed for any equipment that is used under load. The guidance given in the equipment section uses a range of specific terms related to equipment load ratings and safety margins. This appendix explains these terms (i.e. *Stated strength*, *Safe Working Load (SWL)* and *Minimum Breaking Strength (MBS)*).

A3.2 Equipment loading

Proper understanding and use of equipment load ratings (*stated strength*) is needed to allow for an appropriate safety margins (*safety factors*) to be used. This ensures that equipment is never loaded to a point it is in danger of breaking or being damaged.

Manufacturers provide details of the load ratings for equipment either stamped on the equipment or in available documentation. This is called the *stated strength*. *Stated Strength* is the magnitude of load that is either the *Safe Working Load (SWL)* or *Minimum Breaking Strength (MBS)*.

It is critical to understand the difference between *Safe Working Load (SWL)* and *Minimum Breaking Strength (MBS)* because SWL has a *safety factor* already applied to it, while MBS does not.

Safe Working Load (SWL): is the magnitude of load that does not permanently distort, weaken, damaged or break equipment. It is safe to load equipment to 100% of the SWL.

Minimum Breaking Strength (MBS): is the magnitude of a load that may permanently distort or damage a piece of equipment but not cause it to break. An appropriate *safety factor* needs to be applied to the MBS. The MBS is a load, determined by the manufacturer, that might not break a piece of equipment but may make it unusable or unsafe to use. Equipment should never be loaded to the MBS, even for testing purposes when testing a system before being use, the test should not exceed the SWL. Some equipment may be in danger of being overloaded even at less than half the MBS. It should be noted that the stated MBS value is calculated from tests on a selection of items, not on each individual item. It is therefore likely that a small percentage of similar items, (usually less than 1%) will break slightly below their stated MBS value.

Safety Factor: The ratio between the *Minimum Breaking Strength (MBS)* and *Safe Working Load (SWL)* which is used to provide a safety margin. It is expressed as a ratio (e.g. written as 4:1 or 8:1, etc.). An appropriate *safety factor* is chosen based on the type of equipment and intended use. The *safety factor* applicable may be specified in relevant standards or manufacturers instructions. It is recommended to follow known safe practices, manufacturers recommendations, relevant standards or calculated assessments when determining *safety factors*.

A3.3 Examples

Refer to [Climbing and Abseiling GPG](#) for examples.

A3.4 Kilonewtons (kN) of force vs kilograms (kg) of load (mass)

Newtons, (abbreviated to N) are the metric units of force. A 102kg object applies, approximately, 1,000 N, (1kN) downward force at the surface of the earth, (due to its mass and gravity).

In a simple vertical loading situation, it is generally accurate enough to convert a load mass of 100 kg to a force of 1kN. Forces can exist in any direction, not just up and down. Force is calculated by multiplying mass by acceleration. Gravity at earth's surface produces approximately 10m/s^2 of acceleration, (the exact value varies and is slightly less).

Therefore, equipment rated 1 kN of force equals equipment rated approximately 100kg of load (1,000N divided by 10 = 100kg of load). So 1kN of force = approximately 100kg of load. Note that peak loads can

vary and allowance for these should be made, including but not limited to taking into account weight, fall factor (see Appendix 4) and rope stretch under load.

Examples:

Refer to Climbing and Abseiling GPG for examples.

Appendix 4 fall factors

Refer Equipment section for equipment requirements and usage.

A4.1 Introduction to fall factor

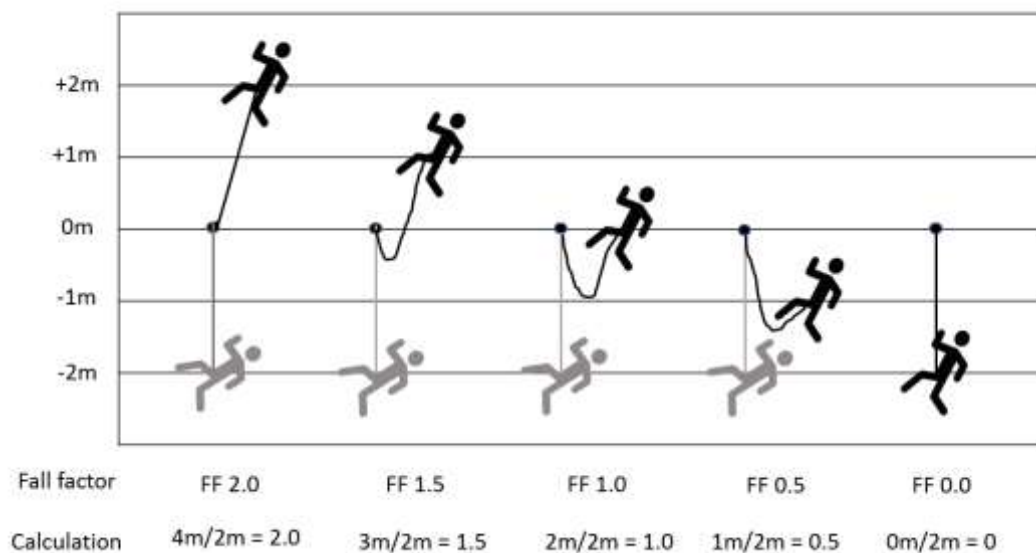
Safety systems (e.g. a *belay system*, traverse lines) are used to protect cavers from falls from a height. When a caver falls, the equipment needs to be able to withstand the load placed on it and stop the fall. When stopping the fall, the safety system places an impact force on the person as it stops them. The *fall factor* is how severe that impact force is on the person falling.

Appropriate equipment needs to a) stop the fall and b) minimise the amount of impact force on the person as they are stopped from falling.

The guidance given in the equipment section uses *fall factor* as the way to consider the impact force on the person when their equipment stops their fall. For example, the type of rope used in a *belay system* (e.g. *dynamic rope* vs *static rope*). This appendix explains what *fall factor* is and how to calculate it.

A4.2 Fall factors

Fall factor is the ratio of the height of a fall (h) (measured before the rope or *cow's tail* begins to stretch) and the rope or *cow's tail* length available to absorb the energy of the fall (L). It is used as a representation of the severity of a fall when arrested by a *belay system*. It is calculated by (h) divided by (L). *Fall factors* are illustrated in the following diagram A5-1. fall-factor-diagram



Appendix 5 Harness hang syndrome

Harness hang syndrome is medical complications due to being suspended and motionless “within a body harness for a prolonged period of time (5 to 30 minutes)” (reference: Australian Resuscitation Council – Guideline 9.1.5 – July 2009). Harness hang syndrome can lead to blood pooling, “shock”, unconsciousness and/or death. It is also known as suspension trauma or suspension syndrome.

Rescue systems in place must enable rescue of a person suspended in a harness in timely manner.

Emergency management plans must include:

- rescue of unconscious persons suspended in a harness
- guidance on *trigger points* for considering the possibility of harness hang syndrome occurring
- appropriate actions to follow where harness hang syndrome is suspected, including but not limited to the relevant first aid treatment.

Appendix 6 Foul air

Foul air is any atmosphere which has a noticeable abnormal physiological effect on humans.

A6.1 Indicators to consider

Potential situational indicators to consider may include:

- high use caves with areas of poor ventilation (human respiration producing carbon dioxide (CO₂))
- signs of fires or use of cooking stoves (both produce CO and CO₂)
- known bat habitat's (bat respiration producing CO₂) or decomposing guano (ammonia is a by product of decomposition)
- poorly ventilated low-lying areas where organic matter accumulates
- geothermal activity (release of hydrogen sulphide/other sulphur gases).

A6.2 Signs of foul air

Typically, there is no smell or visual sign of *foul air*.

The physiological effects can include:

- increased pulse
- increased breathing rates
- lack of energy or feeling fatigued
- clumsiness
- unable to concentrate
- severe headaches
- dizziness
- nausea
- falling unconscious
- death.

Note that not everyone shows the other physiological signs of *foul air* prior to falling unconscious or dying and that different people display different symptoms and severity.

Care should be taken to not to confuse physiological effects of *foul air* with other health issues (e.g. low blood sugar) or *vice versa*.

A6.3 Experiencing symptoms

Immediately move out of the area at a slow pace (i.e. avoid increasing the breathing rate) in a direction that enables access to a cave exit (i.e. avoid moving through the suspect area and especially if it would cut off the means of escape).

A6.4 Testing for foul air

The most appropriate means of testing for foul air is using an air analyser meter. When an air analyser meter is unavailable, a means of testing air suspected of being *foul air* is by lighting a naked flame (the naked flame test). In higher concentrations of *foul air*, it will fail to ignite or burn. The naked flame test can be completed by attempting to light a match, candle, or butane (cigarette) lighter. Ideally cavers should use a butane lighter flame.

The failure of a naked flame test or experiencing symptoms is a reason to exit the area immediately.

Note that the naked flame test is not conclusive that there is an absence of *foul air*, only that the concentration is low enough to allow a flame and the concentration may still be sufficient to have adverse health effects. While the naked flame test does not measure carbon dioxide (CO₂) concentration, in the majority of cases, if a person has any of the symptoms of elevated carbon dioxide concentration, a simple naked flame test will fail to ignite (Smith, 1998).

A6.5 Reference

Non Toxic “Foul Air” Can Kill. Garry K. Smith “Rescue Australia”. December 1998 found at: <http://nhvss.org.au/wp-content/publications/Foul%20Air%20Rescue%20Australia.pdf>

Appendix 7 Water hazards and considerations

A7.1 Swimming and wading

Hazards and risks when swimming and wading that must be considered include:

- water temperature
- swimming ability of participants
- any pre-existing or past medical conditions/injuries
- if prescription glasses or contact lens are being worn
- hazards including those at the current activity location and downstream
- the velocity of the water
- the amount of aerated water and the buoyancy available
- the depth of the water including being too shallow or too deep for the method used
- the base of the watercourse including its stability and grip
- the spacing between and the progress of participants.

Swimming and wading activity management considerations should include but are not limited to:

- matching the activities to the participants abilities
- using appropriate routes to address entrapment or other hazards and risks
- wearing appropriate thermal protection or clothing in cold water
- monitoring the group for risks associated with cold water immersion
- swimming competence being checked prior to commencing the activity
- assessment of swims and wades to ensure:
 - appropriate supervise can be provided
 - appropriate intervention can be used if needed
 - direct supervision of difficult swim, wade, exit points or where exiting at a point is integral to avoiding hazard(s)
- managing weaker swimmers by:
 - using alternatives to avoid the swim or wade
 - swimming with an activity leader
 - providing extra buoyancy
- the location and difficulty of the exit from the water

- how clear the water is and if the base of the watercourse can be seen
- the depth, velocity, and amount of water needed to be overcome to avoid being washed away (see below [A7.2 Crossing moving water](#))
- the base of the watercourse (e.g. pebbles, sand, small rocks or large rocks) that can increase the danger of foot entrapment and/or reducing the likelihood of maintaining stable footing.

A7.2 Crossing moving water

When assessing the suitability of a potential crossing, consideration should be given but is not limited to:

- if there is debris floating or flowing in the current as this can indicate the risk of being hit and/or swept away by debris
- how clear the water is and if the base of the crossing can be seen as this can help determine the depth of crossing
- the depth of the crossing as this can indicate the amount of water and force needed to be overcome to avoid being washed away
- the velocity of the water as this can indicate the volume of water and force needed to be overcome to avoid being washed into hazards
- where the water flows as the flow may wash people into dangerous situations (e.g. into *sumps*, into narrow rock crevices)
- the base of the crossing (e.g. pebbles, sand, small rocks or large rocks) as moving water can move the base increasing the danger of foot entrapment and/or reducing the likelihood of maintaining stable footing during the crossing.

A7.3 Jumping from height into water

Hazards and risks when jumping into water that must be considered include:

- ability of participants
- any pre-existing or past medical conditions/injuries
- any items worn that may be loose or become dislodged, lost or damaged (e.g. prescription glasses, contact lens, dentures, hearing aids, insulin pumps, cameras, etc.)
- difficulty and exposure of access routes
- exposure to potential unintended falls from height
- falling or jumping outside of the intended *fall zone*
- the features of the take-off area
- the horizontal travel distance from the take-off position to the *fall zone*
- obstacles within the route of the jump
- the *fall height* involved (see below [A7.5 Water impact](#))
- the depth of and obstacles within the *fall zone*
- the impact forces when entering the water (see below [A7.5 Water impact](#))
- degree of aeration of the water
- equipment being carried impacting the jumper on landing
- fast flowing water in the *fall zone* flowing into hazards.

Procedures to assess the suitability and safety of a deep-water *fall zone* must be developed and used.

Appropriate assessment by a suitably competent person must be undertaken prior to the use of a deep-water *fall zone*.

Procedures must protect against the possibility of anyone using a deep-water *fall zone* being swept into a downstream hazard.

Instruction on how to take-off and land if balance or control is lost must be provided.

Jumps should not be from a height greater than 10 metres.

Jumping into water activity management considerations should include but are not limited to:

- participant management ensures they do not interfere with each other's stability in access and take-off areas
- the *fall zone* is clear of other people before each person jumps
- difficult access, take-offs and/or landings have direct supervision
- appropriate protection against falling used while accesses the take-off areas
- appropriateness of wearing a pack (e.g. height of jump, impact forces, type of pack, weight of pack etc.)
- physical characteristics of the participants
- actively managing jumps into difficult *fall zones*
- positioning an activity leader at the bottom to indicate the required *fall zone* and/or mark a hazard
- providing a suitable alternative where relevant (e.g. lower jump, abseiling or being lowered)
- the location and difficulty of the exit from the water
- features of the take off and technique used
- when wearing a lifejacket, it must be correctly fitted and the correct technique used to ensure the lifejacket does not dislodge on impact and effect movement
- appropriate technique so that helmets and chin strap do not cause injury when a helmet hits the water on higher jumps.

A7.4 Buoyancy aids

Considerations on the use of lifejackets or other buoyancy aids must include:

- the likelihood of falling into or moving through water
- the safety systems used to protect from falling into water
- the water hazards and risk involved
- the water temperature
- the aeration of the water
- the amount of buoyancy provided by the clothing worn or the equipment used
- the amount of reduced buoyancy caused by clothing worn or the equipment carried
- the amount of buoyancy provided by the lifejacket or aid
- the likelihood of being in water for a long time
- the likelihood of being washed downstream
- the swimming ability of participants
- the impact of the length of the journey and environmental conditions on the participants ability to swim
- if needed to assist with jumps into shallow water
- if needed as a means of holding or supporting people
- if needed as a means of helping people out of water.

A7.5 Water impact information to consider

The impact experienced hitting water when jumping needs consideration. Refer to [Canyoning GPG](#) for information.

Appendix 8 Activity leader competencies

A8.1 Horizontal caving competencies

The following table outlines the recommended level of competence activity leaders should have when leading *horizontal caving*:

Activity type	Assistant caving leader - Units describing skills and knowledge	Code (or equivalent)	Caving leader - Units describing skills and knowledge	Code (or equivalent)	Caving Instructor - Units describing skills and knowledge	Code (or equivalent)
Common horizontal caving units						
	Operate communications systems and equipment	PUAOP013A	Operate communications systems and equipment	PUAOP013A	N/A	
			Plan for minimal environmental impact	SISOOPS304A		
Horizontal caving units						
	All units listed in Core Good Practice Guide, all common caving units plus		All units listed in Core Good Practice Guide, all common caving units plus		N/A The minimum competence for instructors of caving is Single Pitch Vertical Caving Instructor – see below.	
	Demonstrate caving skills	SISOCVE201A	Demonstrate caving skills	SISOCVE201A		
			Guide horizontal caving trips	SISOCVE308A		
			Coordinate emergency responses	SISXEMR402A		

A8.2 Single pitch vertical caving competencies

The following table outlines the recommended level of competence activity leaders should have when leading single pitch *vertical caving*:

Activity type	Assistant caving leader - Units describing skills and knowledge	Code (or equivalent)	Caving leader - Units describing skills and knowledge	Code (or equivalent)	Caving Instructor - Units describing skills and knowledge	Code (or equivalent)
Common single pitch vertical caving & climbing units						
	N/A		Operate communications systems and equipment	PUAOP013A	Operate communications systems and equipment	PUAOP013A
			Plan for minimal environmental impact	SISOOPS304A	Plan for minimal environmental impact	SISOOPS304A
			Demonstrate caving skills	SISOCVE201A	Demonstrate caving skills	SISOCVE201A
			Guide horizontal caving trips	SISOCVE308A	Guide horizontal caving trips	SISOCVE308A
			Coordinate emergency responses	SISXEMR402A	Coordinate emergency responses	SISXEMR402A
Single-pitch vertical caving & climbing						
	N/A		All units listed in Core Good Practice Guide, all common single pitch vertical caving units plus		All units listed in Core Good Practice Guide, all common single pitch vertical caving units plus	
			Apply single pitch abseiling skills in caves	SISOCVE302A	Apply single pitch abseiling skills in caves	SISOCVE302A
			Rig a ladder pitch	SISOCVE303A	Rig a ladder pitch	SISOCVE303A
			Apply laddering skills	SISOCVE304A	Apply laddering skills	SISOCVE304A
			Apply caving specific single rope techniques	SISOCVE305A	Apply caving specific single rope techniques	SISOCVE305A
			Rig ropes and establish belays in caves	SISOCVE306A	Rig ropes and establish belays in caves	SISOCVE306A
			Apply vertical caving skills	SISOCVE411A	Apply vertical caving skills	SISOCVE411A
			Guide vertical single pitch caving trips	SISOCVE307A	Guide vertical single pitch caving trips	SISOCVE307A
			Perform vertical rescues	SISOVTR301A	Perform vertical rescues	SISOVTR301A
					Apply navigation skills in an intermediate environment	SISONAV302A
					Instruct vertical single pitch caving skills	SISOCVE417A

A8.3 Multi-pitch vertical caving competencies

The following table outlines the recommended level of competence activity leaders should have when leading multi-pitch *vertical caving*:

Activity type	Assistant caving leader Units describing skills and knowledge	Code (or equivalent)	Caving leader Units describing skills and knowledge	Code (or equivalent)	Caving Instructor Units describing skills and knowledge	Code (or equivalent)
Common multi-pitch vertical caving & climbing						
	N/A		Operate communications systems and equipment	PUAOP013A	Operate communications systems and equipment	PUAOP013A
			Plan for minimal environmental impact	SISOOPS304A	Plan for minimal environmental impact	SISOOPS304A
			Demonstrate caving skills	SISOCVE201A	Demonstrate caving skills	SISOCVE201A
			Guide horizontal caving trips	SISOCVE308A	Guide horizontal caving trips	SISOCVE308A
			Coordinate emergency responses	SISXEMR402A	Coordinate emergency responses	SISXEMR402A
Multi-pitch vertical caving & climbing						
	N/A		All units listed in Core Good Practice Guide, all common multi-pitch vertical caving units plus		All units listed in Core Good Practice Guide, all common multi-pitch vertical caving units plus	
			Apply single pitch abseiling skills in caves	SISOCVE302A	Apply single pitch abseiling skills in caves	SISOCVE302A
			Apply caving specific single rope techniques	SISOCVE305A	Apply caving specific single rope techniques	SISOCVE305A
			Rig ladders in complex situations	SISOCVE409A	Rig ladders in complex situations	SISOCVE409A
			Rig a complex pitch using caving specific techniques	SISOCVE410A	Rig a complex pitch using caving specific techniques	SISOCVE410A
			Apply vertical caving skills	SISOCVE411A	Apply vertical caving skills	SISOCVE411A
			Rig multi pitches in complex vertical cave systems	SISOCVE412A	Rig multi pitches in complex vertical cave systems	SISOCVE412A
			Apply navigation skills in an intermediate environment	SISONAV302A	Apply navigation skills in an intermediate environment	SISONAV302A
			Perform	SISOVTR402A	Perform complex	SISOVTR402A

Activity type	Assistant caving leader Units describing skills and knowledge	Code (or equivalent)	Caving leader Units describing skills and knowledge	Code (or equivalent)	Caving Instructor Units describing skills and knowledge	Code (or equivalent)
			complex vertical rescues		vertical rescues	
			Guide vertical multi pitch caving trips	SISOCVE414A		
					Guide vertical single pitch caving trips	SISOCVE307A
					Instruct vertical multi pitch caving skills	SISOCVE522A

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