2011

Code of practice for the selection and use of temporary access equipment for working at height in theatres

Part of the
Code of Practice
for the Theatre
Industry

2011

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Foreword

The ABTT has long recognised the need for a code on working at height in theatres and especially with *Tallescopes*®. The ABTT initiated specific guidance on the safe use of *Tallescopes* in theatres in the mid-1980s. The ABTT joined with the Health and Safety Executive (HSE) together with other branches of the industry to produce agreed text in order to avoid some of the doubtful practices that had developed. By June 2003 the committee had agreed the text for *The safe use of Tallescopes in theatres and similar locations* (*EIS 23*) and was ready to print when the HSE objected to any movement of a *Tallescope* with a technician in the cage. *EIS 23* was not published.

The ABTT began developing the *Code of practice for work at height in theatres* in 2004 in the knowledge that the new *Work at Height Regulations* would take effect in 2005. It was clear there was a need for the *Code* for all access equipment likely to be used in theatres to be part of the *Code of Practice for the Theatre Industry* which was endorsed by the Theatre Safety Committee.

The ABTT continued discussions with the HSE about using *Tallescopes* whilst developing the new *Code*. The ABTT produced a draft for public comment at the 2005 Theatre Show. This produced some helpful suggestions but the HSE expressed serious concern that the ABTT should ever suggest approving of the moving of a *Tallescope* with someone in the cage.

The ABTT decided to carry out a survey amongst the theatre industry to which many technicians contributed. These enquiries showed relatively few incidents and apparently confirmed that no incident would have occurred if the ABTT best method for moving occupied *Tallescopes* had been followed.

The ABTT decided that research was needed to back this view. With financial help from the Society of London Theatre (SOLT), the Theatrical Management Association (TMA), the Ambassador Theatre Group (ATG), Live Nation and the Stage Management Association (SMA). Neil Darracott of Xolve Ltd was engaged. He was asked to consider the stability of the *Tallescope* particularly if moved with a technician in the cage. His research enlightened the ABTT in various ways; some previous practices were indeed shown to be unsafe. The Xolve Report concluded however that the *Tallescope* could be safely moved with a technician in the cage subject to stringent safeguards.

The HSE conducted its own research using the Health and Safety Laboratories (HSL) and stressed the need to follow the manufacturer's instructions. The ABTT revised the draft *Code* and resubmitted it for public comment in winter 2009. Significant comments of a positive nature were received. The manufacturer was well aware of theatre practice and decided specific instructions should be provided for moving occupied *Tallescopes* in indoor theatres with level stages.

The ABTT decided to publish the *Code* in June 2010. The HSE stated that the risks shown in a second HSL Report indicated that it was not safe to move a *Tallescope* with someone in the cage and action might follow. After consultation with the manufacturer of the *Tallescope*, ABTT decided to withdraw the publication.

Both HSE and the theatre industry were very concerned. Whilst the instructions in the *Code* were more or less acceptable in themselves, they relied completely on trained persons following the instructions precisely. Unfortunately humans are often not perfect.

A working party was set up with SOLT, TMA, the HSE, the ABTT and the manufacturer, Aluminium Access Products Ltd to find a solution. In order to address the specific concerns in the HSL Report, significant improvements were made to the product; these being four outriggers (instead of two), four push-pull posts and four non-lift castors. These must be installed for all use and especially before anyone is moved on a *Tallescope*. There must be strict adherence to the revised section in the *Code* on *Tallescopes*. It was stressed that employers and employees must be able to justify the use of a *Tallescope* instead of using safer methods of gaining access at height. The ABTT has made significant changes within the *Code* both about the use of *Tallescopes* but also emphasising the need to refer to the hierarchy for the selection of equipment for work at height outlined in the *Work at Height Regulations 2005* before considering means for any work at height.

This revised *Code of practice for the selection and use of temporary access equipment for working at height in theatres* was published in August 2011.

Scope

This *Code*

Access equipment is used regularly in places of entertainment. Although this guidance is primarily aimed at the stage and workshop areas, the safe use of access equipment in other areas should not be overlooked.

This *Code* does not cover the use of access equipment outdoors nor does it apply to access for building construction or inspection in theatre premises. For guidance on these matters consult the HSE website. See www.hse.gov.uk

The main purpose of this guide is to make theatre staff aware of the risks involved in working at height and to offer guidance in the safe use of the equipment. It is not a specification or a statement of the law. It is intended, however, to guide theatre managements and technicians on how to comply with the law and also achieve good practice. The *Code* suggests how to evaluate the hazard and risk for each item, how to select suitable equipment and how to use it safely.

How to use this *Code*

All users should first read Section 1, use Section 2 to help decide which access equipment is best, and then turn to the Section concerned with the equipment chosen.

Conventions and definitions

The recommendations generally use the verb 'should'; where the word 'must' is used this signifies a legal requirement insofar as we have understood the law correctly. Explanations of some terms and some general background information are in Appendix 1. Words in *italics* refer to publications, fuller details of these appear in Appendix 2. All British and European Standards are cited by number only within the text; full details appear in Appendix 2. In this Code the *Work at Height Regulations 2005 as amended* are referred to as the *Work at Height Regulations*.

Credits

The Association of British Theatre Technicians (ABTT) thanks the many ABTT members and others who contributed to the preparation of this *Code*. Particular thanks are due to Chris Higgs and to David Adams as Editor. Thanks also for the assistance of the *Tallescope* Working Party with the improvements in enhancing the *Code* and safety.

1. Legal considerations

1.1 Work at height

Work at height as defined by the *Work at Height Regulations 2005: Work in any place including at or below ground level from which a person could fall. Obtaining access to or egress from any place while at work involving a risk of a person falling a distance liable to cause personal injury, not including access by means of a permanent stairway in a workplace.*

1.2 Legislation

The principal legislation relating specifically to work at height is the *Work at Height Regulations 2005* (*WAHR*). *WAHR* relates to working places and the means of access to them, together with planning, supervision, training of users and use of equipment.

All access equipment is 'work equipment' and therefore covered by the *Provision and Use of Work Equipment Regulations 1998* (*PUWER*). Additionally, because the equipment lifts people, powered access equipment, rope access and work positioning equipment are covered by the *Lifting Operations and Lifting Equipment Regulations 1998* (*LOLER*).

Inspection criteria are specified in *PUWER*, *LOLER* and *WAHR* to ensure systems are in place to detect shortcomings before they become serious hazards.

Responsibility for health and safety enforcement in most theatres and places of entertainment is delegated to the Local Authority unless the venue owner or producer is the Local Authority when the Health and Safety Executive (HSE) inspect and enforce (the *Health and Safety (Enforcing Authority) Regulations 1998*).

1.3 *Work at Height Regulations 2005*

WAHR replaces most previous legislation on work at height and includes any temporary means of access to a work platform. (The *Building Regulations* generally regulate permanent access.)

The *Regulations* are risk based and goal setting linking to the general duties of the *Health and Safety at Work Act 1974* and the *Management of Health and Safety at Work Regulations 1999*.

Employers must select the most appropriate method of access for the intended work. When deciding the need to work at height, consider:

- Avoiding work at height
- Taking positive steps to prevent or reduce risk
- Following the hierarchy for managing risk
- Carrying out a risk assessment and acting upon it
- Using the safest equipment to avoid falls
- Ensuring competent people plan, organise and carry out the task

1.4 Work at height principles and hierarchy

Hierarchy when planning work at height

The Regulations have specific requirements which can be described in a hierarchy. It sets out the best practice when planning work at height. Planning may be formal, undertaken in advance by management, or happen during the course of the work.

In either way, the hierarchy should be applied so that risks can be reduced to the lowest possible level.

Good practice is for supervision/management to instruct technicians on the means of access to be used for a given task; the technician however should be able to use this hierarchy when such instruction is not given.

This reduces risk by ensuring that technicians feel empowered to make decisions that reflect a safe approach to their work, *not as an excuse to cut corners and do the work the quickest way*.

Very often employees believe they must carry out the work as quickly as possible with the only equipment available. The *Work at Height Regulations* expect the opposite.

Don't work at height if you can do it in any other way

Many tasks undertaken at height might have been possible to carry out at stage level by

i) better planning the work;

ii) coordination between departments or contractors; or

iii) consulting other technicians.

A typical example might be hanging masking on a bar at a height because the set prevents the bar from being brought in. The planning process should have identified the opportunity to hang the masking prior to the bar being taken out in order to eliminate the need to work at height.

If you have to work at height, work from an 'existing safe place of work'

An existing safe place of work is defined as:

> Any existing permanent place of work which does not require extra work equipment to prevent a fall from height occurring, that is to say a position from which there is no risk of falling and is therefore 'safe'. A safe place may include stairways and landings or platforms where there is no risk if the permanent barriers prevent falling.

In a theatre, this could be the grid, a bridge, gallery or similar platform with guardrails and toe-boards. It may include working from a stairway or other permanent access with guardrails, for example the access stairs to the flys or grid.

1.4 Work at height principles and hierarchy *(continued)*

If there is no existing safe place of work, use equipment to prevent the fall

This means powered access, towers or other means of access that provide safe and appropriate access to the work at height. In theatres, Mobile Elevating Work Platforms (MEWPs) are not typical, but vertical personnel lifts are sometimes used. These eliminate the risks involved in setting up other means of access, such as mobile towers.

If these are not available or appropriate to the situation, mobile alloy tower scaffolds are probably the safest means of access to workplaces at height in terms of access and stability for lengthy work. Towers with inclined internal ladders are preferred because they avoid climbing vertically.

'Personal' fall prevention measures should be used where individuals are working in situations where it is possible to fall out of or off a platform, lean over a guardrail or where guardrails cannot be used.

This may be where the use of a tower is not reasonably practicable in terms of time or accessibility or where a serviceable working surface exists but has no guardrails.

Best practice in such situations is to use 'work restraint'. Restraint requires a belt or harness with a lanyard that is taut when in use; as a rule of thumb, the anchorage must be capable of sustaining three times the user's weight. Building scenery can often involve standing on an appropriate surface but without any means of preventing a fall. In such cases, use of temporary access equipment may be inappropriate for the task on grounds of frequency or the route to be negotiated.

If you can't prevent the fall, minimise height and consequences of the fall

It may be possible to prevent falls by using nets or 'soft landing systems'. These should be positioned at foot level in preference to a distance below the work. If it is necessary to use nets at a lower level, the distance to fall should not exceed 6m *(BS 8411)* and *BS EN 1263-1)*.

At a personal level, fall protection should be considered in order as follows:

'Fall factor 0' (a restraint lanyard without slack). This requires the use of work restraint to reduce the distance that can be fallen. In consequence the energy generated is minimised and more easily sustained by the anchor.

If restraint is inappropriate, techniques that limit the fall distance to 'fall factor 1' (a lanyard that only allows a fall equal to the lanyard length — that is the lanyard is anchored level with the user's harness attachment point.)

1.4 Work at height principles and hierarchy *(continued)*

Lastly techniques limiting the distance to 'fall factor 2' (the user is one lanyard length above the anchor point, and therefore can fall twice that distance). This is traditionally referred to as fall arrest and requires use of a full harness, an energy absorbing device and an anchorage capable of sustaining the energy generated by an arrested fall. This is typically taken as 10 kiloNewtons (roughly 1 tonne).

The system must ensure that the person cannot hit the floor whichever system is used.

If you can't minimise both the height and consequence, minimise the consequences of the fall

Use nets or fall arrest equipment to absorb the energy generated by a fall. This should be considered first as a collective measure; the nets will catch anyone who falls.

Individual fall arrest (using a full harness and energy absorbing lanyard with an approved anchor point) only protects the person wearing the harness and should therefore be only considered where collective measures are inappropriate.

If you can't do that, minimise the risk by instruction, training and supervision

Equipment used at this level in the hierarchy will not have any method for preventing a fall and includes ladders, stepladders and trestles. However work restraint may yet reduce the chance of a fall.

Technicians and stage staff should be fit and able and must be trained to correctly check prior to use, set up, use and dismantle the range of access equipment provided to them.

Technicians need to understand the hazards in using fall arrest equipment and the rescue or recovery techniques *as defined by the employer* in the event of an arrested fall.

Rescue must be planned in advance and ready to take action quickly

Planning for work involving use of fall restraint harnesses must include rescue plans to rapidly recover a person who has fallen and is or may become unconscious. Recovery must occur within 10 minutes if potentially fatal consequences are to be avoided.

1.5 Risk assessment

Employers must assess the risks to their employees and others who may be affected by their work; this process starts with avoiding work at height wherever possible.

The Management of Health and Safety at Work Regulations 1999 impose a duty on all employers to carry out suitable and sufficient assessments of all risks to the health and safety of employees and others. Each theatre should carry out its own risk assessment and

1.5 Risk assessment *(continued)*

review and, where found necessary, augment individual production requirements.

Risk assessments must be carried out by a competent person (who may be an employee: see Appendix 1) appointed by the employer in order to identify hazards and record significant findings. Control measures in proportion to the risks presented are then designed and implemented. To comply with legislation, these assessments must be monitored and reviewed in order to be kept up to date and to maintain their effectiveness.

A suitable and sufficient risk assessment is one that:

- ♦ identifies the hazards and those at risk
- ♦ evaluates and prioritises the risks
- ♦ decides on preventative actions
- ♦ takes action
- ♦ records the action
- ♦ monitors and reviews the situation

1.5.1 Risk assessment sequence shown graphically

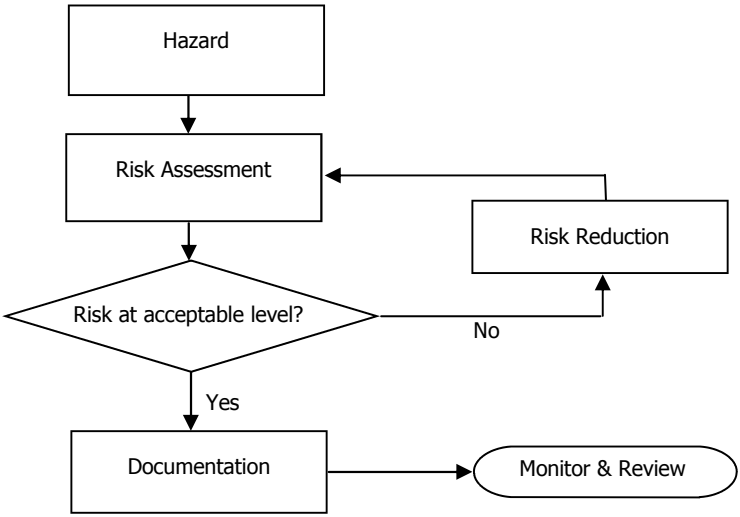


Table 1.5.1: Example only of risk assessment for work at height

What is the hazard?	Who might be harmed?	What are you already doing?	What more necessary?	Action by whom?	Action by when?	OK
Falls from height	Staff may suffer serious, possibly fatal, injuries if they fall from any height. For example, staff doing cleaning/ maintenance, or working on the lighting rig. Staff working below also at risk.	Employ safe system, trained staff. All access platforms are adequately fenced with safe means of access. Control and use of ladders policy. Ladders to be suitable, regularly inspected, and used only for light work of short duration. Only trained, authorised staff may work on the lighting rig.	Include work at height when planning and toolbox talks before beginning work. Also give staff the ABTT guidance on access equipment.	Tech/ Manager		
Head injury from falling objects	Staff working below or holding access tower.	Hard hat rule. Remove staff below when work above. Lanyards on tools.	Rope off area to form exclusion zone.	Tech/ Manager		

Table 1.5.1 shows an example risk assessment following an HSE model. Other models are available. Risk assessments are often based on a numerical assessment. Table 1.5.2 shows the basis for one such assessment.

Table 1.5.2 : Sample risk assessment grading system

Severity	Likelihood	No. of people affected	Risk factor	Action
1 = Trivial injury	1= Improbable	1 = 1 person	<4	Acceptable
2 = Minor injury	2 = Unlikely	2 = 1 to 5 people	5 - 10	Low priority
3 = "3 Day" injury	3 = Possible	3 = 6 to 10 people	11 - 14	Medium priority
4 = Major injury	4 = Likely	4 = 11 to 50 people	15 - 20	High priority
5 = Death	5 = Probable	5 = > 50 people	>20	Urgent priority

Severity x Likelihood x Number of people affected indicates the Risk factor

Risk assessments of work at height show that severity is always high and risks almost always due to poor operation. However selecting appropriate equipment can reduce the risk – see Section 2.

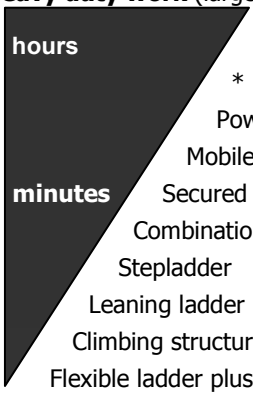
2. Selection of the right equipment for the job

2.1 Introduction

The employer is required to select the most appropriate work equipment; this is governed by a hierarchy. Figure 2.1 illustrates this hierarchy with reference to some access equipment used in theatres. Stepladders and ladders occupy a poor position in this hierarchy, preference being given to mobile elevating work platforms or equipment where there is a reduced risk of the user falling, for example access towers or *Tallescopes*, which have platforms and guardrails.

Figure 2.1 **Hierarchy of access** taking into account of duration of work

Heavy duty work (large power tools, manual handling, long period)



Existing place of work (bridge, catwalk)
* Purpose-made access
Powered access equipment
Mobile tower/*Tallescope*
Secured leaning ladder
Combination ladder (*Zarges style*)
Stepladder
Leaning ladder
Climbing structure plus FPE
Flexible ladder plus FPE

Light duty work (no tools, very light work at height, short period)

* A specific properly-made structure should be as safe or better than an existing structure.

FPE: fall protection equipment

It may not, however, always be possible to use the safest equipment for practical reasons.
Flowchart 2.2 provides both a shorthand and a reminder. Table 2.3 gives details a selection of access equipment.

Flowchart 2.2: Selecting the right equipment for the job

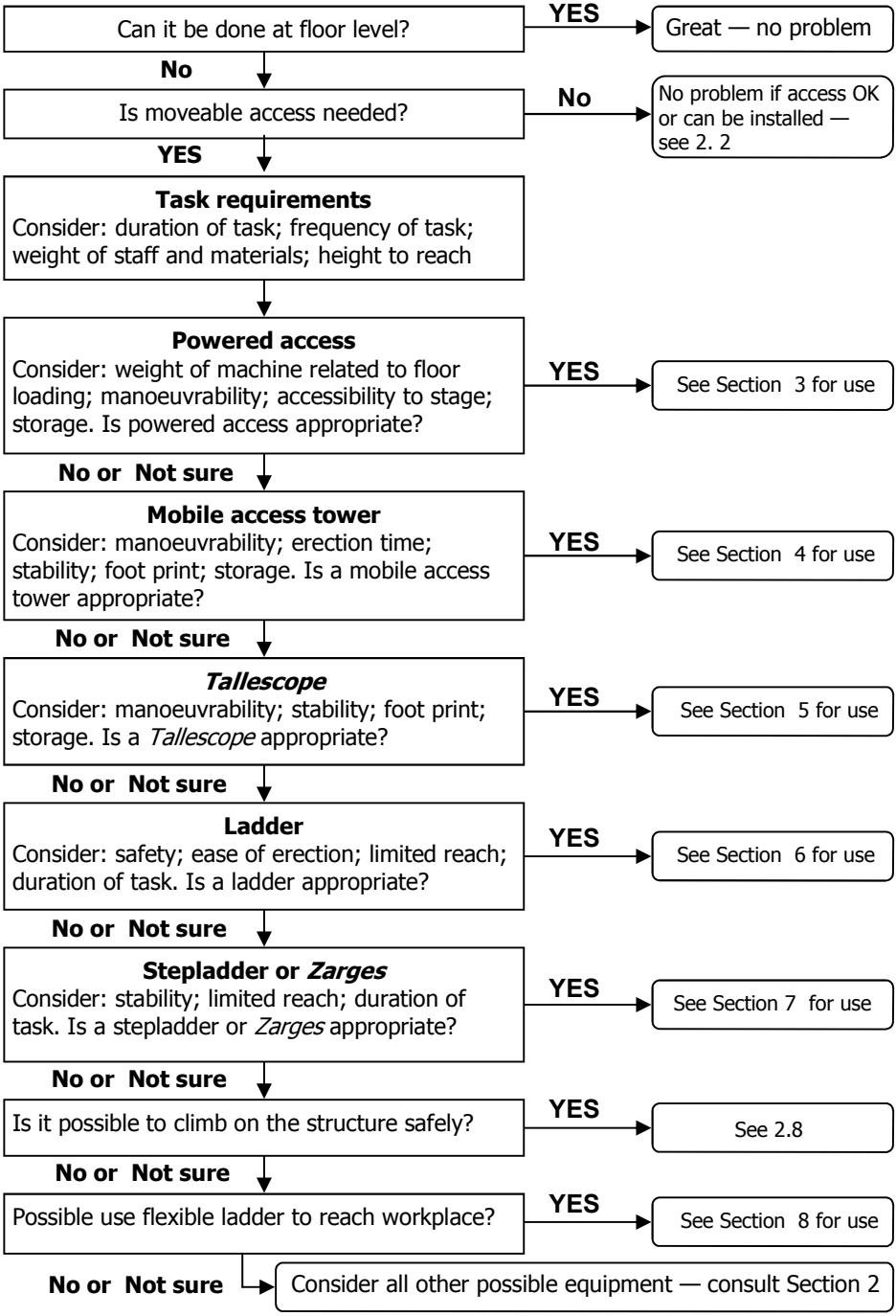


Table 2.3: A selection of access equipment

Equipment type	Example of equipment	Duty (1)	Usage (2)	SWL kg (3)	Up m (4)	Max. User (5)	kg (6)	Standard (7)
Powered access (MEWP)	Upright SL30 (works on rake $<19^{o}$)	Medium /heavy	High	580	11	3	2900	*EN 280*
Powered access (IWP)	Genie	Medium	High	136	9.44	1	630	Complies CE
Mobile access tower	Typical alloy tower 2.7m x 1.4m x 8.5m	Light/ medium	Medium	200 sq.m	15	4	300	*EN 1004*
Pulpit steps	Typical alloy	Light	Medium	150	4	1	45	*EN 131*
Tallescope	Model 50524	Light/ medium	Medium	115	9	1	130	—
Zarges free standing	3 x 12 rung	Light	Low	150	6	1	30.1	*EN 131*
Ladders	Typical extension 2 x 15 rung	Light	Low	150	7	1	20	*EN 131*
Stepladders	Typical 12 tread	Light	Low	150	3	1	15	*EN 131*
Flexible ladders	As required	Light	Low	—	Any	1	—	See 2.8

Notes
(1) As intended by the manufacturer
(2) Expected frequency of use
(3) Total permitted load on platform, cage or rungs, taken from manufacturers' literature
(4) Comfortable working height = platform height taken from manufacturers' literature + 1.2m
(5) Maximum number of people on platform, cage or rungs
(6) Weight, figures taken from manufacturers' literature
(7) There are specifications for most common equipment to ensure adequate manufacture

2.2 Purpose - made access

It may be sensible to provide a specific access route which can be installed in advance or maybe as part of the scenery. These routes have proved both safe and convenient for actions such as refocusing, re-lamping or colour filter changing. Other parts of (unseen) scenery have been provided for ease of setting up and breakdown. With care these can be as safe as a permanent structure. See also 2.8.

2.3 Deciding whether to use powered access equipment

Powered access equipment is access equipment that requires no physical effort to elevate people to height. There are many types ranging from simple compressed air platforms to rough terrain platforms with large platform capacity. These machines are commonly referred to as MEWPs (Mobile Elevating Work Platforms) or IWPs (Individual Working Platforms).

IWPs have single operators and can be driven from an elevated position or with earlier machines require positioning by hand but are raised and lowered under power and controlled from the cage.

There are a number of models that allow the cage to be extended horizontally to gain access to work outside the footprint of the machine. Larger scissor lift or boom types may seem appropriate for use in larger theatres, but the manoeuvrability of the machines or their booms may be a problem even where weight and size are not. Consider carefully the foot print of the machine in all variations.

The trend is for smaller and lighter machines. Most powered access machines used in theatres are the smaller, lighter type such as *Easy Up* or *Genie IWP* style. In the future powered access equipment may be appropriate for use in theatres in all but the most difficult situations.

Though using powered access equipment reduces risks compared to other means of access there are a number of factors that need to be considered.

The weight of the machine must be considered with regard to the load-bearing capacity of the stage surface and the floor. **Note that wheels or castors can exert excessive loads far above the designed point load, which is based upon a load spread over 300mm square** (not actually 'a point'). Access to the stage may also be difficult, so a lightweight machine with good portability is usually required.

The machine removes many of the physical risks found in other means of access but work is still being carried out at height and the relative complexity of powered access equipment may create hazards not encountered with more traditional methods. There have been injuries caused by collision with a structure such as the grid or fly gallery. Tools or equipment could still be dropped.

2.4 Deciding whether to use a mobile access tower

Mobile access towers are a practical means of access where the stability of other access equipment for certain tasks, such as drilling, is questionable. These types of tower are referred to as mobile tower scaffolds in legislation. Steel access towers are heavy and not appropriate for use in theatres. Most mobile access towers are relatively lightweight and made of aluminium alloy or fibreglass, being lightweight structures constructed from interchangeable prefabricated end-frames connected by spigot joints and braced apart by single tubes or frames and without needing tools for erection.

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WAHR requires consideration of duty, frequency and platform size as key factors in providing a safe place of work at height. Access towers offer a simple means of providing a stable and spacious working place at height. There are various versions of towers. The means of access to the platforms should be as safe as possible; a tower with inclined ladders and handrails is clearly better than most other forms of non-powered access equipment but consider also the footprint of the tower with its 4 outriggers.

The decision to use a tower will probably be based on a need for strength and stability. However, it should be remembered that, whilst the user may feel more confident working from an enclosed platform, work is still being carried out at height and tools or equipment could be dropped.

Towers should be used where access equipment such as ladders would be insecure or where the work involves use of heavy equipment, for example larger power tools used in maintenance work, particularly where they need to be hauled to height.

Where work is likely to last for some time, the use of a tower is often more appropriate given the larger platform size rather than a *Tallescope*.

When fully dismantled, towers may be more compact to store and transport than *Tallescopes*. However *Tallescopes* are frequently stored upright in less of a footprint than a 9m access tower.

Towers are quick to position and offer many advantages over step-ladders, although deployment from storage takes longer than with a

2.4 Deciding whether to use a mobile access tower *(continued)*

Tallescope and the adjustment of the height of the platform can be time consuming.

Towers are particularly useful for such functions as painting or focusing luminaires where rigged at a uniform height. The large platform allows a painter or technician focusing luminaires greater productivity before the need to descend. However it is often impossible to place a tower so as not to obscure light beams when focusing.

Ascent and descent on towers with internal stairs are relatively easy; 'ladder frames' present a fatigue and slip hazard similar to using a *Tallescope*.

Mobile Access Towers and Tallescopes have different advantages

Most mobile access towers are suitable for more than one person working on the platform. The assembly of towers can take considerable time; the parts have to be brought up separately and assembled in the air. Some systems are difficult, if not dangerous, to assemble. Generally towers are too large to store on the average stage. The manufacturer's instructions for safe use of access towers generally exclude people from the platform whilst the tower is being moved.

Tallescopes cannot be used where more than one person in the basket is needed. *Tallescopes* have few parts, are quick to assembly and assembled at stage level. There are no serious risks with the assembly. *Tallescopes* tend to remain assembled. The manufacturer's instructions permit someone to be moved in the basket when subject to their exact instructions.

2.5 Deciding whether to use a *Tallescope*

The type and duration of the work to be carried out must be considered before deciding to use a *Tallescope;* consider whether other, safer, means of access can be used. A *Tallescope* is better than a ladder since there is a stable platform, but a *Tallescope* does not offer the security afforded by access towers or powered access equipment.

A *Tallescope* provides a working place for one person.

The great advantage of a *Tallescope* on stage is that the working height is readily adjusted and the device is highly manoeuvrable. *Tallescopes* can be erected more easily and quickly and much more safely than access towers. Compared with powered access machines and mobile access towers *Tallescopes* are much more manoeuvrable and more easily stored on stage. However accidents have occurred as with other equipment which has not been properly maintained or where untrained personnel have been used or the manufacturer's instructions ignored. Consider also the footprint of the *Tallescope* with its 4 outriggers.

Stability is assured by correct set up and with a safe system of work.

2.5 Deciding whether to use a *Tallescope* *(continued)*

Tallescopes are especially suited for focusing luminaires where the ease of movement and the ability to easily alter the height of the working platform are important. A *Tallescope* is particularly useful during production periods and during performances (for instance in the interval to replace a lamp or to change a colour filter) as it may be readily stored in the assembled mode.

Ascending and descending the vertical ladder can be tiring. Frequent journeys up and down can sometimes be avoided through selecting more appropriate equipment or by moving a *Tallescope* with someone in the cage, subject to stringent precautions. Anyone proposing to select to use a *Tallescope* for this purpose should consider section 5.9 to 5.10.1 before making the decision.

Tallescopes and mobile access towers have different advantages

Tallescopes cannot be used where more than one person in the basket is needed. *Tallescopes* have few parts, are quick to assembly and assembled at stage level. There are no serious risks with the assembly. *Tallescopes* tend to remain assembled. The manufacturer's instructions permit someone to be moved in the basket subject to those exact instructions.

Most mobile access towers are suitable for more than one person working on the platform. The assembly of towers can take considerable time; the parts have to be brought up separately and assembled in the air. Some systems are difficult, if not dangerous, to assemble. Generally towers are too large to store on the average stage. The manufacturer's instructions for safe use of access towers generally exclude people from the platform whilst the tower is being moved.

2.6 Deciding whether to use a ladder

Ladders are often used in theatres as a means of access and as a temporary working place because of the speed with which a ladder can be deployed and the small footprint required. This flexibility combined with low cost in comparison to other more sophisticated access equipment means that ladders are common in technical theatre work.

However ladders are relatively unsafe and preference should be given to mobile elevating work platforms and other methods with a reduced risk of the user falling, for example mobile towers or *Tallescopes*.

Ladders should be used primarily as a means of access to platforms or similar working places. Ladders used for access to a platform or landing need to extend at least one metre above the platform to provide an effective handhold when getting off, and importantly, back on to the ladder.

2.6 Deciding whether to use a ladder *(continued)*

The extent and duration of the work carried out from ladders must be considered in deciding if the use of a ladder is appropriate. The frequency of the task in hand must also to be considered. Users should always be able to hold the ladder should they need to during the work.

Ladders should not be used for tasks for which they are unsuited, such as focusing and painting. However there may be occasions when ladders are appropriate and justifiable as means of access and as working places, for example re-touching paint on scenery where the work is short term, light duty and allows the ladder user to hold on to the ladder most of the time.

2.6.1 Selecting the right type of ladder

It is important to choose the correct ladder for the job. All ladders should comply with the relevant British or European Standards.

Ladders are classified according to their maximum static vertical load (designed working load) taking into account the general conditions and probable frequency of use for each type. Any ladders marked *BS EN 131* or *EN 131* are appropriate for use in theatres and these include extending ladders, sectional ladders and combination ladders, such as *Zarges style*.

BS 2037: Class 2 or *3* ladders as found in some DIY stores are not appropriate for use at work in theatres, not being designed for trade use; their use on stage may even be illegal. Timber 'pole ladders' are heavy and twist readily and would be equally unsuitable.

There are three principal materials used in ladders, each with advantages and disadvantages.

Table 2.6.1: Types of ladder

Type of ladder	Type of use	British Standard	Loads max. duty/static
Aluminium alloy	Heavy industrial use	*BS 2037: Class 1*	130kg/ 175kg
Aluminium alloy	Light trade use	*BS EN 131*	110kg/ 150 kg
Timber	Heavy industrial use	*BS 1129: Class 1*	130kg/ 175 kg
Timber	Light trade use	*BS EN 131*	110kg/ 150kg
Fibreglass/grp	Light trade use	*BS EN 131*	110kg/ 150 kg

2.6.2 Alloy ladders

Alloy ladders are used to reduce weight and improve strength and are resilient to general wear and tear. Alloy ladders will dent without chipping or cracking when subjected to impact. They do not need a protective finish and will not dry out or weather with age or exposure to sunlight. Nevertheless best practice is to store indoors.

2.6.2 Alloy ladders *(continued)*

Alloy ladders conduct electricity and should not be used where serious electrical hazards such as exposed terminals or damaged plug tops may exist.

All alloy ladders should have slip-resistant rubber or plastic feet offering good grip.

2.6.3 Timber ladders

Timber ladders age and are susceptible to drying and splitting when stored in a heated environment such as on a stage. Nevertheless best practice is to store indoors.

Timber ladders should not be painted because paint covers defects. Therefore timber ladders are generally inappropriate for paint shops.

Timber ladders do not conduct electricity (when dry) and may be considered where serious electrical hazards, such as exposed terminals, may exist. Note however that some timber ladders have metal reinforced stiles.

2.6.4 Fibreglass ladders

Fibreglass ladders are generally lighter than other ladders. Fibreglass (grp) does not conduct electricity when dry. Many fibreglass ladders have alloy rungs although there is usually no metal connection between the rungs and the stiles.

Fibreglass does not dry out or split when left in sunlight or stored near heat. It can withstand short exposures to high temperature without significant weakening.

Fibreglass ladders tend to chip and can crack under severe impact, failing suddenly.

2.7 Deciding whether to use a stepladder

Stepladders occupy a low position in the hierarchy of risk, preference being given to mobile elevating work platforms or methods with a partially enclosed platform with a low risk of the user falling, for example access towers or *Tallescopes*. Stepladders are useful for short duration lower risk work as opposed to higher level higher risk work.

A stepladder allows a user access to work where a ladder cannot be leant or a *Tallescope* erected, for example when gaining access to suspended props. There are occasions when swing-back stepladders will be a more appropriate working place than a combination ladder since a flat surface is available to stand on. Stepladder treads are generally more comfortable to stand on than ladder rungs.

A stepladder can be finely positioned to reach work as easily as possible and to allow the user to work on their preferred side.

Tall stepladders can be unstable and sway in use which makes them more suitable for light work such as painting rather than construction work, whilst short ‘three tread’ types are often quite rigid and suitable for a range of low level jobs.

2.7 Deciding whether to use a stepladder *(continued)*

Where a person can stand above 2 metres on a stepladder an alternative means of access should be found where practicable; an access tower might be ideal.

A stepladder could easily be de-stabilised when even small horizontal forces are applied at the top by pulling or pushing on an object at height, reaching or stepping out especially sideways. Tasks such as drilling should only be carried out if other, safer means of access are not possible.

2.7.1 Selecting the right type of stepladder or *Zarges*-style combination ladder

It is important to choose the correct stepladder for the job. All stepladders should comply with the relevant British or European Standards.

Designs of stepladders vary, the classic one being the timber 'swing-back' painter's stepladder. Some modern aluminium models have platforms with guardrails; these provide good working positions for tasks suited to the size of stepladder provided the platform has adequate handrails.

There are hybrid products known as 'combination ladders' that are essentially variable trestles or ladders with extension sections. This type is generally alloy with rungs, not treads. *Zarges* is a major manufacturer of combination ladders.

Stepladders are classified according to their maximum static vertical load (designed working load) taking into account the general conditions and probable frequency of use for each type of ladder. Stepladders and combination ladders marked *BS EN 131* or *EN 131* are suitable for use in theatres.

BS 2037: Class 2 or *3* stepladders as found in some DIY stores are not appropriate for use at work in theatres, not being designed for trade use; their use on stage may even be illegal.

There are three principal materials used in stepladders.

Table 2.7.1: Types of stepladder

Type of stepladder	Type of use	British Standard	Loads max. duty/ static
Aluminium alloy	Heavy industrial use	*BS 2037: Class 1*	130kg/ 175kg
Aluminium alloy	Light trade use	*BS EN 131*	110kg/ 150 kg
Timber	Heavy industrial use	*BS 1129: Class 1*	130kg/ 175 kg
Timber	Light trade use	*BS EN 131*	110kg/ 150 kg
Fibreglass/grp	Light trade use	*BS EN 131*	110kg/ 150 kg

2.7.2 Alloy stepladders

Alloy stepladders are much lighter in weight and more common than timber stepladders. However very light alloy stepladders can easily be damaged by rough handling. Alloy stepladders do not need a protective finish and will not dry out or weather with age or exposure to sunlight as a timber stepladder would.

Alloy stepladders conduct electricity and should not be used where serious electrical hazards such as exposed terminals or damaged plug tops may exist.

All alloy stepladders should have slip-resistant rubber or plastic feet offering good grip.

2.7.3 Timber stepladders

Timber stepladders age more quickly than aluminium ones and are susceptible to drying and splitting when stored in a heated environment such as a stage.

Timber stepladders should not be painted because paint covers defects. Therefore timber stepladders are generally inappropriate for paint shops.

Timber stepladders do not conduct electricity (when dry) and may be considered where serious electrical hazards, such as exposed terminals, may exist. Note however that some timber stepladders have metal-reinforced stiles.

2.7.4 Fibreglass stepladders

Fibreglass stepladders are generally lighter than other ladders. Fibreglass does not conduct electricity when dry. Many fibreglass stepladders have alloy rungs although there is usually no metal connection between the rungs and the stiles.

Fibreglass does not dry out or split when left in sunlight or stored near heat. It can withstand short exposures to high temperature without significant weakening.

Fibreglass stepladders tend to chip and can crack under severe impact, failing suddenly.

2.7.5 *Zarges*-style combination ladders

Zarges is a German manufacturer of access equipment and associated aluminium products. One range of their range is combination ladders. The term *Zarges* is often used to mean any free-standing 'A frame' ladder or combination ladder.

'*Zarges*' have much in common with stepladders as they are essentially trestles, which may also support an extending ladder. They are designed to be used as separate components, as extension ladders or in combinations with other accessories, such as platforms. A notable example is their use as a 'stair ladder' that is to say with the ladder extension inverted to level the ladder on stairs or a stage edge. *Free-standing Zarges*-style combination ladders provide working heights typically between 3 and 8 metres, although there are larger

2.7.5 *Zarges*-style combination ladders *(continued)*

models. Technicians have found them very useful for access to difficult positions and for focusing luminaires. Some models of *Zarges*-style can be adjusted for raked floors. Using *Zarges*-style combination ladders without damaging the trestle pivot requires understanding and practice.

2.8 Deciding whether to climb a structure

It may be possible to reach the work at height by climbing a structure. This is particularly appropriate:

- where other access equipment is not available
- where there is insufficient space to fit up any access equipment safely
- where the time in fitting up the access equipment is out of all proportion to the job, for example inserting a single connector: a bolt or a pin in a hinge
- where repeated access is needed, for example changing colour filters

For this to be successful and safe the route should be designed and not be left to chance or hope. The structure may form part of the scenery or be a separate unit designed only for that purpose.

Unless the access method is designed to the same standard as for a permanent route, the technician may well require fall protection whilst climbing the structure and then work positioning to allow both hands to be free for the work.

2.9 Deciding whether to use a flexible ladder

Flexible ladders are a useful means of access, being easy to transport, requiring no "footprint" and being able to be pulled out of the way when not in use. A separate fall protection system (FPE) is required if a flexible ladder is chosen. Users must be trained in the fall arrest technique used. Rescue training is vital; in the event of a serious fall the ability to recover someone from mid-air must be available.

A flexible ladder is a way of reaching a workplace; the ladder is not generally suitable for working upon. Flexible ladders are often used to reach gantries and focus bridges, even fixed grids, and are commonly used for access to suspended trusses because they can be rigged to the trusses before they are hauled up.

Flexible ladders are not suitable for emergency escape by untrained people.

Flexible ladders require access to (normally) two suitably strong and appropriately certified load bearing points to install the ladder and the fall protection system.

Care is needed when selecting a rope ladder as standards of design, quality and engineering may be inappropriate to work activity. The ABTT believes that at present there is no appropriate British Standard covering flexible ladders.

2. Selection of the right equipment for the job

2.10 Work at height in theatres

Copy and make use of the form below.

Further information can be found in *Five steps to risk assessment* at http://www.hse.gov.uk/pubns/indg163.pdf and *A brief guide to the Work at Height Regulations 2005* at http://www.hse.gov.uk/pubns/indg401.pdf

Follow the hierarchy for managing risk Carry out a risk assessment and act upon it		
Control measure	**Possible methods**	**Note decision, why and date**
No work at height	Work at stage level when refocusing to tapes Remote controlled luminaires	
Work from existing structure	Bridge Tensioned wire grid	
Install temporary structure	Gantry Catwalk or crawl truss Access stairs & platform	
Fall protection	MEWP Provide protection whilst climbing to location	
Work positioning	Enclosed access platform Work positioning system	
Fall mitigation	Fall arrest net if practicable Nets (over pits) Fall arrestor if possible	
System of work	Powered access Mobile access tower *Tallescope* Ladder Stepladder/Z*arges* Flexible ladder/climbing set	
Duty holders/employers should be able, and may be required to explain why it was necessary to work at height at all and why reasonably practicable measures could not be taken rather than increasing risk.		

3. Powered access equipment

3.1 Introduction Selection of access equipment

The ABTT reminds employers and employees that they must be able to justify the use of powered access equipment instead of safer methods for gaining access to work at height. This may have to be justified in a court of law. The ABTT provides some assistance with the selection of the right equipment for the job (clause 1.4 and Section 2.) Powered access equipment remains one of the methods for working at height in theatres. However powered access equipment should not automatically be regarded as the default or first choice for working at height The ABTT strongly recommends that employers and employees make themselves familiar with the hierarchy for the selection of work equipment in the *Work at Height Regulations 2005*.

3.1.1 Work at height in theatres

Copy and make use of the form opposite.
Further information can be found in
A brief guide to the Work at Height Regulations 2005:
http://www.hse.gov.uk/pubns/indg401.pdf
and in
Five steps to risk assessment:
http://www.hse.gov.uk/pubns/indg163.pdf

3.2 Risk assessment

- The initial risk assessment should consider the work to be done then identify the appropriate access equipment and the safe method of working which should be recorded in a method statement (RAMS: risk assessment/method statement).
- A risk assessment should be made before deciding which equipment is to be used. The conclusions should be acted upon as necessary. This should be recorded.
- The risk assessment should be reviewed whenever significant changes occur and action taken as necessary. This should be recorded.
- Even if there is no change the risk assessment should be reviewed regularly, the frequency will vary dependent upon the premises and the work but at least once a year would seem appropriate. Again this should be recorded.
- Where there is a new production or a change of staff the risk assessment should be reviewed appropriately and recorded.
- There should be a quick risk assessment every working day (and possibly more often). This may need only to be a visual check unless something serious is recognised but it is important that it occurs. This includes checking equipment and premises and ensuring those working are fit and able (health, age and fatigue insofar as this affects safety), and trained. Proof of training is strongly recommended.

3. Powered access equipment

Follow the hierarchy for managing risk Carry out a risk assessment and act upon it		
Control measure	**Possible methods**	**Note decision, why and date**
No work at height	Work at stage level when refocusing to tapes Remote controlled luminaires	
Work from existing structure	Bridge Tensioned wire grid	
Install temporary structure	Gantry Catwalk or crawl truss Access stairs & platform	
Fall protection	MEWP Provide protection whilst climbing to location	
Work positioning	Enclosed access platform Work positioning system	
Fall mitigation	Fall arrest net if practicable Nets (over pits) Fall arrestor if possible	
System of work	Powered access Mobile access tower *Tallescope* Ladder Stepladder/*Zarges* Flexible ladder/climbing set	
Duty holders/employers should be able, and may be required to explain why it was necessary to work at height at all and why reasonably practicable measures could not be taken rather than increasing risk.		

3.3 Training

WAHR requires formal training for people who use access equipment. It is essential that people working at height are confident to work at height.

People who use powered access equipment should be competent to carry out their duties at the level of their responsibility. People who use, supervise or manage the use of this equipment should consider training in addition to reading guidance material, even though this may seem to be unnecessary.

Training courses are for specific equipment and should include:

- legislation
- types and models
- pre-use checks and inspection for defects
- positioning of equipment
- loading on stages
- low-light concerns
- work on raked floors
- hauling loads
- maintenance
- storage

There are many centres throughout the UK offering the widely recognised International Powered Access Federation (IPAF) certification courses. IPAF will provide names of trainers; courses generally last one day for powered access equipment. The minimum standard considered necessary for a particular machine can usually be obtained from the maker or supplier.

Persons should not operate powered access equipment unless they have been trained and authorised or are undergoing formal training under supervision. After completion of formal training participants should understand the requirements of the relevant legislation and have the skills and knowledge to inspect, carry and use access equipment safely. Users must be provided with regular refresher training to maintain skills; this being particularly important as powered access equipment could easily injure not just the operator but also other personnel and bystanders.

Note: It is far too easy for the untrained to think they understand the equipment, especially as most powered access equipment looks very easy to use. The major cause of accidents is the lack of proper training without which accidents will continue. Training is background knowledge gained from study as well as practice.

3.4 Planning

Establish a safe system of work appropriate to the task, the premises and the staff available. Confirm that powered access is the most appropriate equipment for the task. Ensure that the appropriate type of powered access equipment is selected and that anyone using powered access equipment has been properly instructed in its use. Documented training is recommended for all users and supervisors.

The working height to be reached should be checked as being within the capacity of the machine so as to discourage attempts to gain height by improvisation and to save the effort of needlessly setting up the machine and its attendant safe systems of work. The manufacturer's instructions should always be followed as powered access equipment is potentially very dangerous.

Powered access equipment should not be used for any other purpose than was intended by the manufacturer.

3.4.1 Power supply

Some theatres hire powered access equipment. Ensure a suitable electricity supply will be available. Combustion-engine powered machines require ventilation and fuel supply and are not suitable for use in theatres.

3.4.2 Work restraint

The use of work restraint equipment must be considered **where there may be any risk that the operator could fall or be thrown from the cage.** This may happen as the result of unexpected movement controlled by the operator, the activity carried out in the cage or by an external action such as being struck by other plant.

Anchor points should be appropriate for the Fall Protection Equipment (FPE) selected.

Operators in particular need to be aware of the difference between fall arrest and restraint, the effects of 'shock' loading and the effects on the stability of the platform.

A suitable harness must be worn and the harness must be attached to the anchor points provided, using a work positioning lanyard, or, if the MEWP's manufacturer states that the specific MEWP can cope with the strains imposed, a fall arrest harness and lanyard can be used.

3.4.3 Rescue

WAHR requires employers to provide appropriate measures to rescue someone from height in cases of accident or emergency.

Advisedly this will include Fall Protection Equipment and full training for employees as well as inspections of equipment being undertaken.

Planning for work involving use of fall arrest harnesses must include rescue plans to rapidly recover a person who has fallen, is still suspended and is or may become unconscious. (Recovery after someone falls unconscious must occur in less than 10 minutes to reduce the risk of fatality.)

3.4.3 Rescue *(continued)*

The rescue plan should consider the risks to rescuers as well as to casualties. For repetitive work at height activities the rescue drills should be tested out on a regular basis to ensure the planned method(s) is effective.

Reliance on the local Fire Brigade is not appropriate and should not be part of the rescue plan.

Generally operators in scissor lift and vertical telescopic platforms are less likely to require fall arrest than in boom-type machines.

3.4.4 Lone working

Working alone at height or with access equipment should not be allowed. At least two people should work together when access equipment is being used.

3.4.5 Communication

There should be a reliable means of communication available to summon emergency services at all times that people are working at height.

3.4.6 Illumination levels

It is important to ensure there is sufficient light where work at height is to be carried out. Normal stage working light may not be sufficient. Adequate lighting is necessary for setting up and positioning access equipment safely. There should be good light to ensure all changes in level are easily seen as well as hazards such as steps or stage edges.

Blackouts or low light levels are potential hazards. A sudden increase in light level can also create sudden difficulty in vision and this should be avoided. Even with warning, changes in light levels can adversely affect sight and balance, so a system of work that allows a level of light appropriate for the work in hand is important. When focusing luminaires, the policy of cross fading between the luminaire to be focused and a working light state is good practice and should be included in induction training for lighting operators.

3.4.7 Noise levels

Similar precautions are needed concerning sound levels. High sound levels will inhibit clear communication, which is essential when work at height is in progress. Loud noise can cause accidents.

All technicians involved in working at height operations should be able to hear clearly.

3.4.8 Floors

The floor and structural stage should be checked as suitable for the type of machine with regard to the footprint, weight and position of outriggers. Stability needs to be assured; flexible surfaces will affect the stability of the machine. **Note wheels or castors can exert excessive loads far above the designed point load (which is based upon the load spread over 300mm square).**

3.2.8 Floors *(continued)*

The weight of personnel, tools and other loads should be estimated and checked as within the manufacturer's quoted figures. Access machines should not be used to lift materials unless specified by the manufacturers.

Do not erect the machine across a join in the floor or on a moving floor unless it is certain that no part of the floor can flex or move whilst the machine is in use. Any moving floor such as a truck, revolve or elevator must be secured against movement.

Keep the floor clear of hazards and maintain a clear area around the machine during the work.

3.4.9 Front edge of stage

Wherever wheeled equipment (powered access, mobile access towers, *Tallescopes* and pulpit steps as well as flight cases and trucks) is being moved there is a risk in most theatres that the machine or a person might fall off the edge of the stage. Fixing batten stops on the floor have been tried but may cause a trip. A new (2011) product, *Edge-Safe*® (see Glossary) should be more effective.

3.4.10 Electrical hazards

Proximity to electrical hazards must be considered. Ensure that serious electrical hazards such as exposed terminals or damaged plug tops either do not exist or are made safe before the work begins.

Equipment operating at high voltages such as neon tubes requires extra precautions.

3.4.11 PPE

All those close-by should wear hard hats (meeting *BS EN 397* for 'stage work') if there is any risk of falling objects. The technician in the cage should wear a bump cap (meeting *BS EN 812*) or a ventilated helmet with no peak and a chin strap (meeting *BS EN 12492*) if there are any obstructions overhead. Consider what other PPE such as heavy boots should be provided, if any. Sailing-style gloves, where index finger and thumb are removed, may be good when focusing luminaires. Consider whether barriers should be provided to exclude people.

3.5 Pre-use checks

Pre-use checks are essential. Technicians should also develop a keen sense of the performance and condition of their equipment. The type and complexity of the equipment will determine the checks, but as a minimum they should include:

- emergency stop and emergency lowering controls operate correctly
- functional and operational checks of controls
- guardrails, gate mechanisms and catches operational

3.5 Pre-use checks *(continued)*

- outriggers present and operational
- electrical cables and hydraulic hoses secure and protected against mechanical damage
- platform clear of objects which could fall
- all objects required for work secured
- restraint anchors present and fit to use
- data clearly marked on the platform:
  - ◊ maximum number of persons that may be lifted in cage
  - ◊ safe working load (SWL) which may be carried on platform
  - ◊ weight of machine itself
  - ◊ maximum gradient on which the machine may operate (means provided to establish angle of slope)
  - ◊ regular maintenance information

3.6 Setting up

Follow the manufacturer's instructions.

Where a machine is operated close to obstructions, for example overhead steelwork, the operator should ensure that there is no risk of any part of the machine colliding with an obstruction.

3.7 Use

The work will need to be carefully planned in order to allow for the required footprint of the machine. Setting up and manoeuvring the machine is often difficult and the ease of working around obstructions, such as scenery, should be considered at an early stage. Both the vertical dimension as well as the plan view should be considered.

The following risks must be considered before using the machine and appropriate preventive measures taken:

- possibility of tools, people or materials falling from platform
- overturning due to side loads, uneven surfaces, gradients or moving with raised platform
- trapping/crushing between platform or guardrails and structures
- overhead obstructions such as lighting bars, steelwork, electrical cables, lifting or other equipment
- failure or power loss resulting in an operator being stranded on the raised platform
- uncontrolled movement caused by misapplication or sudden operation of controls
- people being struck or trapped by the lifting mechanism at stage level

Where fitted, outriggers must be in place before the cage is elevated.

3.7 Use *(continued)*

Operatives must not climb on to the rails of the basket, or out of the basket, at any height.

Machines that can be driven from the cage should not travel with the platform elevated unless approved by the manufacturer. Travelling with the platform raised may be considered safe but should be restricted to the minimum distances necessary to complete the work in hand (only for slight positional adjustments).

Machines that are moved by hand must not be moved with the cage elevated. Accidents have occurred where outriggers have been released with the cage raised causing it to topple when moved.

Keep the floor clear of hazards and obstructions and maintain a clear area around the bottom of the equipment during work.

3.8 Inspection

Powered access equipment is subject to the requirements of *PUWER* and of *LOLER*, which covers lifting equipment used for lifting people.

LOLER requires employers to have in place arrangements to ensure the equipment is inspected frequently to ensure that any defect is detected before it becomes a hazard. Employers, self-employed people and anyone with control over equipment for lifting people (such as a hire company) should ensure a thorough examination is made by a competent person at least once every 6 months or in accordance with a written scheme of examination determined by a competent person bearing in mind the conditions and frequency of use. The manufacturer's instructions are regarded as a minimum standard.

A logbook of all inspections, defects and repairs should be maintained in accordance with *PUWER*. Written records should show the dates and extent of inspections.

Visual checks against a checklist should be made at regular intervals. Written records should show:

- identification — equipment should be identifiable by number or other unique marking. Identification must be legible and be somewhere not easily obscured or defaced
- class or BS/ BS EN standard
- maximum permitted load bearing
- manufacturer's name
- description
- location
- date of inspection and date next inspection due (expiry date)
- name of inspector
- conclusion – OK/repair/replace/destroy

Any damaged equipment should be taken out of service, labelled as faulty and locked out of use (for example key removed or padlock

3.8 Inspection *(continued)*

and chain fitted) until repaired by a competent person or destroyed. Modifications or repairs should only be made by a competent person. Any equipment that cannot be repaired should be destroyed.

Note: Lack of proper inspections or, when needed, following through to maintenance (or disposal) are significant causes of accidents, sometimes fatal.

3.9 Storage

Equipment should be stored safely, accessible only to authorised personnel and with regard to weather conditions if stored outside. Access doors should be secured and where necessary protected against damage whilst machines are being moved through them. Keys should be removed to a secure place when the machine is not in use.

There should be secondary suspension if it is intended to hang powered access equipment overhead unless the manufacturer has specifically stated the equipment has been designed to hang above people or it has been tested with an 8:1 safety factor.

The distance and floor surfaces to be traversed by portable or self-propelled machines should be considered. Steep gradients, cambers and changes in level (such as steps) may restrict or even prevent safe movement.

3.10 Maintenance

Maintenance should be carried out in accordance with manufacturer's printed instructions as a minimum standard. Modifications or repairs should only be made by a competent person. Any equipment that cannot be repaired should be destroyed.

3.11 Notes on using powered access equipment safely

Risk Assessment

What work to be done?

Is powered access most suitable equipment?

Right type: boom, scissor, vertical telescopic?

Manoeuvrability?

Floor (surface and structure) carries full load?

Ease of get in?

Where/how store until removed?

Ensure height and reach sufficient?

Is suitable **electricity** supply available?

Work restraint or fall arrest equipment required (FPE) ? Anchor points OK?

What other PPE required e.g. hard hats, head torches?

Record decisions

Prepare Method Statement

Floor

The floor (surface and structure) must be suitable taking account of footprint, weight and position of outriggers

Must be stable; flexible surfaces can affect stability of machine

Wheels/castors can exert excessive loads; ensure not above the designed point load

Check total weight of technician, tools and other loads within the manufacturer's figures

Ensure machine not across floor joint or moving floor if risk of movement

Ensure floor is clear of hazards

Pre-use checks

Emergency stop and lowering controls work

All controls function properly

Guardrails, gate mechanisms, catches OK

Cables and hoses secure and protected

Restraint anchors fit for use

When in use

Must be sufficient illumination throughout job

Clear communication — no loud noise

Before use

Are staff sufficient, formally trained (refreshed if needed) and authorised to use the specific machine?

Is satisfactory Method Statement agreed?

At least two technicians present?

Has machine been inspected? Is inspection record available?

Ensure *PUWER* & *LOLER* obeyed

Ensure preventive measures

Possibility of tools, people or materials falling from cage

Overturning due to side loads or moving with raised cage

Trapping/crushing between cage and/or structures

Colliding with overhead or other obstructions

Failure or power loss resulting in an operator being stranded in raised cage

Uncontrolled movement caused by misapplication or sudden operation of controls

People struck or trapped by the lifting mechanism at stage level

Outriggers

Where fitted outriggers must be in place before cage elevated

Cage

Do not climb inside cage or stand on rails or boxes to increase height

Movement

If machine moved manually must not be moved when cage elevated

If driven must not be moved when elevated unless approved by manufacturer. Travel should be minimised

Do not lift materials on machine unless approved by manufacturer

Ensure supervisor present when machine is moving

4. Mobile access towers

4.1 Introduction Selection of access equipment

The ABTT reminds employers and employees that they must be able to justify the use of a mobile access tower instead of safer methods for gaining access to work at height. This may have to be justified in a court of law. The ABTT provides some assistance with the selection of the right equipment for the job (clause 1.4 and Section 2.) A mobile access tower remains one of the methods for working at height in theatres. However mobile access towers should not automatically be regarded as the default or first choice for working at height. The ABTT strongly recommends that employers and employees make themselves familiar with the hierarchy for the selection of work equipment in the *Work at Height Regulations 2005.*

4.1.1 Work at height in theatres

Copy and make use of the form opposite.
Further information can be found in
A brief guide to the Work at Height Regulations 2005:
http://www.hse.gov.uk/pubns/indg401.pdf
and in
Five steps to risk assessment:
http://www.hse.gov.uk/pubns/indg163.pdf

4.2 Risk assessment

- The initial risk assessment should consider the work to be done then identify the appropriate access equipment and the safe method of working which should be recorded in a method statement (RAMS: risk assessment/method statement).
- A risk assessment should be made before deciding which equipment is to be used. The conclusions should be acted upon as necessary. This should be recorded.
- The risk assessment should be reviewed whenever significant changes occur and action taken as necessary. This should be recorded.
- Even if there is no change the risk assessment should be reviewed regularly, the frequency will vary dependent upon the premises and the work but at least once a year would seem appropriate. Again this should be recorded.
- Where there is a new production or a change of staff the risk assessment should be reviewed appropriately and recorded.
- There should be a quick risk assessment every working day (and possibly more often). This may need only to be a visual check unless something serious is recognised but it is important that it occurs. This includes checking equipment and premises and ensuring those working are fit and able (health, age and fatigue insofar as this affects safety), and trained. Proof of training is strongly recommended.

4. Mobile access towers

Follow the hierarchy for managing risk Carry out a risk assessment and act upon it		
Control measure	**Possible methods**	**Note decision, why and date**
No work at height	Work at stage level when refocusing to tapes Remote controlled luminaires	
Work from existing structure	Bridge Tensioned wire grid	
Install temporary structure	Gantry Catwalk or crawl truss Access stairs & platform	
Fall protection	MEWP Provide protection whilst climbing to location	
Work positioning	Enclosed access platform Work positioning system	
Fall mitigation	Fall arrest net if practicable Nets (over pits) Fall arrestor if possible	
System of work	Powered access Mobile access tower *Tallescope* Ladder Stepladder/*Zarges* Flexible ladder/climbing set	
Duty holders/employers should be able, and may be required to explain why it was necessary to work at height at all and why reasonably practicable measures could not be taken rather than increasing risk.		

4.3 Training

WAHR requires formal training for people who use access equipment. It is essential that people working at height are confident to work at height.

People who use access towers should be competent to carry out their duties at the level of their responsibility. People who use, supervise or manage the use of access equipment should consider training in addition to reading guidance material, even though this may seem to be unnecessary.

Training courses are for specific equipment and should include:

- legislation
- types and models
- pre-use checks and inspection for defects
- carrying and positioning of equipment
- climbing (up and down)
- loading on stages
- low-light concerns
- work on raked floors
- hauling loads
- maintenance
- storage

There are many training courses available. The Prefabricated Access Suppliers' and Manufacturers' Association (PASMA) syllabus is nationally recognised. PASMA will provide names of trainers, generally one-day courses for access towers. Training courses include those of Aluminium Access Products Ltd and the ABTT. After completion of formal training participants should understand the requirements of the relevant legislation and have the skills and knowledge to inspect, carry and use access equipment safely.

Note: It is far too easy for the untrained to think they understand mobile access towers, especially as they look very easy to erect and use. The major cause of accidents is the lack of proper training without which accidents will continue. Training is background knowledge gained from study as well as practice.

4.4 Planning

Establish a safe system of work appropriate to the task, the premises and the staff available. Confirm that a mobile access tower is the most appropriate equipment for the task. Ensure that anyone using an access tower has been properly instructed in its use. Documented training is recommended for all users and supervisors.

The manufacturer's instructions should always be followed as access towers are potentially dangerous. Towers are designed for vertical loading. Any horizontal or diagonal forces at or near the top will destabilise a tower; work should be planned to avoid this. Not all

4.4 Planning *(continued)*

towers work the same way, frame connections and interlock clip styles vary, as do the bracing patterns and methods of building and levelling. An access tower should not be used for any other purpose than was intended by the manufacturer; for example, propping or supporting loads can be dangerous.

4.4.1 Lone working

Working alone at height or with access equipment should not be allowed. A minimum of three people is recommended when using an access tower.

4.4.2 Communication

There should be a reliable means of communication available to summon emergency services at all times that people are working at height.

4.4.3 Illumination levels

It is important to ensure there is sufficient light where work at height is to be carried out. Normal stage working light may not be sufficient. Adequate lighting is necessary for setting up and positioning access equipment safely. There should be good light to ensure all changes in level are easily seen as well as hazards such as steps or stage edges.

Blackouts or low light levels are potential hazards. A sudden increase in light level can also create sudden difficulty in vision and this should be avoided. Even with warning, changes in light levels can adversely affect sight and balance, so a system of work that allows a level of light appropriate for the work in hand is important. When focusing luminaires, the policy of cross fading between the luminaire to be focused and a working light state is good practice and should be included in induction training for lighting operators.

4.4.4 Noise levels

Similar precautions are needed concerning sound levels. High sound levels will inhibit clear communication, which is essential when work at height is in progress. Loud noise can cause accidents.

All technicians involved in working at height operations should be able to hear clearly.

4.4.5 Floors

Check that the floor and the supporting surface are strong enough to support the combined weight of the tower and the user. The floor must be sufficiently rigid to assure that flexible surfaces will not affect the stability of the tower.

Do not erect the tower or the outriggers across a join in the floor or on a moving floor unless it is certain that no part of the floor can flex or move whilst the tower is in use. Any moving floor such as a revolve, elevator or truck must be secured against movement and, if powered, be isolated.

Keep the floor clear of hazards and obstructions and maintain a clear area around the bottom of the tower during the work.

4.4.6 Front edge of stage Wherever wheeled equipment (powered access, mobile access towers, *Tallescopes* and pulpit steps as well as flight cases and trucks) is being moved there is a risk in most theatres that the machine or a person might fall off the edge of the stage. Fixing batten stops on the floor have been tried but may cause a trip. A new (2011) product, *Edge-Safe*® (see Glossary) should be more effective.

4.4.7 Electrical hazards Proximity to electrical hazards must be considered. Ensure that serious electrical hazards such as exposed terminals or damaged plugs either do not exist or are made safe before the work begins. Equipment operating at high voltages such as neon tubes requires extra precautions.

4.4.8 PPE All those close-by should wear hard hats (meeting *BS EN 397* for 'stage work') if there is any risk of falling objects. The technician on the work platform should wear a bump cap (meeting *BS EN 812*) or a ventilated helmet with no peak and a chin strap (meeting *BS EN 12492*) if there are any obstructions overhead. Consider whether barriers should be provided.

Consider what other PPE should be provided, if any. It is sensible to wear lightweight safety boots and gloves when building or striking towers. Sailing style gloves, where index finger and thumb are removed, may be good when focusing luminaires. However do not wear gloves or heavy boots when climbing.

4.4.9 Rescue *WAHR* requires employers to provide appropriate measures to rescue someone from height in cases of accident or emergency. This may include providing full training and equipment for employees. Rescue plans should consider the risks to rescuers as well as to casualties. Rescue drills should be carried out on a regular basis to ensure the planned method(s) is effective. Reliance on the local Fire Brigade is not appropriate and should not be part of the rescue plan.

Planning for work involving use of fall arrest harnesses should include rescue plans to rapidly recover a person who has fallen and is or may become unconscious. Recovery after someone falls unconscious must occur in less than 10 minutes to reduce the risk of fatality.

4.5 Pre-use checks Pre-use checks are essential to the safe use of mobile access towers. The manufacturer's information should give guidance on the particular tower.

Significant deformation to any tubular component (frame member, brace, guardrail or stabiliser) is sufficient to condemn the item.

In addition to pre-use checks, towers should also be inspected by a competent person before first use, after any substantial alteration (such as re-levelling or change in platform heights) and after any event likely to have affected its stability.

Table 4.5: Pre-Use Checks for Access Towers		
Component	**Check**	**Take out of service if**
Instruction labels	Owner, plant number, etc. Design loads and sequence of erection	Illegible and information not known
Frames	Tubes not bent or crushed Welds complete and not cracked Spigots, interlock clips and fittings secure and undamaged	Significant deformation Corrosion, bent in any plane Fittings missing or broken
Platforms	Clean, sound, not bent Hooks secure and working Trapdoor working	Loose boarding, trapdoor hinge. Any damage to bearers, hooks or boards
Braces and guardrails	Straight, true and not crushed Hooks secure, working correctly	Bent, significantly damaged by crushing or hooks missing or broken
Toe-boards	Function/fit together, hinge correctly	Loose, insecure, poor fit or split
Stabilisers	As for braces, plus all four present with rubber feet, secure, working. Check couplers, fasteners and 'telescope' function working	Functioning badly, bent or damaged Rubber feet missing or articulation impaired
Wheels	Clean, secure and all same size	Damaged, not free running or different sizes
Adjustable legs	Straight and true, threads working and clean. Locking collar or device secure and clean	Corrosion, bent, threads damaged. Locking device missing or broken

4.6 Setting up

The manufacturer or supplier/rental company should provide adequate instructions on the erection sequence. Ensure the person supervising the use of the tower is competent and has a copy of the relevant instructions. There are many different designs and ways of building towers; ensure you know how to properly construct the tower. Wherever possible, use a system that physically contains the people building the tower.

This is usually by working through a trapped platform or by temporary guardrails that can be used independently. Platforms are designed to be used with guardrails and toe-boards to completely enclose workers. *WAHR* requires:

4.6 Setting up *(continued)*

- ladder access to the platform (vertical or inclined)
- toe-boards fitted around all platforms used for working
- stabilisers or outriggers fitted where necessary to guard against overturning
- double guardrails at each working platform (vertical gaps less than 470mm)

Additionally a trapdoor for safe access from the ladder is desirable.

4.6.1 Guardrails

It is not always made clear that guardrails must be added as the platforms are placed and must remain in situ until dismantled. The biggest danger with towers is whilst erecting, altering and dismantling the tower as the guardrails were often fitted last so placing the technicians at risk whilst working on unprotected platforms. The Prefabricated Access Suppliers' and Manufacturers' Association, (PASMA) the leading organisation for the mobile access tower sector, recommends that users follow the manufacturer's guidance which should involve either the 'through-the-trap' or the 'advance guard-rail' method. These were developed in co-operation with the Health and Safety Executive (HSE).

3T – through the trap

With this method the technician works partially through the open trap of the platform to position guardrails at appropriate distances above the platform and then stands on the platform to continue the assembly process. This method uses standard components.

Advance guardrail

With this method specially designed temporary guardrails are fitted whilst the technician is standing on the level below and the temporary guards are then moved up to the next level. The technician then moves to the next level and installs the permanent guardrails. The advance guardrails are then repositioned ahead of the next platform thus the technician is never exposed to an unguarded platform.

4.6.2 Typical erection sequence

Make sure the tower is on firm surface with the wheels or feet properly supported. Use the adjustable legs when necessary to level the tower; do not improvise.

Position two 'base' end frames, already with wheels fitted, so that the first horizontal braces can be fitted on to the *vertical* tubes of the end frames just above the lowest rung. (The horizontal brace length required can easily be established by checking its length is the same as the length of the platform.)

This allows the frames to stand vertical whilst the first two diagonals are fitted, checking they fit without pulling the end frames off vertical.

Ensure the first 'lift' is square and vertical, and the lowest pair of frames has both the diagonal and horizontal braces fitted before proceeding.

4.6.2 Typical erection sequence *(continued)*

Fit and adjust the outriggers.

Climb the inside of the first lift and add an end-frame either side and continue the bracing pattern as per instructions. (From the same tube as the last diagonal finished on if no guidance is given.)

Ensure guardrails are fitted as in 4.6.1.

Haul platforms to higher levels through the tower by hand line. (Use the hole provided in the platform, NOT the hole for the trapdoor catch.)

Do not use a ladder, stepladder or other device to gain height from the platform.

Check that the tower is vertical before work begins.

Note: Manufacturer's instructions may provide more detailed information. If these are not available the latest edition of all PASMA manufacturers' instruction manuals can be downloaded from www.pasma.co.uk

4.7 Access on to a tower

There must be a safe way to get to and from the work platform as work progresses and when the tower is ready for use. Do not climb unless the brakes are on and the outriggers set. Do not climb up the outside of the tower.

It is never safe to climb end frames unless they are designed to be used as a built-in ladder; these have rungs spaced at between 230 and 300mm with an anti-slip surface and even then should only be used inside the tower and with the interlock clips fitted.

Purpose-made clip on ladder sections can be attached safely on the inside where provided.

If fitting a separate ladder ensure that it is fixed securely *to the inside*, not the outside of the tower and set at an appropriate angle (approximately 15^{o} from vertical). Ideally the ladder should rest on the tower, not the supporting surface, to avoid a toppling force as it is climbed.

4.8 Platform load

The weight of individual items should be assessed before hauling up the tower.

Loading platforms with heavy equipment should be monitored to ensure the design loading is not exceeded. This must include the weight of the users, materials and checked against the manufacturer's information. The safe working loads (SWL) are often marked on the platform or end frames. Check the total load on the tower whilst work in progress.

When towers are used for such jobs as drilling, horizontal forces will result. Great care should be taken to ensure that the tower is not overturned.

4.8 Platform load *(continued)*

Use a suitable container to keep tools and materials whilst on the platform. Use a hand-line to raise or lower equipment and tools; heavy items must be hauled within the tower.

4.9 Moving a tower

Lowering the height of a tall tower, prior to moving, may be easier and safer. *CIS 10* and PASMA recommend that the tower be reduced to a maximum height of 4m before it is moved. Before an access tower is moved, its path should be checked for obstructions both on the floor and overhead and the floor surface checked to be level.

To move a tower, after releasing the brakes, force should be applied near the base so as not to topple the tower. At least two people are needed; more may be needed to ensure that someone controls the movement and can see the route ahead to be clear. The tower must be checked as vertical and the castors braked before it is used again.

The manufacturer's instructions typically forbid moving an occupied access tower as do HSE and PASMA.

4.10 Dismantling

Follow the manufacturer's instructions, which will generally be the reverse of the erection sequence.

Prepare the area to be used, and consider lowering a few lifts which will make the tower more stable when moved. Not completely dismantling the tower until it is close to storage or transport area reduces the manual handling risks and time. Note that *CIS 10* and PASMA recommend the tower be reduced to a maximum height of 4m before it is moved.

Do not drop components or materials from the tower; use a hand-line to lower them. (Chain bags from self-climbing chain motors are excellent for this.)

Clear the platforms of all loose materials before striking, and if powdery or aggressive materials have been used, consider use of eye protection, facemasks and protective clothing.

3T – through the trap

The toe-boards are removed then the guardrails furthest away from the trap are unlocked then the technician partially climbs through the trap and completes the removal of the guardrails. The technician then descends to the next lower level, from where the upper platform and end frames are removed. The sequence is then repeated until dismantling is completed.

Advance guardrail

The technician reinstates the advance guard rail unit so that the permanent toe-boards and guardrails can be removed and the technician descends to the next level. The advance guardrails are then repositioned on the lower level and the sequence is repeated until dismantling is completed thus the technician is never exposed to an unguarded platform.

4.11 Inspection

Towers should be inspected by a competent person and the inspection recorded in a logbook:

- after assembly and before use
- after any event which might have affected its stability including the removal and replacement of any component
- at suitable intervals depending on usage and conditions and in the case of a tower of 2m or more in height at intervals not exceeding seven days if it remains in the same location.

A logbook of all inspections, defects and repairs should be maintained in accordance with *PUWER*. Written records should show the dates and extent of inspections.

A formal annual thorough inspection of access towers is recommended; the manufacturer's instructions are regarded as a minimum standard.

Visual checks against a checklist should be made at regular intervals. Written records should show:

- identification number — equipment should be identifiable by number or other unique marking. Identification must be legible and be somewhere not easily obscured or defaced
- class or BS/BS EN standard
- maximum permitted load bearing
- manufacturer's name
- description
- location
- dates of inspection and next inspection due (expiry date)
- name of inspector
- conclusion — OK/repair/replace/destroy

Any damaged component of an access tower should be taken out of service, labelled as faulty and locked out of use until repaired by a competent person or destroyed. Modifications or repairs should only be made by a competent person.

Note: Lack of proper inspections or following through, when necessary, to maintenance (or disposal) are significant causes of accidents, sometimes fatal.

4.12 Maintenance

Maintenance should be carried out at intervals determined by frequency and type of use by a competent person such as an authorised manufacturer's agent. The manufacturer's instructions should be followed where available.

Keep the tower clean, especially platform, rungs and moving parts such as locking hooks and wheels. Aggressive substances such as solvents, paint and lubricants should be removed with cloths, the

4.12 Maintenance *(continued)*

components hosed with clean water and left to dry naturally such that water can drain out of tubes and other components.

Check all fixing nuts and bolts are tight. Lubricate mechanisms as approved by the manufacturer such as adjustable leg locking collars, hook and brake pivots.

Dents and crushing should only be repaired by the manufacturer or his authorized agent. Welding repairs should only be carried out by competent coded welders with experience of thin wall alloy tower repairs.

Any components that cannot be repaired should be destroyed.

4.13 Storage

Towers should be stored so that components are protected, particularly from crushing. All the tower components should remain together to avoid future incompatibility and misuse.

Storage areas should be secure and access limited to authorised personnel to reduce risk of incorrect use.

This guidance assumes indoor use and storage. If stored outdoors, wind, rain and cold conditions can affect the safe use of towers significantly.

4.12 Notes on using a mobile access tower safely

Risk Assessment

What work to be done?

Is tower most appropriate equipment?

How to prevent technician over-reaching?

What PPE is required – e.g. hard hats, safety boots, head torches?

Record decisions

Prepare a Method Statement

Setting up

Inspect tower for damage, no tubes bent, no clips missing or not working

Ensure all locking collars and pins effective

Ensure floor is strong enough for total load

Ensure guard rails and toe-boards are fitted

Check tower is vertical

Raked stage

Tower **must** be plumb: use leg adjusters make sure at least one and preferably two legs are not extended

Locate the tower so long axis is up and down the rake

Ensure the outriggers feet firmly on floor

Ensure the brakes are on before climbing the ladder

Climbing

Only climb when outriggers are fitted and brakes locked on

Climb only within tower

Do **not** climb on the outside of the tower

Moving the tower

Do not move tower with technician on tower

Reduce height of tower to 4m or less before moving (suggest 2m if on rake)

At least two people to move tower

Force should be applied near the base

Technician pushing is responsible for confirming no hazards in path of movement

Technician pulling is responsible for confirming no overhead hazards and checking tower clear of object

Before use

Are the staff sufficient, trained and authorised to use towers?

Is there a satisfactory Method Statement agreed?

Are at least three technicians present?

Has the tower been inspected and is the inspection record available?

Is the tower in good order and serviceable?

Brakes

Must operate properly

Must be locked when climbing tower, when heavy work in progress and when movement of tower not required

All 4 brakes must be locked on rakes

Outriggers

Must be in contact with floor before climbing tower

On raked stages essential remain in direct contact with the floor

Tower is **unstable** if outrigger(s) are omitted unless other measures taken

When in use

Keep all tools in container or on lanyard

Technician in tower to ensure no tools or materials accumulate on the platform

Always work within platform

Do not overreach

Feet must remain on the platform floor

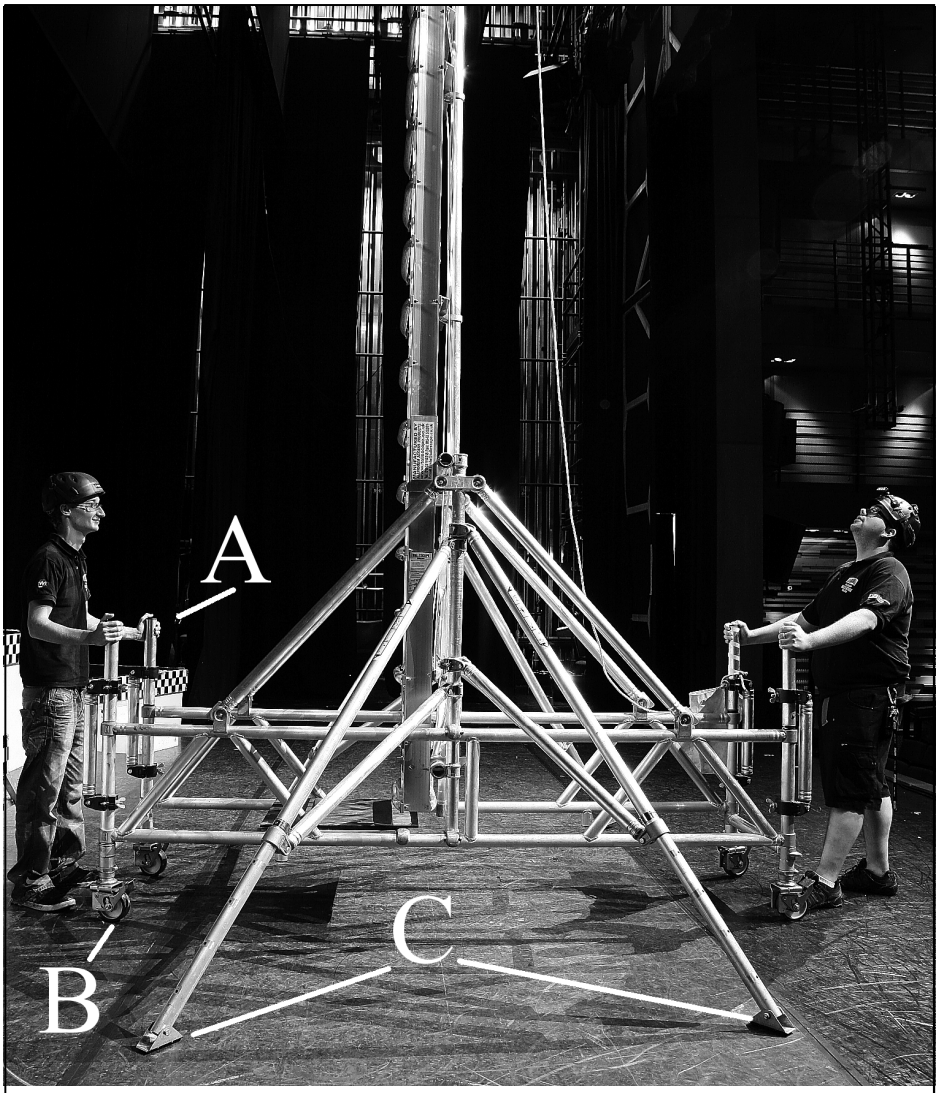
Do not stand on kickboards, rails, boxes or ladders to gain height

Equipment to be pulled up must remain within wheelbase of tower

Monitor total load on tower during work

If in doubt **STOP!**

5.1 *Tallescopes:* Major improvements in 2011



A) Four push-pull posts so operators do not have to bend at the waist and can steer more easily and with a better view.

B) Four non-lift castors fitted so not to cause any movements in the *Tallescope* when brakes are being engaged or disengaged. The brakes should be applied when the *Tallescope* is not in motion.

C) Four outriggers reduce the possibility of a *Tallescope* falling sideways. The outriggers are locked off with the feet not more than 10mm above the floor.

5. *Tallescopes*

5.1 Major Improvements to *Tallescopes*

There have been major improvements to *Tallescopes* in 2011. These are:

- four outriggers to reduce the possibility of a *Tallescope* falling sideways
  Note: The outriggers are locked off with the feet not more than 10mm above the floor. The outriggers when retracted can usually be folded back when out of use
- four push-pull posts (base column extensions) so the operators do not have to bend at the waist and can steer more easily and with better view
- four non-lift castors fitted so they do not cause any movements in the *Tallescope* when the brakes are being engaged or disengaged
  Note: The brakes should always be applied when the *Tallescope* is not in motion

There are kits available to update existing *Tallescopes*. Older Tallescopes may also require structural modifications.

Furthermore the ABTT cannot regard any *Tallescope* acceptable equipment for working at height in a theatre unless Section 5 of this Code is strictly followed. There are specific and additional requirements if a person is to be moved in a *Tallescope*.

Note: Other forms of wheeled platform ladders are not considered here although much of this guidance may be relevant. Such systems include the *Topdek*, a smaller model made by the manufacturer of *Tallescopes*.

5.2 Selection of access equipment

The ABTT reminds employers and employees that they must be able to justify the use of a *Tallescope* instead of safer methods for gaining access to work at height. This may have to be justified in a court of law. The ABTT provides some assistance with the selection of the right equipment for the job (clause 1.4 and Section 2.) A *Tallescope* remains one of the methods for working at height in theatres. However *Tallescopes* should not automatically be regarded as the default or first choice for working at height. The ABTT strongly recommends that employers and employees make themselves familiar with the hierarchy for the selection of work equipment in the *Work at Height Regulations 2005*.

5.2.1 Work at height in theatres

Copy and make use of the form overleaf.

Further information can be found in *A brief guide to the Work at Height Regulations 2005:* http://www.hse.gov.uk/pubns/indg401.pdf and in *Five steps to risk assessment:* http://www.hse.gov.uk/pubns/indg163.pdf

5. *Tallescopes*

Follow the hierarchy for managing risk Carry out a risk assessment and act upon it		
Control measure	**Possible methods**	**Note decision, why and date**
No work at height	Work at stage level when refocusing to tapes Remote controlled luminaires	
Work from existing structure	Bridge Tensioned wire grid	
Install temporary structure	Gantry Catwalk or crawl truss Access stairs & platform	
Fall protection	MEWP Provide protection whilst climbing to location	
Work positioning	Enclosed access platform Work positioning system	
Fall mitigation	Fall arrest net if practicable Nets (over pits) Fall arrestor if possible	
System of work	Powered access Mobile access tower *Tallescope* Ladder Stepladder/*Zarges* Flexible ladder/climbing set	
Duty holders/employers should be able, and may be required to explain why it was necessary to work at height at all and why reasonably practicable measures could not be taken rather than increasing risk.		

5.3 Risk assessment

- The initial risk assessment should consider the work to be done then identify the appropriate access equipment and the safe method of working which should be recorded in a method statement (RAMS: risk assessment/method statement).

5.3 Risk Assessment *(continued)*

- A risk assessment should be made before deciding which equipment is to be used. The conclusions should be acted upon as necessary. This should be recorded.
- The risk assessment should be reviewed whenever significant changes occur and action taken as necessary. This should be recorded.
- Even if there is no change the risk assessment should be reviewed regularly, the frequency will vary dependent upon the premises and the work but at least once a year would seem appropriate. Again this should be recorded.
- Where there is a new production or a change of staff the risk assessment should be reviewed appropriately and recorded.
- There should be a quick risk assessment every working day (and possibly more often). This may need only to be a visual check unless something serious is recognised but it is important that it occurs. This includes checking equipment and premises and ensuring those working are fit and able (health, age and fatigue insofar as this affects safety), and trained. Proof of training is strongly recommended.

5.4 Training

WAHR requires formal training for people who use access equipment. It is essential technicians using *Tallescopes* be trained in their use. It is also essential that people working at height are confident.

People who use *Tallescopes* should be competent to carry out their duties at the level of their responsibility. People who use, supervise or manage the use of *Tallescopes* should consider training in addition to reading guidance material even though this may seem to be unnecessary.

Documented training for all users and supervisors of access equipment is strongly recommended. Training courses are for specific equipment and should include:

- legislation
- types and models
- pre-use checks and inspection for defects
- carrying and positioning of equipment
- climbing (up and down)
- loading on stages
- low-light concerns
- work on rakes
- hauling loads
- maintenance
- storage

5.4 Training *(continued)* Several training bodies including Aluminium Access Products Ltd and the ABTT offer courses, generally half-day. After completion of formal training participants should understand the requirements of the relevant legislation and have the skills and knowledge to inspect, assemble and use *Tallescopes* safely.

Note **It is far too easy for the untrained to think they understand *Tallescopes*, especially as they look easy to use. Accidents will occur if proper training is not undertaken.**

5.5 Planning Establish a safe system of work appropriate to the task, the premises and the staff available. Confirm that a *Tallescope* is the most appropriate equipment for the task. Ensure that everyone using a *Tallescope* has been properly instructed in its use. Documented training is recommended for all users and supervisors. Employers should confirm that the personnel concerned are fit for working at height.

Table 5.5: *Tallescope* models

Model	Maximum platform height	Minimum platform height
50512 standard	4.4m	3.2m
50518 standard	5.9m	3.9m
50524 standard	7.5m	4.7m
All models	**Maximum load on platform**	115 kg (250 lb) with safety factor of 4
	Width at base	740mm
	Maximum working height	Approx 2m above platform height

5.5.1 Lone working Working alone at height or with access equipment should not be allowed. A minimum of three people is recommended when using a *Tallescope*.

5.5.2 Communication There should be a reliable means of communication available to summon emergency services at all times that people are working at height.

5.5.3 Illumination levels

It is important to ensure there is sufficient light where work at height is to be carried out. Normal stage working light may not be sufficient. Adequate lighting is necessary for safely erecting and positioning a *Tallescope*. There should be good light to ensure all changes in level are easily seen as well as hazards such as steps or stage edges.

Blackouts or low light levels are potential hazards. A sudden increase in light level can also create sudden difficulty in vision and this should be avoided. Even with warning, changes in light levels can adversely affect sight and balance, so a system of work that allows a level of light appropriate for the work in hand is important. When focusing luminaires, the policy of cross fading between the luminaire to be focused and a working light state is good practice and should be included in induction training for lighting operators.

5.5.4 Noise levels

Similar precautions are needed concerning sound levels. High sound levels will inhibit clear communication, which is essential when work at height is in progress. Loud noise can cause accidents.

All technicians involved in working at height operations should be able to hear clearly.

5.5.5 Floors

Check that the floor and the supporting surface are strong enough to support the combined weight of the *Tallescope* and the user. The floor must be sufficiently rigid to assure that flexible surfaces will not affect the stability of the *Tallescope*.

5.5.6 Front edge of stage

Wherever wheeled equipment (powered access, mobile access towers, *Tallescopes* and pulpit steps as well as flight cases and trucks) is being moved there is a risk in most theatres that the machine or a person might fall off the edge of the stage. Fixing batten stops on the floor have been tried but may cause a trip. A new (2011) product, *Edge-Safe*® (see Glossary) should be more effective.

5.5.7 Electrical hazards

Proximity to electrical hazards must be considered. Ensure that serious electrical hazards such as exposed terminals or damaged plug tops either do not exist or are made safe before the work begins. Equipment operating at high voltages such as neon tubes requires extra precautions.

5.5.8 PPE

All those close-by should wear hard hats (meeting *BS EN 397* for 'stage work') if there is any risk of falling objects. The technician in the cage should wear a bump cap (meeting *BS EN 812*) or a ventilated helmet with no peak and a chin strap (meeting *BS EN 12492*) if there are any obstructions overhead.

5.5.8 PPE *(continued)* Consider what other PPE such as safety footwear should be provided if any. However do not wear loose fitting gloves or heavy boots when climbing.

5.5.9 Rescue WAHR requires employers to provide appropriate measures to rescue someone from height in cases of accident or emergency. This should include providing full training and equipment for employees. Rescue plans should consider the risks to rescuers as well as to casualties. Rescue drills should be carried out on a regular basis to ensure the planned method(s) is effective. Reliance on the local Fire Brigade is not appropriate and should not be part of the rescue plan.

Rescue plans have to be related to the premises, the production scenery, other equipment and the staff and must be planned on an individual basis. General advice is insufficient.

There should be a reliable means of communication available to summon emergency services at all times that people are working at height.

5.6 Pre-use checks A pre-use check is a simple visual and functional inspection of the *Tallescope* made by the user before each use. Pre-use checks need not be recorded but should form part of a safe system of work to prevent anyone thinking someone else has made the check.

If a fault is found the *Tallescope* should be taken out of service immediately and clearly labelled to show that the *Tallescope* must not be used. The defect should be entered in the logbook and reported as soon as possible to the responsible person to arrange for a formal inspection and act accordingly.

See Table 5.6 Pre-Use Checks for *Tallescopes* opposite.

5.7 Setting up Follow the manufacturer's instructions in assembling and setting up the *Tallescope*; these should be available to the technician and preferably kept with the *Tallescope*.

Position the *Tallescope* and check level visually, adjusting the legs accordingly.

At least one and preferably more legs should rest with the adjustment fully retracted. Adjustable legs must only be used to level the base, never to gain additional height.

Never attempt to level the *Tallescope* by any other means.

Lock the brakes on each wheel.

Check for overhead obstructions and ensure there is clearance needed to swing the mast vertical and avoid proximity of electrical hazards and moving equipment.

5. *Tallescopes*

Table 5.6: Pre-Use Checks for *Tallescopes*		
Compo-nent	**Check**	**Take out of service if**
Tallescope is in good overall condition	Frame not twisted or distorted Free from materials that might obscure defects Ensure all components are included and fitted	*Tallescope* not stable when locked or set in position on a level surface Damage to frame tubes exceeds 10% of original dimension
Stiles, rungs, framework	Ladder stiles straight and true Rungs clean and dry	Cracks in alloy or severe corrosion present Damaged, bent or significantly dirty or greasy
Cage	Platform, guardrails and toe-boards present in good order	Platform, guardrails or toe-boards bent, damaged or loose
Instructions for safe use	Present with the *Tallescope* and legible. Identification number and 'OK to use' label legible	Missing or illegible
Wheels	Free running, brackets (legs) not bent Tyres intact, clean and free from paint or tape	Wheels or tyres missing or broken
Brakes	All 4 brakes fitted with non-lift castors that do not cause any movement when brakes are being engaged or disengaged	Brakes not functioning
Bull's eye spirit level	Intact and working (where installed)	Missing or broken
Mast hooks	Fully functioning	Missing or broken
Mast braces	Fully functioning	Missing or broken
Ladder hooks	Fully functioning	Missing or broken
Adjustable extending legs	Undamaged, straight, free from paint and anything that might prevent secure engagement Ensure locking collars and pins are effective	Bent, missing or damaged Not working properly
Outriggers	All 4 present, working and fitted with rubber feet	Missing, missing parts or not working properly
Ladder rope	Functioning, not stretched, frayed or damaged	Frayed or stretched. Repair or replace before using *Tallescope*

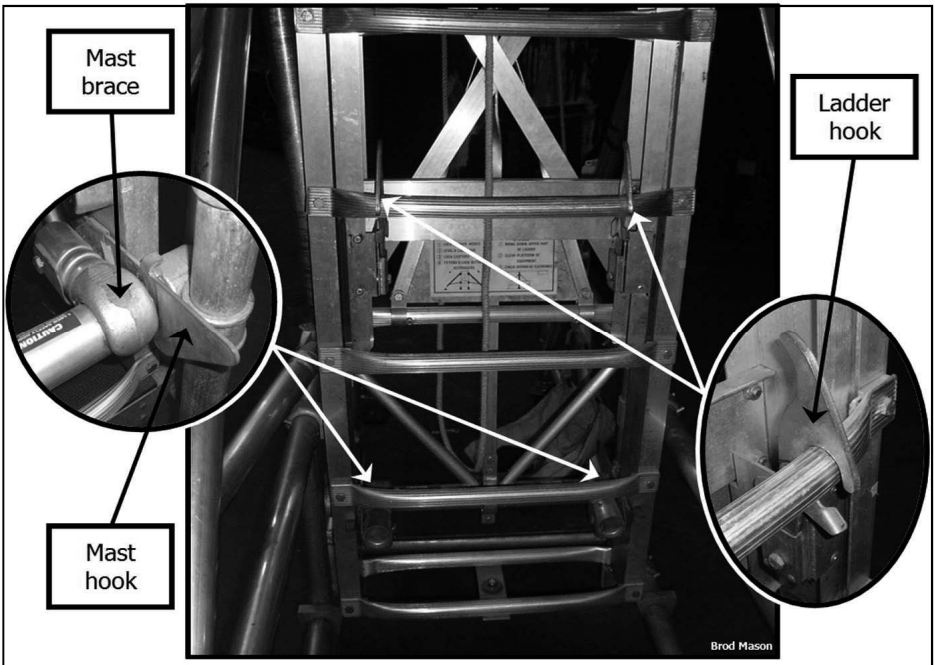


Figure 5.7 Location of mast brace, mast hook and ladder hook

5.7 Setting up *(continued)*

Raise the mast by first pulling down on the bottom rung and then pushing down until the mast hooks engage.

Engage the mast braces on the bottom brace tube; check the mast braces are locked securely.

Visually check that the ladder is vertical and confirm with the bull's eye spirit level (where installed).

Where possible, position and deploy the outriggers prior to extending the ladder.

Pull the ladder rope to extend the ladder until the cage is at the required height, and then gently raise the ladder until both ladder hooks engage, and then gently release the rope.

Position the *Tallescope* as close to the task in hand as possible.

Where there is an obstruction at height or on the floor or a possible drop (for instance off the edge of the stage) the supervisor or an independent person should act as 'look out' to guide movement and to ensure that the *Tallescope* is kept well clear. *Edge-Safe* should assist.

5.7.1 Raked stages, steps, uneven surfaces

When using a *Tallescope* on a raked stage, move and position the *Tallescope* with the long axis up and down the rake.

The two downstage legs should be extended to level the base with the upstage end. At least one, and preferably two legs, should be fully retracted. Adjustable leg sections 'threads' should be kept clean, but still require care in use. After adjustment the level should be checked visually.

The levelling should be done before setting up the mast and the pairs of the four outriggers set at 60 degree angles to the long axis.

Another solution that can be used in conjunction with a system of work is to use an anti-rake (levelling rostrum) of sufficient size and strength with edge protection to prevent wheels rolling off. *Edge-Safe* may suffice properly secured.

On steps and similar situations, the base should be held level by at least two people whilst the other leg(s) are extended and locked into position by a third or more person(s).

Engage all four brakes. Depending upon the floor surface it may be necessary to fix battens around the wheels if there is a risk of slipping.

A lookout should ensure the *Tallescope* is kept well clear wherever there is an obstruction, change in level or possible drop (for instance off the edge of the stage). Sometimes a 'near-edge' such as a timber rail fixed to the floor can act as a warning. *Edge-Safe* may assist.

5.7.2 Outriggers

Deploy four outriggers, two on each long side, as near as possible to 60 degrees to the long axis of the *Tallescope* to gain maximum stability. The distance between the outrigger feet when set should be at least one third of the chosen cage height.

If scenic or other constraints prevent the outriggers being fully installed then additional safety measures will be needed — these might be providing independent fall restraint for the user; bracing the *Tallescope* to a rigid wall: scenery would not be adequate; additional technicians with specific training to stabilise both base and mast.

Tallescopes are only stable when fitted with the outriggers and the outrigger feet must be on the floor before heavy work begins.

However, **except when working on rakes,** it is reasonable with light work such as focusing (rather than hanging or repairing luminaires) to set the outriggers' feet no more than 10mm above the surface. **A piece of 9mm plywood can act as a gauge.**

Outriggers once retracted can usually be folded back and should not be removed unless absolutely necessary.

With rakes the feet of the 4 outriggers must be set firmly on the floor.

5.7.3 Brakes

All 4 brakes should always be applied when the *Tallescope* is not in motion. The four non-lift castors are fitted so as not to cause any movements in the *Tallescope* when brakes are being engaged or dis-engaged.

All four brakes must be locked on before using a *Tallescope* on any rake steeper than 1 in 48. All four brakes must be applied if there is to be any exertion or lateral pressure, such as drilling holes or hanging luminaires.

5.8 Use

Never adjust level or move outriggers whilst someone is on the ladder or in the cage.

Never attempt to lift or level the base, raise the cage or remove the outriggers unless the *Tallescope* is unoccupied.

Do the work only from the cage (not from the ladder) and ensure the swing guardrail is securely closed if one is provided.

Do not gain extra height by standing on guardrails, toe-boards or by putting ladders or boxes on the cage floor.

Consider the available headroom when extending the ladder. Users should be able to stand comfortably on the cage floor.

Do not put loose tools where they could fall and cause an injury. Use the storage bag (if fitted) for materials and secure tools with lanyards.

Do not lean out sideways from the cage to lift even small, light items such as colour frames.

A hoist "chain bag" on a hand rope is an excellent method of transferring materials up and down a *Tallescope*.

Use a separate rope-and-pulley operated from the floor to lift heavy equipment where necessary. Do not rig a pulley to the *Tallescope*.

Maximum platform load 115kg (1 person).

Fatigue is a hazard which may be partly controlled by using more than one technician to work at height and by planning the route for the *Tallescope* to require as few climbs and descents wherever possible. Rotating technicians is usually only practical if their competence is consistent.

5.8.1 Climbing up and down the ladder

It is essential to carry out a pre-use check before you climb the *Tallescope* ladder.

Ensure:

- floor structure supporting the *Tallescope* and outriggers strong and stable
- *Tallescope* visually sighted vertical and confirmed with the bull's eye spirit level (where installed)

5.8.1 Climbing up and down the ladder *(continued)*

- *Tallescope* not too close to a change in floor level
- *Tallescope* positioned close enough to reach the work
- diagonal braces on trunnion frame are located and snapped on
- all four leg extension locking mechanisms secure
- all four push-pull posts are fixed in place on corners of the trunnion frames.
- all four outriggers fully extended, two on each long side, and clips set securely
- both mast hooks engaged
- both mast braces locked
- both ladder hooks fully engaged
- all four brakes locked

Use the power in your legs as much as possible when climbing up or down the ladder, avoid pulling yourself up.

Do not 'hug' the ladder; stand out so you can see where you are putting your feet.

Use a slow, steady pace when climbing up or down, one rung at a time.

Grasp the rungs and look out for any sharp edges that might cut your hands. Sailing style gloves, where index finger and thumb are removed, may be useful.

5.8.2 Stability

A *Tallescope* could be de-stabilised if horizontal forces are applied at the upper end of the ladder or at cage level. This can be caused by pulling or pushing an object at height or over-reaching from the cage, or by movement from a lighting bar or a swinging piece of scenery.

Tasks such as drilling should not generally be carried out from a *Tallescope* — other, more stable, equipment should be used. An access tower may be ideal.

All four outriggers must be used at all times when there is someone using the *Tallescope*.

Do not attempt to climb out of or into a *Tallescope* from another structure.

Do not use a *Tallescope* to support any loads (other than the user and lightweight tools or equipment.)

5.8.3 Moving *Tallescopes* on rake

Using a *Tallescope* on raked stages requires careful preparation so that at least one and preferably two adjustable legs are not extended. Other methods including using compensating anti-rakes provided these cannot move or slip.

5.8.3 Moving *Tallescopes* on rake *(continued)*

- The *Tallescope* must not be moved if the cage is occupied
- The *Tallescope* should be visually sighted vertical and confirmed with the bull's eye spirit level (where installed) before it is moved on the rake
- The *Tallescope* should only be moved on a uniform gradient, with the long axis running parallel to the slope ('up and down the hill') and not sideways across the rake
- Lighting should be sufficient to allow users to see all obstructions and able to maintain control of the operation
- The distance covered at each move should be as short as possible
- The four outriggers must be deployed on either side of the *Tallescope* each as close to 60 degrees to the long axis as possible
- At least two technicians are needed to effect movement
- The *Tallescope* should be pulled using the push-pull posts attached to the vertical component of the trunnion frames (not the diagonals) and steered from the trailing side
- Where there is an obstruction at height or on the floor or a possible drop (for instance off the edge of the stage) the supervisor or an independent person should act as 'look out' to guide movement and to ensure that the *Tallescope* is kept clear. *Edge-Safe* should assist.

Note: The reason that a *Tallescope* must not be moved on a rake with someone in the cage is because it is not possible to move a *Tallescope* absolutely parallel to the rake (stage edge) unless it is running in a fixed metallic track guide. A batten would not be enough. Engineering studies have shown that a very slight off-axis deviation can easily pivot the *Tallescope* on one leg and turn it over.

5.8.4 Using *Tallescopes* in auditoria

Alternative methods must always be considered before planning to use a standard *Tallescope* in most front-of-house situations. Carpeted floors, cambers and poor light levels are potentially hazardous. Using a *Tallescope* on steps and similar situations requires careful planning to ensure when adjusting the legs that at least one and preferably two legs are not extended.

Before the *Tallescope* is used it should be checked as vertical visually and with the bull's eye spirit level (where installed).

Lighting should be sufficient to allow users to see all obstructions and able to maintain control of the operation.

The distance covered at any move should be as short as possible.

Four outriggers must be deployed two on each side of the mast as close to 60 degrees to the long axis as possible.

5.8.4 Using *Tallescopes* in auditoria *(continued)*

At least four people are needed to effect movement.

The *Tallescope* should be pulled from the pull-posts on the trunnion frames and steered from the trailing side. Where necessary, the supervisor or an independent person should act as 'look out' to guide movement.

Other methods of levelling the *Tallescope* may be more appropriate.

There are specially produced mobile alloy towers for difficult areas. *Tallescopes* must not be raised to span over auditorium seating by adjusting the usual legs. An auditorium kit is available from the manufacturer which will be made to measure; alternatively a mobile access tower may suffice.

5.9 Moving a *Tallescope* with a technician in the cage

It has been common to move a technician in the cage of a *Tallescope* to avoid repetitive climbing up and down the mast ladder. The most common repetition is focusing where there could be many luminaires even in a small production, and where it is only possible to focus a few at a time from any means of temporary access. There are other occasions where it would be sensible for the technician to remain in the cage whilst the *Tallescope* is moved.

It is important to consider human error and fatigue as hazards to the person climbing up and down. The likelihood of a technician missing a footing or a handhold when repeatedly climbing up to 7.5 metres is a significant risk during the working day. Climbing that distance once or twice an hour reduces that risk greatly. Fatigue might be significantly reduced by selecting access equipment with a longer platform, by using motorised equipment or by swapping crews where this is practicable. However there are many situations where the *Tallescope* is the safest practicable equipment.

Moving a *Tallescope* whilst occupied reduces the risk of falling from the ladder but introduces a hazard in that the *Tallescope* might topple over unless precise care is taken. However whilst there have been accidents, no case is known where a *Tallescope* has become unstable when the procedures outlined in this Code of Practice have been properly followed.

However, if it is intended to move a *Tallescope* with a technician in the cage, in addition to meeting the previous clauses where appropriate, clauses 5.9 and 5.10 must be met in full together with the manufacturer's instructions as set out in the *Code* (page 62). Until all requirements of 5.9 and 5.10 including the manufacturer's instructions are brought into effect, people should not be moved in a *Tallescope*. The ABTT understands that, if any HSE or local authority officer were to find such an error, formal enforcement action would be taken.

5.9.1 Risk assessment Where there is repetitious work which involves moving the *Tallescope* frequently a risk assessment may show that it would be more sensible for the technician to remain in the cage whilst the *Tallescope* is moved to its next position. Moving a *Tallescope* with a technician in the cage is only justifiable where the risk assessment deems it less hazardous to remain in the cage than risk fatigue and the associated likelihood of slipping or falling from the access ladder or when climbing in and out of the cage and the additional precautions are all in place.

Table 5.9.1: Example risk assessment after controls were implemented

Hazard/ Risk	Controls already in place	S	L	P	R	Controls for remaining risk
Fall because of *Tallescope* overturning	Documented formal safe system of work used, pre-use checks, training	5	1	1	Low (5)	Supervision, assess and monitor floor surfaces and working conditions (especially good light and low noise levels)
Collapse of *Tallescope*	Maintenance Training	5	1	2	Low (10)	Pre-use checks and periodic inspection
Head injury (at height)	Hard hat (with chin strap) rule	2	2	1	OK (4)	Supervision
Head injury (floor level)	Hard hat rule	2	2	1	OK (4)	Supervision
Fatigue: climbing and in/out of cage	Safe system with training Rotate technicians if possible Occupied *Tallescope* moved slowly, short moves, outriggers on	4	2	1	Low (8)	Supervision required at all times
Falling objects	Eliminate, secure or contain objects used at height	3	2	1	Low (6)	Exclusion zone, hard hat rule, lanyards on tools

S = severity of harm; **L** = likelihood; **P** = people affected. **S x L x P = R**

R = risk factor. The Risk Assessment Grading System used is shown in Table 1.4.2

5.9.1 Example risk assessment

An example risk assessment for moving an occupied *Tallescope* when focusing might be Table 5.9.1 on the left. This risk assessment is based upon independent research, industry survey and after implementation of controls.

The previous risk assessment showed a high likelihood of injury caused by fatigue from repeatedly climbing up and down the mast ladder and getting in or out of the cage which could very easily cause a slip or fall. The controls imposed showed that by moving an occupied *Tallescope*, which is in itself safe if properly managed, the risk of injury is reduced to a low risk.

However **each theatre** must carry out its own detailed risk assessment and review and, where necessary augment, individual production requirements.

5.9.2 Method statement

A method statement should also be adopted. This must meet all of the instructions of the manufacturer as stated below.

For example the method statement is for the movement of an 'occupied' *Tallescope* to allow focusing luminaires without requiring the technician having to climb down each time the *Tallescope* needs to be moved for a very short distance — less than 750mm in any one movement (750mm centres are the norm when rigging luminaires on bars). This might be based upon the text in Section 5 or the manufacturer's instructions adjusted to suit the specific theatre and production.

Similar light work which involves insignificant energy, such as shuffling a light-weight cloth along a bar by a few centimetres or spraying some wrinkles out of a cloth, may reasonably be treated as with focusing that is moving an occupied *Tallescope*.

The method statement should be agreed and recorded.

5.10 Requirements for moving an occupied *Tallescope*

Moving an occupied *Tallescope* is only acceptable if:

a) the stage is horizontal and level;

b) i) the *Tallescope* is a 2011 (or later) year of manufacture model; or

ii) the *Tallescope* has been fitted with a manufacturer's upgrade kit comprising two additional outriggers (four in total), four 450mm push-pull posts and four non-lift brake castors; additional strengthening may also be required;

c) the *Tallescope* has been inspected at least annually by a competent and qualified engineer who shall state whether the *Tallescope* is fit for use or otherwise. The engineer shall also confirm that either b) i) or b) ii) is in place;

5.10 Requirements for moving an occupied *Tallescope* *(continued)*

Note 1: The ABTT recommends that Aluminium Access Products Ltd (AAP) or its agent carry out the inspection, repair if necessary, and certify it as being in good order.

Note 2: If requested, AAP will endeavour to inspect *Tallescopes* manufactured by the previous companies and repair if reasonably practicable.

Note 3: If the *Tallescope* was manufactured by Access International of Hemel Hempstead the *Tallescope* should have been overhauled and must be overhauled before it is moved with anyone in the cage: this is because significant modifications had to be made to the initial design in order to strengthen some of the components.

d) the T*allescope* shall not be used until the engineer's certificate that it is in good order has been passed to the owner or employer;

e) a full risk assessment has been undertaken and all control measures required are in place;

f) the manufacturer's rules, as set out opposite, are followed precisely.

5.10.1 Precautions

Moving a *Tallescope* with someone in the cage should only take place where:

- there is a documented safe system of work based on the risk assessment
- stage surface sound, level and not heavily textured; check flexible surfaces will not affect the stability of the *Tallescope*
- stage floor clear of all obstructions including bolts, tools and cables before movement starts
- clear agreed route avoiding over-head obstructions
- moves planned to avoid repeated visits as far as possible
- a supervisor with at least two crew to move the base; the supervisor not one of those moving the *Tallescope*; crew numbers sufficient to avoid obstructions and to maintain control over the *Tallescope* including the wheels and base frame. Two people are often sufficient but the number necessary is determined by the type of floor surface. The usual method is:
  - ◊ technician pushing is responsible for confirming no hazards in path of movement
  - ◊ technician pulling is responsible for confirming no over-head hazards and checking the cage
  - ◊ technician in the cage should ensure no tools or materials accumulate in the cage or in the bag

USE OF TALLESCOPES

These manufacturer's instructions are specifically applicable to Tallescopes used in indoor theatres and similar premises with horizontal (level) stages:

1. A logbook shall be kept for each Tallescope.
2. At least one technician working on the job shall have been fully trained by a competent training provider and carry proof of this training.
3. A visual inspection shall be made before each use of the Tallescope. If there be any fault the Tallescope shall be taken out of service immediately, labelled as ***Not to be used***, and the defect noted in the logbook.
4. The Tallescope shall be erected in accordance with the manufacturer's instructions.
5. If it is intended to move the Tallescope with a person in the cage:

a) the Tallescope shall only be used on a horizontal (flat and level) stage

b) at least one technician shall have proven training (this may be the technician in the cage)

c) the Tallescope is a 2011 (or later) year of manufacture model OR the Tallescope has been fitted with a manufacturer's upgrade kit comprising two additional outriggers (four in total), four 450mm push-pull posts and four non-lift braked castors, and Tallescope strengthened if necessary

d) there shall be a supervisor who is not moving the Tallescope

e) there shall be no obstructions along the route of the movement at stage level or overhead

f) the outriggers shall be locked off just above the floor (with the feet not more than 10mm above the floor)

g) the Tallescope shall only be moved along its long axis

h) movement shall be by pushing or pulling the push-pull posts on the base frames (trunnions) and not the diagonals

i) the Tallescope shall only be moved slowly and smoothly (not more than 0.5m per second/1 mph)

j) the Tallescope shall be moved by at least two people, the technician pushing the Tallescope shall confirm there are no hazards at stage level and the technician pulling the Tallescope shall confirm there are no overhead hazards

k) the technician in the cage shall hold on with both hands while the Tallescope is moving

l) the technician in the cage shall instruct the technicians moving the Tallescope and the instructions acknowledged before movement occurs

m) the brakes shall always be applied when the Tallescope is not in motion

n) the details of each job and the personnel must be recorded in the logbook and be signed off by the trained person present.

6. The user should consult section 5 of the *Code of Practice for the Theatre Industry for the Selection and use of temporary access equipment for working at height in theatres* (published by ABTT) for further information on working at heights using Tallescopes.

5.10.1 Precautions

- ◊ the technician in the cage gives the instructions which are acknowledged by the crew before the *Tallescope* is moved
- ◊ technician in the cage wears a helmet (for example meeting *BS EN 397* with a chinstrap) or bump cap (meeting *BS EN 812*)

- ♦ the Tallescope is a 2011 (or later) year of manufacture model or the Tallescope has been fitted with a manufacturer's up-grade kit comprising two additional outriggers (four in total), four 450mm push-pull posts and four non-lift braked castors; additional strengthening may be required
- ♦ all technicians should be able to hear clearly
- ♦ light levels sufficient and may be increased during movement to ensure good visibility. Avoid sudden changes of light levels — use dimmers rather than switches
- ♦ outrigger feet kept just clear of the floor during movement and never more than 10mm above the floor — a piece of 9mm plywood is a good gauge
- ♦ wheels remain in constant contact with the supporting surface (no lifting over cables). Do not lift the *Tallescope* over any obstructions; any gaps between adjacent rostra or flooring material 'bumps' should be negotiated only on the long axis of the *Tallescope*
- ♦ *Tallescope* only moved maximum of 750mm on each move (750mm centres are the norm when hanging luminaires)
- ♦ long axis aligned with the direction of travel
- ♦ technician must descend before the *Tallescope* is moved on the short axis, for instance when moving between bars; moving the *Tallescope* on the short axis is forbidden with anyone in the cage
- ♦ *Tallescope* moved very slowly (no more than 0.5m/second)
- ♦ no attempt made to lift or level the base, raise the platform or remove the outriggers of the *Tallescope* unless the cage is unoccupied

Occupied *Tallescopes* should not be moved when attempting such jobs as touching up paintwork or hanging gauzes or tabs. There have been several accidents in the past where the mast has toppled over because of applying force to the cage from the drag weight of the cloth. Generally an access tower is more suitable for such work although the tower should not be moved with someone on it — see clause 4.9.

A *Tallescope* should never be moved with anyone in the cage on a raked surface.

5.11 Lowering a *Tallescope*

This should be the reverse of setting up.

Prepare the area and ensure that trip hazards are cleared, check overhead clearance and plan the action.

Ensure all materials are removed from the cage.

Leave all 4 outriggers extended. Lock the brakes on each wheel.

Ensure the upper ladder is retracted completely: use the rope to lift the upper ladder enough to unlock the ladder hooks, then lower the upper ladder to its lowest position within the mast using the rope.

Remove the base platform if necessary, disengage the mast braces.

Keep fingers clear of trapping points.

Prepare to lower and warn assistants before disengaging the mast hooks and lifting the bottom of the mast.

Anticipate the upwards force as the mast tips over; try to control the speed and allow the mast to come to rest gently. Two people may be needed to lower the mast to the horizontal plane.

5.12 Inspection

A formal annual thorough inspection of *Tallescopes* is recommended; the manufacturer's instructions are regarded as a minimum standard.

Visual checks against a checklist should be made at regular intervals.

Written records should show:

- Identification number — equipment should be identifiable by number or other unique marking. Identification must be legible and be somewhere not easily obscured or defaced
- Maximum permitted load bearing
- Manufacturer's name
- Description
- Location
- Date of inspection
- Date next inspection due (expiry date)
- Name of inspector
- Conclusion — OK/repair/replace/destroy

A damaged *Tallescope* should be taken out of service, labelled as faulty and locked out of use (for example, with padlock and chain) until repaired by a competent person or destroyed. Modifications or repairs should only be made by a competent person. Any *Tallescope* that cannot be repaired should be destroyed.

Note: Lack of proper inspection or, when necessary, follow through to maintenance (or disposal) are significant causes of accident, sometimes fatal.

5.13 Maintenance

Maintenance should be carried out at intervals determined by frequency and type of use by a competent person such as the authorised manufacturer's agent. The manufacturer's instructions should always be followed.

Keep the *Tallescope* clean, especially cage, base platform, rungs and moving parts such as hooks, braces and wheels.

Ensure the threads on the adjustable legs are free of foreign matter and where necessary cleaned with a wire brush.

Check all fixing nuts and bolts are tight.

Lubricate mechanisms, such as adjustable leg locking collars, hooks and brake pivots, following the manufacturer's recommendation.

Check hooks and pivots, and that the swing guardrail is not deformed and works correctly.

If damage is found the *Tallescope* should be taken out of service, labelled as faulty and locked out of use (for example with padlock and chain) until repaired. Modifications or repairs should only be made by a competent person. Any replacement components should be obtained from the manufacturer. Any *Tallescope* that cannot be repaired should be destroyed.

5.14 Storage

Avoid storing *Tallescopes* outdoors.

Corrosion can be caused by some acids and salts, severe urban and marine environments particularly.

Rinsing with plain water may be necessary if the *Tallescope* is left outdoors for long periods.

Store in an accessible place — difficult access may encourage use of other less safe methods. Keep all components together to avoid incompatibility and misuse. Secure *Tallescopes* so they cannot roll or fall whilst stored.

Consider locking *Tallescopes* when in store to prevent access by unauthorised personnel.

5.14.1 Hanging (flying) *Tallescopes* for storage

Tallescopes are usually flown with the mast horizontal; *Tallescopes* may also be flown with the mast vertical provided all parts are properly secured before lifting.

Ensure that the lifting equipment used is fit for the purpose and the sling(s) are attached at strong point(s) on the *Tallescope*. Ensure that the ladder cannot slide open by using the spring latch provided.

Wheels, adjustable legs, base platform and other loose parts should be removed prior to lifting. Ensure the cage and tool bag are empty.

Develop and record the best method for the particular circumstances encountered.

5.15 Notes on using a *Tallescope* safely

Risk Assessment
What work to be done?
Is *Tallescope* most appropriate equipment?
How to prevent the technician over-reaching?
Are repetitious actions needing *Tallescope* to be moved frequently?
e.g. Are there many luminaires to focus?
e.g. How many skilled focusers are available?
How to prevent fatigue and associated risk of slipping or falling whilst climbing the ladder or getting in or out of the cage?
Is it reasonably safe to move the *Tallescope* with the technician in the cage?
What PPE is required e.g. hard hats, safety boots, head torches?
Record decisions
Prepare a Method Statement

Brakes
Brakes should be fully functioning
Brakes shall always be applied when the *Tallescope* is not in motion
Must be locked when heavy work in progress
All 4 brakes **must be locked on** rakes

Setting up
Inspect *Tallescope* for damage
Ensure all locking collars and pins effective
Ensure floor is strong enough for total load
Ensure foot platform and tie bar are located
Ensure mast hooks engaged
Ensure mast braces engaged on bottom brace tube
Ensure ladder hooks fully engaged

Raked stage
Mast **must** be plumb: use leg adjusters make sure at least one and preferably two legs are not extended
Locate *Tallescope* so long axis is up and down the rake
Ensure the outriggers feet firmly on floor
Ensure the brakes are on before climbing the ladder
Check tower is vertical

Before use
Are staff sufficient, trained and authorised to use *Tallescopes*?
Are at least two technicians present?
Has the *Tallescope* been inspected and is the inspection record available?
Is the *Tallescope* in good order?
Satisfactory Method Statement agreed?

Outriggers
All 4 outriggers should be fully functioning
Tallescope is unstable if outrigger is omitted to stabilise unless other safety measures taken instead — these might be providing independent fall restraint for the user or bracing to a rigid wall
Deploy all 4 outriggers (2 each side) as near as possible to 60 degrees to the long axis of the *Tallescope* to gain maximum stability
The distance between the outrigger feet when set should be at least one third of the chosen cage height
On raked stages essential remain in direct contact with the floor
If *Tallescope* to be moved see below

When in use
At least two people to move *Tallescope*
Force should be applied **via the push-pull posts**
Technician pushing responsible for confirming no hazards in path of movement
Technician pulling responsible for confirming no overhead hazards and checking clear of objects
Keep all tools in container or on lanyard
Always work within cage **Do not overreach**
Feet must remain on the platform floor
If in doubt **STOP!**

If *Tallescope* is to be moved with technician in cage must comply with the manufacturer's instructions — see 5.10

6. Ladders

6.1 Background information

A ladder could be significantly de-stabilised if horizontal force is applied at the top of the ladder by pulling or pushing on an object at height, reaching out and so on.

Ladders are designed for use by one person, and, at the correct angle, should be strong enough to support the weight of a person using the ladder plus any increase in load caused by the work.

A ladder contacts the floor in only two very small areas and most of the weight of the ladder and the user, together with any extra loads created by the user, is concentrated on the two feet. Therefore the floor must be stable, load bearing and level.

The security of a ladder is derived from the friction between its feet and the supporting surface. The condition of the feet is critical as is the surface finish of the floor which must together have adequate grip to prevent the feet slipping under load.

The strength of a ladder depends on the 'span' between the feet and the top support and the angle at which the ladder is inclined. The stability of the ladder is proportional to the height of the load on the ladder. The ladder angle is a compromise between strength and stability. The longer the ladder, the more it bounces when it is climbed which can affect stability.

The angle of the ladder against the structure governs the amount of load transferred to the feet of the ladder. The more the base of the ladder is moved away from the structure the greater the risk that the ladder will suddenly slip and fall without any warning. Too near vertical and stability is lost. The ladder angle of 75^{o} inclination from horizontal is the best compromise between strength and stability.

33% of ladder accidents are attributable to unsecured ladders. Lateral stability is derived from the friction between the ladder and the structure supporting it. If the load on the ladder is not applied vertically, the ladder will not be stable unless it is restrained. Therefore ladders should be secured at the top wherever possible; the condition of the horns at the top of the ladder is also important. Ties, proprietary stabilisers or other means of securing both the top and bottom of a ladder should always be considered.

Recent research shows that footing is generally ineffectual against ladders slipping at the top. Although helpful, footing is usually unnecessary to improve base friction.

6.2 Introduction: Selection of access

The ABTT reminds employers and employees that they must be able to justify the use of a ladder instead of safer methods for gaining access to work at height. This may have to be justified in a court of law. The ABTT provides some assistance with the selection of the right equipment for the job (clause 1.4 and Section 2.) Ladders remain one of the methods for working at height in theatres. However

6.2 Selection of access equipment *(continued)*

ladders should not automatically be regarded as the default or first choice for working at height The ABTT strongly recommends that employers and employees make themselves familiar with the hierarchy for the selection of work equipment in the *Work at Height Regulations 2005*.

6.2.1 Work at height in theatres

Copy and make use of the form overleaf.

Further information can be found in *A brief guide to the Work at Height Regulations 2005:* http://www.hse.gov.uk/pubns/indg401.pdf and in *Five steps to risk assessment:* http://www.hse.gov.uk/pubns/indg163.pdf

6.3 Risk assessment

- The initial risk assessment should consider the work to be done then identify the appropriate access equipment and the safe method of working which should be recorded in a method statement (RAMS: risk assessment/method statement).
- A risk assessment should be made before deciding which equipment is to be used. The conclusions should be acted upon as necessary. This should be recorded.
- The risk assessment should be reviewed whenever significant changes occur and action taken as necessary. This should be recorded.
- Even if there is no change the risk assessment should be reviewed regularly, the frequency will vary dependent upon the premises and the work but at least once a year would seem appropriate. Again this should be recorded.
- Where there is a new production or a change of staff the risk assessment should be reviewed appropriately and recorded.
- There should be a quick risk assessment every working day (and possibly more often). This may need only to be a visual check unless something serious is recognised but it is important that it occurs. This includes checking equipment and premises and ensuring those working are fit and able (health, age and fatigue insofar as this affects safety), and trained. Proof of training is strongly recommended.

6.4 Training

WAHR requires formal training for people who use access equipment. It is essential that people working at height are confident to work at height.

People who use, supervise or manage the use of ladders should consider training in addition to reading guidance material, even though this may seem to be unnecessary. People who use ladders should be competent to carry out their duties at the level of their responsibility. Documented training for all users and supervisors of ladders is strongly recommended.

6. Ladders

Follow the hierarchy for managing risk Carry out a risk assessment and act upon it		
Control measure	**Possible methods**	**Note decision, why and date**
No work at height	Work at stage level when refocusing to tapes Remote controlled luminaires	
Work from existing structure	Bridge Tensioned wire grid	
Install temporary structure	Gantry Catwalk or crawl truss Access stairs & platform	
Fall protection	MEWP Provide protection whilst climbing to location	
Work positioning	Enclosed access platform Work positioning system	
Fall mitigation	Fall arrest net if practicable Nets (over pits) Fall arrestor if possible	
System of work	Powered access Mobile access tower *Tallescope* Ladder Stepladder/*Zarges* Flexible ladder/climbing set	
Duty holders/employers should be able, and may be required to explain why it was necessary to work at height at all and why reasonably practicable measures could not be taken rather than increasing risk.		

6.4 Training *(continued)*

Training courses should include:

- legislation
- types and models
- pre-use checks and inspection for defects
- carrying and positioning of equipment
- climbing (up and down)
- loading on stages
- low-light concerns
- work on raked floors
- hauling loads
- maintenance
- storage

After completion of formal training participants should understand the requirements of the relevant legislation and have the skills and knowledge to inspect, carry and use ladders safely.

There are many training courses available for work at height. The ABTT offers courses, generally half day.

Note: **It is far too easy for the untrained to think they understand ladders, especially as they look very easy to use. The major cause of accidents is the lack of proper training without which accidents will continue, for instance failing to assemble a ladder properly or understanding the need for a ladder to be both at the correct angle and properly secured. Training is background knowledge gained from study as well as practice.**

6.5 Planning

Establish a safe system of work appropriate to the task, the premises and the staff available. Confirm that a ladder is the most appropriate equipment for the task. Ensure that the appropriate type of ladder is selected and that everyone using a ladder has been properly instructed in its use. Documented training is recommended for all users and supervisors.

The manufacturer's instructions should always be followed as ladders are potentially very dangerous — see 6.1 for background information.

A ladder should not be used for any other purpose than was intended by the manufacturer; for example, propping or supporting loads can be dangerous.

6.5.1 Lone working

Working alone at height or with access equipment should not be allowed. A minimum of two people is recommended when using a ladder.

6.5.2 Communication There should be a reliable means of communication available to summon emergency services at all times that people are working at height.

6.5.3 Illumination levels It is important to ensure there is sufficient light where work at height is to be carried out. Normal stage working light may not be sufficient. Adequate lighting is necessary for setting up and positioning ladders safely. There should be good light to ensure all changes in level are easily seen as well as hazards such as steps or stage edges.

Blackouts or low light levels are potential hazards. A sudden increase in light level can also create sudden difficulty in vision and this should be avoided. Even with warning, changes in light levels can adversely affect sight and balance, so a system of work that allows a level of light appropriate for the work in hand is important.

In general terms ladders are not suitable when focusing luminaires. If focusing luminaires, the policy of cross fading between the luminaire to be focused and a working light state is good practice and should be included in induction training for lighting operators.

6.5.4 Noise levels Similar precautions are needed concerning sound levels. High sound levels will inhibit clear communication, which is essential when work at height is in progress. Loud noise can cause accidents.

All technicians involved in working at height operations should be able to hear clearly.

6.5.5 Floors Check that the floor and the supporting surface are strong enough to support the combined weight of the ladder and the user. The floor must be sufficiently rigid to ensure that flexible surfaces will not affect the stability of the ladder.

Do not erect the ladder across a join in the floor or on a moving floor unless it is certain that no part of the floor can flex or move whilst the ladder is in use. Any moving floor such as a revolve, elevator or truck must be secured against movement.

Keep the floor clear of hazards and obstructions and maintain a clear area around the bottom of the equipment during the work.

6.5.6 Electrical hazards Proximity to electrical hazards must be considered. Metal ladders and wet ladders conduct electricity and should not be used where serious electrical hazards such as exposed terminals or damaged plug tops may exist. Whenever possible all such hazards should be made safe before the work begins.

Equipment operating at high voltages such as neon tubes requires extra precautions.

6.5.7 PPE All those close-by should wear hard hats (meeting *BS EN 397* for 'stage work') if there is any risk of falling objects. The technician on the ladder should wear a bump cap (meeting *BS EN 812*) or a ventilated helmet with no peak and a chin strap (meeting *BS EN 12492*) if there are any obstructions overhead. Consider whether other PPE is needed. However do not wear gloves or heavy boots when climbing. Consider whether barriers should be provided to exclude people.

6.5.8 Rescue *WAHR* requires employers to provide appropriate measures to rescue someone from height in cases of accident or emergency. This may include providing full training and equipment for employees. Rescue plans should consider the risks to rescuers as well as to casualties. Rescue drills should be carried out on a regular basis to ensure the planned method(s) is effective. Reliance on the local Fire Brigade is not satisfactory and should not be part of the rescue plan.

Table 6.6: Pre-Use Checks for Ladders

	Check	**Take out of service if:**
All ladders	Sound, clean, dry, free of paint Clear of paint, materials or PVC tape which obscure defects Good overall appearance Stiles straight and true Identification number legible Ensure the highest load permitted is shown on the ladder Ladder angle indicator or device, if fitted, present and working Feet where provided are complete and not prevented from gripping by caked-on materials Latching devices between sections present and working Hauling rope in good order	Rungs – missing, bent, damaged or loose Stiles – damaged or bent Securing devices – missing or broken Ladder guides – damaged, missing or broken Feet and horns – caps/rubber fittings missing or broken Signs of damage from heat
Alloy ladders	Feet articulate freely	Cracks or severe corrosion Sharp edges or dents
Timber ladders	Check varnish on timber at least every 6 months (unless never out of doors) Rung tie rods secure	Warping of stiles or rungs Splitting of stiles or rungs Rungs rotate in stiles Tie rods loose or missing

6.6 Pre-use checks

A pre-use check is a simple visual and functional inspection of the ladder made by the user before each use. Pre-use checks need not be recorded but should form part of a safe system of work to prevent anyone thinking someone else has made the check.

The table on the previous page can be used as a guide for both pre-use checks as well as part of more detailed recorded periodic inspections.

6.7 Setting up

It is essential that a visual inspection is carried out before each working day the ladder is used.

Follow the manufacturer's instructions in setting up the ladder; these should be available to the user.

Adequate lighting is important when handling ladders, particularly on stage where low light levels may make it difficult to see if the ladder is securely positioned.

Check that the floor is strong enough to support the combined weight of the ladder(s) and user(s), and that the floor cannot move, for example on the truck or the revolve.

Clear the floor of hazards and obstructions such as bolts, tools and cables before setting up ladders and maintain a clear area during work.

Do not lean a ladder against scenery or a structure unless you are certain it can support the ladder safely. Wheeled structures and scenery are unlikely to provide safe support as the horizontal force on the top of the ladder increases as the ladder is climbed which could cause the structure to overbalance or run away on its wheels.

Resting a ladder against flats, flying bars or flown pieces is not safe practice.

6.7.1 Short, one piece ladders (used by one person, say, up to 4m long)

Place the base against a firm solid surface.

Lift the top of the ladder and 'walk down', rung by rung, and hand over hand, moving towards the base until the ladder is upright.

Rest the top of the ladder against the solid surface, then lift or slide the base out to its final position.

If the ladder is heavy or it is not possible to raise the ladder in the vertical then follow 6.7.2.

6.7.2 Long ladders and extension ladders

These are ladders requiring two or more people to use.

Lay the ladder on the floor with the base where it is to stand.

The heaviest competent person stands at the base and puts a foot on the bottom rung while the other(s) raise the ladder, as in 6.7.1, the 'footer' reaches forward from the base to assist and grasps the stiles but without risking stability, back strain or loss of balance.

6.7.2 Long ladders and extension ladders *(continued)*

Once the ladder is balanced upright, the weight being centred over the base, gently guide the top to rest against the supporting structure having ensured this is sufficient to take the load of the person on the ladder as well as the ladder.

In the absence of manufacturer's information or safety devices, make sure that there is an overlap between sections of extension ladders of at least three rungs.

Check that the securing devices, which prevent the ladder sections moving relative to each other, are engaged before the ladder is climbed.

6.7.3 Moving ladders

Do not try to move a long ladder without help. Use enough people to handle and lift the ladder from storage to the work site and back to storage.

Carry ladders between two people, one at each end to reduce risk of striking people or objects. If the surroundings are unfamiliar the route should be walked before moving the ladder.

Take care round corners or on steps and slopes.

Move extension ladders in a retracted position wherever possible.

If moving a ladder upright, check for obstructions along the intended route before moving it. Use the same technique as when 'running' scenery flats: one hand high to provide stability, the other arm straight and supporting the weight of the ladder.

6.7.4 Stability

All ladders should be secured to prevent slipping, preferably near the top or at the bottom. Where the length of the ladder exceeds 3m it must be secured. Where lashing or a proprietary device is not possible a person must be at the foot of the ladder to prevent it slipping. Ladders over 6m long should be secured in the midway as well as top and bottom.

The most effective way of securing a ladder is lashing the stiles, **not the rungs**, using cord or thin rope to suitable anchorages at top and bottom, and in the centre if necessary.

Purpose made ladder cramps (scaffolding accessories), proprietary stand-offs and 'cripples' to fix to ladder horns or purpose-made fitted hooks that engage with a secure anchorage are possible alternatives and wedging between secure fixtures may be possible. It is not a case of one being better than another, rather one of suitability to the work in hand.

To secure ladders at the bottom only is the last option unless the top is secure between solid structures. Possible ways of securing ladders at low level include ties from close to the feet back to a suitable anchorage at floor level, battens spiked to the stage floor, with or without anti-raking features and weighting of the base of the ladder.

6.7.4 Stability *(continued)*

Ladders that are left in situ for any length of time as means of access to a platform or working place must be secured at the top and bottom.

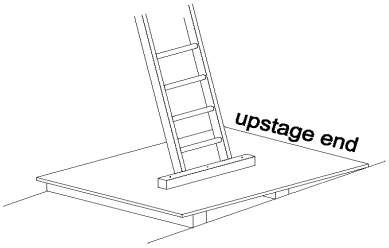
Footing is only used as a last resort: an assistant (of equal or greater weight than the ladder user) stands with one foot on the bottom rung of the ladder whilst gripping the stiles with both hands. However someone footing the ladder can also act as a sentry or lookout.

Recent HSE research shows the gripping ability of ladder feet is more important than footing a ladder for safety.

6.7.5 Raked stages

Ladders can work safely on slopes up to 16° (about 3.5:1) as a safe limit. A thick batten fixed securely to the floor could be used to stop the feet slipping.

Where a ladder is to be used across the rake some means of 'anti-raking' (as often used for scenery) is needed. There are proprietary devices that clamp to the stile or alternatively timber and thick plywood can be used to level the area where the ladder will rest. This must be secure and to prevent displacement should be spiked to the stage.



6.8 Using the ladder

At least two technicians must be present when there is work at height occurring.

The feet of the ladder must be undamaged and clean and the surface finish of the floor must have adequate grip to prevent the feet slipping under load. The horns at the top of the ladder must be undamaged and not slippery.

If a ladder is to be used in front of a door or trapdoor ensure it is locked or guarded. Use barriers, signs or hazard tape where necessary to warn people of the work.

Fit a hauling rope over a pulley (or block and tackle) attached to a secure structure if equipment is to be lifted; do not haul equipment from the ladder. Do not carry heavy equipment up or down the ladder.

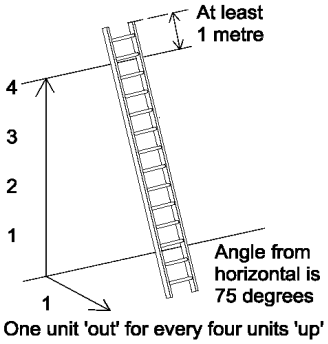
Work positioning/restraint systems may be of value when working from permanent ladders, particularly with vertical ladders such as booms or perches.

Do not attempt to alter the height of an extension ladder when there is someone on it. Do not use an extension ladder until the two parts have been interlocked to prevent movement relative to each other.

6.8 Using the ladder *(continued)*

Ladders require a firm, level load-bearing surface sufficient to support both stiles with the weight of the ladder, the weight of the user and any extra loads created by the user. Do not stand ladders on anything unstable or unsound in order to gain extra height.

The ladder should be set at an angle of 75° inclination from horizontal; this can be estimated by dividing the vertical height of the ladder when set up by 4. This result is the horizontal distance required between the bottom of the ladder and the wall or structure. Some modern ladders are fitted with a visual angle indicator. The top of the ladder should be secured wherever possible.



A ladder when gaining access to another level or platform should always be extended at least one metre above the landing to provide an effective handhold when stepping on or off the ladder. The ladder must be secured.

6.8.1 Climbing technique

- Keep your weight on your feet and keep your hands no higher than chest height
- Don't 'hug' the ladder; stand upright but don't lean back, so you can see where you are putting your feet
- Use your legs to push you up, not your arms to pull you up
- Use a slow, steady pace when climbing up or down, one rung at a time
- Whenever possible use both hands to hold the rungs of the ladder. Always ensure that there are three points of contact whilst climbing up or down
- Do not climb any higher than with your waist level with the top rung
- Do not climb off a ladder on to another structure unless both the structure and the ladder are secure
- Overreaching causes slips and tires your arms
- If your legs begin to shake when standing on a rung, 'drop' your heels
- Watch out for sharp edges and snags that could cut your hands

6.8.2 Working on the ladder

- Wear strong, flat shoes or boots with dry soles and a good grip
- Do not carry loose items or materials up the ladder; use a bag, tool belt or holster
- Keep your body facing the ladder at all times and centred between the stiles
- Keep the weight of your body vertically on the ladder, avoid reaching or leaning outwards
- Do not pull or push anything when at the top of a ladder
- Do not use tools such as drills when working on a ladder
- Ensure there are three points of contact and have a secure handhold available at all times whilst working
- Position the ladder close to the work so as to avoid overreaching and secure the ladder as necessary. Do not reach sideways.
- The working position should be not less than five rungs from the top of the ladder and both hips and thighs should be kept between the stiles
- Don't work with one foot on the ladder and one elsewhere. Keep both feet on the ladder
- Do not carry heavy loads up ladders, certainly not more than 10kg. Use a pulley (or block and tackle) rigged to an independent strong anchor
- Only work on the ladder for 30 minutes maximum

6.9 Lowering a ladder

This should be the reverse of setting up. Prepare the area and ensure that trip hazards are cleared, check clearance overhead and plan the action.

Check that tools and equipment are removed before moving or retracting the ladder.

Ensure the foot of the ladder is restrained.

Retract long ladders as much as possible before moving or 'walking down'.

6.10 Inspection

A logbook of all inspections, defects and repairs should be maintained in accordance with *PUWER*. Written records should show the dates and extent of inspections.

Visual inspections and checks against a checklist should be made regularly determined by the frequency and type of use.

Paint, tape or texturing hides defects and should be removed prior to inspection.

A formal annual thorough inspection is recommended and may be carried out for the insurers. The manufacturer's instructions are regarded as a minimum standard.

6.10 Inspection *(continued)*

Written records should show:

- identification number — equipment should be identifiable by number or other unique marking. Identification must be legible and be somewhere not easily obscured or defaced
- class or BS/ BS EN standard
- maximum permitted load bearing
- manufacturer's name
- description
- location
- date of inspection
- date next inspection due (expiry date)
- name of inspector
- conclusion — OK/repair/replace/destroy

Any ladder showing fire or heat damage should be destroyed.

Alloy ladders subjected to fire even for a brief period may become annealed and will no longer have the original load capacity.

Fibreglass ladders leave a telltale burn mark similar to timber if subject to fire. Fibreglass ladders will show signs of aging by typically slow fading of colour and ultra-violet erosion of the surface.

Note: Lack of proper inspections or, when needed, following through to maintenance (or disposal) are significant causes of accidents, sometimes fatal.

6.11 Maintenance

The manufacturer's instructions should be followed where available. Maintenance should be carried out at intervals determined by frequency and type of use. Ladders used infrequently on stage are unlikely to need as much attention as those used every day in a busy paint shop.

Keep ladders clean, especially the rungs and moving parts.

Clean feet to remove anything that may affect their gripping capacity. Replace worn rubber or plastic feet as necessary.

Check all fixings are tight. Lubricate interlocking mechanisms, pivots and metal fittings.

With timber ladders the stiles must be straight and without flaws. Tie-rods must be fitted between the stiles to keep them snug on the rung ends.

Clear varnish is the best way of protecting timber ladders from the ingress of moisture but only if the varnish remains intact. The varnish should be checked at least every six months and replaced annually. Do not paint any ladders because paint covers defects.

Modifications or repairs should only be made by a competent person. Any ladder that cannot be repaired should be destroyed.

6.12 Storage Storage should follow the manufacturer's instructions; these should be available to the user. This is particularly important with fibreglass ladders.

Avoid outdoor storage where possible, particularly with timber ladders and prevent contact with corrosive substances.

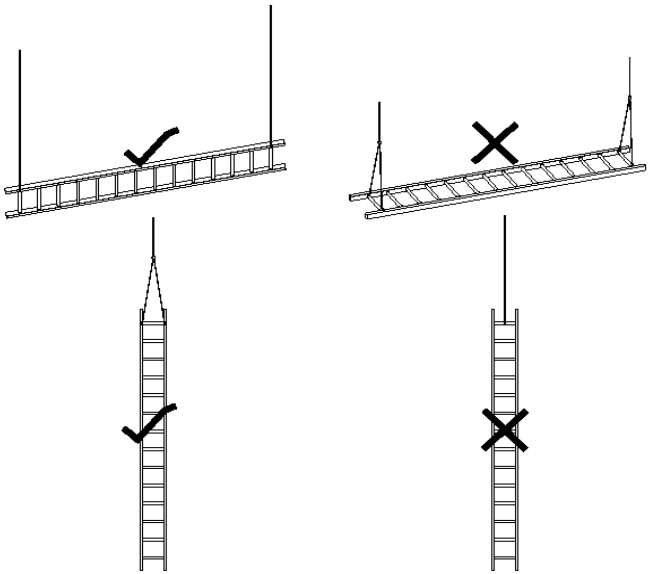
Secure ladders vertically so they cannot fall or overbalance, or horizontally on sufficient number of brackets to prevent ladders from deflection.

Hang ladders on the stiles, not on the rungs.

Store ladders in accessible places — difficult access may encourage people to improvise.

Consider locking ladders in storage to prevent access to unauthorised personnel. These should be left so that unauthorized persons are unable to obtain access. A board locked in place is usually sufficient on the ladder itself.

6.12.1 Flown storage Fly horizontally or vertically, but ensure that the ladder cannot slide open — sling or tie through the rungs against the stiles and in a way that prevents deflection whilst stored. Two or more lines are required to fly ladders horizontally; ensure rungs are perpendicular to the stage. Hang ladders on the stiles, not on the rungs.



6.13 Notes on using a ladder safely

Risk assessment
What work to be done?
Is a ladder the most appropriate equipment?
Short duration (maximum 30 minutes)?
Light work (up to 10kg)?
What PPE required such as hard hats, safety boots?
Plan ahead — prepare a Method Statement

Setting the ladder
Is ladder long enough? Allow one metre above the highest rung to be used.
Extension ladders must have at least three overlapping rungs
Position the ladder close to the work so as to avoid overreaching and secure the ladder as necessary
Ladder angle at 75 degrees inclination = 1 unit out for every 4 units up
Don't stand ladder on anything unstable
Confirm floors clean, not slippery

Prevent the ladder from slipping
All ladders should be secured to prevent slipping near the top and at the bottom
Any ladder exceeding 3 metres should be secured by lashing or proprietary device
The best way of securing the ladder is lashing the stiles, not the rungs, using cord or thin rope to suitable anchorages at top and bottom, and in the centre if necessary
Ladders over 6 metres long should be secured midway as well as top and bottom

Footing
Footing is only used as a last resort
An assistant (of equal or greater weight than the ladder user) stands with one foot on the bottom rung of the ladder whilst gripping the stiles with both hands

Load
Ensure total load – ladder plus technician plus effort (load created by technician) – does not exceed maximum load as marked on the ladder

Before use
Are the staff sufficient, trained and authorised to use ladders?
Satisfactory Method Statement agreed?
Are at least two technicians present?
Is the ladder in good order and serviceable?
Carry out a full pre-use check
Do not use ladders if you feel unfit, suffer from giddiness or not confident with height
Wear strong, flat shoes or boots with dry soles, good grip

Climbing the ladder
Keep hands free – use a shoulder bag or tool belt for tools, light components
Face ladder when climbing with both hands on the rungs
Keep your weight on your feet and keep your hands no higher than chest height
Don't 'hug' the ladder; stand upright but don't lean back, so you can see where you are putting your feet; use your legs to push you up, not your arms to pull you up
Use a slow, steady pace, one rung at a time
Stop climbing before your waist is higher than the top rung
Do not climb off the ladder on to a structure unless both ladder and structure secure

Working on the ladder
Keep your body facing the ladder always, centred between the stiles. both hips and thighs kept between the stiles
Keep the weight of your body vertically on the ladder, avoid reaching or leaning outwards. Do not reach sideways
Working position not less than 5 rungs from the top of the ladder. Keep both feet on the same rung – not have one foot off the ladder
Use the top 3 rungs only as a handhold
Ensure there are 3 points of contact whilst working and have a sure handhold available at all times whilst working
Do not use percussive power tools
Do not carry heavy equipment up/down the ladder

7. Stepladders and *Zarges*-style ladder systems

7.1 Introduction: Selection of access equipment

The ABTT reminds employers and employees that they must be able to justify the use of a step ladder or *Zarges*-style ladder systems instead of safer methods for gaining access to work at height. This may have to be justified in a court of law. The ABTT provides some assistance with the selection of the right equipment for the job (clause 1.4 and Section 2.) Step ladders and ladder systems remain one of the methods for working at height in theatres. However step ladder and ladder systems should not automatically be regarded as the default or first choice for working at height The ABTT strongly recommends that employers and employees make themselves familiar with the hierarchy for the selection of work equipment in the *Work at Height Regulations 2005*.

7.1.1 Work at height in theatres

Copy and make use of the form opposite.

Further information can be found in
A brief guide to the Work at Height Regulations 2005:
http://www.hse.gov.uk/pubns/indg401.pdf
and in
Five steps to risk assessment:
http://www.hse.gov.uk/pubns/indg163.pdf

7.2 Risk assessment

- The initial risk assessment should consider the work to be done then identify the appropriate access equipment and the safe method of working which should be recorded in a method statement (RAMS: risk assessment/method statement).
- A risk assessment should be made before deciding which equipment is to be used. The conclusions should be acted upon as necessary. This should be recorded.
- The risk assessment should be reviewed whenever significant changes occur and action taken as necessary. This should be recorded.
- Even if there is no change the risk assessment should be reviewed regularly, the frequency will vary dependent upon the premises and the work but at least once a year would seem appropriate. Again this should be recorded.
- Where there is a new production or a change of staff the risk assessment should be reviewed appropriately and recorded.
- There should be a quick risk assessment every working day (and possibly more often). This may need only to be a visual check unless something serious is recognised but it is important that it occurs. This includes checking equipment and premises and ensuring those working are fit and able (health, age and fatigue insofar as this affects safety), and trained. Proof of training is strongly recommended.

7. Stepladders and *Zarges*-style ladder systems

Follow the hierarchy for managing risk Carry out a risk assessment and act upon it		
Control measure	**Possible methods**	**Note decision, why and date**
No work at height	Work at stage level when refocusing to tapes Remote controlled luminaires	
Work from existing structure	Bridge Tensioned wire grid	
Install temporary structure	Gantry Catwalk or crawl truss Access stairs & platform	
Fall protection	MEWP Provide protection whilst climbing to location	
Work positioning	Enclosed access platform Work positioning system	
Fall mitigation	Fall arrest net if practicable Nets (over pits) Fall arrestor if possible	
System of work	Powered access Mobile access tower *Tallescope* Ladder Stepladder/*Zarges* Flexible ladder/climbing set	
Duty holders/employers should be able, and may be required to explain why it was necessary to work at height at all and why reasonably practicable measures could not be taken rather than increasing risk.		

7.3 Training

WAHR requires formal training for people who use access equipment. It is essential that people working at height are confident to work at height.

People who use stepladders or *Zarges*-style ladders should be competent to carry out their duties at the level of their responsibility. People who use, supervise or manage the use of access equipment should consider training in addition to reading guidance material, even though this may seem to be unnecessary. Documented training for all users and supervisors of stepladders or *Zarges*-style ladders is recommended.

Training courses are for specific equipment and should include:

- legislation
- types and models
- pre-use checks and inspection for defects
- carrying and positioning of equipment
- climbing (up and down)
- loading on stages
- low-light concerns
- work on raked stages
- hauling loads
- maintenance
- storage

After completion of formal training, participants should understand the requirements of the relevant legislation and have the skills and knowledge to inspect, carry and use access equipment safely.

There are many training courses available for work at height. The ABTT offers half-day courses.

Note: It is far too easy for the untrained to think they understand step-ladders, especially as stepladders look very easy to use. Research shows most stepladder accidents are caused by human error not by the failure of the stepladder. Training is background knowledge gained from study as well as practice.

7.4 Planning

Establish a safe system of work appropriate to the task, the premises and the staff available. Confirm that a stepladder is the most appropriate equipment for the task. Stepladders are designed for use by one person. Where a person can stand above two metres on a stepladder an alternative means of access should be found where practicable: an access tower could be ideal.

A stepladder could easily be de-stabilised when even small horizontal forces are applied at the top by pulling or pushing on an object at

7.4 Planning *(continued)*

height, reaching or stepping out especially sideways. Tasks such as drilling should only be carried out if other, safer means of access are not possible.

7.4.1 Lone working

Working alone at height or with access equipment should not be allowed. A minimum of two people is recommended when using a ladder or *Zarges*-style combination ladder.

7.4.2 Communication

There should be a reliable means of communication available to summon emergency services at all times that people are working at height.

7.4.3 Illumination levels

It is important to ensure there is sufficient light where work at height is to be carried out. Normal stage working light may not be sufficient. Adequate lighting is necessary for setting up and positioning stepladders safely. There should be good light to ensure all changes in level are easily seen as well as hazards such as steps or stage edges.

Blackouts or low light levels are potential hazards. A sudden increase in light level can also create sudden difficulty in vision and this should be avoided. Even with warning, changes in light levels can adversely affect sight and balance, so a system of work that allows a level of light appropriate for the work in hand is important.

In general terms stepladders are not particularly suitable for focusing luminaires. When focusing, the policy of cross fading between the luminaire to be focused and a working light state is good practice and should be included in induction training for lighting operators.

7.4.4 Noise levels

Similar precautions are needed concerning sound levels. High sound levels will inhibit clear communication, which is essential when work at height is in progress. Loud noise can cause accidents.

7.4.5 Floors

Check that the floor and the supporting surface are strong enough to support the combined weight of the stepladder and the user. The floor must be sufficiently rigid to ensure that flexible surfaces will not affect the stability of the stepladder.

Do not erect the stepladder across a join in the floor or on a moving floor unless it is certain that no part of the floor can flex or move whilst the stepladder is in use. Any moving floor such as a truck, revolve or elevator must be secured against movement.

Keep the floor clear of hazards and obstructions and maintain a clear area around the bottom of the equipment during the work.

7.4.6 Front edge of stage

Wherever wheeled equipment (access towers, *Tallescopes,* pulpit steps as well as flight cases and trucks) is being moved there is a risk in most theatres that the machine or a person might fall off the edge of the stage. Fixing batten stops on the floor have been tried but may cause a trip. A new (2011) product, *Edge-Safe*® (see Glossary) should be more effective.

7.4.7 Electrical hazards Proximity to electrical hazards must be considered. Metal ladders and wet ladders conduct electricity and should not be used where serious electrical hazards such as exposed terminals or damaged plug tops may exist. Whenever possible all such hazards should be made safe before the work begins. Equipment operating at high voltages such as neon tubes requires extra precautions.

7.4.8 PPE Consider what PPE should be provided. Consider the use of a bump cap (meeting *BS EN 812*) or a ventilated helmet with no peak and a chin strap (meeting *BS EN 12492*) if there is a risk of head injury whilst working from a stepladder. However do not wear gloves or heavy boots when climbing. Consider whether barriers should be provided to exclude people.

7.4.9 Rescue *WAHR* requires employers to provide appropriate measures to rescue someone from height in cases of accident or emergency. This may include providing full training and equipment for employees.

7.5 Pre-use checks A pre-use check is a simple visual and functional inspection of the stepladder made by the user before each use. Pre-use checks need not be recorded but should form part of a safe system of work to prevent anyone thinking someone else has made the check.
The following table can be used as a guide for both pre-use checks as well as more detailed recorded periodic inspections.

Table 7.5: Pre-Use Checks for Stepladders

	Check:	**Take out of service if:**
All stepladders	Sound, clean, dry, free from paint and substances obscuring defects Stiles straight and true Hinges intact and functioning Good overall appearance Identification number legible Tread to stile joints rigid Treads all present, clean and dry	Treads or platform missing, bent, damaged or loose Stiles damaged or bent Securing devices missing or broken Hinges damaged or out of true Not stable when locked Not stable when placed on a level surface Signs of damage from heat
Alloy stepladders	Securing devices and webbing/ braces present and in good order Feet free from substances likely to affect grip	Cracks or severe corrosion Sharp edges or dents Feet missing or broken Braces or webbing damaged
Timber stepladders	Cord or webbing ties both present, of equal length and in good order	Warping or splitting of stiles or treads

7.6 Setting up

It is essential that a visual inspection is carried out each working day before the stepladder is used.

Follow the manufacturer's instructions in setting up; these should be available to the user.

Make sure the stepladder is used in the right configuration for the job if there are different options.

Ensure there is sufficient space to fully open the stepladder. Position the stepladder close to the work. Check that the stepladder is fully open and locked into its correct position, where provided. Check it is level.

7.6.1 Small step-ladders (used by one person, say, up to 4m long)

Standing at the side of the stepladder, put one foot on the bottom of the steps and swing the brace out and engage spreader bars or set the webbing or cords taut.

Ensure the platform and other devices are secured in their working position before climbing the stepladder. Platforms or braces can often disengage suddenly when the steps are being climbed if the brace is not set correctly.

7.6.2 Long stepladders (two or more people required to set them up)

One person "foots" the tread side and another swings out the brace.

If the stepladder is very heavy, lay the stepladder on its side close to where it is to stand and open it on the floor. The platform and brace should be secured in position before raising the stepladder like a scenery flat, one or more people 'footing', the rest walking it up until upright and manoeuvred into position.

Ensure the securing devices (webbing, spreader bars or chains) that prevent the stepladder from opening further are engaged before the stepladder is used.

7.6.3 Moving long stepladders

Carry long stepladders horizontally with a person at either end to reduce risk of striking people or objects.

Use enough people to handle and lift the stepladder from storage to the work and back to storage.

When carrying stepladders upright, plan the route and check for obstructions along the intended route before moving it.

Take care the steps do not open and cause hand injury or ground down on steps and slopes.

Do not try to move a long stepladder upright without help. The centre of gravity is higher than an ordinary ladder and may be top heavy.

7.6.4 Stability

In normal use a stepladder contacts the floor in four places and the weight of the stepladder and user is spread between these points. The contact points should be in the same plane, and level wherever possible. It is essential that the stepladder is not tilted sideways.

7.6.4 Stability *(continued)*

A stepladder needs a level surface and to be opened out fully before use.

Whilst footing a stepladder at the back or front is usually unnecessary, acting as an 'outrigger' on one or both sides will improve stability on taller stepladders. Consider using a hard hat whilst performing this function.

Some metal stepladders have holes in the feet that allow them to be fixed to the floor.

Stepladders used on raked stages should be placed up and down the rake or provided with some form of anti-rake.

7.7 Use

Do not move any stepladder with someone on it.

Wear strong, flat shoes or boots with dry soles and a good grip.

A stepladder relies on a level surface and must be opened fully and any locking devices engaged before climbing.

Do not carry loose items or materials up the stepladder; use a bag, tool belt or holster. Do not put loose tools where they could fall and cause an injury. Use a fixed-on tray or bag if necessary.

Keep your body facing the stepladder at all times and centred between the stiles. Do not overreach — make sure your belt buckle (navel) stays within the stiles and keep both feet on the same tread.

Do not work using the top two steps or rungs unless there is a suitable handrail on the stepladder.

Do not work using the top three steps of swing-back or double-sided stepladders where a step forms the top of the stepladder.

Do not stand on the top of a stepladder unless there is a platform (not a step) with sufficient strong handrails at correct height.

Do not stand on any platform unless it has adequately strong hand-rails at the correct height.

Position the stepladder close to the work so as to avoid overreaching. A stepladder is best positioned facing the work to ensure stability. To ensure the stepladder remains stable when using tools or needing to apply pressure for the task, work should only be carried out in line with the long axis of the stepladder base.

Avoid reaching sideways. Side-on working is dangerous and not recommended unless the stepladder is firmly lashed or otherwise secured.

Do not carry heavy loads up stepladders, certainly not more than 10kg. Do not haul equipment from stepladders; operate a hauling rope over a pulley (or a block and tackle) operated from the floor, not from the stepladder.

7.7 Use *(continued)*

If a stepladder is to be used in front of a door or trapdoor ensure it is locked or guarded. Use barriers, signs or hazard tape where necessary to warn people of the work.

Care is necessary to avoid lightweight stepladders 'skating away' on hard surfaces as the user takes the first step on to the stepladder.

Keep both feet on the stepladder at all times avoiding any transfer of your weight to any other structure. Stepladders can overturn if stepped off or on to at height. Do not climb on to another structure unless the stepladder has been designed specifically for this purpose.

Only work on the stepladder for 30 minutes maximum.

Stepladders should not be used for other purposes such as supporting loads. A stepladder should not be used as an inclined ladder.

7.7.1 Climbing technique

A stepladder relies on a level surface and must be opened fully before climbing and any locking devices engaged.

Keep your weight on your feet and keep your hands no higher than waist height.

Don't 'hug' the stepladder; stand so you can see where you are putting your feet. Climb facing the stepladder using both hands to hold on.

Use a slow, steady pace when climbing up or down, one tread at a time.

If your legs begin to shake when standing on a tread, 'drop' your heels.

Look out for sharp edges and burrs on alloy steps and splinters on timber steps.

7.8 Taking down

This should be the reverse of setting up. Plan the action. Prepare the area and ensure that trip hazards are cleared.

Check the top step to ensure that tools and equipment are removed before moving or closing the stepladder. Keep fingers clear of trapping points.

Ensure the feet of the stepladder cannot slip and make the tread side vertical on its feet while the brace is swung in. Hold or tie the two halves together before moving or 'walking down'.

Long or heavy stepladders should be taken down as a direct reversal of putting them up, that is to say with enough people footing and lowering the steps into a prepared area. Fold up the stepladder once it is lying on its side on the floor.

7.9 Inspection

A log of all inspections, defects and repairs should be maintained in accordance with *PUWER*. Written records should show the dates and extent of inspections.

Visual inspections and checks against a checklist should be made regularly determined by the frequency and type of use.

7.9 Inspection *(continued)*

Paint, tape or texturing hides defects and should be removed prior to inspection.

A formal annual thorough inspection of stepladders and *Zarges*-style ladders is recommended and may be carried out for the insurers; the manufacturer's instructions should be regarded as a minimum standard.

Visual checks against a checklist should be made at regular intervals.

Written records should show:

- identification number — equipment should be identifiable by number or other unique marking. Identification must be legible and be somewhere not easily obscured or defaced
- class or BS/ BS EN standard
- maximum permitted load bearing
- manufacturer's name
- description
- location
- date of inspection
- date next inspection due (expiry date)
- name of inspector
- conclusion — OK/repair/replace/destroy

Any stepladder showing fire or heat damage should be destroyed.

Alloy stepladders subjected to fire even for a brief period may become annealed and will no longer have the original load capacity.

Fibreglass ladders leave a telltale burn mark similar to timber if subject to fire. Fibreglass ladders will show signs of ageing by typically slow fading of colour and ultra-violet erosion of the surface.

A damaged stepladder should be taken out of service, labelled as faulty and locked out of use (for example with padlock and chain) until repaired by a competent person or destroyed.

Note: Lack of proper inspections or following through, when necessary, to maintenance (or disposal) are significant causes of accidents, sometimes fatal.

7.10 Maintenance

The manufacturer's instructions should be followed where available.

Maintenance should be carried out at intervals determined by frequency and type of use.

Timber stiles must be straight and without flaws. Treads should be free from 'shakes' and be straight. The connection with the stiles should be secure and not allow movement.

Keep stepladders clean, especially treads, feet, platforms and moving parts.

7.10 Maintenance *(continued)*

Lubricate pivots and metal fittings and check all nuts and bolts are tight.

Modifications or repairs should only be made by a competent person.

Any stepladder that cannot be repaired should be destroyed.

7.11 Storage

Secure stepladders vertically so they cannot fall or overbalance. Ensure that long stepladders cannot fall open — tie stiles to the brace.

Never hang stepladders from treads, if flying them, secure to stiles; not treads.

Use enough supports to prevent deflection of the stiles if stored horizontally.

Store in accessible places; difficult access may encourage people to use less safe means. Consider locking stepladders in storage to prevent unauthorised access.

Avoid outdoor storage where possible, particularly with timber. If timber stepladders are stored outdoor the protective varnish needs to be maintained.

7.12 *Zarges*-style combination ladder systems

Zarges is a German manufacturer of access equipment and associated aluminium products. The term *Zarges* is often used to mean any free-standing 'A frame' ladder or combination ladder.

Ensure that the pivot pegs are engaged properly before opening the A frame out. Using *Zarges*-style combination ladders without damaging the trestle pivot requires understanding and practice as the ladder sections could lever the pivot pegs in their housings at the 'hinge' point. If their security is compromised, the ladder could collapse as the user ascends.

Check that all four feet are level with each other before extending the top section.

Keep the webbing stays taut (or bracing struts engaged) before extending the top section.

Keep a four-rung overlap between top and bottom ladder sections. Engage interlocks between extension sections before climbing.

Only allow one person on one ladder at any time.

Do not climb higher than when the top rung is level with your waist. Do not ever overreach, lean out sideways or push or pull anything from the ladder.

Zarges-style do not need footing front or back, although acting as an outrigger at the side may increase confidence by reducing 'sway' in use. Care should be taken not to overload the ladder or its components by standing on the lower rungs of the tapered base section of some models or the supporting structure to improve stability.

7.13 Notes on using a stepladder safely

Risk Assessment
What work to be done?
Stepladder the most appropriate equipment?
Work above 2m – why not use a tower?
Short duration (maximum 30 minutes)
Light work (up to 10kg)
PPE required e.g. hard hats, safety boots?
Plan ahead — Prepare a Method Statement

Pre-use check
General condition sound
No steps/rungs bent, missing, broken or loose
No missing or damaged tie rods
Not painted; hinges in order
No stiles damaged or bent
No warping or splitting
No corrosion, no cracks
No cracked/damaged welds, missing screws or rivets
No missing, damaged or worn anti-slip feet
Webbing/cords equal

Stability of stepladder
Relies on all four feet on a plane surface
Pairs of feet on each side frame must be level
Ladder must not tilt sideways
Ensure stepladder fully open and braces, tapes or cords taut
Do not apply tools sideways pressure unless stepladder firmly secure
Position stepladder close to the work so as to avoid overreaching

Load
Ensure total load – stepladder plus technician plus effort (load created by technician) – does not exceed maximum load as marked on the stepladder

Combination ladders
Treat as both ladder and stepladder
Ensure combination ladder is level
Ensure no sideways pressure
Extension ladders must have at least 4 rungs/steps overlapping
Ensure interlocks are engaged

Staff and working at height
Staff sufficient, trained to use stepladders?
Satisfactory Method Statement agreed?
At least two technicians present?
Do not use stepladders if you do not feel fit or unsure or suffer from giddiness
Wear strong, flat shoes/boots, dry soles, good grip

Climbing the stepladder
Keep both hands free when climbing the ladder – use a shoulder bag or tool belt
Face stepladder with hands on the treads/ rungs
Keep your weight on your feet and keep your hands no higher than chest height
Don't 'hug' the ladder; stand upright, but don't lean back, so you can see where you are putting your feet
Use your legs to push you up, not your arms to pull you up
Use a slow, steady pace one tread at a time
Stop climbing before your waist is higher than the top rung
Do not climb off the stepladder on to another structure
Ensure stepladder does not skid away as user takes first step

Working on the stepladder
Keep your body facing the ladder at all times, centred between the stiles
Keep the weight of your body vertically on the stepladder, avoid reaching or leaning outwards
Do not stand on top two treads/rungs or platform unless with correct handrails
Do not stand on top 3 steps on swing-back or double-sided ladders
Keep both hips and thighs between the stiles
Keep both feet on the same rung – do not have one foot off the ladder
Have sure handhold available at all times
Do not carry heavy equipment up/down stepladder – use a rope over a pulley not attached to stepladder
Do not reach out sideways

8. Flexible ladders

8.1 Introduction: Selection of access equipment

The ABTT reminds employers and employees that they must be able to justify the use of flexible ladders systems instead of safer methods for gaining access to work at height. This may have to be justified in a court of law. The ABTT provides some assistance with the selection of the right equipment for the job (clause 1.4 and Section 2.) Flexible ladders remain one of the methods for working at height in theatres. However flexible ladders should not automatically be regarded as the default or first choice for working at height. The ABTT strongly recommends that employers and employees make themselves familiar with the hierarchy for the selection of work equipment in the *Work at Height Regulations 2005*.

8.1.1 Work at height in theatres

Copy and make use of the form overleaf.

Further information can be found in
A brief guide to the Work at Height Regulations 2005:
http://www.hse.gov.uk/pubns/indg401.pdf
and in
Five steps to risk assessment:
http://www.hse.gov.uk/pubns/indg163.pdf

8.2 Risk assessment

- The initial risk assessment should consider the work to be done then identify the appropriate access equipment and the safe method of working which should be recorded in a method statement (RAMS: risk assessment/method statement).
- A risk assessment should be made before deciding which equipment is to be used. The conclusions should be acted upon as necessary. This should be recorded.
- The risk assessment should be reviewed whenever significant changes occur and action taken as necessary. This should be recorded.
- Even if there is no change the risk assessment should be reviewed regularly, the frequency will vary dependent upon the premises and the work but at least once a year would seem appropriate. Again this should be recorded.
- Where there is a new production or a change of staff the risk assessment should be reviewed appropriately and recorded.
- There should be a quick risk assessment every working day (and possibly more often). This may need only to be a visual check unless something serious is recognised but it is important that it occurs. This includes checking equipment and premises and ensuring those working are fit and able (health, age and fatigue insofar as this affects safety), and trained. Proof of training is strongly recommended.

8. Flexible ladders

Follow the hierarchy for managing risk Carry out a risk assessment and act upon it		
Control measure	**Possible methods**	**Note decision, why and date**
No work at height	Work at stage level when refocusing to tapes Remote controlled luminaires	
Work from existing structure	Bridge Tensioned wire grid	
Install temporary structure	Gantry Catwalk or crawl truss Access stairs & platform	
Fall protection	MEWP Provide protection whilst climbing to location	
Work positioning	Enclosed access platform Work positioning system	
Fall mitigation	Fall arrest net if practicable Nets (over pits) Fall arrestor if possible	
System of work	Powered access Mobile access tower *Tallescope* Ladder Stepladder/*Zarges* Flexible ladder/climbing set	
Duty holders/employers should be able, and may be required to explain why it was necessary to work at height at all and why reasonably practicable measures could not be taken rather than increasing risk.		

8.3 Training

WAHR requires formal training for people who use access equipment. It is essential that people working at height are confident to work at height. The trainer should check during practical training that the climber has the strength and co-ordination necessary to climb and descend flexible ladders.

Documented training for all users and supervisors of flexible ladders is strongly recommended.

Learning how to climb a flexible ladder should be under supervision by a competent teacher in a safe environment and with a fall protection system that allows easy lowering should a fall occur. The ABTT does not offer training on climbing flexible ladders; however some suppliers including Lyon Equipment Ltd can provide training.

8.4 Planning

Confirm that using a flexible ladder is the most appropriate equipment for the task. Ensure that an appropriate ladder is selected. Flexible ladders may be made of wire or fibre rope or textile webbing with rope, plastic or metal rungs. Steel wire rope ladders with aluminium alloy rungs are the most robust whilst ladders with webbing and composite material rungs, such as carbon fibre, are compact and light but require greater care in use and in storage and need replacing more often than with a wire rope ladder.

Ensure that anyone using the ladder has been properly instructed in its use. Establish a safe system of work appropriate to the task, the premises and the staff available. Documented training is recommended for all users and supervisors.

8.4.1 Lone working

Working alone at height or with access equipment should not be allowed. At least two people should work together when access equipment is in use.

8.4.2 Communication

There should be a reliable means of communication available to summon emergency services at all times that people are working at height.

8.4.3 Floor

Keep the floor clear of hazards and obstructions.

8.4.4 Illumination levels

It is important to ensure there is sufficient light where work at height is to be carried out. Normal stage working light may not be sufficient. Adequate lighting is necessary for setting up and positioning flexible ladders safely.

A sudden increase in light level can also create sudden difficulty in vision and this should be avoided. Even with warning, changes in light levels can adversely affect sight and balance, so a system of work that allows a level of light appropriate for the work in hand is important.

8.4.5 Noise levels Similar precautions are needed concerning sound levels. High sound levels will inhibit clear communication, which is essential when work at height is in progress. Loud noise can cause accidents.

8.4.6 Electrical hazards Proximity to electrical hazards must be considered. Where serious electrical hazards such as exposed terminals or damaged plug tops may exist these should be rectified or made safe before the work begins. Equipment operating at high voltages such as neon tubes requires extra precautions.

8.4.7 Rescue *WAHR* requires employers to provide appropriate measures to effect rescue from height should someone require it in cases of accident or emergency. This may include providing full training and equipment for employees. In some cases the local Fire Brigade may be involved but this is usually only in the last resort. It should not form part of the rescue plan.

Planning for work involving use of fall restraint harnesses should include rescue plans to rapidly recover a person who has fallen and is or may become unconscious. Recovery after someone falls unconscious must occur in less than 10 minutes if potentially fatal consequences are to be avoided.

Rescue plans have to be related to the premises, the equipment and the staff and must be planned on an individual basis. General advice is insufficient.

Rescue plans should consider the risks to rescuers as well as to casualties.

Rescue drills should be carried out on a regular basis to ensure the planned method(s) is effective.

8.5 Pre-use checks A pre-use check is a simple visual and functional inspection of the ladder made by the user before use. The ladder should be unrolled by hand and each rung and both sides should be carefully checked for any signs of wear, damage or corrosion. Particular care is needed around the first and last rungs. Wire rope is particularly prone to deterioration in this area.

Pre-use checks should be recorded and form part of a safe system of work.

8.6 Inspection A logbook of all inspections, defects and repairs should be maintained in accordance with *PUWER*. Written records should show the dates and extent of inspections.

A formal thorough inspection of access equipment is recommended every three months; the manufacturer's instructions are regarded as a minimum standard.

Visual checks against a checklist should be made at regular intervals.

8.6 Inspection *(continued)*

Written records should show:

- identification number — equipment should be identifiable by number or other unique marking. Identification must be legible and be somewhere not easily obscured or defaced
- maximum permitted load bearing
- manufacturer's name
- description
- location
- date of inspection
- date next inspection due (expiry date)
- name of inspector
- conclusion — OK/repair/destroy

Refer to the manufacturer's instructions when examining flexible ladders; these should be available to the inspector.

A competent person should make the inspection. This person will understand the nature of the use of the ladder, be familiar with the materials used and be able to detect any damage or deformation of the sides, the rungs and the connections. Knowledge of how the rungs are secured is essential. Any apparent defect should be carefully inspected.

Check wire ropes, particularly at the point of entry/exit into the rungs (where wear and tear is greatest) and that no visible wire is broken.

Check rungs for deformation, cracks or abrasion/wear and sharp edges that might cut user's hands. The last few rungs at either end of the ladder often receive the most wear.

A damaged ladder should be taken out of service, labelled as faulty and locked out of use, for example with padlock and chain, until repaired by a competent person or destroyed. Modifications or repairs should only be made by a competent person. Any ladder that cannot be repaired should be destroyed.

Note: Lack of proper inspections or following through, when necessary, to maintenance (or disposal) is a significant cause of accidents, sometimes fatal.

8.7 Fall protection system

A suitable and separate fall protection system must be provided and users must have been trained in its use. Without such protection the climber may fall with possible fatal result. The *appropriate* fall protection system must be installed by a competent person to an identified point on the structure or adjacent structure capable of sustaining the forces generated by a fall occurring.

Whatever system is selected, it must be installed and used by

8.7 Fall protection system *(continued)*

competent people. In most cases this will be an independently anchored system incorporating a harness, a rope, and other elements. A simple method of protection is the sliding 'rope chuck' system. This requires a vertical rope to be rigged within 300mm or so of the ladder to an identified load bearing point compatible with the manufacturer's instructions.

The worker's harness should be connected to a fall protection system such that in the event of a fall, the worker is close enough to the ladder to "self rescue" if possible.

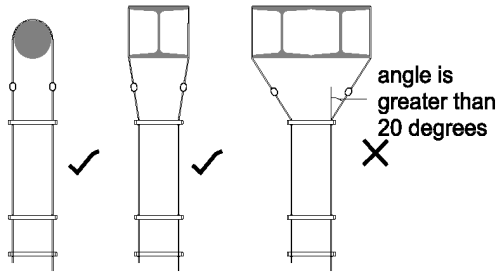
For further information see *BS 8437*.

8.7.1 Other PPE

Consider what other PPE should be provided, if any. Hard hats may be needed. Sailing style gloves, where index finger and thumb are removed, may be good when checking the equipment. Consider whether barriers should be provided to ensure there is no one beneath the climber.

8.8 Installation

Ensure the ladder is anchored to a secure point(s). Ensure that anchorages have at least the minimum strength necessary and that the anchorages are suitable to the ladder. The anchorages should have a safety factor of 8:1 (for information see clauses 5.2.1 and 5.2.2 of *BS 7906-1.2005*).



Install the rigging points for the ladder at identified points that are suitable (such as a node point on a truss or at a support point on a beam). Use two rigging points at similar centres to the ladder sides so that the top rung is horizontal. When anchoring the ladder confirm that the angle is not more than 20°.

Use a good quality connector (such as a shackle, karabiner or quick-link [maillon]) with the necessary Working Load Limit (WLL) marked on it to connect each ladder rope eye termination to a sling, eye or fixing of adequate strength.

Do not 'choke' a wire rope back on itself or rely on 'C' links to rig the ladder. They are designed for joining ladders end to end.

Ensure that the rungs are not caught on any projection; this could cause undue strain to the rung.

When ladder is in position hook up any excess length so that it does not get damaged or become a trip hazard.

Do not attach any type of connector to any rung as the rung may fail.

8. Flexible ladders

8.9 Use

Flexible ladders may provide one way of reaching the work at height but are not suitable as workplaces. Flexible ladders are simple to use but need understanding in order to use them safely. Always ensure the user has had practical training from a competent person.

Keep the ladder vertical and avoid footing or tethering the ladder with any real tension. The forces generated by enthusiastic footing can create dangerously high loading in the ladder.

Check the WLL of the ladder. Remember this will be an 'as new' figure, *usually* in kilograms, typically 120kg. This is the weight of the climber and any tools or equipment. Any loads should be lifted by a rope and pulley (or block and tackle) operated by someone at floor level and not be carried by the climber.

Only one person should ever climb the ladder at one time. The climber must have a separate and appropriate fall protection system installed before climbing the ladder.

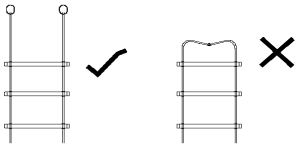
8.10 Storage

Clean ladders before storage — see 8.11. Keep in a dry aired space away from heat, chemicals and contaminants. Ladders with textile sides should be kept out of direct sunlight.

Do not place other objects (beam clamps, truss components, scaffold fittings etc) on top of flexible ladders in flight cases. Make a safe designated area for their storage, as for ropes, harnesses and lanyards for example.

Wire rope ladders should never be coiled so that the sides get passed through the ladder. This causes damage and deformation to the wire in the strand and is potentially dangerous. When coiling start the coil about 300mm diameter across and do not wrap tightly.

Secure the last turn with a piece of cord. Do not attempt to catch the ladder ends through the ladder as a method of keeping the coil intact, as over time this would damage the wire rope.



8.11 Maintenance

Keep the ladder clean and dry. If dirty the ladder should be washed in clean water not exceeding 30°C with mild soap or detergent if necessary, rinsed thoroughly and left to dry without heating.

Modifications or repairs should only be made by a competent person. Any ladder that cannot be repaired should be destroyed.

Appendix 1. Glossary

AAP Aluminium Access Products Ltd

Adjustable legs threaded extension tubes with collars allowing the base to be levelled

Anti-rake sloped rostrum or rostra designed to counter a specific rake

Axis an imaginary line about which a symmetrical object could rotate

Base frame access tower end frame designed to accept feet/wheels

Boom arm supporting the platform of a cherry picker, often telescopic

(i) Brace diagonal tube with hook each end

(ii) Brace hinged rear swing-back frame that supports the stepladder

Brace hooks automatic 'scaffold hooks' that secure the *Tallescope* mast upright

Bull's eye single 'bubble' level on base; spirit level indicating level over 360°

Cage enclosed elevated work platform (also with *Tallescope* called a basket or bucket)

Cherry picker boom type lifts, usually MEWPs (originally harvesting fruit)

Climber person going up or down a ladder

Coded welder welder approved to particular standard such as *BS EN ISO 15614-1*

Combination ladder see Ladder systems

Competent person someone having such practical and theoretical knowledge and such experience as is necessary to carry out the work. Needs to be aware of the limits of his/her expertise and knowledge and sufficiently independent and impartial to allow him/her to make objective decisions. Does not necessarily need to be employed by an independent company, but in-house personnel must have enough authority and independence to be able to make necessary decisions and recommendations

***Edge-Safe*®** proprietary safety product aiming to reduce hazard of the exposed front edge of the stage; provides ribbed rubber strips laid flat intended to delay or stop the wheels of moving equipment and alert people together with raised visible reflective/photo-luminescent strips to alert both crew and actors to the edge of the stage

EIS *Entertainment Information Sheet* published by HSE

EN European Standard — all European Standards also become British Standards under heading *BS EN*

End frame vertical frame of an access component providing support for platforms

EWP Elevating Work Platform

Feet end of the stiles that contact the supporting surface below

Fibre glass sometimes called grp

Footing person with one foot on the bottom rung whilst gripping the stiles with both hands, or putting a foot against a rung whilst the ladder is raised

Appendix 1. Glossary

FPE fall protection equipment

Gradient see Rake

grp glass reinforced plastic – see Fibre glass

Guardrail on a tower: a horizontal brace tube with hook each end enclosing a platform to prevent falls or designed temporary barrier

Hauling rope rope used to raise and lower materials or equipment

Hazard anything that may cause harm such as working from ladders, electricity, slippery floors

Horns the parts of the stiles above the top rung of a ladder

HSE the Health and Safety Executive

HSL the Health and Safety Laboratories

Interlock clips captive pins to lock mobile scaffold tower end-frame spigots to prevent separation in use

IPAF Industrial Powered Access Federation

IWP Individual Elevating Work Platform (one person occupancy)

Ladder frame on a tower: end-frame incorporating tubes designed as rungs

Ladder device which locks the top section of a ladder on to the lower section

hook as used with *Tallescopes* (see Figure 5.5) and on extension ladders

Ladder rope cord used to extend the top part of a ladder

Ladder systems *ladders* essentially rely on leaning on a structure for support, even if they have treads

stepladders are essentially self-supporting whether or not they have treads rather than rungs

combination ladders, sometimes called *system ladders,* can generally be configured in various ways; most can be arranged as ladders and as stepladders, some may also be set up as trestles

trestles are self-supporting frames intended to support other loads for example as work surfaces

Mast vertical ladder of *Tallescope* and the direct supporting assembly

Mast brace two tubular braces that secure a *Tallescope* ladder vertical: see Fig. 5.5

Mast hook two flat hooks that temporarily hold a *Tallescope* ladder vertical mast brace locked in place: see Figure 5.5

MEWP Mobile Elevating Work Platform

Mobile access tower for the purposes of this *Code* a lightweight structure constructed from interchangeable prefabricated alloy (sometimes fibreglass) end-frames connected by spigot joints and braced apart by single tubes or frames without needing tools for erection.

Occupied *Tallescope* technician in the cage

Appendix 1. Glossary

Outriggers separate extending tubular braces with articulating rubber feet, stabilisers

PASMA Prefabricated Access Suppliers' and Manufacturers' Association

Platform area provided for standing on when working

Point load a load, which is measured over a square with 300mm sides (as distinct from a distributed loading)

Powered access equipment machinery not requiring human effort to elevate people to work at height

PPE Personal Protective Equipment

Pre-use check a simple visual and functional inspection of the equipment before use

PUWER *the Provision and Use of Work Equipment Regulations 1998*

Rake *Approved Document M* states the floor is to be regarded as level if the slope is 1:60 or less. Steep gradients are regarded as a slope of 1:20 or greater. However cross gradients must not exceed 1:40. Many, generally older, stages have gradients of between 1:24 to 1:20. However at these gradients towers and similar equipment must counter the rake so that the equipment remains vertical; this is usually achieved by adjusting the legs of the equipment although some venues use anti-rakes

For the purpose of work at height any floor slope greater than 1:48 should be treated as a rake. All necessary precautions should be taken unless the manufacturer of the equipment has stated otherwise

Raked floor a raked floor especially a raked stage floor or raked rostrum or false floor; a sloping floor; usually known in theatres as a rake

RAMS risk assessment/method statement

Restraint PPE restraining technician under tension to prevent technician falling

Restraint anchorage fixing provided for anchoring work restraint lanyard

Risk chance somebody could be harmed from a hazard together with how serious the harm, high or low

Rungs parts of ladder to stand on, usually round or half round

Safe system of work method of working designed to eliminate, if possible, or otherwise reduce risks to health and safety

Safety factor minimum breaking load of a component divided by the maximum designed static load

Scissor-lift EWPs with multiple scissors lifting mechanism

Securing devices interlocking hooks, catches or guides between ladder sections

Stable self-righting when the disturbing action ('force') is removed

Staff includes casuals, self-employed people, volunteers and amateurs where relevant

Stepladder set of treads between stiles with a hinged 'swing-back' brace frame

Appendix 1. Glossary

Stiles vertical supports for rungs or treads

Swing rail swing over guardrail at knee height in a *Tallescope* cage

SWL Safe Working Load; maximum mass that is permitted to be raised, lowered or suspended

Tallescope® proprietary extending mobile ladder with an enclosed work platform

Tie rods metal rods keeping rung ends snug inside the stiles of timber ladders

Toe-board edge protection device to stop objects or someone slipping from a work platform

Tower size access tower sized as width x long axis x platform height

Trailer mount lightweight EWP/IWP on a trailer that may be towed by vehicle

Training includes induction

Treads parts of a stepladder you stand on, usually ribbed for grip

Trunnion tubular side frame with adjustable legs on wheels on which the *Tallescope* mast is pivoted

WAHR *the Work at Height Regulations 2005 as amended*

Width on a tower: end-frame width (typically 1.2m or 1.5m)

WLL Working Load Limit; maximum permitted mass that equipment is designed to lift, as specified by the equipment manufacturer

Work at height *'Work in any place including at or below ground level from which a person could fall. Obtaining access to or egress from any place while at work involving a risk of a person falling a distance liable to cause personal injury, not including access by means of a permanent stairway in a workplace.'* (*The Work at Height Regulations 2005)*

***Zarges* combination ladders** Zarges is a German manufacturer of aluminium access equipment. Part of their range is combination ladders. *Zarges* have much in common with stepladders as they are essentially trestles, which may also support an extending ladder. They are designed to be used as separate components, as extension ladders or in combination with other accessories, such as platforms. A notable example is their combination ladder being used as a 'stair ladder' that is with the ladder extension inverted to level the ladder on stairs or a stage edge

Zarges style see Ladder systems. *Zarges* is often colloquially used to mean any free standing 'A frame' ladder or combination ladder referred to in this *Code* as *'Zarges*-style*'*

Appendix 2. References

Legislation

Obtainable from The Stationery Office (TSO) or download

Health and Safety at Work etc. Act 1974: www.hse.gov.uk/legislation/hswa.pdf

Workplace (Health, Safety and Welfare) Regulations 1992 SI No. 3004. ww.opsi.gov.uk

Health and Safety (Enforcing Authority) Regulations 1998 SI No. 494. www.opsi.gov.uk

Provision and Use of Work Equipment Regulations 1998 SI No. 2306. www.opsi.gov.uk

Lifting Operations and Lifting Equipment Regulations 1998 SI No. 2307. www.opsi.gov.uk

Management of Health & Safety at Work Regulations 1999 SI No. 3242. www.opsi.gov.uk

The Work at Height Regulations 2005 SI No.0735. www.opsi.gov.uk

Also other publications

Five steps to risk assessment: Guidance Note HSG 163 — HSE www.hse.gov.uk/pubns/indg163.pdf

The Work at Height Regulations 2005. A brief guide. Guidance Note HSG 401 — HSE www.hse.gov.uk/pubns/indg401.pdf

Construction Information Sheet no.10: Tower Scaffolds — HSE

Building Regulations Approved Document M Access and use of buildings — TSO

British and other Standards

BS 1129: Specification for portable timber ladders, steps, trestles & lightweight stagings

BS 1139 Part 3: British implementation of HD1004 which now replaced by BS EN 1004

BS 2037: Spec. portable aluminium ladders, steps, trestles & lightweight stagings

BS 7906-1: Use of lifting equipment for performance, broadcast & similar applications CoP installation, use & removal of above stage equipment (excluding trusses & towers)

BS 8300: CoP Design of buildings & their approaches to meet needs of disabled people

BS 8411: Code of practice for safety nets on construction sites and other works

BS 8437: CoP for selection, use & maintenance of personal fall protection systems & equipment for use in the workplace

BS EN 131: Ladders

BS EN 280: Mobile elevating work platforms. Design calculations. Stability criteria. Construction. Safety. Examinations and tests

BS EN 397: Specification for industrial safety helmets

BS EN 812: Industrial bump caps

BS EN 1004: Mobile access & working towers made of prefabricated elements. Materials, dimensions, design loads, safety & performance requirements (Replaces HD 1004)

BS EN 12492: Mountaineering equipment Helmets for mountaineers. Safety requirements & test methods

BS EN 1263-1: Safety nets. Safety requirements, test methods

American Standard (ANSI E1.1-2006) Entertainment Technology - Construction and use of wire rope ladders. This is considered unduly onerous for many theatre purposes