

Safety in the selection and use of ladders

Produced by:

HSE Safety Unit
Injuries Reduction Programme
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The position in this paper is correct at June 2005.

Ladders – what could be simpler. However I’m going to convince you that this is a new branch of rocket science. I apologise for the length, but there are a lot of considerations and myths that need to be exploded.

Why are ladders and stepladders important?

- Accident History
 - Revitalising & PSA targets
- New Messages
 - Loughborough Research
- New Legislation
 - Work at Height Regulations
- Programme work
 - Falls from Height
- Lack of guidance
 - From HSE



HSE has the Revitalising H&S targets that were set in 2000 to be achieved by 2010, using the baseline year of 99/00. More recently HSE has the 3 year Public Service Agreement targets that need to be achieved by 2007/08, using the baseline year of 04/05. Both sets of targets require drop in major injuries, 3% for the PSA targets and 10% for revitalising.

Part 1 – FfH Statistics



Why are moveable ladders important? At work -

- 14 Fatalities per year to workers
(averaged over 6 years)
- 1226 Major injuries – 32% (02/03P)
- 40% High fall major injuries – 02/03P
(high fall - 2 metres of greater fall height)
- 30% Low fall major injuries – 02/03P
(low fall – less than 2 metres fall height)



Source:

<http://www.hse.gov.uk/statistics/pdf/rhsfall.pdf>

Ladders are the piece of access equipment that was being used at the time of the fall.

02/03P – Provision figures – Latest detailed figures and will be updated to 03/04P when the new factsheet is released later this year.

Part 2 – Ladders and Stepladders



Thinking about Safety

Ladder Safety can be split into 4 elements:

- Ladder/Stepladder
- Activity
- Site
- User



This allows ladder work to be considered in bit size chunks and gives structure to thinking and risk assessments. It is based upon workplace transports safe vehicle(ladder), site(same); driver(user) with the additional factor of the task being done on the ladder – activity.

KEY ISSUES

- **Not Banning ladders**

Ensure the most suitable access equipment is selected and used safely

- **Competence**

Anyone at work who uses or specifies the use of ladders needs adequate information and training so that they understand their limitations and safe use



The points made in this talk do not apply to:

- Fixed ladders
- Other types of fixed access – step irons
- Specialist rescue ladders
- Roof ladders
- Step stools, including kick stools
- Warehouse steps/mobile stairs



Work at Height Regulations and Directive key requirements

- More suitable work equipment is not justified (RA) because of the low level of risk and
 - Short duration of useor
 - Existing features on site which the employer cannot alter

Part 3 –Safe Ladder / Stepladder



Employers – Type of ladder and its physical condition

Employees - is my ladder safe to use now

Is the ladder or stepladder safe to be used? – Section in the leaflet

In this part

- Types
- Load ratings
- Domestic ladders
- Checks, Inspections and Maintenance

Ladder and Stepladder types

4 Types:

- Class 1 – Industrial (Heavy duty)
- EN131 – replaced Class 2 (Light trades)
- Class 3 - Domestic
- Not manufactured to a standard



Classes relate to British Standards (BS2037 & BS1129).

Differentiation is on the basis of working load called duty rating.

Why are ladders not manufactured to a standard?

1. Some types not covered (not within the scope of current standards) e.g. timber pole ladders, window cleaners and fruit pickers triangular ladders.
2. Some manufacturers do not choose to use standards. Nearest standard informs what is reasonably practicable
3. Some home made

Future – EN131 is being revised with 2 classes, professional and domestic with the same maximum load but differentiated on durability testing.

Ladder and stepladder ratings

The highest figure quoted on ladder is the maximum weight (person and materials) it can carry in the working position.



Two commonly used terms are Duty rating, which comes from the British Standards and is not defined. The other is maximum static vertical load from EN131, which is related to the ladder in the working position, though it is the maximum permissible load that is quoted on the ladder and this is not defined. Maximum static vertical load is due to change to maximum load or maximum permissible load, though this term is currently not defined in the draft standard (11/04).

Domestic Steps (Class3)



Domestic labels are red

EN131 Ladder



No colour requirement for labels, though class 2 which it replaced was yellow.
No CE mark as EN131 is not a harmonised standard, no directive which allows this to happen currently.

Class 1



Industrial have blue labels. The colours are not hard and fast as I have seen an EN131 ladder with a blue label and yellow feet.

Use of Domestic (Class 3) at work

- Should not be used in arduous work environments (e.g. construction sites)
- Other workplaces Class 1 & EN131 types should be encouraged
- Cannot insist where use is infrequent
 - justified by risk assessment
 - not overloaded (only 95 or 125 kg)



Domestic ladders are less durable and have a lower rating. However if infrequently used and not overloaded then they may be justified by a risk assessment, especially as they are lighter and thus reduce manual handling risks, but more frequent inspections may be needed as they are less robust.

The key issue is overloading 95 Kg is only 15 Stone and that is person and materials

Spot the difference



Domestic
Class 3

Professional
Class 1



Looking after ladders/Steps

- 3 stages

Pre-use checks (KEY ISSUE)

- By the user
- Each working day, do not need to record them
- After something has changed – dropped ladder or moved from a dirty area to clean (check feet - more later)

Detailed Visual Inspection

- Intervals depend on use – should be recorded
- Expect most will be done in-house
- Interim inspections if something has changed

Maintenance

- In accordance with manufacturers instructions
- Could be done at same time as inspections



Not a charter for third party inspections

Frequency of inspections should be in accordance with manufacturer's instructions:

As a guide at least once every:

6 months – For frequently or Occasionally used ladders (daily to weekly use)

12 months – Infrequently used (normally used in excess on monthly)

Still every 7 days for scaffolding including the associated ladder, but no need remove it each time.

KEY ISSUE is the daily checks should be picking up the immediate/serious defects

Checks v Inspections

What's the Difference?

Both:

- Same parts
- Visual checks for obvious defects

Pre-use check

- Is my ladder safe to use now?
 - rivets present

Detailed visual inspection

- Will it be safe till the next inspection e.g.
 - rivets present and none are loose



Pre-use checks are less detailed than inspections.

Ladders and steps are inexpensive to buy, so no intention or need for expensive testing. We do not want people replacing all their ladders every 6 months. No load testing or non-destructive testing, only visual checks for obvious defects.

Example of Inspection Labels



- Hired or loaned ladders must have proof of inspection provided with them
 - Document
 - or
 - Label



Proprietary management and tagging systems are available, this is one example

Examples of obvious defects
that would prevent further use

None of these have been
staged!



Further use would present a risk of serious personal injury. Options: Prohibition notice, taking into possession, having it destroyed, or removed from use until repaired – all the usual options that you might apply to defective lifting tackle.

Ladders:



Split stile – beyond repair



Dented and twisted rungs – beyond repair



Dent in stiles – Beyond repair



Missing ladder feet – critical for slip resistance. As the stiles are damaged, this ladder cannot be repaired.



Twisted stile – beyond repair



Bent ladder – How? Possibly used as a ladder beam and overloaded? Beyond repair.

Worst ladder ever?



Missing rungs – baling twine to replace rungs.

Stepladders



Bent rear right hand stile – beyond repair



Bent restraint bar – beyond repair



Missing foot, will lead to wobble and reduced slip resistance – Could be repaired



Rivet replaced with a nut and bolt. Also poor storage – thrown in the storeroom with all the other junk. Could be repaired, depends upon manufacturer and cost



Damaged restraint connection – Beyond repair hole in stile has been worn or made larger



Split top platform, this is part of the restraint and shows gross overloading and abuse of the platform. Beyond repair. What have they been using this stepladder for?



Split stile – Class 1 industrial steps. Beyond repair



Plating works, steps covered in chemicals, hinge screws pulling out. Beyond repair



Bent back bar, this reduces the rigidity of the stepladder – defect should be replaced

Part 4 – Safe Activity



Employer - what work is going to be done off the ladder/steps
Employers - is it safe to do this task off my ladder
Is it a suitable activity – Section in the leaflet

In this part

- Short duration work
- Provision of a handhold
- Light work
- Securing a ladder hierarchy
- Overreaching

Short Duration

Maximum of 15 - 30 minutes work at a single position before it is moved
– Still allows a window to be painted



Short duration is stipulated in the Directive and WAHR, but is not defined. There are decided cases which indicate how short, short duration can be, but not how long is short duration.

Handhold on ladders

Climbing or descending

- Avoid holding items
 - Tool belt, have items passed to you..
- When climbing a **ladder** you **must** have one hand free to grip the ladder



WAHR Schedule 6, Para 10 (b) The user can maintain a safe handhold when carrying a load

Handhold on ladders

Working Position

- Normally 3 points of contact (hands and feet)
 - Short excursions are acceptable, start a screw
- If a handhold cannot be maintained
 - Can suitable fall arrest be used
 - Ladder must be tied
 - Hooking arms around same stile
 - Can be used for light drilling operations
- Handhold must be available



If a handhold cannot be maintained you have not got sufficient security to prevent a fall, or be able to recover should you slip, etc. More needs to be done or other equipment used.

WAHR Schedule 6, Para 10(a) a secure handhold and secure support are always available to the user

How to have a handhold available on a ladder



When working from a ladder

- Do not use the top three rungs

Picture 1 too high

Picture 2 okay

No 1 – 3rd rung from the top. No handhold available, legs only supported up to the knee

No 2 – Handhold available and being used, legs supported above and below the knee. Could be working one rung higher

Handhold on stepladders (does not include step/kick stools)

Climbing or descending

- Avoid holding items
 - Tool belt, place items on tool tray...
- When climbing a stepladder you **SHOULD** have one hand free to grip the ladder
 - Can have two free hands
 - Not practicable to have a hand hold
 - wallpapering and placing boxes on shelves
 - Justified by a risk assessment – next slide



With stepladders a handhold is not a must have but a should have to allow boxes etc. to be carried up.

Handhold on stepladders

Working Position

- Normally 3 points of contact (hand and feet)
 - Short excursions are acceptable, start a screw
- If a handhold cannot be maintained, use must be justify by a risk assessment
 - Consider
 - Height of task – normally single storey
 - Handhold must be available
 - Light work and short duration
 - Avoids side loading – more later
 - Avoids overreaching – more later
 - Whether whole foot is supported
 - Whether you can tie the stepladder



Single storey 2.5-3.5 metres – not the ceiling of warehouse or a large out of town store.

Still need to think about the alternatives – is a stepladder still the most suitable access equipment

Fully enclosed platforms



- All sides protected
- Can be used hands free
- No limit on duration of task



There are alternatives to stepladders such as fully enclosed platforms, small tower scaffolds etc. These platforms are not stepladders.

Improved Steps Designs



- Higher, Longer handrail
- Larger platform
- Work 2 hands free
- Still short duration
 - Does not enclose all four sides (only 3)

Light work

Where carrying is necessary:

- Single person
 - Up to 10 kg is acceptable
 - A bucket of something
 - Up to 25 kg must be justified
 - Detailed manual handling assessment + RA
 - Allows roof ladders to be used
 - Above 25 kg not acceptable
 - Replacement glazing and security screens still an area of on-going negotiation.



10 – 25 kg need a detailed manual handling assessment, this is the grey area that needs a case by case consideration. Specialist support may be needed if you are considering enforcement action. Employers could carry out generic assessments for repetitive, foreseeable tasks, but if generic assessments are used it needs to be established that they are still valid at the specific location and for the intended task, this would need to be done each time.

Light Work

Includes strenuous work

- Freeing a seized valve where a sudden release could cause a fall
- Pulling cables through (cable trays)
- Should be avoided by use of other suitable access equipment

Ladder Stability Hierarchy Summary

1. Tie – where possible
 - Ladders used for access to another level should be tied
2. Safe unsecured equipment
 - Ladder or ladder with a stability device(s)
3. Wedge it
4. Foot it



This is quite complex to explain so there are 8 slides that explain each of the options.

Stability 1

If you can tie a ladder you should

- Tie at the top
- Tie part way down
 - Drilled anchor point
 - Through a window (like a scaffolding through tie)
- Tie at the base
 - Stake it out

Tying to suitable point will always improve stability



Stability 2

Problems with tying:

- Nothing readily available to tie to
- Unsuitable substrate for a tie bolt
- Working at multiple points
 - E.g. painting all upstairs windows



A drilled anchor point depends upon the surface substrate being suitable to be drilled and for the type of fixing being used.

Stability 3

Tying a ladder:

- Tie both stiles
- Knot - strong and tight
- Proprietary devices are available
- Cable ties only for short duration.



Can use scaffold clips between the scaffold ledger (horizontal member) and around the stiles.

Cable ties problems with: UV degradation, corrosion and low temperature embrittlement

Stability 4

Safe unsecured equipment:

- Ladder or ladder supplemented with ladder stability devices
 - Users define worst surface (worst case)
 - Supplier/manufacturer confirms stability for use unsecured on worst surface
- WAHR refers to EFFECTIVE anti-slip and stability devices (HSE's position)
 - Min stability Loughborough Research (RR 205)
 - Surface dependant
 - Manufacturers claim



Definition of 'Effective': This is a new term used in the Work at Height Regulations 2005 that describes ladder anti-slip or stability devices that have sufficient stability to be **used unsecured** for the intended range of **surface types, so long as the manufacturers instructions for safe use are followed. It is up to manufacturers to state if or where their products are 'effective'**. This level of stability has been measured and defined by recent research

Stability 5

Loughborough Ladder Research - User trials:

- Stability envelop of foreseeable use & misuse
- Established 4 failure mode
 - Base slip; flip; fall back; and top slide

Work is being raised with manufacturers



HSE does not know of any 'effective' ladders or 'effective' ladder stability devices (April 05)

Professional and non-professional user groups were used in the trials. The work established the forces that users demand of ladder systems under conditions of foreseeable use and therefore the forces that such equipment should accommodate before losing stability.

Stability 6

Safe unsecured equipment the way forward:

- New concept
 - This year
 - Raise the issue
 - Risk assessments need to be done
 - Enquiries with manufacturers/suppliers to establish effectiveness



Softly softly on this issue at the moment:

For example the window cleaners trade association have methods using unsecured and certainly preferred ladder stability devices. They should continue with these methods and substantiate claims/performance with manufacturers and await the arrival of effective equipment in the market place, after all the alternative is footing, which is covered later.

Stability 7

Wedging a ladder against an immovable object

– E.g. Against a wall or under a van



Van must be prevented from intentional (driven away) or unintentional movement (rolls away)

Stability 8

Last resort footing a ladder

- Limited effect
 - Reduced the likelihood of ladder flip
- Inconsistent method and application
- Best measured method
 - Can overload the ladder

Use where other access equipment is not reasonably practicable and it is not possible to tie, have safe unsecured equipment or wedge.



With footing there is no consistent methodology (understanding of it) or application for the duration of the task. It is an active strategy, rather than having a ladder system that has sufficient inherent stability to cope with the stability demands.

From the Loughborough work the most effective ladder footing strategy was for the second person (the footer) to stand facing the ladder with both feet on the bottom rung, each foot as far apart as possible on the rung (stile to stile), and both hands on the stiles. The person footing the ladder should remain in the position described until the person using the ladder has descended to at least the half waypoint. This method could exceed the duty rating or maximum permissible load of current ladders.

You could use a suitable static load on the bottom step of the ladder instead of a person.

Stepladder Stability

- Avoid side on working
- Avoid wobbles

Stepladder Stability 1

Stepladders:

- Avoid side on working
 - Narrowest base dimension
 - Common cause of accidents
 - Problems: reaching the task and blocking routes
 - Acceptable with low loadings e.g. painting, drilling into soft materials (e.g. plasterboard)



If doing side on working that imposes a loading tie the stepladder to an available structure where possible. As a last resort if other equipment is not reasonably practicable and you cannot tie it - a second person pushes against the stepladder to counter the thrust.

Tying it is to a readily available point, no intention for people to start drilling walls to fit ties, it is taking advantage of what is already there.

Stepladder Stability 2



Tie is between 2nd and 3rd stile from the top. Both stiles are tied around the traffic light column. Though devices are being developed so that only one stile needs to be tied.

Good working practice: Steps tied and handhold available.

Stepladder Stability 3

Stepladder

- Avoid wobbles
 - Uneven surfaces, missing feet



Wobbles put the user off balance

Overreaching

- Keep navel (belt buckle) inside the stiles and both feet on the same rung throughout the task.



Once people start lifting one foot off the rung to counterbalance themselves they are overreaching. They should reposition the ladder to prevent this.

Part 5 – Safe Site



Employer - is a ladder or steps suitable for the ground conditions

Employee - is it safe to use my ladder/steps on this ground.

Is it a safe place to use a ladder or stepladder? – section in the leaflet

In this part

- Ground surface
- Upper surface
- Ladder angle
- Insulated Ladders

Ground Surface

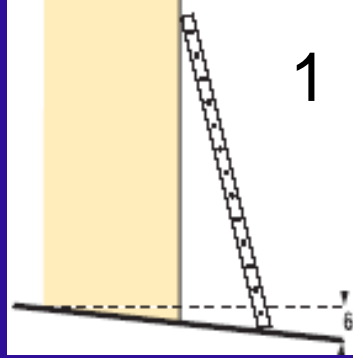
- Needs to be firm or made firm
- Anything slippery should be removed from solid surfaces
 - Liquids – oils, algae, etc.
 - Solids – sand, packaging film, moss
- Needs to be level
 - Maximum back slope 6 degrees (ladders only)
 - Maximum side slope 16 degrees (ladders only)
(with a levelled ladder)
Measuring device trial planned
 - Slopes not known for steps



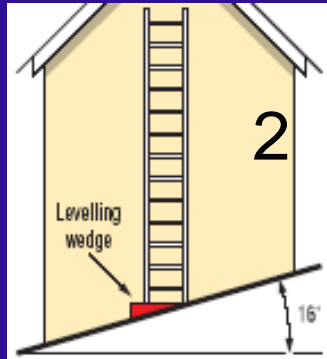
Guides:

6 degrees steeper than a single step disabled persons ramp.

16 degrees steeper than a multi-storey car park ramp.



1 Back slope



2 Side slope





Okay – these slabs are not pressure washed clean but they are fine.

Not okay – This is a tarmac surface - if a ladder was going to be placed on the thick leaf litter in the top corner it would need to be brushed away along with any sludge underneath. This is because the ‘rubber’ ladder feet actually need to come into contact with the tarmac to get the slip resistance (necessary grip).

Ground surface

- Ladders
 - Preventing the base slipping for ladders is critical for ladder stability
 - Ladder feet are critical here

Some examples:



It is as not critical for stepladders, which will initially slide rather than fall. Wobbling or working side on is more critical

Missing



Damaged foot



Okay



Upper surface



- Do not rest ladders on weak surfaces
 - E.g. Plastic guttering, glazing
 - Remedies
 - Ladder stays or spreader bars
- Be aware of slippery surfaces
 - E.g. Metal guttering
 - Remedies
 - Ladder stays or tying the ladder

Ladder angle

- Best angle for a ladder is 75 degrees
 - 1 in 4 rule
 - Marked on some ladders

Stepladders

- Restraint must be fully open and any locking device must be used



1 unit out from the wall for every 4 units vertically up the wall

Insulated ladders / steps

- If you must work live (e.g. electrical testing and fault finding)
 - Should have insulated ladder/steps
 - Eliminates one path to earth
 - No protection against direct contact
 - Wooden ladders may be conductive
- Immediate enforcement – need:
 - Foreseeable contact;
 - Dangerous voltage; and
 - Conductive surface floor or wall (ladders only)



Wooden ladders may have steel strengthening wires in the stiles, so do not assume that they are non-conductive.

Other paths to earth are earthed enclosures, structural steelwork

Concrete floors can be considered conductive, wooden floor boards are not.

Note for information: Electricity At Work Regulations R14 –when working live where danger may arise, it must be – unreasonable to work dead; reasonable to work on it or be near it while it is live; and suitable precautions are taken to prevent injury. All 3 points have to be satisfied.

Part 6 - Safe User



Employers – are my employees competent?

Employees – do I know how to use my ladder and access equipment safely?

Do my ladder ‘users know how to use them safely?’ Section in the leaflet

In this part

- Competence
- Minimum length
- Level
- Weather
- Footwear
- Fitness



Training

KEY ISSUE

- Users & Specifiers do not understand the limitations

Can they safely:

- Check it
- Carry it
- Erect including any accessories
- Use it
- Move it



Minimum length

- Working from ladders
 - At least 3 clear rungs
- Using a ladder for access
 - Extend at least 1 metre above the landing point or have a secure handhold available

Minimum length 2

Working from a stepladder

- 2 clear steps where top of stepladder is a hinge or stile
- 3 clear steps where top of stepladder is a step
- Suitable platform, with a handrail that can be used for a secure handhold



Does not apply to step or kick stools

Examples in the next slide

Minimum length 3



2 clear
steps



3 clear
steps



Convention steps on left 2 clear rungs. Other two the very top is counted as a step, so the middle steps would be sold as an 8 step ladder, for these 3 clear steps. This is so a handhold is available on the steps.

Ladder straight & rungs level?

- Judge by eye
- Specifically designed devices
 - Not bits of brick, wood, etc.
 - Remember 16 degrees maximum side slope
- Stepladders are not normally levelled, follow the manufacturers instructions.



Acceptable as well proprietary devices.

Weather

Do not use in strong wind

– Follow manufacturer's recommendations



Guide if asked: Force 6 – strong breeze when the branches of large trees are in motion. Remember this does not apply to emergency situations (e.g. fire service, plus their specialist ladders are not covered by this guidance)

Footwear

- Robust, sensible footwear.
 - Safety shoes/boots or trainers
- No trip hazards
 - Long dangling laces
 - Sole hanging off
- No slip hazards
 - Not thick with mud
 - Contaminated with oil, etc



Fitness to use a ladder

- What would prevent you from using a ladder?
 - Recurring dizziness
 - Epilepsy
 - Psychiatric conditions (inc fear of heights)
 - Heart condition
 - Severe lung conditions
 - Alcohol and drug abuse
 - Significant impaired joint function
 - Medication
 - Anything that recommends you do not operate machinery could be a problem



Fitness to use a ladder 2

What do you do if suspect if someone is unfit?

- Inspectors – EMAS service
- Employers
 - Pre-employment
 - Information to employees
 - Issue - Assistance from Occ Health Specialists
- Employees
 - Inform employers of short or long term conditions



EMAS - Employment Medical Advisory Service

Part 7

Quiz

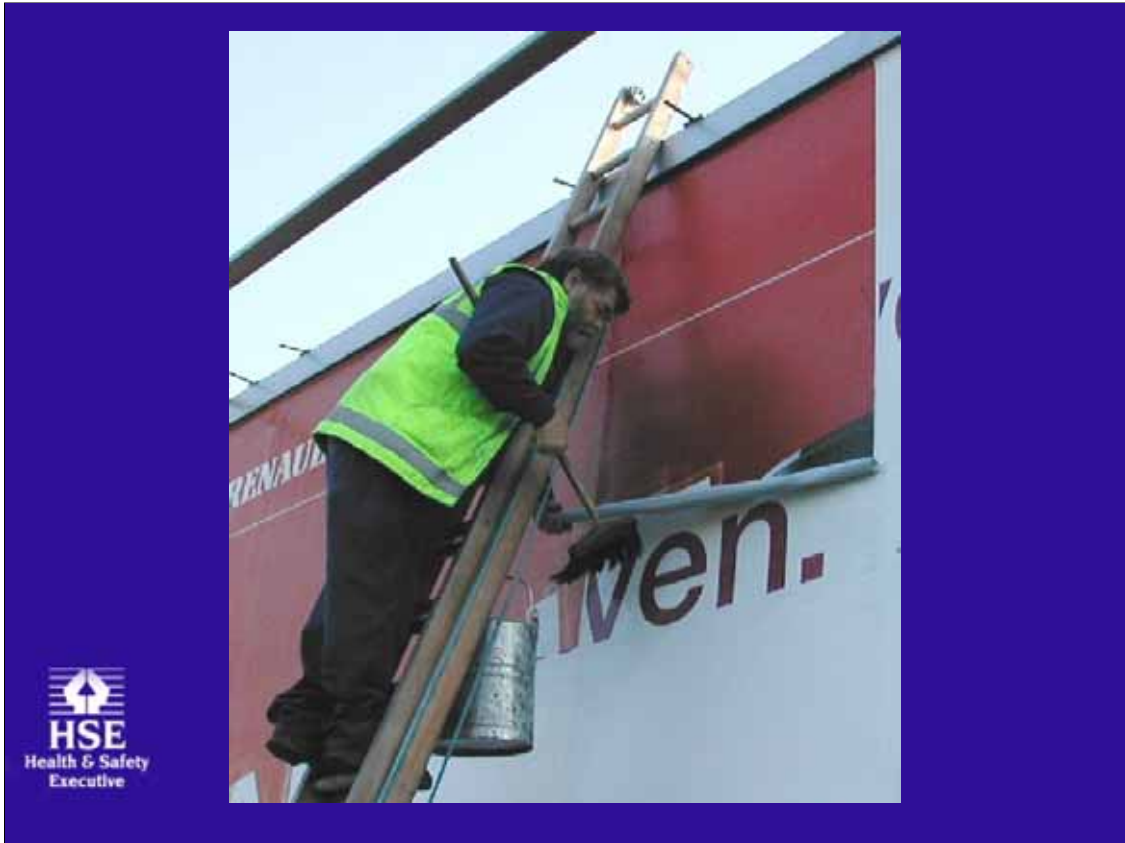
What's wrong?
Acceptable or not?





Source: 'Safety Soapbox' email
construction@workcover.vic.gov.au

Getting an air conditioning unit on to a roof: Ladder too short (need 1 m extension above landing point); not secured (only footed – not best method); no free hand for climbing; box too heavy and an awkward load (could be over 25kg, certainly over 10 kg – need a detailed manual handling assessment); and is the ladder overloaded (could be). Action – Stop the job. Alternative present air con unit onto the roof using a FLT and pallet.



Billboard posting. Technique being used is acceptable - though this is probably best practice. Man is working through the ladder. Industry is introducing fall arrest and better methods of securing. No immediate risk of serious personal injury, however is a ladder the most suitable piece of kit, are they taking sufficient measures to prevent or mitigate against the effects of a fall. Can they justify using a ladder – are they doing enough?



Stepladder is on top of a portacabin. Stepladder too short (no hand hold available on the stepladder); working side on (least stable direction). Unacceptable.
Action: Risk of serious personal injury – Prohibition Notice an option



Acceptable – light side on working with 2 hands, not too high up the steps (another step and it would unacceptable). No immediate risk of serious personal injury. Given the activity, space limitations and height this is arguably the most suitable access equipment for this task.



Unacceptable. Steps too short, no handhold available and working side on. Would be better to use a mobile access tower or small scissor lift (if the floor could take the loading). Action: Risk of serious personal injury – Prohibition Notice an option. Should be using different access equipment

Part – 8 Further information

- Falls from height web page
<http://www.hse.gov.uk/falls/index.htm>
- Ladder stability - HSE Research Report 205
- Stepladder stability - HSE Contract Research Reports 418/2002 and 423/2002
<http://www.hse.gov.uk/research/publish.htm>
- New guidance – INDG 402



Schedule 6 Requirements for ladders

- Must show that safer work equipment is not justified due to low risk and short duration of use; or existing features on site which he cannot alter
- Surface should be suitable to support a ladder
- Positioned to ensure stability during use

Requirements cont.

- A portable ladder shall be prevented from slipping during use by
 - securing styles at or near upper or lower ends; or
 - effective anti-slip or other effective stability device; or
 - other equivalent effective arrangements

Requirements cont

- Access ladders should protrude sufficiently above the landing place to ensure a firm handhold
- Used so that a safe handhold and secure support is available to the user and a safe handhold can be maintained when carrying a load
 - Stepladders can be used without the need to maintain handhold where it is not practicable to do so and use of a stepladder is justified by risk assessment



STEPLADDERS AND HANDHOLDS

A stepladder can be used without a handhold if it is not practicable to maintain a handhold when carrying a load. Providing a risk assessment can justify this practice due to low risk and short duration.