BRITISH STANDARD

BS 6037-2:2004

Code of practice for the planning, design, installation and use of permanently installed access equipment —

Part 2: Travelling ladders and gantries

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Contents

Foreword

Technical Committee B/514/39 has prepared this part of BS 6037.

This part of BS 6037 covers the planning, design, installation and use of travelling ladders and gantries.

As a code of practice this British Standard takes the form of guidance and recommendations. It should not be quoted as if it were a specification and particular care should be taken to ensure that claims of compliance are not misleading.

It has been assumed in the preparation of this standard that the execution of its provisions will be entrusted to appropriately qualified and experienced people for whose use it has been produced.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 21 and a back cover

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Introduction

It is increasingly common for modern commercial office buildings to incorporate an atrium and/or a glazed corridor, glazed entrance or roof that requires special provision for continuing maintenance access.

Modern shopping malls also often incorporate extensive, high-level glazed roofs which are difficult to access using mobile equipment.

The Construction (Design and Management) Regulations 1994 (CDM Regulations) [1] require that all façades and other items that require periodic access are designed and positioned so that they can be accessed safely.

To keep these often large and inaccessible areas of glass clean and also to provide safe access for the routine maintenance of items such as lights and smoke detectors, these buildings should be provided with some form of permanently installed appliance, which could be in the form of a travelling ladder or gantry, sometimes used in conjunction with a suspended platform.

It is essential that the requirements for permanently installed access equipment be considered at an early stage in the building design process. The dimensions and capability of any travelling ladder or gantry need to be appropriate for the nature of the task(s) to be performed.

The installation can be manually or power operated or a combination of both.

It should be noted that working at height can expose workers and other persons in the vicinity to particularly severe risks to their health and safety, in particular the risk of falling from height, falling objects and other serious occupational accidents.

1 Scope

This part of BS 6037 gives recommendations for the planning, design, installation, use, examination, maintenance and testing of permanently installed travelling ladders and gantries (TLGs) including equipment installed on a building to facilitate routine maintenance of the building fabric and its services. It is intended for those involved in specifying, designing, managing the use of, maintaining and examining such equipment.

This standard does not cover TLG systems designed for heavy duty and industrial applications such as underbridge gantries or gantries for industrial processes.

Where TLGs are intended to be used in conjunction with suspended access equipment (SAE), this code of practice is supplemented by BS EN 1808:1999 and BS 6037-1:2003.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

BS 449-2*, Specification for the use of structural steel in building — Part 2: Metric units.*

BS 4211*, Specification for ladders for access to chimneys, other high structures, silos and bins.*

BS 5268-2*, Structural use of timber — Part 2: Code of practice for permissible stress design, materials and workmanship.*

BS 5395-3:1985*, Stairs, ladders and walkways — Part 3: Code of practice for the design of industrial type stairs, permanent ladders and walkways.*

BS 5950 (all parts)*, Structural use of steelwork in building.*

BS 6037-1:2003*, Code of practice for the planning, design, installation and use of permanently installed access equipment — Part 1: Suspended access equipment.*

BS 7671*, Requirements for electrical installations — IEE Wiring Regulations.*

BS 7883*, Code of practice for application and use of anchor devices conforming to BS EN 795.*

BS 8110 (all parts)*, Structural use of concrete.*

BS 8118 (all parts)*, Structural use of aluminium.*

BS EN 795*, Protection against falls from height — Anchor devices — Requirements and testing.*

BS EN 1808:1999, *Safety requirements on suspended access equipment — Design calculations, stability criteria, construction — Tests.*

BS EN 60204-1, *Safety of machinery — Electrical equipment of machines — Part 1: General requirements.*

BS EN 60947-3, *Specification for low-voltage switchgear and control gear — Part 3: Switches, disconnectors, switch-disconnectors and fuse-combination units.*

3 Terms and definitions

For the purposes of this part of BS 6037, the terms and definitions given in BS 6037-1:2003, BS EN 1808:1999 and the following apply.

3.1
gantry
workplace with a continuous footway or treads and inclined to the horizontal at an angle of 65° or less

3.2
ladder
workplace with rungs or treads and inclined to the horizontal at an angle of more than 65°

3.3
travelling ladder and/or gantry
TLG
purpose designed mobile workplace supported by or running on rails, beams or prepared tracks, designed specifically to provide access for operatives to carry out cleaning and maintenance tasks on a building or similar structure and for no other purpose

4 Identifying hazards and taking preventative action

4.1 Design stage

Travelling ladders and gantries are required to conform to the Machinery Directive (98/37/EC) [2], which sets machinery design requirements to protect the health and safety of users.

At an early stage in the design of the building, a risk assessment should be carried out in order to identify the access requirements and minimize the potential hazards for the user of a TLG.

NOTE It is a legal requirement under the CDM Regulations 1994 [1] that a risk assessment is carried out at this stage.

4.2 Installation, use and maintenance

The Management of Health and Safety at Work Regulations 1999 [3] require that a risk assessment is carried out before a TLG is put into use. Site-specific hazards and hazardous situations should be identified and the actions required to eliminate or reduce the associated risks should be incorporated in the risk assessment.

A permit-to-work system should be put in place to cover all planned operation, maintenance, testing and thorough examination of the TLG.

NOTE Guidance on producing permit-to-work systems is given in the HSE publication Permit-to-work systems 1998 [4].

A list of the more common hazards encountered when using permanently installed TLGs and the actions which should be taken to eliminate or reduce them, is given in Table 1. Under no circumstances should this list be considered exhaustive.

A method statement should be prepared covering the operation of the TLG. The method statement should include the findings of the risk assessment and the measures required to control or eliminate risk. All operators should be made aware of the findings of the risk assessment and given adequate training and instruction prior to operating or maintaining the TLG (see Clause **19**).

Table 1 — Hazards encountered when installing, maintaining and using TLGs, and recommended actions

Hazard	Action
Exposure	Suitable protective clothing should be worn (see **6.4**). During severe weather conditions, for example if the work area is icy or during very strong winds, work should not be undertaken and operators should report to the duty holder.
Hazardous situation arising from unauthorized use of the equipment	Operators should obtain a permit to work (see **4.2**).
Hazardous situation arising from other work being carried out in the vicinity	Operators should obtain a permit to work and authorization from the duty holder prior to commencing work (see **4.2**).
Falling or tripping	Operators should follow prescribed safe route(s) of access and egress (see **6.2**). Where there is inadequate roof edge protection, safety anchors and/or safety lines and safety harnesses should be used. Suitable, marked anchorage points should be provided on the working platform to permit the attachment of harnesses.
Slipping	Algae and other hazardous materials should be removed from all access and egress routes and working areas.
Injury to passers by from falling objects	Loose objects and tools should be secured with lanyards. Warning notices or barriers should be erected below the workplace (see Clause **20**).
Persons stranded on the TLG	Operators should receive training in the safe use of the TLG and should follow the correct procedures as given in the operating instructions. Operators should be supplied with a means of communication between the TLG and a competent person. Rescue/recovery procedures should be planned in advance.
Damage to power cables	Power cables should be of adequate length to allow for movement of the TLG and should be routed such that they cannot become severed or damaged by movement of the TLG.
Electric shock	Only competent persons should have access to the electrical circuitry of the TLG. The TLG should be switched off or isolated before any maintenance work is carried out on it (see Clause **12** and Clause **22**). The mains power supply should be provided with a residual current device (RCD).
Injury resulting from maloperation or malfunction of the TLG	Operators should receive training/instruction in the safe use of the TLG and should follow the correct procedures as given in the operating instructions. All limit switches and safety devices should be operational at all times and checked at appropriate intervals to ensure they are fit for use (see Clause **12** and Clause **22**).
Collision of TLGs with scenic lifts or mobile devices installed on the same building or neighbouring buildings	Suitable interlocks or controls should be provided and the work planned to remove any danger of the TLG colliding with the scenic lifts or mobile devices.

5 Planning and exchange of information

5.1 Planning

The CDM Regulations 1994 [1] require building designers to provide a safe means of access for activities such as ongoing inspection, cleaning and maintenance of a building. A permanent installation can affect the structure, layout and fenestration of a building and the access requirements should therefore be considered during the preliminary design stage.

NOTE 1 Significant financial savings and design advantages can result from an early consideration of access requirements. Once the design of a building has been finalized it can be very difficult to make changes to enable installation of TLGs to be carried out (see **7.4**).

The preliminary design for any travelling ladders and gantries should be based on advice and guidance concerning the various types of system available and should, therefore, be prepared by a competent person. The dimensions and characteristics of the TLG should be appropriate for the nature of the task(s) to be performed.

The general planning details should be settled at the earliest possible stage by detailed investigation by and agreement between, the building designer and the manufacturer or supplier of the TLG and the results incorporated in the technical file for the building.

NOTE 2 This agreement will be necessary to enable the TLG to be CE marked (see BS 6307-1:2003, Annex A).

The prime responsibility to ensure that access for building maintenance is safe lies with the duty holder.

Persons involved in the planning and exchange of information should include:

a) duty holder;

b) equipment manufacturer or supplier;

c) architect or designer;

d) structural engineer;

e) planning supervisor;

f) principal contractor;

g) local authority;

h) client.

Persons involved in the planning and exchange of information can vary from one installation to another and can include persons not mentioned in the above list which should therefore not be assumed to be exhaustive.

5.2 Exchange of information

5.2.1 *Information for the manufacturer or supplier*

The architect or designer of the building should provide information to the manufacturer or supplier of the TLG on such matters as:

a) the purpose(s) for which the TLG is to be used and the specific tasks that are to be performed from it;

b) the extent of the building which is to be accessed by the equipment;

c) any special requirements as set out by the local authority in the planning permit for installing the equipment and the requirements of any local bylaws that apply;

d) the wind loading for which the building is designed and any other relevant environmental factors;

e) any items identified in the health and safety file as being necessary to fulfil the requirements of the CDM Regulations 1994 [1];

f) any special hazards (e.g. working over water, roads or public areas);

g) any special building features (e.g. flagpoles, CCTV cameras, mobile phone and communication aerials and dishes, boiler flues, adjacent buildings, illuminated signs, chiller units, cooling towers, scenic lifts and lighting, fire detectors/fire protection systems such as sprinklers, smoke vents);

h) any special requirements (e.g. a facility and/or equipment for glazing replacement);

i) the safe means of access/egress to the TLG;

j) emergency egress routes from the building should be planned so as not to be obstructed by the operation or parking/storage of the equipment.

The architect or designer of the building should also provide building plans and other relevant information to enable the manufacturer or supplier to select the most appropriate equipment.

This information should form part of the pre-tender health and safety plan.

5.2.2 *Information for the architect or designer*

The manufacturer or supplier of the TLG should provide the architect or designer of the building with the following information which will form part of the construction phase health and safety plan:

a) the type and rated load of the TLG and the number of systems required;

b) dimensions and clearances necessary for the operation of the equipment;

c) the space requirements necessary for parking and storage of the equipment;

d) the space requirements necessary to facilitate maintenance, examination and testing of the equipment;

e) the maximum static and dynamic loads that the equipment will impose on the building (see **7.1**);

f) the requirements for fixing the track system(s) to the TLG to the building, including any associated structural and/or builder's work;

g) the maximum and minimum distances between the building façade and the TLG, bearing in mind the need to avoid excessive reach and minimize the requirement for operators to use extended cleaning poles;

h) electrical power supply requirements and the preferred location of power supply points where applicable;

i) period of time required for design calculations, the preparation and approval of relevant drawings and the manufacture of the equipment;

j) the procedure for the delivery, installation and commissioning of the equipment.

The information needed can vary from one installation to another and can include items not mentioned in the above list, which should therefore not be assumed to be exhaustive.

6 Health and Safety

6.1 General

Where applicable the design and manufacturing requirements, together with associated safety features for all new TLGs, should conform to BS EN 1808:1999.

NOTE 1 Attention is drawn to the requirements for TLGs in the Supply of Machinery (Safety) Regulations 1992 [5].

NOTE 2 Attention is also drawn to the requirements of the Manual Handling Operations Regulations 1992 [6] and the Workplace (Health, Safety and Welfare) Regulations 1992 [3].

6.2 Safe access and egress

Attention is drawn to the requirement under the CDM Regulations 1994 [1] and the Management of Health and Safety at Work Regulations 1999 [7] that all operators are provided with and made aware of a safe means of access and egress to and from all areas of a building where maintenance or other work is to be carried out. The duty holder should therefore ensure that a designated route to and from all parts of the TLG and the areas of the building it is designed to access is provided for the following persons:

a) cleaning staff;

b) maintenance staff;

c) TLG maintenance engineers;

d) persons carrying out thorough examinations.

NOTE TLG maintenance engineers and persons carrying out thorough examinations will need to gain access to and egress from more areas of the building than the cleaning and maintenance staff.

Where determined necessary by a risk assessment, anchor devices conforming to BS EN 795 should be installed in accordance with BS 7883 or other appropriate means to ensure the safety of operatives (see also Clause **9**).

6.3 Safe use

All persons who use, examine, maintain or have management responsibility for the TLG should be made aware of their responsibilities for ensuring that the TLG is safe to use and used safely. A list of the main aspects relating to safe use, with cross-references to the relevant clauses in this standard, is given in Table 2. This list should not be considered to be exhaustive.

Table 2 — Safe use of TLGs

Aspect of safe use	Clause/subclause
Identification of site-specific hazards and hazardous situations and elimination/reduction of the associated risks	**4**
Provision and use of safe means of access and egress	**6.2**
Provision and use of personal protective equipment	**6.4**
Responsibilities of the duty holder for ensuring that the TLG is safe to use and used safely	**18**
Provision and content of operating instructions	**19**
Provision of notices	**16**
Provision and content of training and instruction	**21**
Carrying out of inspections, maintenance, thorough examinations and testing, as well as remedial work to correct defects found	**22**

6.4 Personal protective equipment

It is a legal requirement under the Management of Health and Safety at Work Regulations 1999 [9] that the duty holder or his representative ensures that all operators are equipped with and use any personal protective equipment (PPE) stated in the building manual as being necessary when carrying out their work.

NOTE Attention is drawn to the Personal Protective Equipment at Work Regulations 1992 [10].

6.5 Emergency rescue

Emergency rescue procedures should be pre-planned to ensure that operatives on TLGs can be recovered.

Following a breakdown the rescue plan should be implemented.

Following a fall the rescue should take place as a matter of urgency.

7 Attachment of the TLG to the building

7.1 Loads on the building

The predicted maximum loads imposed by the TLG should be derived in accordance with the appropriate requirements of BS EN 1808:1999, **6.2.1.1**, load cases 1, 2 and 3, whichever is the most onerous condition. The results should be submitted to the architect or designer and/or structural engineer responsible for the building so that the loads can be taken into account in the overall building structural design.

NOTE Wind loads imposed on outdoor TLGs are likely to be significant in relation to their self-weight.

7.2 Anchor units

A specific risk assessment of anchor units should be carried out during the design stage, taking into account the detailed design of the structure, track supports, type of construction, finishes, weathering details, corrosion protection of concealed components, bi-metallic corrosion, thermal expansion, fatigue and the design life of the anchor units.

All partially or totally hidden fixings associated with the TLG should be designed and manufactured for the lifetime of the building or structure using appropriate materials to ensure that enclosed components are not required to be exposed to check for possible corrosion. Details of how this is achieved should be clearly documented in the technical file.

7.3 Examination

The track anchorage system should be examinable from a safe position, which can be from the TLG itself.

7.4 Installation of TLGs on existing buildings

It is essential that the installation of a TLG on an existing building is only carried out after reference to the design details given in the building manual and consultation with the architect or designer of the building or another appointed competent person. The recommendations given in Clause **5** regarding the exchange of information should be followed where applicable.

8 Track system

8.1 Rail track

The rails, intersections and associated components should be of adequate size and strength, have an even running surface and be capable of being safely maintained. The rails and associated fixings should either be manufactured from corrosion resistant materials appropriate to the environment in which the TLG will be used or be adequately protected against corrosion, including bi-metallic corrosion.

Calculations should be carried out to verify that the rails and their associated supports and fixings are capable of withstanding the stresses calculated for the three load cases given in BS EN 1808:1999, **6.2.1.1**, which include the surges resulting from the traversing of the TLG and from wind effects.

These calculations should be carried out in accordance with one or more of the following standards, depending on the material of manufacture:

a) BS 449-2 or BS 5950 (steel);

b) BS 8110 (concrete);

c) BS 8118 (aluminium);

d) BS 5268-2 (timber).

The results of the calculations, carried out in accordance with the appropriate standard, should be included in the building manual.

Horizontal surges due to traversing should be taken as a minimum of 10 % of the vertical wheel reactions or as specified by the manufacturer.

Transverse surges due to movement of the TLG should also be taken into account.

Loads due to crabbing should also be taken into account.

The effects of thermal expansion should be taken into account when designing the track system. Particular attention should be given to the location and effect of building movement joints, rail junctions and turntables.

The planned route for a track system should:

a) ensure adequate clearance for persons between fixed and moving equipment;

b) allow clearance for all parts of the TLG when the unit is moving, for example when cornering;

c) provide clear, clearly marked emergency escape routes to a place of safety;

d) ensure that the track system and associated fixings can be examined from a safe position, which might be from the TLG itself.

The Supply of Machinery (Safety) Regulations 1992 [9] require that powered TLGs be fitted with devices that act on the tracks or guide rail to prevent derailment. This principle should also be applied to manually operated TLGs.

8.2 Mechanical stops

Mechanical stops should be provided to ensure that the TLG cannot run off its rails, for example where turntables, shunt tracks or spur tracks occur, where the track ends or where the TLG needs to negotiate movable track sections. Friction-type end stops should be avoided.

9 Design recommendations for TLGs

9.1 General

9.1.1 *Introduction*

TLGs are specialized forms of permanently installed access equipment which need particular attention at the design stage.

Depending on the particular application, a TLG might resemble a working platform, staircase or ladder. However, designers should bear in mind the following.

a) Users of TLGs might be required to remain in one position for relatively long periods of time whilst carrying out their work from the TLG. Designers should therefore consider such ergonomic matters as the width and form of treads on travelling ladders.

b) Users of TLGs will probably be required to reach outside the boundary of the TLG to carry out their work. Designers should therefore consider the safety of users and others who might be in the vicinity by providing suitable guard and handrails as well as safety anchorage points or systems.

Fall protection from the TLG should be provided. Preference should be given to the incorporation of permanent, fixed guardrails which should be not less than 1 000 mm vertical height from the top surface of the flooring or treads.

Handrail and bracing arrangements should be provided to give protection and leave openings of not more than 470 mm. Where such permanent handrails cannot be incorporated, protection may be maintained by other means, for example by the incorporation of a continuous safety harness system.

Where appropriate, fall arrest systems should be provided to allow the operatives to attach a safety harness at access points and work positions. Anchorage points should be designed to support the significant loads which would be imposed on the TLG if a fall takes place.

There should be a safe means of access and egress to and from the TLG (see **6.2**).

When a TLG is provided with an access door, that door should open inwards towards the platform and should be designed to prevent accidental opening.

Consideration should also be given to:

a) prevention of accidental movement of the TLG (see **9.1.4**);

b) sides, guardrails, flooring and toe boards, designed to prevent accidental displacement (see **9.1.5**);

c) working load limits (see **9.1.7**);

d) variable angles and the choice of ladder tread, walkway and/or ramp (see **9.2** to **9.7**);

e) any towers and/or elevating platforms or step-up brackets used on the TLG (see **10.2**);

f) special features such as pivoting and telescopic sections (see **10.3**);

g) avoidance of excessive reach and minimizing the need for extended poles (see **5.2.2**);

h) avoidance of trapping hazards between any fixed structure (e.g. overhead beams) and the TLG;

i) provision of a method of rescue (see **6.5**);

j) where appropriate, provision for the inclusion of SAE.

The above list should not be considered to be exhaustive.

9.1.2 *Wheel units*

Wheels units should be fitted with a means to prevent disengagement from the track. The design of the track system should be such that, in the event of a failure of a running component or anti-derailment device, neither the equipment nor any component can fall.

9.1.3 *Drives*

There are three types of drive systems for TLGs:

a) manual operation, where the system is moved by simply pushing the TLG by hand;

b) mechanical drive, where the TLG is fitted with a manually operated mechanical drive;

c) electrical drive, where the TLG is fitted with an electrical drive with "dead man's" control.

The drive system used should be chosen to be appropriate to the weight of the TLG and the dimensions (particularly height) of the façade.

9.1.4 *Brakes*

It is recommended that a spring applied, rope released service brake is incorporated.

Provision of parking and/or storm brakes should also be made as appropriate to the use and location of the TLG, particularly on outdoor, exposed locations.

9.1.5 *Guardrails, toe boards and flooring*

The guardrail or top edge of a rigid side member or top edge of an access door should comply with the loading requirements of BS EN 1808:1999.

Toe boards should extend at least 150 mm above the top surface of the platform floor.

Flooring should have a sound, slip-resistant surface and should be fixed so that it cannot accidentally be displaced.

Consideration should be given to the possibility of small items falling through the flooring onto areas below the equipment by:

a) tethering of small items;

b) temporary boarding over open mesh flooring;

c) safe methods of working, e.g. by restricting access to the area below the work.

9.1.6 *Motion control*

All powered motions should be controlled such that the maximum speed of any part of the equipment does not exceed 0.3 m/s. This requirement includes motions arising from rotational movements.

The force required for any manual operation should not be greater than 250 N.

The use of manual hoisting equipment is not recommended where the operating height exceeds 10 m.

9.1.7 *Working load limits*

Working load limits for people and materials should be in accordance with **6.3.2.1** of BS EN 1808:1999. Where the TLG includes decking, working load limits for the decking should be in accordance with **6.3.2.2** of BS EN 1808:1999. Where a suspended platform (SAE) is used in conjunction with the TLG, the SAE should conform to the requirements of BS EN 1808:1999.

9.2 Construction of gantries when the inclination angle from the horizontal plane is between 0° and 10°

The flooring should incorporate a slip-resistant top surface.

Guardrails and toe boards should be as **9.1.5**.

The clear width between the handrails should be not less than 600 mm.

9.3 Construction of gantries when the inclination angle from the horizontal plane is between 10° and 20°

The flooring should incorporate a method of enhanced slip resistance, e.g. by cross bars, to provide grip on the top surface.

Guardrails and toe boards should be as **9.1.5**.

The clear width between the handrails should be not less than 600 mm.

9.4 Construction of gantries when the inclination angle from the horizontal plane is between 20° and 65°

WARNING Where possible, angles between 50° and 65° should be avoided because stairs within this range encourage users to descend incorrectly.

The treads should be horizontal and have a slip-resistant top surface.

Step tread rise should be uniformly spaced at not less than 150 mm and not more than 225 mm.

Where possible the distance between the lowest tread and the lower landing and the upper tread and the upper landing should be equal to the tread spacing.

Treads should have an adequate width to give an overlap of not less than 20 mm.

Guardrails and toe boards should be as **9.1.5**.

Above an inclination angle of 45°, since a fall down the gantry becomes more likely than a lateral fall, a fall arrest system should also be incorporated.

The clear width between the strings should be not less than 600 mm.

9.5 Construction of ladders when the inclination angle from the horizontal plane is between 65° and 75°

Where there is either a variable departure level, or there is a risk of stepping a distance of more than the tread spacing from the bottom of the ladder, an end platform should be provided.

The treads should be horizontal, in line and not staggered and have a slip-resistant top surface.

Step tread rise should be uniformly spaced at not less than 225 mm and not more than 255 mm.

Where possible, the distance between the lowest tread and the lower landing and the upper tread and the upper landing should be equal to the tread spacing.

The front edge of each tread should be a minimum of 250 mm from any obstruction behind the ladder.

Treads should have a uniform width of not less than 100 mm and have an overlap of not less than 20 mm.

The clear width between the strings should be not less than 400 mm and not more than 550 mm.

Handrails should be provided at a distance of not less than 175 mm normal to the leading edge of the treads.

A fall arrest system should be provided.

9.6 Construction of ladders when the inclination angle from the horizontal plane is between 75° and 90°

Where there is either a variable departure level, or there is a risk of stepping a distance of more than the rung spacing from the bottom of the ladder, an end platform should be provided.

Where the height of a ladder exceeds six metres a rest platform should be provided. This may be achieved either by a moving platform or a series of fixed or folding intermediate platforms.

The cross-section of the rungs should not be difficult to grasp by hand. The thickness of the rungs should be not less than 20 mm and not more than 35 mm and they should have a slip-resistant top surface.

The top surface of flat-topped rungs (polygonal or D-shaped) should have a width of at least 20 mm.

The rungs should be horizontal.

All rungs should be securely fixed so as not to rotate in their supports and if the ends of the rungs protrude through the stiles they should be smoothly finished so as not to injure the user's hands.

Rungs should be uniformly spaced between 225 mm and 300 mm centres.

Where possible, the distance between the lowest rung and the lower landing should be equal to the rung spacing.

The top surface of the top rung should be level with the upper platform or landing.

There should be a clear space of 230 mm behind each rung.

The clear width between the stiles should be not less than 400 mm and not more than 550 mm.

A fall arrest system should be provided.

9.7 Construction of TLGs when the inclination angle from the horizontal plane is beyond 90°(overhanging)

TLGs for access to overhanging structures and surfaces should be designed and constructed to allow operators to work from an integrated platform or platforms. The use of simple ladders in these situations is not recommended.

9.8 Construction of box ladders

Box ladders consist of a lattice box frame and internal platforms. The box frame should include horizontal rungs that the operator can climb, fully enclosed by the frame.

Such TLGs include working platforms situated at pre-designated positions, but at least 2.5 m above each other, to provide secure working stations to access the façade. The platforms are hinged for access from beneath, only opening in an upward direction for safety purposes.

9.9 Construction of variable geometry TLGs

Where different sections of the same TLG vary in angle each section should conform as closely as possible to the recommendations of **9.2** to **9.7** appropriate to each range of angles.

9.10 Travelling mast climbing work platforms

Mast climbing work platforms are a special form of TLG generally consisting of a working platform mounted on a travelling vertical mast supported by upper and lower wheel units. These working platforms provide access to simple façades with limited height.

The working platform itself can be raised or lowered on the mast by a suitable drive system, incorporating a safety device to protect against failure of the mechanism.

NOTE 1 It is desirable to be able to control the traverse motion of the working platform from any position on the mast.

NOTE 2 It is recommended that manual operation of mast climbing work platforms is not considered on elevations greater than 10 m.

The design recommendations for TLGs generally apply to mast climbing work platforms.

Working load limits should be at least in accordance with **6.3.2.1** of BS EN 1808:1999.

The dimensions and safety features of the work platform should be in accordance with the appropriate requirements of Clause **7** of BS EN 1808:1999.

Since mast climbing work platforms might be installed in areas which can be difficult to access by other means (e.g. over roads and rivers) it is essential that the method of emergency rescue of operators is considered during the design stage.

10 Ancillary features of TLGs

10.1 Introduction

Ancillary equipment includes items such as:

a) tower sections;

b) sliding mechanisms;

c) underslung monorails; and

d) pivot points.

Where ancillary equipment is to be used in conjunction with, or built up on or under the TLG, the areas where this is to be carried out and the procedure should be clearly defined. If the ancillary equipment is only to be used when the gantry is static, electrical or mechanical interlocking of the traverse system should be incorporated.

These items should be purpose designed to suit the TLG and in combination with all other pieces of ancillary equipment. The worst-case configuration of all ancillary items should be considered in the design of the TLG.

Where TLGs are intended to be used in conjunction with SAE this code of practice is supplemented by BS EN 1808:1999 and BS 6037-1:2003.

Suitable safety features and warnings should be incorporated to avoid injury to operators and others in the vicinity.

Clear instructions on the use and limitations of any piece of ancillary equipment should be included in the manual for the TLG system.

10.2 Tower sections

A TLG can include a tower (e.g. a mobile elevating work platform, scissor lift or purpose-designed structure) to allow safe access to the higher reaches of an atrium (or similar structure). The tower might have to be collapsible for parking or for re-positioning along the TLG. The tower should be attached to the TLG by a captive system.

An interlock should be provided to prevent a collision between a tower section and an obstruction.

10.3 Extending TLG sections

A TLG can include an extending section, which might be telescopic or drop down. In the case of telescopic mid-sections the TLG will usually expand and contract automatically as it traverses but in the case of telescopic or drop-down end sections an interlock should be provided to prevent collision with an obstruction.

The extending section should be fully load bearing and capable of supporting the loads likely to be imposed upon it.

10.4 Underslung rails

Rails can be fixed to the underside of a TLG to support a dedicated suspended platform providing access to the space or façade below the TLG.

The TLG should incorporate a safe means of rigging access for the suspended platform and hatchways in floor panels for access to rigging points should be sufficiently small to prevent a person falling through.

Special attention should be made to the method of operation and the interlocks necessary when a TLG is used in conjunction with SAE.

10.5 Pivot points

A TLG can include a pivot point to a wheel assembly at one or both ends to allow the TLG to smoothly negotiate bends and curves in the track system. Interlocks and other safety devices should be incorporated in the TLG and track system where appropriate.

10.6 Moving platforms for ladders

Moving platforms for ladders are hoisted person-riding platforms. A mechanical winch (or similar device) should be provided within the platform for ease of raising and lowering. The platform should run the length of the ladder via a twin captive rail. A safety device to prevent uncontrolled descent of the platform should be incorporated.

11 Protection against lightning

Where a TLG is operated in exposed conditions protection for the whole TLG against lightning should be taken into account by the architect or designer of the building and the equipment manufacturer to enable protective measures to be taken by a lightning protection specialist.

Provision should also be made to enable outdoor track systems to be connected to the lightning protection system by the lightning protection specialist.

NOTE Guidance on protection of structures against lightning is given in BS 6651.

12 Electrical systems

12.1 General

The electrical power supply system serving the TLG should be designed, installed, maintained and tested in accordance with BS 7671. The power supply to the TLG should form part of the maintained power supply for the building and generally takes the form of a series of plugs and sockets used in conjunction with a trailing cable or an enclosed busbar.

All electrical equipment and wiring should be selected for the foreseeable conditions of use including accidental impact, climatic (i.e. wet) conditions and environmental damage. Additional mechanical protection should be provided where necessary.

Power outlet sockets and busbars should be weatherproof and the sockets located at conveniently accessible locations that minimize the risk of the power supply cable becoming damaged by the TLG during operation.

12.2 Mains power supply

A dedicated electrical supply should be provided in consultation with the manufacturer or supplier of the TLG. This supply should be of adequate capacity with regard to voltage drop and current rating, and should be provided with appropriate short-circuit protection and an easily accessible residual current device (RCD) having a rated tripping current of not more than 30 mA with no adjustable time delay.

There should be efficient earth continuity, provided by additional suitably rated conductors where necessary, connected to the main earth connection at the point of supply. The supply point should be fitted with a suitably rated disconnecting and isolating switch incorporating “lock off” facilities conforming to BS EN 60947-3. The supply point switchgear should be easily accessible at all times.

12.3 Power supply cables

Cables feeding electrical power from the supply points to TLGs (and any associated SAE) should be of adequate length to allow for all movements. Whilst being reasonably flexible they should also be sufficiently robust to permit repeated use and be routed so that they do not cause a hazard or become subject to mechanical damage. Cables should be terminated in appropriate fittings that will ensure earth continuity. In addition, an anchor system should be fitted at the cable ends to avoid excessive loads being imposed on the plugs/sockets.

12.4 Electrical safeguards

The safety features of the electrical installation should conform to BS EN 60204-1.

All metal parts should be effectively bonded together with efficient continuity to earth. This can require the provision of additional bonding conductors at joints and at connections of the structural parts of the TLG. Where cables are taken into enclosures it is essential that the gland system used maintains the integrity of the bonding and earthing.

13 Hydraulic and pneumatic systems

For hydraulic and pneumatic systems Clause **10** of BS EN 1808:1999 should be followed.

14 Control systems

14.1 Safety related controls

14.1.1 *General*

For power operated equipment Clause **11** of BS EN 1808:1999 should be followed, where appropriate, for safety related parts of control systems.

14.1.2 *Safety interlocks*

Where it is necessary to operate a TLG in close proximity to scenic lifts or other mobile devices installed on the same building or a neighbouring building, suitable interlocks or controls should be provided for the TLG and the work planned to remove any danger of the TLG colliding with the scenic lifts or mobile devices.

Where interlocks are to be provided on access gates they should be in accordance with **7.4** of BS EN 1808:1999.

14.1.3 *Emergency stops*

For emergency stop equipment see **11.6** and Table 11 and Table 12 of BS EN 1808:1999.

14.2 Layout and operation of controls

All controls should be arranged in a clear and logical sequence. The possibility of operators wearing gloves should be taken into account.

The equipment should be provided with hold-to-run controls.

The direction and the movement of all operations should be clearly indicated on or near the controls by words and/or symbols.

15 Safety devices

15.1 A mechanical end-of-travel stop should be provided for both manual and power operated systems to arrest and sustain the TLG if contact is made at maximum travelling speed.

15.2 Where the TLG traverse system is power operated, a travel limit switch should be provided to stop motion before the TLG makes contact with the mechanical stop.

15.3 Where the TLG is to operate on an inclined runway a safety device should be provided to arrest and sustain the TLG in case of failure of the traverse system.

15.4 Where the TLG can be traversed into positions where the headroom above the platform becomes restricted, emergency stop buttons should be provided in readily accessible positions unless other effective measures are taken to protect the user(s).

15.5 During powered traversing of the TLG an audible signal should warn persons that it is moving.

15.6 A means of locking the TLG to the runway rail or building should be provided at the parking position, particularly on outdoor equipment.

16 Marking

The TLG should be clearly and durably marked with the following information in a position where it can easily be read:

a) name and address of manufacturer and/or supplier;

b) name and/or number of model;

c) serial number and year of manufacture;

d) the rated load and the maximum number of persons on the TLG;

e) where the TLG is to be used in conjunction with SAE then the rated load of the suspended platform (where the suspended platform is permanently attached to the system) or the maximum total suspended load (where the system has a suspended platform which can be de-rigged). See BS 6037-1:2003 for the marking of the platform.

NOTE Dedicated track systems do not need to be marked separately.

17 Commissioning, verification and handover

Following completion of the installation the installer should carry out commissioning and/or load tests on the TLG at site to assess whether it is capable of fulfilling the performance specifications and safety requirements. The following tests should be carried out on the TLG in its working configuration and the results documented in the technical file for the equipment.

a) Safety related components of the TLG should be functionally tested in accordance with BS EN 1808:1999, Table 12, where applicable.

b) Static and dynamic tests should be carried out at factors of 1.5 and 1.1 respectively of the rated load of the TLG. The dynamic test should include all functions including traversing the equipment over the full extent of the building.

Following any alterations or adjustments to the TLG the competent person should assess which, if any, functional tests on the equipment need to be repeated before the equipment can be put into service.

It is a legal requirement under the Supply of Machinery (Safety) Regulations 1992 [9] that the TLG is not handed over for use until all commissioning tests have been completed successfully and documented.

The results of the works tests carried out on the TLG should also be included in the handover documentation.

18 Responsibilities of the duty holder

The duty holder should ensure that:

a) a designated route to and from all parts of the TLG and the areas of the building it is designed to access is provided for the persons listed in **6.2**;

b) only designated persons who have received training and demonstrated competence in using and/or maintaining the TLG are allowed to use or maintain the TLG;

c) operators are provided with any personal protective equipment stated in the building manual as being necessary for carrying out their work;

d) notices are provided where necessary as detailed in Clause **20**;

e) the TLG is maintained so that it is safe to use;

f) a competent person is selected and trained to conduct thorough examinations;

g) the TLG is examined every six months or in accordance with an examination scheme for the particular installation;

h) any remedial or other work on the TLG which is found to be necessary before it can be safely returned to service is carried out satisfactorily and promptly without jeopardizing the safety of operators or other persons;

i) all persons using, maintaining and carrying out thorough examinations of the TLG are informed of any changes in the TLG operating conditions which could affect the current risk assessment and these should also be included in the building manual;

j) relevant documents, e.g. manufacturer's or supplier's instructions and maintenance records, are made available to persons as required;

k) all documentation, including records, certificates and test reports/results, conforms to the relevant regulations and is kept available for inspection for as long as necessary (see Clause **23**);

l) records are kept up to date (see Clause **23**);

m) any features (e.g. flagpoles, CCTV cameras, mobile phone and communication aerials and dishes, boiler flues, adjacent buildings, illuminated signs, chiller units, cooling towers) added to the building after the installation of the TLG do not interfere with the operation of the TLG.

19 Instructions for use

19.1 General

The TLG should be used in accordance with the manufacturer's or supplier's instructions.

NOTE A list of information to be provided by the manufacturer for the use and maintenance of a TLG is given in BS EN 1808:1999, Clause **14**.

The manufacturer's or supplier's instructions should include clear and concise operating instructions (see **19.2**) covering tasks such as safe access to the equipment, rigging and de-rigging procedures, location of power supply points and the safety of the general public.

19.2 Content of operating instructions

The operating instructions should include the following where applicable:

a) the name, address and telephone number of the organization to be contacted in case of emergency;

b) an instruction for users to carry a communication device allowing direct contact with the duty holder or a competent person inside the building or stationed nearby;

c) an instruction that the installation is to be used only for the purpose(s) for which it is designed;

d) an instruction that the installation is only to be used by designated users;

e) an instruction that outdoor equipment is not to be used in adverse weather conditions or if electrical storms are forecast for the area;

f) the wind speeds appropriate to the safe operation of outdoor equipment;

NOTE The operating wind speed will always be substantially less than the design wind speed.

g) an instruction for operators to wear and use any personal protective equipment (including safety harnesses) stated in the building manual as being necessary to carry out their work safely (see also Clause **6**);

h) an instruction to secure any loose items on the TLG with lanyards to minimize the risk of injury to others from falling objects;

i) an instruction to keep all the safety devices operational at all times;

j) the precise movement operated by each control;

k) the location of power supply points;

l) the rated load that may be imposed on the TLG and, where applicable, the suspended platform;

m) clear procedures to be carried out by a competent person in case of malfunction of the equipment or power supply failure or evacuation of the building;

n) any special obligations on the building owner and the operator to comply with requirements of local authorities (e.g. to provide barriers and/or warning notices below the work area);

o) the approved means of access to and from the TLG and, where appropriate, any SAE for users, with an instruction that under no circumstances are users to enter or leave a TLG by unapproved means unless in an emergency and when so directed by a competent person;

p) an instruction to return the TLG to the specified parking position after use, storing any detachable parts in a safe manner and applying the parking brake;

q) an instruction that no lifting device other than that specified is to be attached to or used from a TLG;

r) an instruction that any malfunction of the equipment is to be immediately reported to the duty holder or his representative;

s) a statement that no TLG is to be left unattended in a position where it could be misused.

20 Provision of notices

The duty holder should ensure that notices are provided where necessary:

a) below the workplace to warn the public that the TLG is in use;

b) to notify operators that the TLG is out of service and may not be used;

c) to prohibit the use of the TLG on certain areas of the building and to advise users to adopt certain safeguards when operating the equipment in specific locations, for instance adjacent to flues, vents and electrical equipment.

21 Training and instruction

The Management of Health and Safety at Work Regulations 1999 [7] require employers to ensure that their employees are provided with adequate health and safety training on recruitment and on being exposed to new or increased risks. In the context of TLGs this particularly applies to working at height, operation and maintenance. The Provision and Use of Work Equipment Regulations 1998 (PUWER) [10] further requires training for users, supervisors and managers. The duty holder should therefore ensure that only trained operators use the TLG.

Training of operators should include instruction in the following:

a) familiarization with the site-specific risk assessment (see **4.2**) and method statements;

b) operation of the TLG;

c) safety systems including the approved means of safe access and egress;

d) emergency procedures including the procedure to be followed to allow for safe escape in the event of a malfunction of the equipment or an emergency situation;

e) the operating parameters of the TLG;

f) carrying out of pre-use checks.

Depending upon the complexity of the TLG, refresher training should be given at appropriate intervals.

22 Inspections, maintenance, thorough examinations and testing

22.1 General

Pre-use checks, inspections, maintenance and testing of the TLG during its working life should be carried out in accordance with the manufacturer's or supplier's recommendations and include all components of the equipment itself including demountable parts and ancillary systems as well as all associated supporting structures and roof fixings.

There are four levels of inspection/examination, maintenance and testing which should be carried out:

a) pre-use checks carried out by the operator(s) before commencing work each day or each shift (see **22.2**);

b) inspections and maintenance, generally carried out at three-monthly intervals, with a more extensive inspection carried out generally at six-monthly intervals (see **22.3**);

c) load testing carried out annually (see **22.4**);

d) thorough examinations generally carried out at six-monthly intervals (see **22.5**).

The duty holder should ensure that the four levels of inspection/examination, maintenance and testing are carried out and that reports are issued and retained (see Clause **23**).

If the person carrying out the pre-use check, inspection, maintenance, testing or thorough examination finds any defect which could, in his opinion, jeopardize safe operation of the TLG it is essential that the TLG is immediately withdrawn from service and the defect brought to the attention of the duty holder without delay.

The duty holder should ensure that any remedial or other work on the TLG which is found to be necessary as a result of a pre-use check, inspection, testing or examination is carried out satisfactorily without jeopardizing the safety of operators or other persons before the equipment is returned to service.

No maintenance of the TLG should be carried out whilst the equipment is being used by operators carrying out maintenance work on the building.

22.2 Pre-use checks

The operators should carry out a visual inspection of the TLG before commencing work each day or each shift to check whether any parts of the equipment are obviously loose or have been removed and whether all parts of the TLG and associated track systems appear to be in good condition.

Where the TLG is used outdoors the operators should check whether any electrical storms are forecast for the area [see also **19.2**e)].

The runway and surrounding area should also be checked for any obstructions and cleared if necessary.

The power supply to the TLG should be switched on, the RCD checked and a functional test of all movements carried out to determine whether the equipment is functioning correctly and is ready for use.

22.3 Inspections and maintenance

The scope of the inspections and maintenance should be in accordance with the manufacturer's or supplier's recommendations. Their frequency should be determined by carrying out a risk assessment and will depend on the design, purpose and frequency of use of the particular installation.

Inspections and maintenance of the TLG should be carried out by a competent person in accordance with the manufacturer's or supplier's instructions.

The competent person should inspect all components of the equipment itself including, but not restricted to the following:

a) the TLG structure itself;

b) drive motors, gearboxes and associated items;

c) safety devices;

d) moving parts, e.g. travel wheels and rollers;

e) SAE if incorporated (see BS 6037-1:2003);

f) tracks;

g) supporting structures and connections to the building structure, e.g. track supports and roof fixings;

h) any demountable parts.

The competent person should check for wear, corrosion and correct operation to determine whether the equipment is fit for further use. Parts which are found to be worn or defective should be repaired or replaced as necessary. Before any major repair or replacement work is commenced a method statement and risk assessment for the task(s) should be prepared and a copy issued to the duty holder. All work carried out during inspection and maintenance should be documented in a report, which should be issued to and retained by the duty holder.

Where moving parts require lubrication, the lubricant used should be in accordance with the manufacturer's or supplier's recommendations and care should be taken to ensure that lubricant is not transferred to any other items where this could adversely affect operation of the equipment or damage the building.

22.4 Load testing

Annual load tests should be carried out on the TLG at intervals not exceeding 13 months.

After every two years service the load testing should be arranged to coincide with a thorough examination in order to allow the competent person carrying out the thorough examination to witness the load testing.

The TLG should be evenly loaded with its rated load (which by necessity might include operators) and operated over its full range of movement. During this test the TLG should be observed closely to determine whether it functions correctly under load and whether any deterioration which could affect the safe operation of the equipment is apparent. All limit switches and under/overload detection devices should also be observed during the test to determine whether they are functioning correctly.

On successful completion of the load testing the competent person supervising the load test should issue a certificate to the duty holder.

22.5 Thorough examinations

Where TLGs incorporate man lifting equipment it is a requirement of the Lifting Operations and Lifting Equipment Regulations 1998 (LOLER) [11] that they be thoroughly examined every six months or in accordance with an examination scheme. For TLGs not incorporating man lifting equipment it is considered good practice to carry out similar examinations as part of the duty holder's responsibilities under PUWER.

Where thorough examinations are to be carried out in accordance with a written examination scheme, a site-specific risk assessment should be carried out to allow the examination scheme to be drawn up.

Thorough examinations should include close visual inspection and, where appropriate, testing of all safety-critical components of the equipment to determine whether there are any signs of distress, overstrain, corrosion or dislodgement and to determine whether the equipment is functioning correctly. The examination should include the operation of all functions over their full working range.

On completion of the thorough examination the competent person carrying out the thorough examination should issue a report to the duty holder.

Where the thorough examination identifies an existing or imminent serious defect which could affect the safe use of the TLG, the competent person should immediately issue a rejection note to the duty holder. If the TLG includes man lifting equipment, a copy of the thorough examination report should also be sent to the relevant enforcing authority.

The duty holder should ensure that any remedial or other work on the TLG which is found to be necessary as a result of the thorough examination is carried out satisfactorily without jeopardizing the safety of operators or other persons. In the case of existing or imminent serious defects which could affect the safe use of the TLG, remedial work should be carried out before the equipment is returned to service.

22.6 Supplementary tasks

In addition to the thorough examinations detailed in **22.5**, certain safety critical components should be subjected to detailed periodic examination. The detailed nature and extent of these supplementary examinations and their frequency should be identified by carrying out a site-specific risk assessment and will depend upon the design and purpose of the particular installation, with any manufacturer's or supplier's recommendations being taken into consideration.

Supplementary thorough examination tasks should generally be carried out at intervals of ten years.

The supplementary examination should include the following tasks, where appropriate.

a) All fixings and associated track holding down units should be inspected for indications of water ingress. If water ingress and possible consequential corrosion is suspected, or other reasons are found to suspect their integrity, then a representative sample of at least 5 % should be fully exposed for examination.

Particular attention should be paid to track holding down units in uplift.

b) Any articulating bogies of the TLG, central swivel units of turntables and other safety critical components should be stripped down to assess their condition. This assessment should include non-destructive testing (NDT) by an approved NDT engineer.

The tasks listed above should not be taken to be exhaustive.

Whilst it is not necessary for the supplementary thorough examination tasks to be witnessed by the person carrying out the thorough examinations, unless he so requires, it is essential that, once the tasks have been carried out, certificates are issued to the duty holder by the organisation carrying out the work, and retained for future reference. It is also essential that the dimensions of any safety critical components which are found to be worn, but judged to be suitable for further service, be recorded on the certificates where appropriate.

23 Record keeping

The duty holder has a legal obligation to ensure that the CE declaration of conformity (where applicable, see BS 6037-1:2003, Annex A), certificates of incorporation (where applicable, see BS 6037-1:2003, Annex A), commissioning test results and the first thorough examination report issued for the TLG are kept available for inspection for as long as the equipment is in use. All subsequent thorough examination reports should be kept available for inspection for a period of at least two years from the date of the thorough examination.

In addition the following should be made available to any competent person involved in the use, maintenance and thorough examination of the equipment, and to any enforcing authority:

a) certificates for any load tests or supplementary tests carried out on the equipment for the period of their validity (see **22.4** and **22.6**);

b) certificates for all safety related components;

c) records of the latest inspection and maintenance carried out;

d) details of any major repairs (see **22.3**) or changes to the TLG;

e) an up-to-date list of competent persons who have had specific training in the operation of the TLG.

24 Changes to the TLG

If changes, renewal or upgrading of the TLG becomes necessary as a result of, for example, alterations to the building or wear and tear of the TLG, the recommendations given in Clause **5** regarding the exchange of information should be followed where applicable.

It is essential that no changes, renewal or upgrading of the TLG be made until the design structural calculation data has been obtained from the following sources and used to verify the proposed alteration:

a) the building manual;

b) the manufacturer or supplier of the TLG;

c) the architect or designer of the building;

d) the results of investigation, calculation and testing.

It is essential that the design structural calculation data obtained include the design details of the anchor units and/or associated building structure.

The TLG should only be changed or modified by companies employing suitably qualified and experienced personnel who are fully conversant with current regulations and codes of practice relating to the design and use of TLGs.

No alteration of the TLG should be carried out whilst the equipment is being used by operators carrying out maintenance work on the building.

The whole TLG should be subjected to a thorough examination by a competent person on completion of the changes, renewal or upgrading.

NOTE It might also be necessary to carry out a static and dynamic load test before the TLG is returned to service.

The building manual and any other manuals or documentation relating to the TLG should be revised where necessary to incorporate all changes made to the TLG.

Operators and maintenance staff should be made aware of any changes made to the TLG and given retraining where necessary.

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