

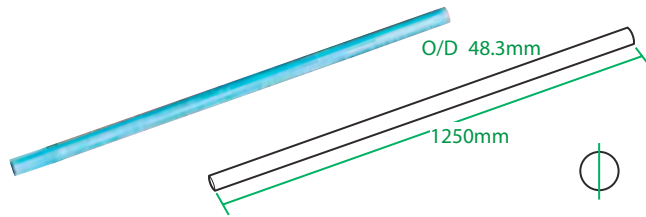
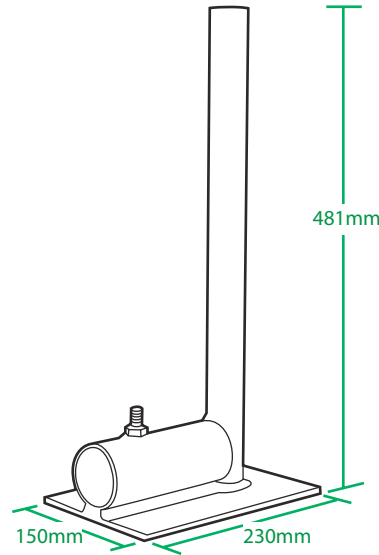


Safesite Cantilevered Edge Protection System Specification



BASE FOOT - SL 101A

This component provides support to the system and is utilised where cantilever tubes and counter weights are required. The base is bonded with fluted rubber matting for membrane protection. Material : galvanised steel to BS EN ISO 1461. Component weight : 4.3kg



CANTILEVER TUBE - SL 104

This component provides the link between the counter weight and base foot. Material : galvanised steel to BS EN ISO 1461. Component weight : 4.6kg



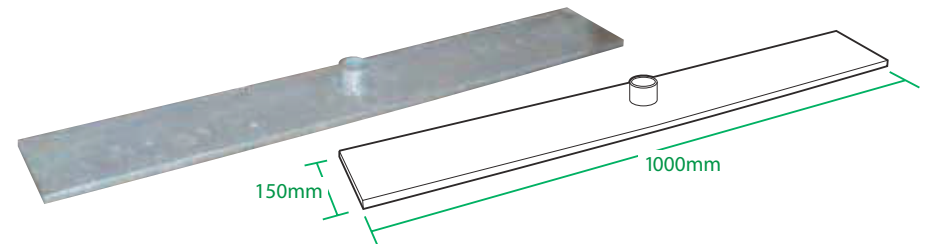
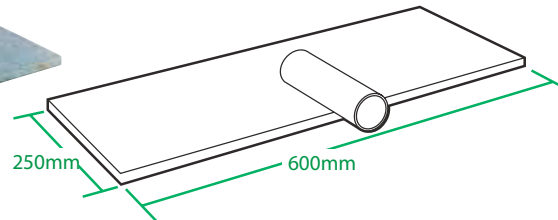
SYSTEM PLAQUE - SL 111

Provides details of the given system and approvals. Material : plastic. Component weight : 0.085kg.



COUNTER WEIGHT - SL 106

This component provides the stability to the system. The base is bonded with fluted rubber matting for membrane protection. Material : galvanised steel to BS EN ISO 1461. Component weight : 19.7kg.



COUNTER WEIGHT - SL106A

Ditto description as SL-106. This is a specially fabricated counter weight for utilisation on cladded roofs. The dimensions of the counter weight are adjusted to suit the given proprietary cladding panel.

GENERAL

System 2000 is a fully cantilevered guardrail without any requirement for physical fixing into the roof's structure/membrane. The complete system's design, manufacture, testing and installation has been externally assessed by the British Board of Agrément and issued with a BBA Certificate No. 95/3182.

MATERIALS

System 2000 is fabricated from steel to BS EN 10025 S275 Grade : 1993 and S275JO Grade. All steel components are then hot dipped galvanised to BS EN ISO 1461. Guardrail upper and lower rails are produced in steel - 48.3mm external diameter. All fixing screws are A2 Grade Stainless Steel and are greased before installation. All cast clamps used to join the guardrail are galvanised malleable cast iron produced to BS EN 1562 : 1997 founding malleable cast iron. All components in contact with the roof membrane are covered with 3mm fluted rubber. Counter weights are totally fabricated in steel. Where tubing is cut on site zinc rich paint is applied to the cut end of the tube.

LAYOUT

Height of guardrail is set at 1100mm. All vertical supports are set at no more than 2M centres with counter weights set at no more than 4M centres on astraight run. All stop ends are double counter weighted or supported by way of a wall/ladderclamp.

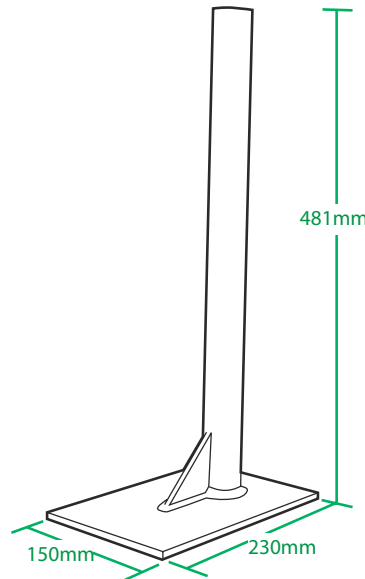
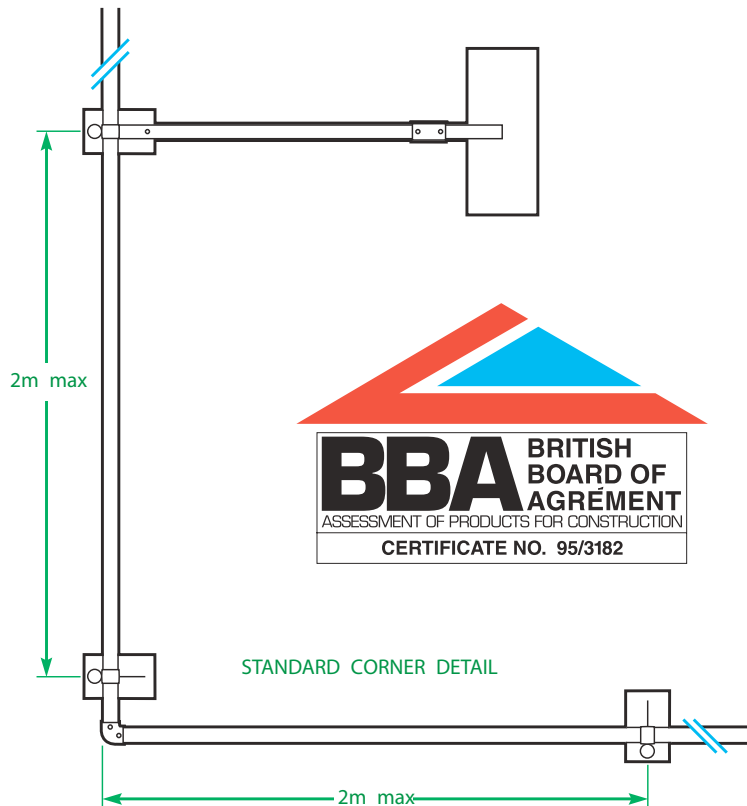
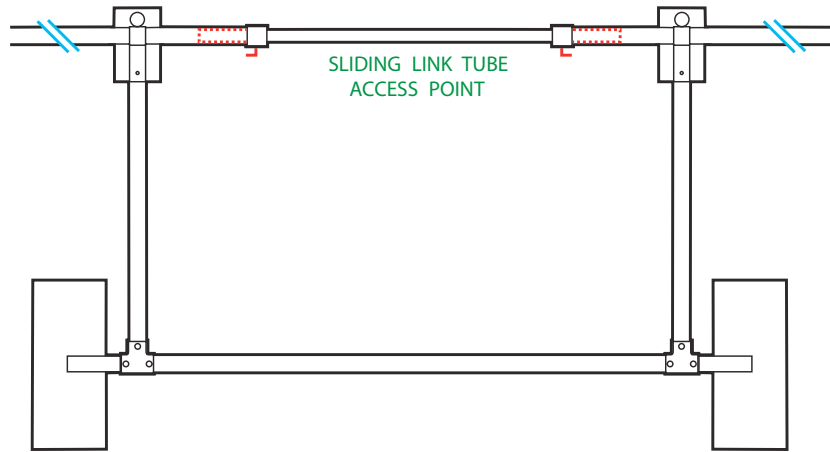
TEST CRITERIA

- System 2000 was tested to the Health & Safety Executives Specialist Inspectors Report No 15 by the British Standards Institute (BSI) and the National Engineering Laboratory (NEL).
1. All testing was carried out on a roof pitch of 10° as the Building Regulations stipulate a flat roof can be 0°-10° in pitch.
 2. All guardrail testing was carried out on a 6M straight run of guardrail without end returns.
 3. A 0.7kN load was applied to the top rail at the very end of the 6M straight run with out moving more than 100mm at the base.
 4. Ditto above with a 0.3kN load applied to the top rail between vertical supports in the first bay from one end. Tube deflection not to exceed 35mm.

WIND LOADING

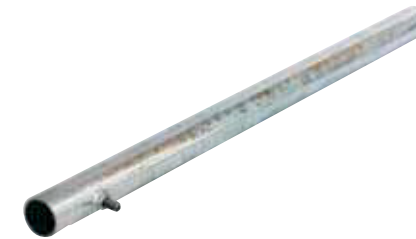
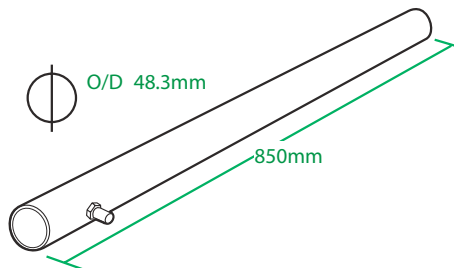
System 2000 was assessed by the British Board of Agrément to ensure compliance with BS 6399 : Part 2 : 1997 Code of Practice for Wind Loads. This is fully documented and approved by the British Board of Agrément.

Safesite Cantilevered Edge Protection System Specification



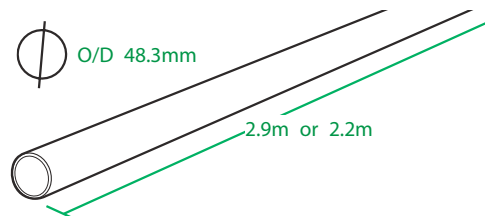
INTERMEDIATE BASE FOOT - SL 101C

This component provides support to the system and is utilised as an intermediate base between those requiring a counter weight. The base is bonded with fluted rubber matting for membrane protection. Material : galvanised steel to BS EN ISO 1461. Component weight : 2.9kg.



SUPPORT LEG - SL 103

This component provides height adjustment to the system. Its unique telescopic design allows re-roofing operations to continue without the need to move the system. Material : galvanised steel to BS EN ISO 1461. Component weight : 3.1kg.

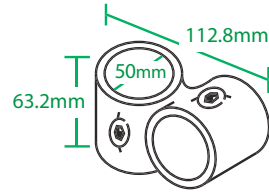


MAIN RAIL TUBE (2.9M - SL 102) (2.2M - SL 107)

Supplied in two sizes for convenience, these components provide the horizontal rails of the system. Material : galvanised steel to BS EN ISO 1461. Component weight : 10.4kg. & 8.1kg.

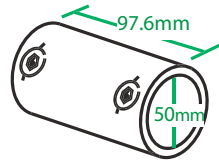


SPECIFICATION Safesite Cantilevered Edge Protection System Specification



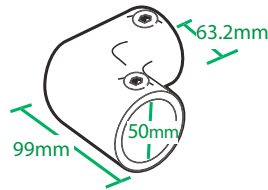
CROSS OVER CLAMP - SL 200

This component provides the method of linking the horizontal main rail tubes (SL102 & SL107) to the support legs. Material : malleable cast iron to BS 1562 and galvanised to BS EN ISO 1461. Component weight : 1.1kg.



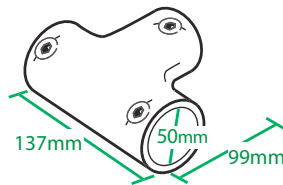
ON LINE CONNECTOR - SL 201

This component provides the method to link the horizontal main rail tubes (SL102 & SL107) and also the counter weight (SL106) to the cantilever tube (SL104). Material : malleable cast iron to BS 1562 and galvanised to BS EN ISO 1461. Component weight : 0.87kg.



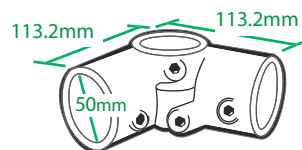
90° ELBOW - SL 203

This component provides the means of dealing with corners and changes in level. Material : malleable cast iron to BS 1562 and galvanised to BS EN ISO 1461. Component Weight : 1.1kg.



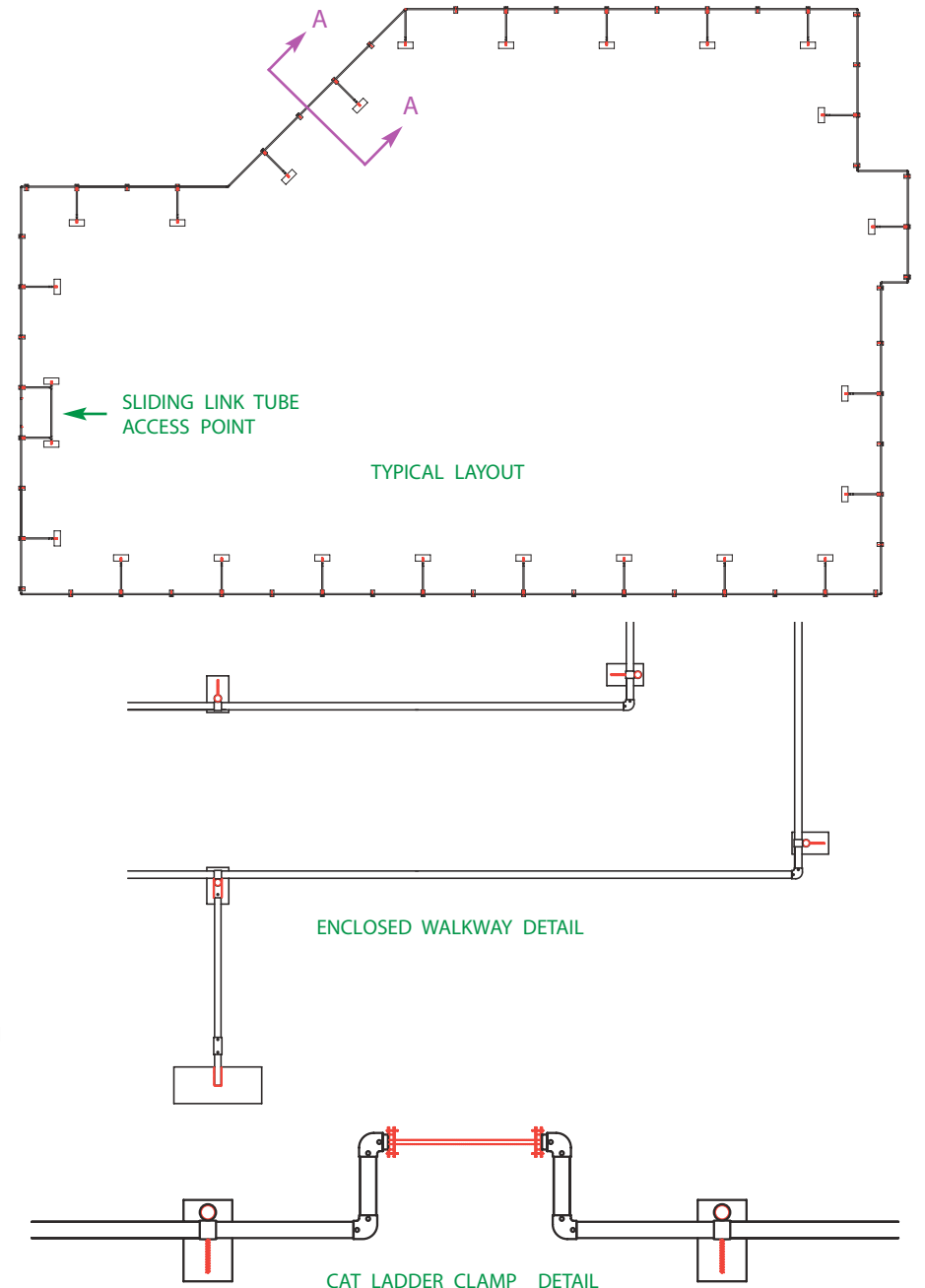
T-CONNECTOR - SL 204

This component is utilised in many different instances, for example, to provide a double counter weight end detail and also changes in level. Material : malleable cast iron to BS 1562 and galvanised to BS EN ISO 1461. Component weight : 0.96kg.

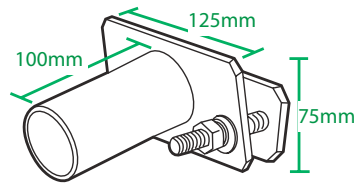
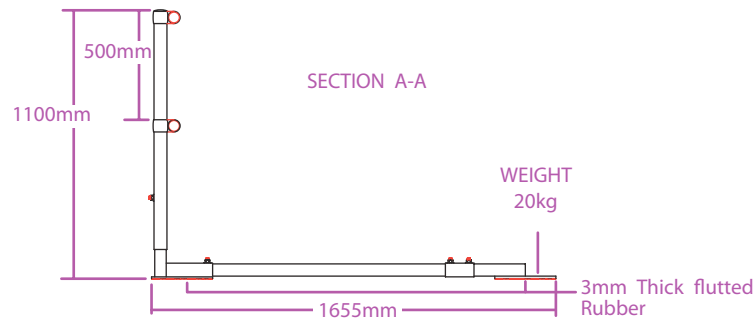


ADJUSTABLE ELBOW - SL 205

This component is utilised to deal with non 90 degree corner details and changes in level. Material : malleable cast iron to BS 1562 and galvanised to BS EN ISO 1461. Component Weight : 1.2kg.

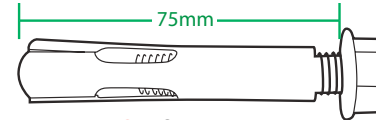


Safesite Cantilevered Edge Protection System Specification



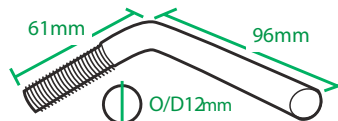
WALL/LADDER CLAMP - SL 109C

This component provides the means to terminate the system against a facade or clamp the system to a cat ladder/structure where the stringer is a maximum of 70mm wide.
Material : galvanised steel to BS EN ISO 1461. Component weight : 1.1kg.



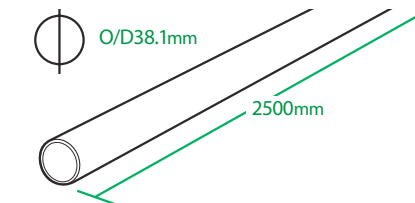
WALL FIXING - SL 110

The wall fixing is utilised in pairs in conjunction with a Wall Clamp (SL 109c)
Material : stainless steel. Component weight : 0.064kg.



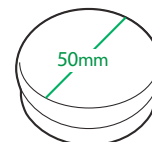
L BOLT - MMA 005

This component is utilised in conjunction with a link tube (SL 108) and a pair of on line connectors (SL 201) when one is providing a sliding link tube access point. One of the grub screws, of each of the on line connectors (SL 201) is replaced with an L-bar. The L-bars in each of the on line connectors provides the means of locking the link tube in place. Material : stainless steel. A2-50 component weight : 0.113kg.



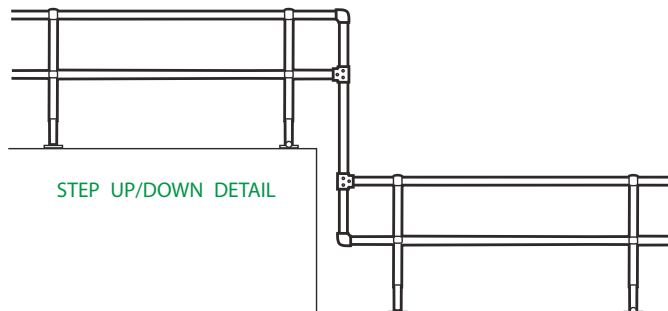
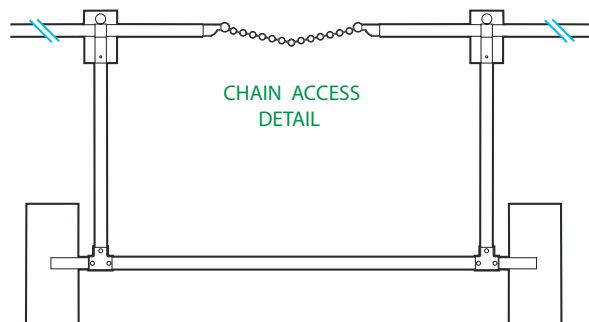
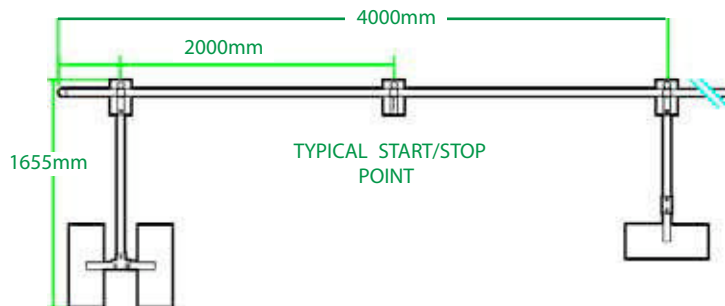
LINK TUBE - SL 108

This component provides a telescopic entrance/exit point within the main rail tubes length at any desired position. The link tube is utilised with an on line connector (SL201) adapted with L-bolts to provide the means of locking the link tube to the main rail tubes when not in use.
Material : galvanised steel to BS EN ISO 1461. Component weight : 6.5kg.



PLASTIC CAP - SL 105

This component is fitted to the top of the support leg (SL103) to prevent water ingress. It is also fitted to the exposed counter weight tube (SL106) when the system is installed.
Material : PVC. Component weight : 0.009kg.



System 2000 Assembly Guide

1. Base Feet and Support Leg (SL101A) (SL101C) Feet (SL103) Leg.

Stand a base foot (SL101A) or (SL101C) on a flat surface, slide the support leg (SL103) over the base foot as shown, (make sure the grub screw is at the bottom of the support tube).

Rotate the support leg until the grub screw is on the right hand side of the base foot.

Repeat the procedure for the required amount of legs.

2. Setting the Height of the Base Foot and Support Leg.

Raise the support leg up from the base foot 275mm and lock the grub screw using a 6mm allen key. Use this procedure for all required feet and legs.

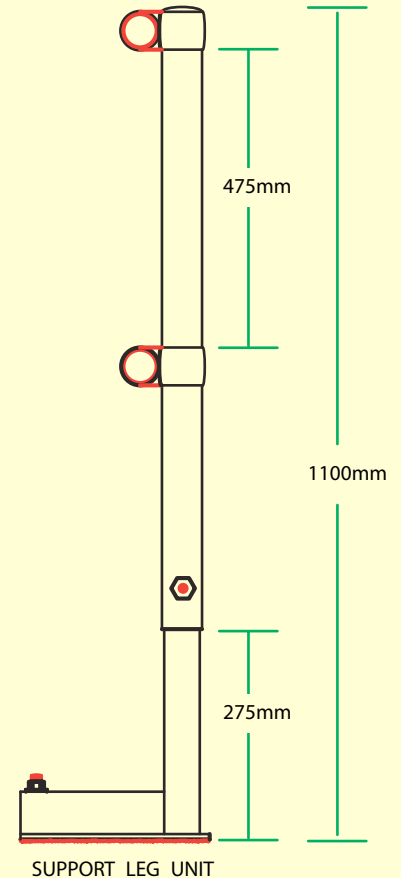
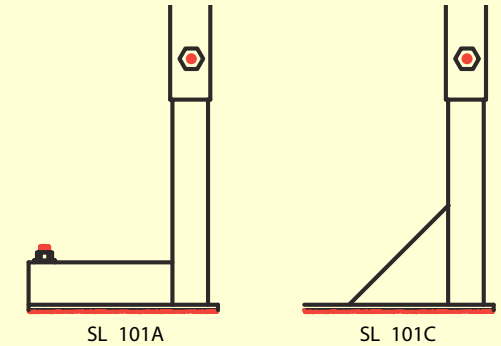
3. Fixing the 90° Cross Over Clamps (SL200) to the Support Leg

Slide 2 No. cross over clamps onto the support leg with the grub screws facing down. You should be able to read SAFESITE BBA 95/3182 on top of the cross over clamp. Place the top cross over clamp flush with the top of the support leg, making sure that the cross over clamp is square with the base foot. (The grub screw of the cross over should be in line with the grub screw of the support leg) tighten the grub screw.

Slide the second cross over clamp up until there is 475mm gap between the bottom of the top cross over clamp and the top of the second cross over clamp. Turn the cross over clamp until it is square with the base foot making sure the grub screw of this support leg aligns with the top cross over grub screw, and the base foot grub screw. Tighten the grub screw of this cross over. Repeat to all legs.

The support leg with a base foot (SL101A) is now known as a weighted leg.

The support leg with a base foot (SL101C) is now known as a budget leg.



4. Laying Out Support Leg And Main Rail Tubes (SL102) 2.9m (SL107) 2.2m Main Rail Tube

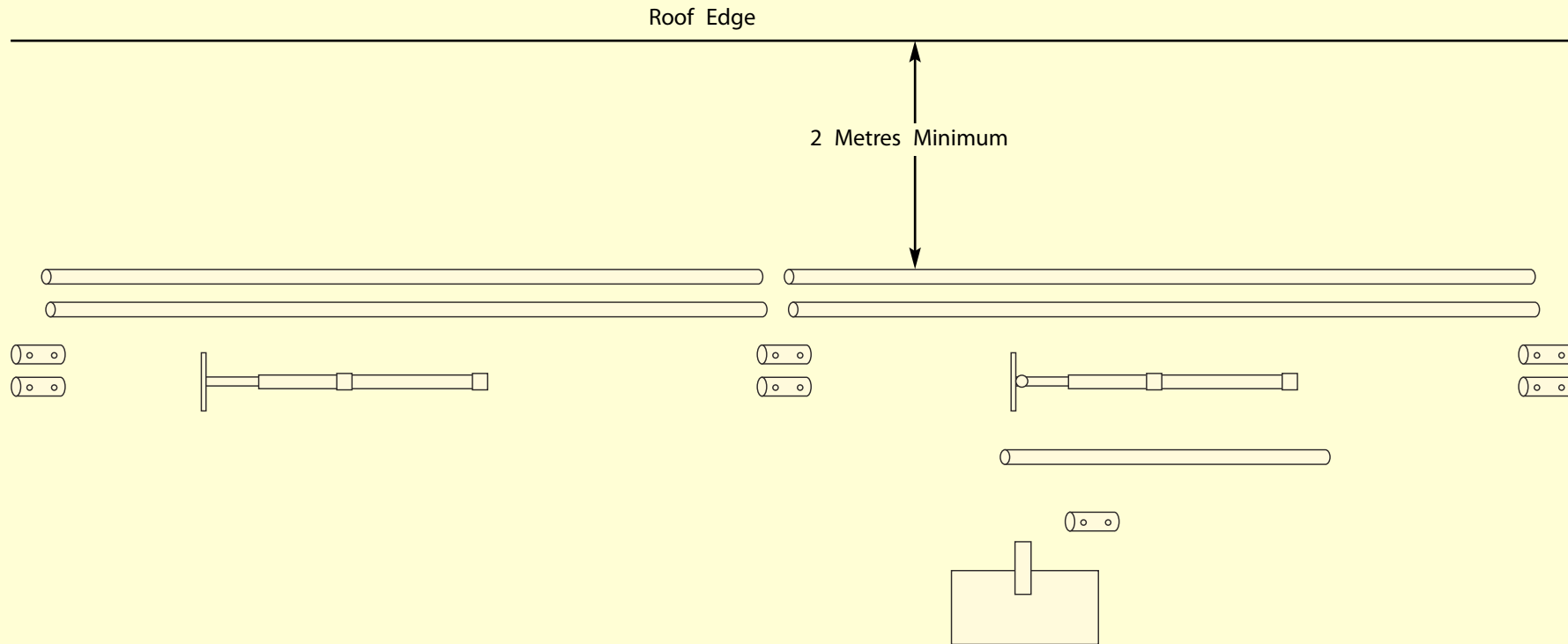
Lay out the equipment in approximately the positions shown below. Always ensure that you and the equipment are at a safe distance from the roof edge. It is a recommendation of Safesite that this distance is no less than 2 metres.

Lay out two 2.9m main rail tubes (SL102) or (SL107) main rail tubes side by side and in a continual line, for the whole length of the required guardrail. (ensure these do not roll towards the roof edge).

Then start laying out the support leg units (budget leg/weighted leg).

If your start position is from a corner, start with a budget leg.

2m along from that position lay a weighted leg, carry on laying out the support leg units in this alternative manner for the required length of guardrail.



COMPONENT LAYOUT

FIGURE 1



The guardrail must always end on a weighted leg, the only exception to this rule is if the guardrail can be fixed to a suitable structure i.e. brick/concrete walls or cat ladders etc, then a budget leg can be used.

If the start point of the guardrail is from a position that can not be fixed, (this might be a glass or steel building) then your first leg must be a weighted leg then the next one is a budget leg laid 2m away along the guardrail length, then carry on laying out the support leg units alternating between the two different support leg units. (Budget/Weighted).

START/END DETAILS

DETAIL A, B, C REQUIRE DOUBLE WEIGHT OR LINKED DOUBLE WEIGHT

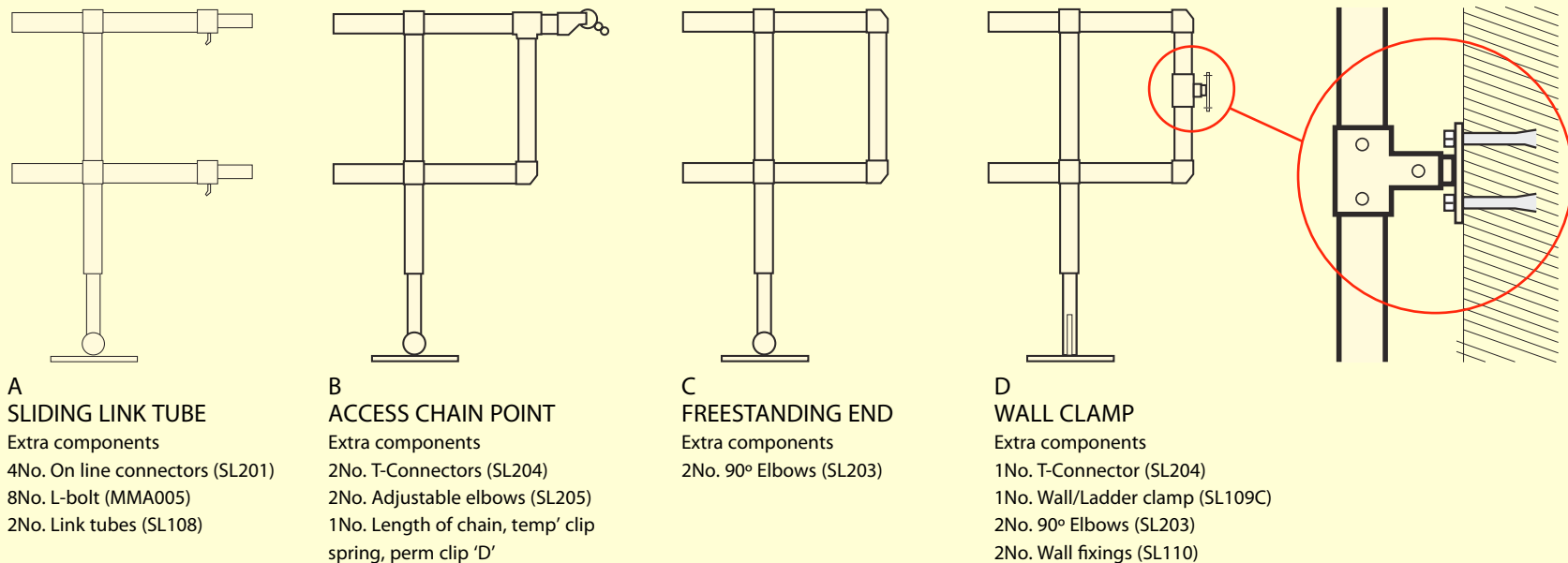


FIGURE 2

5. Laying Out Counter Weights (SL106) and Cantilever Tubes (SL104) (see figure 1.)

At the positions where the weighted legs are placed you will also require one cantilever tube (SL104) and one counter weight (SL106).

At the stop ends of the guardrail that has a weighted leg you will require one cantilever tube, two counter weights and a tee fitting (S204).

At the stop ends you will also require a length of tube 475mm long, to connect vertically between the top and the bottom main rail tubes using two 90° elbows.

6. Laying out fittings (see figure 1.)

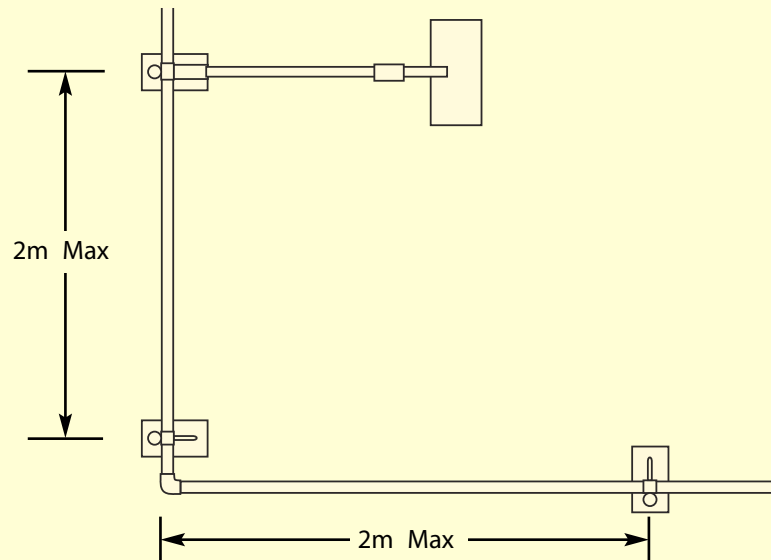
Where the two main tubes butt together lay out two on line connectors (SL201) in order for the main tubes to be joined. At corners two 90° degree elbows will be used (SL203). (Use adjustable elbows in pairs where corners are not 90° degree, SL205).

Also while laying out the on line connectors for the main tubes, lay one extra on line connector for joining the counter weight to the cantilever tube.

Erection Guide

Stage 1

Starting at the corner, stand up the corner two legs, (the first one a budget leg and the second a weighted leg) making sure the cross over clamps (SL200) are facing you. You should be able to read SAFESITE BBA 95/3182 Space the legs 2m apart.



Stage 2

Slide a 2.9m main rail tube (SL102) into the bottom cross over clamp (SL 200) of each of the standing legs. Position the tube so there is 60mm protruding from the cross over clamp (SL200), and tighten the grub screw. These are located on the bottom of the cross over clamp (SL200).

Slide the second 2.9m main rail tube (SL102) into the top cross over clamp (SL200), positioning the tube as before, leaving 60mm of the tube protruding from the cross over clamp (SL200), and tighten the grub screw of the cross over clamp (SL200), but on the budget leg only.

The weighted leg is left free for the moment so that you can make adjustments to the height of the guardrail. This is achieved by releasing the grub screw at the bottom right of the support leg unit, and using a spirit level, lift or lower, until the assembly is level and then re-tighten the grub screw.

Once the assembly is level the weighted leg needs to be plumbed. To do this you simply slide the top of the leg slightly left or right, after checking with a spirit level tighten the grub screw of the top and bottom cross over clamps (SL200).



FIGURE 3

Stage 3

Connect the cantilever tube (SL104) to the counter weight (SL106) using the on line connector clamp (SL201). Now slide the free end of the cantilever tube (SL104) into the bottom of the weighted leg and tighten the grub screw.

Slide and secure the 90° elbows (SL103) to the 60mm of 2.9m main rail tube (SL102) extending from the budget leg.

Stage 4

Working perpendicular to where you started, stand up the next support leg unit, which is a budget leg.

With the cross over clamps (SL200) facing you slide a 2.9m main rail tube (SL102) through the bottom cross over clamp (SL200) and back into the 90° elbow (SL203) and tighten the grub screw locking the 2.9m main rail tube (SL102) to the first assembly.

Slide the top 2.9m main rail tube (SL 102) into the top cross over clamp (SL200) as before and secure the 2m main rail tube (SL 102) to the 90° elbow (SL203).

Now level and plumb the budget leg as described in stage 2.

BREAKS IN THE GUARDRAIL AND REQUIRED CANTILEVERED WEIGHTS

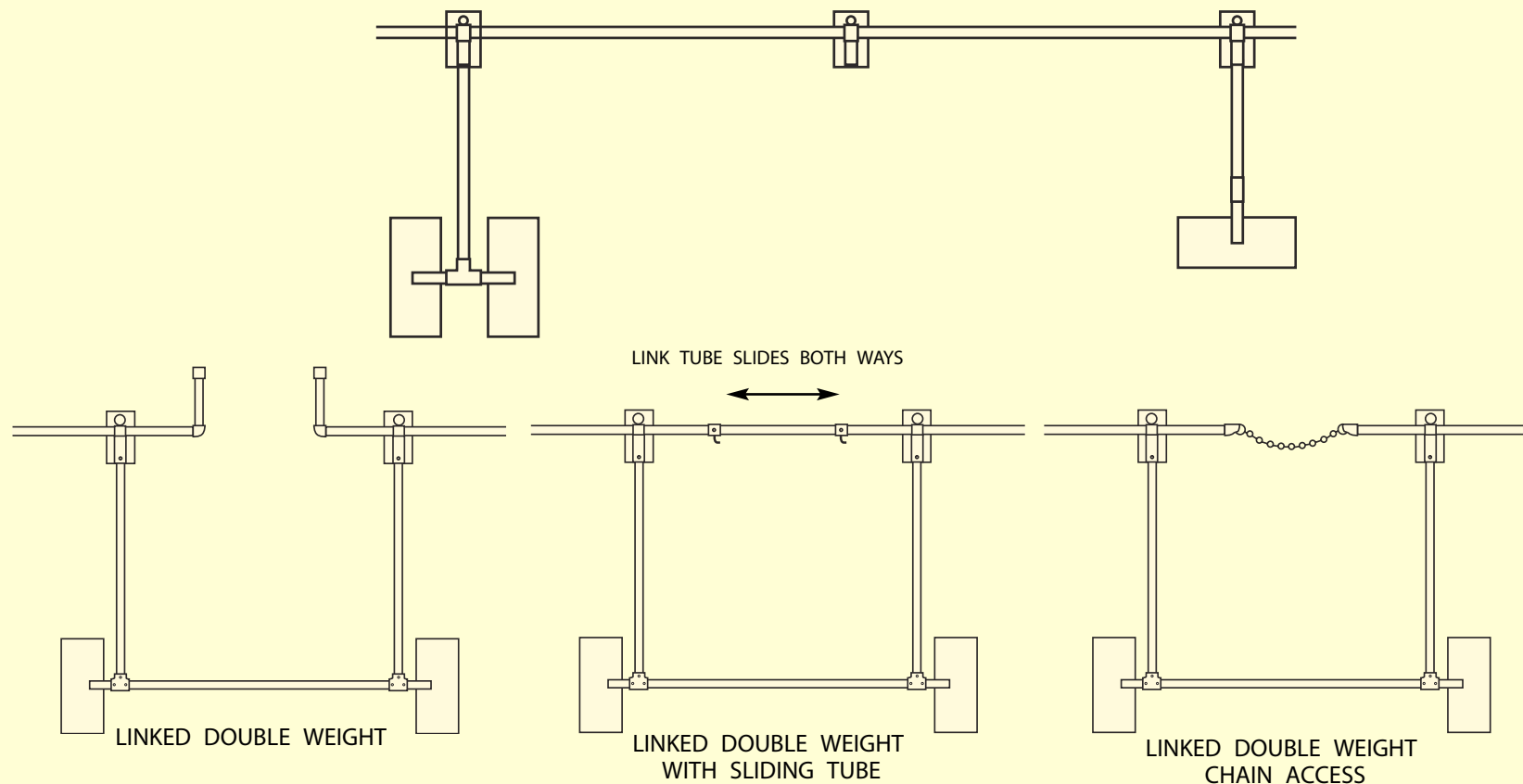


FIGURE 4

Stage 5
Slide this completed assembly into position, at the roof edge.

Stage 6
Secure an on line connector clamp (SL201) to each of the free ends of the 2.9m main rail tube (SL102) of the now standing assembly.

Working from both sides stand up the next support leg unit and slide a 2.9m main rail tube (SL102) through the bottom cross over clamp (SL200) and back into the on line connector clamp (SL201) and tighten the grub screw securing the 2.9m main rail tube (SL102) into the on line connector clamp (SL201), carry on with the top 2.9 main rail tube (SL102), again going through the top cross over clamp (SL200) and into the top on line connector clamp (SL201) do not tighten the grub screw yet, as this will permit movement while you level the support leg unit. Once you have established this level, (as described in stage 2), tighten the grub screw on the on line connector clamp (SL201) securing the tube.

Stage 7
Continue with this method of fitting the 2.9m main rail tube (SL102) and legs together for this given run of guardrail, remembering to connect the cantilever tubes (SL104) and counter weights (SL106) to the appropriate legs as you proceed.

Stage 8
Determine the end detail and finish the guardrail accordingly (see end detail drawings figure 2.).

BREAKS IN THE GUARDRAIL AND REQUIRED CANTILEVERED WEIGHTS

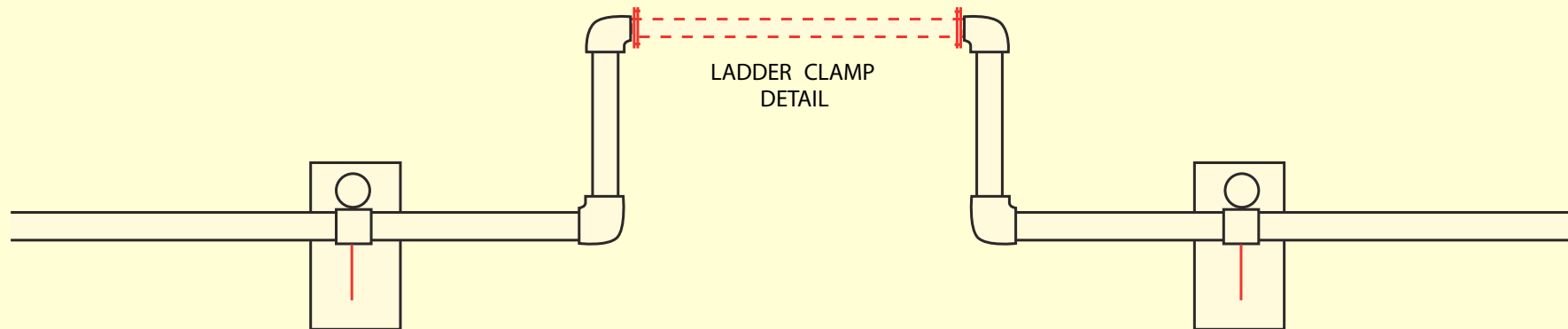
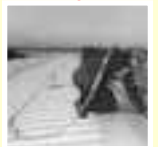
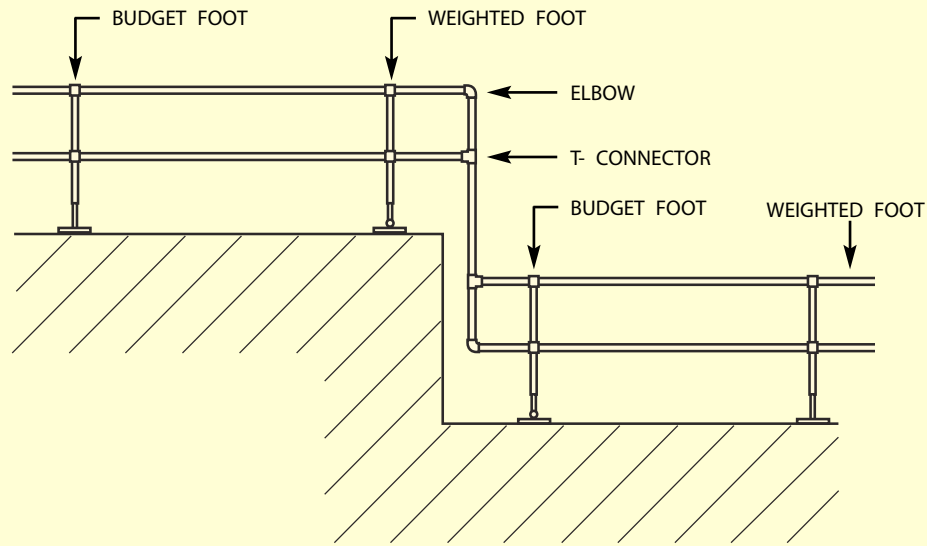


FIGURE 5

Warning
Under no circumstances should any person be anchored to the system for fall arrest purposes. Further, components such as timber infill, advertising boards, polyethylene sheets must not be fixed to the system.



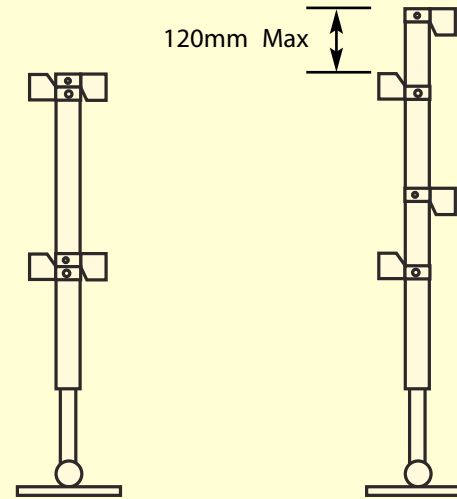
ASSEMBLY GUIDE



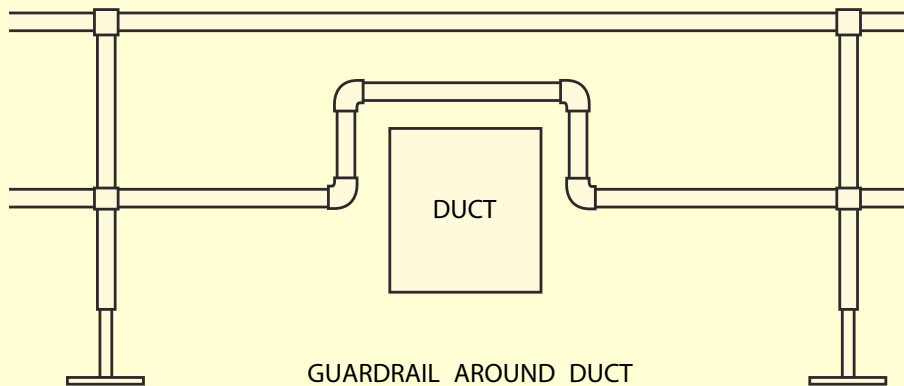
STEP UP/DOWN DETAIL

ADJUSTABLE ANGLE CORNER

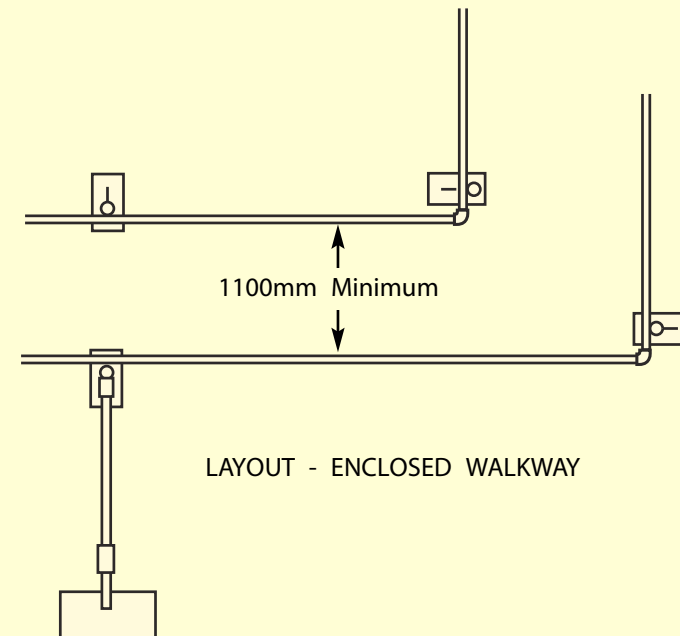
STEP DETAIL 120mm Max



STEP DETAILS



GUARDRAIL AROUND DUCT



LAYOUT - ENCLOSED WALKWAY

RE-CERTIFICATION

SAFESITE SYSTEM 2000 RE-CERTIFICATION

- Periodic inspections by a competent person are required under Regulation 5 of the “Workplace (Health Safety & Welfare) Regulations 1992” and BS EN 365. The frequency will depend upon environment, location and utilisation, but should be at least every twelve months.
- Walk and visual inspect the complete system installation in relation to the general clients needs. Establish if any modifications, additional products are required to reflect any refurbishment or additional plant and equipment that has been installed and requires access.
- Check installation configuration is complete as per the installation original drawing/plan.
- Ensure the system has not been modified/tampered with via unauthorised persons.
- Check all base feet are in contact with roof membrane
- Check all counter weights are in place as per original drawing this is essential for wind loading calculations.
- Check all grub screws are in place, greased and sufficiently torque.
- Check the general height and level of the system including the leg centres do not exceed 2m. (This only tends to be an issue if the system has been tampered with between inspections)
- Any galvanised components showing signs of corrosion, wire brush thoroughly and apply galvanised spray / paint as appropriate. If rusted significantly take digital photographs and include in the inspection report.
- Where toe-boards are fitted check brackets that support the toe-board are in place, greased and sufficiently torque.
- Where applicable check fixings to walls/structures including cat ladder clamps are in place, greased and sufficiently torque
- Check System plaque position & mark up system plaque to reflect date of next inspection required. Establish if additional plaques are required due to any refurbishment works.





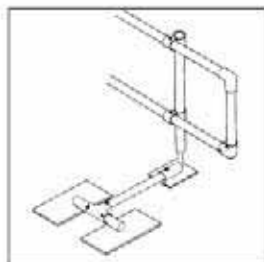
Designated by Government
to issue
European Technical
Approvals

Product

• THIS CERTIFICATE RELATES TO SAFESITE PERMANENT GUARDRAIL SYSTEM 2000, A COUNTERWEIGHTED GUARDRAIL SYSTEM FOR USE ON FLAT ROOFS.

• The system is for use on fully finished structural roofs with slopes from 1° to 10° where access is limited to maintenance and repair.

• Fixing through the roof deck is not required to achieve stability.



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Agrement
Certificate
No 95/3182

SAFESITE PERMANENT GUARDRAIL SYSTEM 2000

Barrière de sécurité pour toits
Schutzgelande für Dächer

Building Regulations

1 The Building Regulations 1991 (as amended 1994) (England and Wales)

The Secretary of State has agreed with the British Board of Agrément the aspects of performance to be used by the BBA in assessing the compliance of safety barriers with the Building Regulations. In the opinion of the BBA, the Safesite Permanent Guardrail System 2000, if used in accordance with the provisions of this Certificate, will meet the relevant requirements.

Requirement: A1	loading
Comment:	When installed in accordance with this Certificate, System 2000 has sufficient strength and stability to sustain the loads it may be subjected to as described in section 8.
Requirement: K2	Protection from falling
Comment:	System 2000 is acceptable for use where access to the flat roofs is limited to maintenance and repair.
Requirement: Regulation 7	Materials and workmanship
Comment:	System 2000 is acceptable. See section 9 of this Certificate.

2 The Building Standards (Scotland) Regulations 1990 (as amended)

In the opinion of the BBA, Safesite Permanent Guardrail System 2000, if used in accordance with the provisions of this Certificate, will satisfy or contribute to satisfying the various Regulations and related Technical Standards as listed below.

Regulation: 10	Fitness of materials
Standard: B2.1	Selection and use of materials and components
Comment:	System 2000 is acceptable. See section 9 of this Certificate.
Regulations: 27	Miscellaneous hazards
Standard: P2.3 and P.4	Clipping of windows and skylights
Comment:	System 2000 has a height of 1.1 m and will therefore contribute to satisfying the above Standard.
Standard: P2.7	Access to manual control
Comment:	System 2000 has sufficient strength and stiffness to protect a person operating a manual window control, adjacent to a roof edge. See section 8 of this Certificate.

3 The Building Regulations (Northern Ireland) 1994

In the opinion of the BBA, Safesite Permanent Guardrail System 2000, if used in accordance with the provisions of this Certificate, will satisfy or contribute to satisfying the various Building Regulations as listed below.

Regulation: B2	Fitness of materials and workmanship
Comment:	System 2000 is acceptable. See section 9 of this Certificate.
Regulation: D2	Stability
Comment:	When installed in accordance with this Certificate, System 2000 has sufficient strength and stiffness to sustain the loads as described in section 8 of this Certificate.

Technical Specification

4 Description

4.1 Safesite Permanent Guardrail System 2000 is designed to provide permanent roof edge protection without the need to mechanically fix through the roofing membrane.

4.2 The system is based on a simple cantilever principle and designed to resist the forces it may be subjected to, whether from the self-weight of the

system's components, or from those outlined in section 8 by the provision of counterweights set at a remote distance from the base foot (this is to increase the moment of resistance). The counterweights and the base feet are attached by cantilever tubes.

4.3 The system comprises steel tubing of grade 43C to BS 4360 : 1990 and galvanized to BS 729 : 1971 (1986) with a minimum galvanizing thickness of 75 µm, joined together by galvanized malleable cast iron and fabricated steel components. Details of components used are listed in Table 1.

Table 1 Components

Component	Dimensions (mm)	Weight (kg)	Component	Dimensions (mm)	Weight (kg)
Main rail tube	OD = 48.3 I = 3.2 L = 2900	10.4	Online connector	OD = 64.50 I = 5.6 L = 97.6	0.87
Rail Tube	OD = 48.3 I = 3.2 L = 2200	8.1	90° elbow	OD = 64.50 I = 5.6 L = 99	1.1
Base foot comprises:			T connector	ID = 48 OD = 67 L = 134	0.96
(i) vertical tube	OD = 38.1 I = 3.0 L = 495		Adjustable elbow	OD = 98 L = 81	1.2
(ii) horizontal tube	OD = 60.3 I = 1.7 L = 149		Wall clamp	ID = 48.3 I = 10/ O = 152 G = 114	1.3
(iii) flat base plate	I = 6 L = 230 W = 150		Wall fixing	thread length = 10 overall length = 70	0.064
(iv) flat spacer	I = 6 L = 150 W = 30		Plastic caps	OD = 43.75	0.009
(v) rubber matting	total weight =	4.3			
Support leg	OD = 48.3 I = 3.2 L = 850	3.1			
Cantilever tube	OD = 48.3 I = 3.2 L = 1250	4.6			
Counterweight comprises:					
(i) tube	OD = 48.3 I = 3.2 L = 175				
(ii) base plate	I = 15 L = 600 W = 250				
(iii) rubber matting	thickness = 3 mm quality = fine fitted matting				
Total weight =		19.7			
90° cross-over clamp	OD = 65.3 I = 5.6 L = 122	1.1			

ID = inside diameter of tube
OD = outside diameter of tube
I = thickness of tube wall
L = length of tube
W = width of base plate

4.4 The design of the vertical leg enables the base foot to be raised or lowered to allow the system to be levelled during installation.

4.5 Components used for connecting the system are socketed and have a 14 mm diameter hole incorporating an M12 nut and a stainless steel grub screw for locking purposes. All locking screws are supplied greased before fixing.

4.6 The roof membrane is protected from damage by fluted rubber matting fixed to the underside of all components that come into contact with the roof surface.

4.7 Quality control checks include:
dimensions
mechanical adequacy of connectors
coating thickness.

5 Delivery and site handling

5.1 Guidance on delivery and site handling of System 2000 components is provided by Safesite Ltd. The main rail and rail tubes are delivered in banded bundles, each tube bears the BBA identification mark including the number of this Certificate.

5.2 Vertical legs, base feet, support legs, cantilever tubes and counterweights are delivered in crates, each component bears the BBA identification mark including the number of this Certificate. The maximum weight per crate should not exceed 0.25 tonne.

5.3 All fittings and connectors are delivered to site in nylon bags, each item bears the BBA identification mark including the number of this Certificate.

5.4 The bundles, crates and bags can be handled using conventional lifting equipment.

5.5 Care must be taken to ensure that tubes or other components of the system do not damage the roof membrane by overloading or mishandling.

Design Data

6 General

6.1 Safesite Permanent Guardrail System 2000, when installed in accordance with this Certificate, is satisfactory for use as a guardrail system on flat roofs which have slopes of 1° to 10°, and where access is limited to maintenance and repair.

6.2 Part of the stability of the system depends on the sliding resistance between the rubber membrane, which is attached to the underside of the base plate, and the roof covering. The system has been tested on a roof covering comprising layers of felt with a mineral type finish, Grade SE, in accordance with BS 747 : 1994.

6.3 Where other roof coverings are encountered, eg asphalt, stone chippings bonded in bitumen

compound and laid onto other proprietary covering materials, it is Safesite Ltd's responsibility to demonstrate that the roof membrane has sufficient sliding resistance.

6.4 If the system is installed behind a concrete or masonry parapet it is assumed that sliding will be prevented by the parapet.

6.5 Where the roof covering comprises stone chippings bonded in bitumen compound or laid onto other proprietary covering materials, the chippings must be removed in the areas of the base foot and counterweights.

6.6 The system, which is versatile, can accommodate various shapes and sizes of flat roofs, roof fall, changes in level, and difficult details such as ductwork passing over the roof edge.

6.7 The counterweight and cantilever tubes constitute a trip hazard, and personnel having access to the area should exercise care.

6.8 With no through fixings, this system may be installed where other forms of barrier would be impractical, particularly in remedial work.

7 Practicability of installation

System 2000 is practicable to install provided Safesite Ltd's instructions and the procedures listed in sections 11 and 12 of this Certificate are followed (installation details are shown in Figure 1).

8 Structural performance

8.1 When installed by Safesite Ltd and in accordance with this Certificate, System 2000 will have adequate strength and stiffness as a free standing unit to withstand the loads resulting from accidental human body impacts, or from persons leaning against the guardrail.

8.2 Safesite Ltd undertake the design of System 2000 for each individual project. Each installation is designed taking into account the following (given here as a background to Safesite Ltd's design procedure):

(a) The maximum clear distance between the supports must not exceed 2.0 m [see Figure 1(h)].

(b) Securing the end of a given run can be achieved by additional counterweight or mechanical fixing to an existing structure [see section 12.5].

Note: Due to the various fixing requirements which will be encountered, the detail given in section 12.5(b) is outside the scope of this Certificate, and is individually assessed by Safesite Ltd.

(c) A minimum of a single counterweight to be placed at each alternate leg support unit as described in section 12.6.

(d) The socket screw of the support leg to be positioned to the side parallel to the edge of the roof when locking on to the base foot upstand [see Figure 1(h), and sections 12.1 and 12.2].

(e) The top and bottom guardrail to be set at heights of 1.1 m and 0.6 m respectively from the roof surface level [see Figure 1(h)].

(f) The overhanging distance at the end of free standing guardrail must not exceed 200 mm [see sections 12.4, 12.5 and Figure 1(e)].

8.3 In addition to the standard procedures detailed in section 8.2, each system design will be checked by Safesite Ltd to ensure it will withstand the forces to which it may be subjected due to wind loading, dependant on the height, locality and level of exposure of the building. In some instances additional weights or end returns may be required to ensure the design provides adequate stability.

8.4 Wind calculations are carried out in accordance with Safesite Ltd's Design Guide *Safesite System 2000 – Wind Loading, June 1995*, which has been assessed and approved by the BBA. In general, the Design Guide constitutes:

(a) wind calculation of three wind case studies in accordance with CP3 : Chapter V : Part 2 : 1972 as given in Table 2. The calculations are represented by straight lines (with each line representing a wind case) on the wind moment graph (see Figure 2)

(b) calculations of stabilising moments due to weights (see Figure 2)

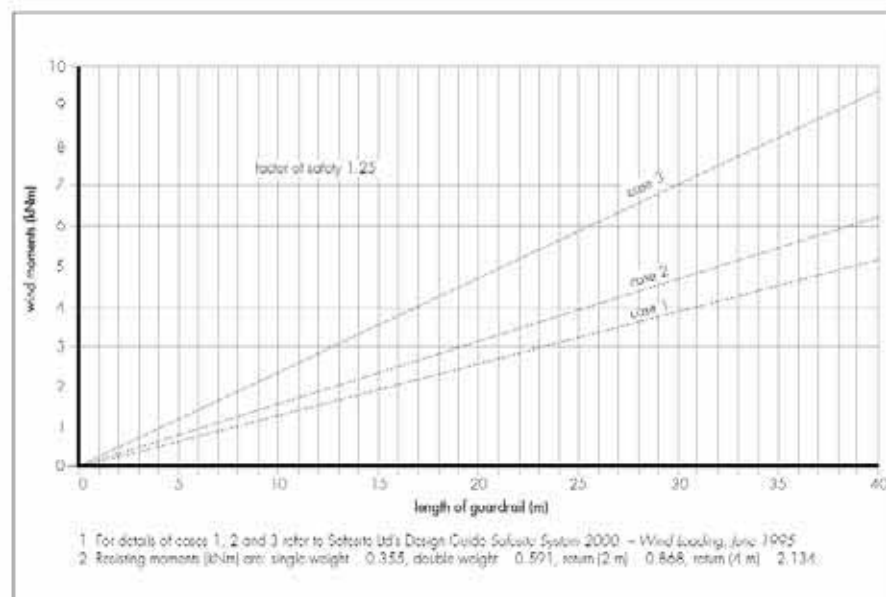
(c) examples on checking typical standard details for wind resistance.

Table 2 Wind loading case studies

Case	Wind speed (m/s)	Maximum height of building (m)	Guard height, building size and height above ground, Factor S _z
1	38	65.2	214 1.11
2	46	30.5	100 1.01
3	52	65.2	214 1.11

8.5 Where the installation includes corner details [see Figure 1(g)] the effect of these returns can be taken into account to increase the resisting moment provided they are within the limitations given in the notes to Figure 2.

Figure 2 Wind/guardrail calculation



- (d) The socket screw of the support leg to be positioned to the side parallel to the edge of the roof when locking on to the base foot upstand [see Figure 1(h), and sections 12.1 and 12.2].
- (e) The top and bottom guardrail to be set at heights of 1.1 m and 0.6 m respectively from the roof surface level [see Figure 1(h)].
- (f) The overhanging distance at the end of free standing guardrail must not exceed 200 mm [see sections 12.4, 12.5 and Figure 1(e)].

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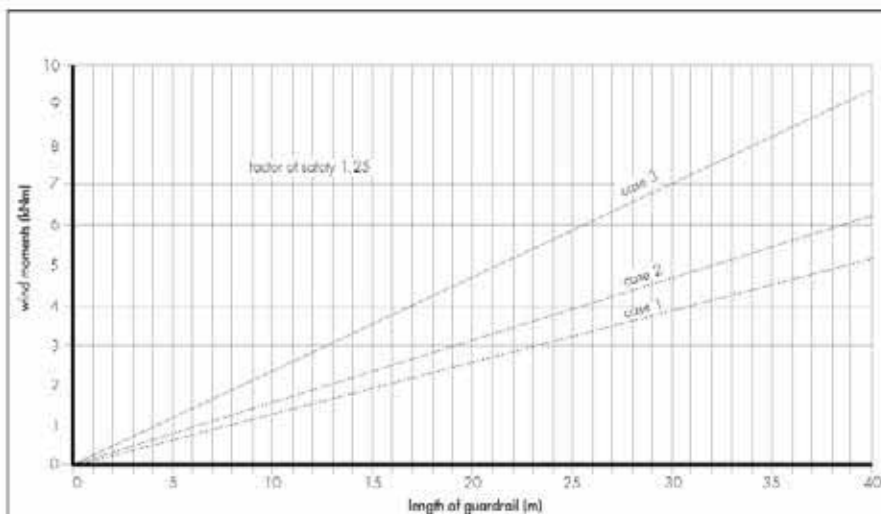
(c) examples on checking typical standard details for wind resistance.

Table 2 Wind loading case studies

Case	Wind speed (m/s)	Maximum height of building (m)	Ground roughness, building site and height above ground Factor S_s
1	38	65.2	2.14
2	46	30.5	1.01
3	52	65.2	2.14

8.5 Where the installation includes corner details [see Figure 1(g)] the effect of these returns can be taken into account to increase the resisting moment provided they are within the limitations given in the notes to Figure 2.

Figure 2 Wind/guardrail calculation



1. For details of cases 1, 2 and 3 refer to Safesite Ltd's Design Guide Safesite System 2000 – Wind Loading, June 1995.
2. Resisting moments (kNm) are: single weight 0.355, double weight 0.591, return (2 m) 0.848, return (1 m) 2.134.

8.6 If a project is outside the scope of these three basic cases, Safesite Ltd will undertake the design using conventional calculations in accordance with CP3 : Chapter V : Part 2 : 1972.

8.7 System 2000 can withstand a static point load of 0.7 kN without fracture or disconnecting and at a displacement of less than 100 mm from the original line, and a point load of 0.3 kN with an elastic deflection less than 35 mm, as specified in the Health and Safety Executive Specialist Inspector Report No 15, September 1988.

8.8 Each system designed in accordance with sections 8.2, 8.3 and 8.4 will have adequate resistance to soft body impact energy of 100 Nm as described in MOAT No 43 : 1987.

8.9 Other components (eg timber infill, advertising boards, polyethylene sheets) must not be fixed to the system as this would increase the surface area and decrease the ability of the system to resist wind forces.

8.10 The performance of the system has not been assessed by the BBA in relation to other external forces occurring from impacts due to slinging cradles, forklift trucks, or any other loading not described in this Certificate.

8.11 The maximum compressive stress generated by the system is $7.56 \text{ by } 10^{-3} \text{ Nmm}^{-2}$ (7.56 kPa).

9 Durability

When used within the context of this Certificate, Safesite Permanent Guardrail System 2000 will have the minimum service life given in Table 3. Service life is defined as the elapsed period before the first major maintenance.

Table 3 Service life

Product	Minimum service life (years)			
	Environment			
	Polluted coastal conditions	Unpolluted coastal conditions	Polluted inland conditions	Unpolluted inland conditions
Safesite Permanent System 2000	7.5	14	9	25

10 Maintenance

10.1 Periodic inspections are required, the frequency will depend on environment, location and use.

10.2 Should any installed component of System 2000 become damaged it can be replaced. Any component damaged before installation will not be used.

Installation

11 General

Installation is carried out by Safesite Ltd only, using all safety precautions necessary. Procedure as detailed in section 12 is, therefore, for information only.

12 Procedure

Base foot and support leg

12.1 The base foot is placed on a flat surface and the support tube positioned over it [see Figure 1(a)]. The socket screw must be at the bottom of the support leg. The procedure is repeated for remaining base feet and support legs.

Setting the height of the base foot and support leg

12.2 The support leg is lifted and the blue template is positioned on the base foot, the support leg is lowered onto the template. The socket set screw is locked into position at the side of the base foot upstand [see Figure 1(h)] using a 6 mm Allen key/ratchet tool supplied by Safesite Ltd. The procedure is repeated for the remaining base feet and support legs. The support leg, the template and the base foot constitutes the 'support leg unit' [see Figure 1(b)].

Fixing the 90° cross-over clamps to the support leg unit

12.3 The two cross-over clamps are slid on to the support leg unit with the socket set screws face down [see Figure 1(c)]. The top cross-over clamp is made level with the top of the support leg unit. The cross-over clamp must be square with the base foot. The socket set screw of the top clamp is locked. The red template is positioned under the top cross-over clamp (see Figure 1(c)). The bottom cross-over clamp is brought up to the template, square with the base foot and the socket set screw is locked. Ensure both cross-over clamps are square (by locking down the tube). The procedure is repeated for the remaining units.

Note: The blue and red templates are designed to ensure that the distance between the roof level and centre of the top and the bottom guardrails are set at 1.1 m and 0.6 m. Random checks using a standard measuring tape are carried out to ensure these heights are maintained.

Laying out leg support unit and main rail tube

12.4 The equipment is laid (at a safe distance from the roof edge) in its approximate correct position [see Figure 1(d)]. Two 2.9 m rail tubes are laid side by side for the required guardrail run. Ensure that tubes do not roll towards the roof edge. Where tubes are to butt together, two online connectors for joining the tubes are laid out. Two 90° elbows are laid out at each corner (adjustable

elbows apply for non-90° bends). The first leg unit is positioned 100 mm in from the starting point of the guardrail. The remaining leg support units are spaced along the run of the guardrail and the clear distance between the support leg should not exceed 2.0 m. The legs may be balanced at smaller distances to achieve uniform spacing. The procedure is repeated for each run of guardrail required.

Laying out counterweights and cantilever tubes

12.5 The method of securing the end of the guardrail must be determined.

(a) Free standing — Method (a)

Two counterweights, one cantilever tube and one T-connector are attached as shown in Figure 1(e). Two 90° elbows and one piece of standard tube 485 mm long form the end detail.

(b) Physically fixing — Method (b)

When bolting into a concrete structure, for example, two wall clamps and four wall fixings are positioned to start the installation [see Figure 1(f)].

12.6 Once a given run has been laid out [method (a) or (b)], every alternate leg support unit requires a single counterweight, cantilever tube and an on-line connector to be attached into the base foot [see Figure 1(i)].

Erection stages

12.7 Installation is started at a corner, two operatives are required. Two leg support units are stood upright approximately in position [see Figure 1(h)] and a 2.9 m rail tube is slid through the top two cross-over clamps. The first leg support unit is positioned and the socket set screw locked. The second unit is positioned and the socket set screw locked.

Note: The maximum clear distance of 2 m between the legs must be maintained.

12.8 The bottom main rail tube is pushed through the bottom cross-over clamps and the socket set screws to each unit are locked. The completed frame is positioned 300 mm from the roof edge. The cantilever tube is slid into the base foot of the second leg, an on-line connector is fitted over the open end of the cantilever tube. The counterweight is positioned at the open end of the cantilever tube and the join is completed using the two socket set screws. The socket set screw of the base foot is locked, connecting the cantilever tube leg to the leg support unit.

12.9 The instructions given in section 12.8 are repeated to form a further frame. The two frames are connected together at the corner using two 90° elbow clamps or by the on-line connector along the guardrail run. The clamps are positioned to ensure socket set screws are face down. The level of the

rail is adjusted by releasing the two socket set screws of the support legs, adjustment is made and the set screw tightened.

12.10 On completion of a given length, the last tubes are cut to size and the cut ends of tube painted with zinc rich paint. To complete the installation, PVC caps are fitted to all the support leg tops and at the ends of the counterweights. The complete installation is checked and the roof cleared of all spare equipment [see Figure 1(i) for a typical guardrail layout].

Technical Investigations

The following is a summary of the technical investigations carried out on the Safesite Permanent Guardrail System 2000.

13 Tests

Tests were conducted on various configurations of guardrail, including a six-metre run without end return installed in accordance with this Certificate, built on a 10° pitched roof. Tests included:

static loading in accordance with Health and Safety Executive Specialist Inspector's Report No 15, September 1988, point loads of 0.3 kN and 0.7 kN at various positions soft body impact loads of 100 Nm at various positions, and in accordance with BS 5234 : Part 2 : 1992 and MOAT No 43 : 1987

14 Investigations

14.1 The manufacturing process was examined, including the methods adopted for quality control, and details were obtained relating to the quality and composition of the materials used.

14.2 An assessment was made of:
site visits to investigate the practicability of installation and ease of handling of the system existing information relating to durability and compatibility of materials in contact resistance against static load and soft body impact loads resistance against wind loads a user survey was carried out to investigate the performance of the system in use.

Bibliography

BS 729 : 1971(1986) *Specification for hot dip galvanized coatings on iron and steel articles*
BS 747 : 1994 *Specification for roofing felts*
BS 4360 : 1990 *Specification for weldable structural steels*
BS 5234 : Part 2 : 1992 *Specification for performance requirements for strength and robustness including methods of test*

CP 3 : *Code of basic data for the design of buildings*

Chapter V : *Loading*
Part 2 : 1972 *Windloads*

Health and Safety Executive Specialist Inspector's Report No 15 *Design loadings for temporary roof and floor edge protection*, September 1988

MOAT No 43 : 1987 *UEA's Directives for Impact Testing Opaque Vertical Building Components*

Conditions of Certification

15 Conditions

15.1 Where reference is made in this Certificate to any Act of Parliament, Regulation made thereunder, Statutory Instrument, Code of Practice, British Standard, manufacturer's instruction or similar publication, it shall be construed as reference to such publication in the form in which it is in force at the date of this Certificate.

15.2 The quality of materials and the method of manufacture have been examined and found satisfactory by the BBA and must be maintained to this standard during the period of validity of this Certificate. This Certificate will remain valid for an unlimited period provided:

(a) the specification of the product is unchanged; and

(b) the manufacturer continues to have the product checked by the BBA.

15.3 This Certificate will apply only to the product that is installed, used and maintained as set out in this Certificate.

15.4 In granting this Certificate, the BBA makes no representation as to:

- (a) the presence or absence of patent or similar rights subsisting in the product; and
- (b) the legal right of Safesite Ltd to market, install or maintain the product; and
- (c) the nature of individual installations of the product, including methods and workmanship.

15.5 It should be noted that any recommendations relating to the safe use of this product which are contained or referred to in this Certificate are the minimum standards required to be met when the product is used. They do not purport in any way to restate the requirements of the Health & Safety at Work etc Act 1974, or of any other statutory or Common law duties of care, or of any duty of care which exist at the date of this Certificate or in the future; nor is conformity with such recommendations to be taken as satisfying the requirements of the 1974 Act or of any present or future statutory or Common law duties of care. In granting this Certificate, the BBA does not accept responsibility to any person or body for any loss or damage, including personal injury, arising as a direct or indirect result of the use of this product.



In the opinion of the British Board of Agrément, the Safesite Permanent Guardrail System 2000 is fit for its intended use provided it is installed, used and maintained as set out in this Certificate. Certificate No 95/3182 is accordingly awarded to Safesite Ltd.

On behalf of the British Board of Agrément

Director

Date of issue: 26th September 1995

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