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BBA BRITISH BOARD OF AGRÉMENT
TECHNICAL APPROVALS FOR CONSTRUCTION

Agrément Certificate
No 08/4539

PRODUCT SHEET 1 — SAFESITE GUARDRAIL SYSTEM 2000

PRODUCT SCOPE AND SUMMARY OF CERTIFICATE

This Certificate replaces Certificate No 95/3182 and relates to the Safesite Guardrail System 2000, a counterweighted guardrail system for use on flat roofs.



AGRÉMENT CERTIFICATION INCLUDES:

- factors relating to compliance with Building Regulations where applicable
- factors relating to additional non-regulatory information where applicable
- independently verified technical specification
- assessment criteria and technical investigations
- design considerations
- installation guidance
- regular surveillance of production
- formal three-yearly review.

KEY FACTORS ASSESSED

Practicability of installation — the product must be installed by the Certificate holder (see section 4).

Structural performance — the system has adequate strength and stiffness to resist the loads associated with infrequent maintenance activities and can be designed to resist wind actions for flat roof applications (see section 5).

Durability — the system will have a service life of between 7.5 and 25 years depending on the environment (see section 7).

The BBA has awarded this Agrément Certificate for Safesite Guardrail System 2000 to Safesite Ltd as fit for its intended use provided it is installed, used and maintained as set out in this Agrément Certificate.

On behalf of the British Board of Agrément

B C Chamberlain — Head of Approvals — Engineering

Chief Executive

Date of First issue: 27 March 2008

The BBA is a UKAS accredited certification body — Number 113. The schedule of the current scope of accreditation for product certification is available in pdf format via the UKAS link on the BBA website at www.bbacerts.co.uk

Readers are advised to check the validity and latest issue number of this Agrément Certificate by either referring to the BBA website or contacting the BBA direct.

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Regulations

The Building Regulations 2000 (as amended) (England and Wales)



These Regulations impose requirements on guarding of areas where frequent access will be required for maintenance. This system has been assessed for use where access for maintenance is less frequent than once per month, therefore, in the opinion of the BBA, the use of this product is not subject to these Regulations.

The Building (Scotland) Regulations 2004 (as amended)



These Regulations do not relate to guarding of areas where access will be required for maintenance, therefore, in the opinion of the BBA, the use of this product is not subject to these Regulations.

The Building Regulations (Northern Ireland) 2000 (as amended)



These Regulations do not relate to guarding of areas where access will be required for maintenance, therefore, in the opinion of the BBA, the use of this product is not subject to these Regulations.

Construction (Design and Management) Regulations 2007

Construction (Design and Management) Regulations (Northern Ireland) 2007

Information in this Certificate may assist the client, planning supervisor, designer and contractors to address their obligations under these Regulations.

See sections: 1 Description (1.2) 2 Delivery and site handling (2.1 to 2.5) and 3 General (3.8).

Non-regulatory Information

NHBC Standards 2007

In the opinion of the BBA, the use of the Safesite Guardrail System 2000, in relation to this Certificate, is not subject to the requirements of these Standards.

Zurich Building Guarantee Technical Manual 2007

In the opinion of the BBA, the use of the Safesite Guardrail System 2000, in relation to this Certificate, is not subject to the requirements of this Technical Manual.

General

This Certificate replaces Certificate No 95/3182 and relates to the Safesite 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 authorised infrequent maintenance and repair eg less than once per month. Fixing through the roof deck is not required to achieve stability.

Technical Specification

1 Description

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

1.2 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 5 by the provision of counterweights set at a remote distance from the base feet (this is to increase the moment of resistance). The counterweights and the base feet are attached by cantilever tubes.

1.3 The system is fabricated from steel tube, plate and casting. All steel components are then hot-dipped galvanized to BS EN ISO 1461 : 1999.

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

1.5 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.

1.6 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.

1.7 Quality control checks include:

- dimensions
- mechanical adequacy of connectors
- coating thickness.

2 Delivery and site handling

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

2.2 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.

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

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

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

Assessment and Technical Investigations

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

Design Considerations

3 General

3.1 The Safesite 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 infrequent maintenance and repair.

3.2 Guarding can be supplied with a height between 950 mm and 1100 mm and, depending on the application, a toe-board may be required. For some applications there may be a limit on the maximum gap in the guarding, for which adjustment of the overall height, position of the intermediate rail and use of toe-boards can accommodate these requirements.

3.3 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 5E, in accordance with BS 747 : 1994.

3.4 Where other roof coverings are encountered, eg asphalt, stone chippings bonded in bitumen compound and laid onto other proprietary covering materials, it is the Certificate holder's responsibility to demonstrate that the roof membrane has sufficient sliding resistance.

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

3.6 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 feet and counterweights.

3.7 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.

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

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

4 Practicability of installation

The system is practicable to install, but must only be installed by the Certificate holder.

5 Structural performance

5.1 When installed by the Certificate holder and in accordance with this Certificate, the system 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.

5.2 The Certificate holder undertakes the design of the system for each individual project. Each installation is designed taking into account the following (given here as a background to the Certificate holder's design procedure):

- the maximum clear distance between the supports must not exceed 2.0 m [see detail (h) in the Installation details Figure shown in section 9]
- securing the end of a given run can be achieved by additional counterweight or mechanical fixing to an existing structure (see section 9.5)[1]
- a minimum of a single counterweight should be placed at each alternate leg support unit as described in section 9.6

- the socket screw of the support leg should be positioned to the side parallel to the edge of the roof when locking on to the base foot upstand [see detail (h) in the Installation details Figure shown in section 9, and as described in sections 9.1 and 9.2]
- the top and bottom guardrail should be set at heights of 1.1 m and 0.6 m respectively (or as required) from the roof surface level [see detail (h) in the Installation details Figure shown in section 9]
- the overhanging distance at the end of free standing guardrail must not exceed 200 mm [see detail (e) in the Installation details Figure shown in section 9 and as described in sections 9.4 and 9.5].

(1) Due to the various fixing requirements which will be encountered, the detail given in section 8.5, Method (b), is outside the scope of this Certificate, and is individually assessed by the Certificate holder.

5.3 In addition to the standard procedures detailed in section 5.2, each system design will be checked by the Certificate holder to ensure it will withstand the forces to which it may be subjected due to wind loading, dependent 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.

5.4 Wind calculations are carried out in accordance with the Certificate holder's Design Guide Safesite System 2000 — Wind Loading, June 1995, which has been assessed and approved by the BBA.

5.5 Where the installation includes corner details [see detail (g) in the Installation details Figure shown in section 9]. The effect of these returns can be taken into account to increase the resisting moment.

5.6 The system 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.

5.7 Each system designed in accordance with sections 5.2, 5.3 and 5.4 will have adequate resistance to soft body impact energy of 100 Nm as described in MOAT No 43 : 1987.

5.8 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.

5.9 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, fork-lift trucks, or any other loading not described in this Certificate.

5.10 The maximum compressive stress generated by the system is 7.56 by 1023 Nmm^{-2} (7.56 kPa).

6 Maintenance

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

6.2 Should any installed component of the system become damaged it can be replaced. Any component damaged before installation must not be used.

7 Durability

When used within the context of this Certificate, the system will have the minimum service life given in Table 1. Service life is defined as the elapsed period before the first major maintenance.

Table 1 Service life

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

Installation

8 General

Installation of the Safesite Guardrail System 2000 is carried out by the Certificate holder only, using all safety precautions necessary. The procedure as detailed in Figure 1 and section 9 is, therefore, for information only.

9 Procedure

Base foot and support leg

9.1 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 the remaining base feet and support legs.

Setting the height of the base foot and support leg

9.2 The support leg is lifted 250 mm and the socket set screw is locked into position at the side of the base foot upstand [see Figure 1(b)]. 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

9.3 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 bottom cross-over clamp is brought up to leave a gap of 475 mm, square with the base foot and the socket set screw is locked [see Figure 1(c)]. The procedure is repeated for the remaining units.

Laying out leg support unit and main rail tube

9.4 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. It must be ensured that tubes do not roll towards the roof edge. Where tubes are to butt together, two on-line connectors for jointing 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

9.5 The method of securing the end of the guardrail must be determined:

- Free standing — Method (a)
  - two counterweights, one cantilever tube and one T-connector are attached as shown in Figure 2(e). Two 90° elbows and one piece of standard tube 485 mm long form the end detail.
- 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)].

9.6 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

9.7 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.

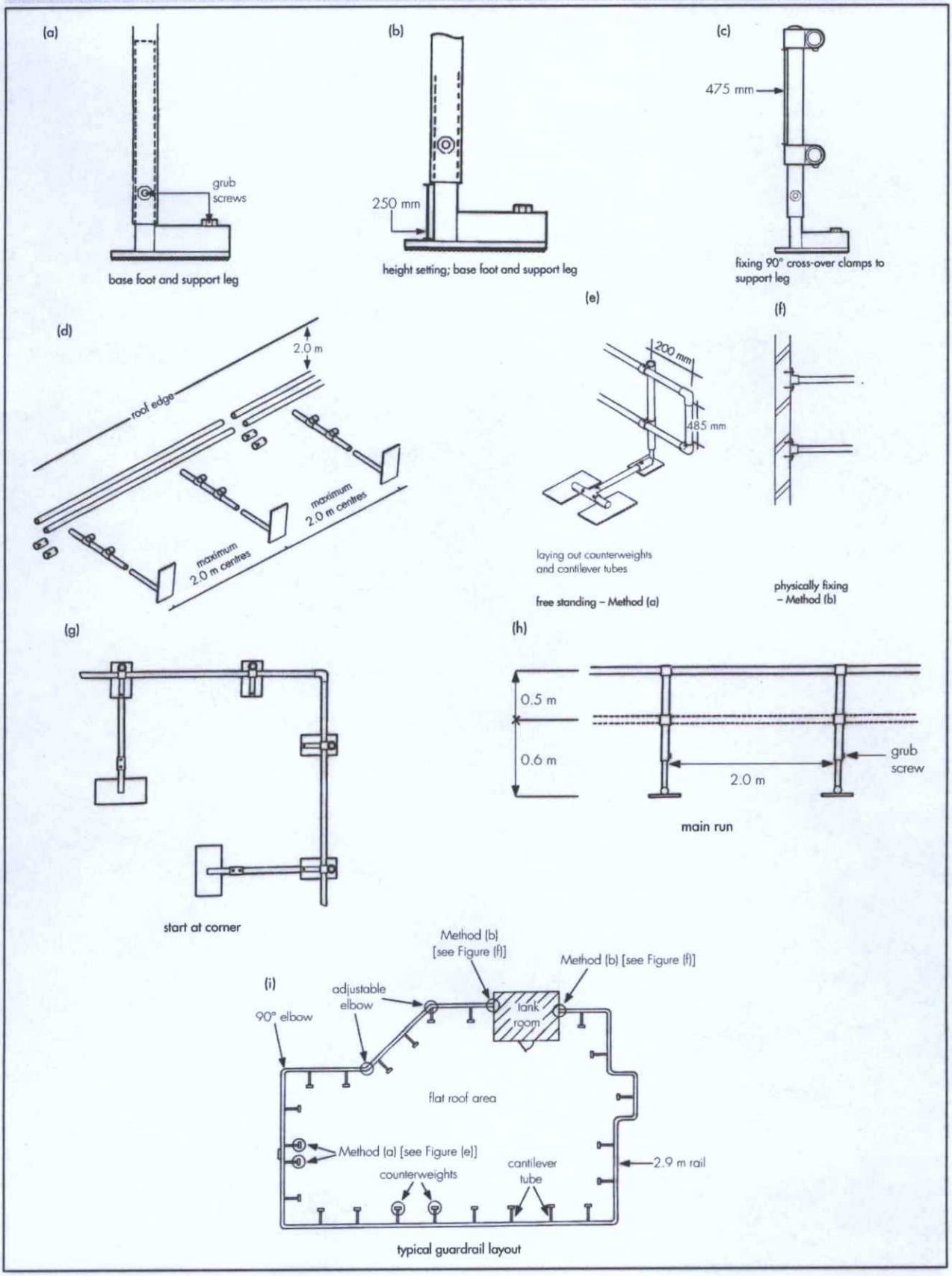
Note: The maximum clear distance of 2 m between the legs must be maintained.

9.8 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.

9.9 The instructions given in section 9.8 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.

9.10 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].

Figure 1 Installation details



Technical Investigations

10 Tests

Tests were conducted on various configurations of the Safesite Guardrail System 2000, 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 Design loadings for temporary roof and floor edge protection, 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 5234-2 : 1992 and MOAT No 43 : 1987.

11 Investigations

11.1 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.

11.2 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 747 : 1994 Specification for roofing felts

BS 4360 : 1990 Specification for weldable structural steels

BS 5234-2 : 1992 Partitions (including matching linings) — Specification for performance requirements for strength and robustness including methods of test

BS EN ISO 1461 : 1999 Hot dip galvanized coatings on fabricated iron and steel articles — Specifications and test methods

MOAT No 43 : 1987 UEAtc Directives for Impact Testing Opaque Vertical Building Components

12 Conditions

12.1 This Certificate:

- relates only to the product/system that is named and described on the front page
- is granted only to the company, firm or person named on the front page — no other company, firm or person may hold or claim any entitlement to this Certificate
- is valid only within the UK
- has to be read, considered and used as a whole document — it may be misleading and will be incomplete to be selective
- is copyright of the BBA
- is subject to English law.

12.2 References in this Certificate to any Act of Parliament, Statutory Instrument, Directive or Regulation of the European Union, British, European or International Standard, Code of Practice, manufacturers' instructions or similar publication, are references to such publication in the form in which it was current at the date of this Certificate.

12.3 This Certificate will remain valid for an unlimited period provided that the product/system and the manufacture and/or fabrication including all related and relevant processes thereof:

- are maintained at or above the levels which have been assessed and found to be satisfactory by the BBA
- continue to be checked as and when deemed appropriate by the BBA under arrangements that it will determine
- are reviewed by the BBA as and when it considers appropriate.

12.4 In granting this Certificate, the BBA is not responsible for:

- the presence or absence of any patent, intellectual property or similar rights subsisting in the product/system or any other product/system
- the right of the Certificate holder to manufacture, supply, install, maintain or market the product/system
- individual installations of the product/system, including the nature, design, methods and workmanship of or related to the installation
- the actual works in which the product/system is installed, used and maintained, including the nature, design, methods and workmanship of such works.

12.5 Any information relating to the manufacture, supply, installation, use and maintenance of this product/system which is contained or referred to in this Certificate is the minimum required to be met when the product/system is manufactured, supplied, installed, used and maintained. It does not purport in any way to restate the requirements of the Health & Safety at Work etc Act 1974, or of any other statutory, common law or other duty which may exist at the date of this Certificate; nor is conformity with such information to be taken as satisfying the requirements of the 1974 Act or of any statutory, common law or other duty 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 manufacture, supply, installation, use and maintenance of this product/system.

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