concentrated load of 0.9 kN, in accordance with BS 6399 : Part 3 : 1988, and is therefore acceptable where no access is provided, other than that necessary for cleaning or repair.

7.9 The floor is designed to support a uniformly distributed imposed load of 3 kNm^{-2} or a concentrated load of 4.5 kN, in accordance with BS 6399 : Part 1 : 1984, and is therefore acceptable, for example, in classrooms and offices for general use. Raised access floors have not been assessed and are therefore not covered within the scope of this Certificate.

7.10 Most building configurations require the modules to be bolted to foundations. Stability calculations are available from Portakabin Ltd justifying any requirements for bolting modules to the foundation.

7.11 Foundations must be designed in accordance with BS 8004 : 1986.

Table 2 Module size limitations

Module type	Span[1]	No of storeys	Basic[2] wind speed (ms^{-1})	Minimum size of building (No of bays)	Maximum size of building[1] (No of bays) A	B
024	single	1	50	2	no limit	7
024	double	1	50	2	no limit	15
024	single	2	46	3	4	*
024	double	2	46	6	8	*
024	single	3	46	4	*	*
024	double	3	46	8	*	*
032	single	1	50	2	no limit	10
032	double	1	50	3	no limit	20
032	single	2	46	4	5	*
032	double	2	46	7	10	*
032	single	3	46	5	*	*
032	double	3	46	10	*	*
040	single	1	50	2	no limit	12
040	double	1	50	3	no limit	25
040	single	2	46	5	7	*
040	double	2	46	9	14	*
040	single	3	46	6	*	*
040	double	3	46	12	*	*

(1) Where triple or quadruple module spans are required, reference should be made to Portakabin Ltd.

(2) As defined in CP 3 : Chapter V : Part 2 : 1972.

(3) These sizes can be exceeded if required but depend on local factors, the inclusion of deflection limiting walls, etc.

A building sited in open country with scattered windbreaks

B building sited in open country with no obstructions.

*maximum building size can be determined on a project basis by the inclusion of deflection limiting walls.

8 Behaviour in relation to fire

8.1 Buildings subject to the Building Regulations 1991 (England and Wales) or the Building Regulations (Northern Ireland) 1994 must not be erected within one metre of a boundary. Due regard must be taken of all 'unprotected areas'.

8.2 Buildings subject to the Building Standards (Scotland) Regulations 1990 (as amended) must be sited in accordance with the provisions of Technical Standard D2.6 for compliance with these Regulations. Due regard must be taken of all 'unprotected areas'.

8.3 It can be shown by tests and assessment that the buildings will meet building regulations requirements for fire rating as given in Table 3.

8.4 The various exposed surfaces of the buildings assessed as having a Class 0* rating are:

plastisol-coated steel external wall and roof surfaces
vinyl-coated gypsum board internal wall surfaces
polyester ceiling surface
mineral fibre tiles (suspended) ceiling surface.

*As defined in the Building Regulations 1991 (England and Wales), Approved Document B, Appendix A; the Building Regulations (Northern Ireland) 1994 Technical Booklet E and the Appendix to Part D of the Technical Standards for compliance with the Building Standards (Scotland) Regulations 1990 (as amended).

Table 3 Fire rating

Component	Duration
External walls	one hour (from inside)
Combined ceiling and floor assembly	one hour (from underside)*
Steel column casing	one hour

*an optional ceiling/floor assembly with a 30 minute rating is available where appropriate.

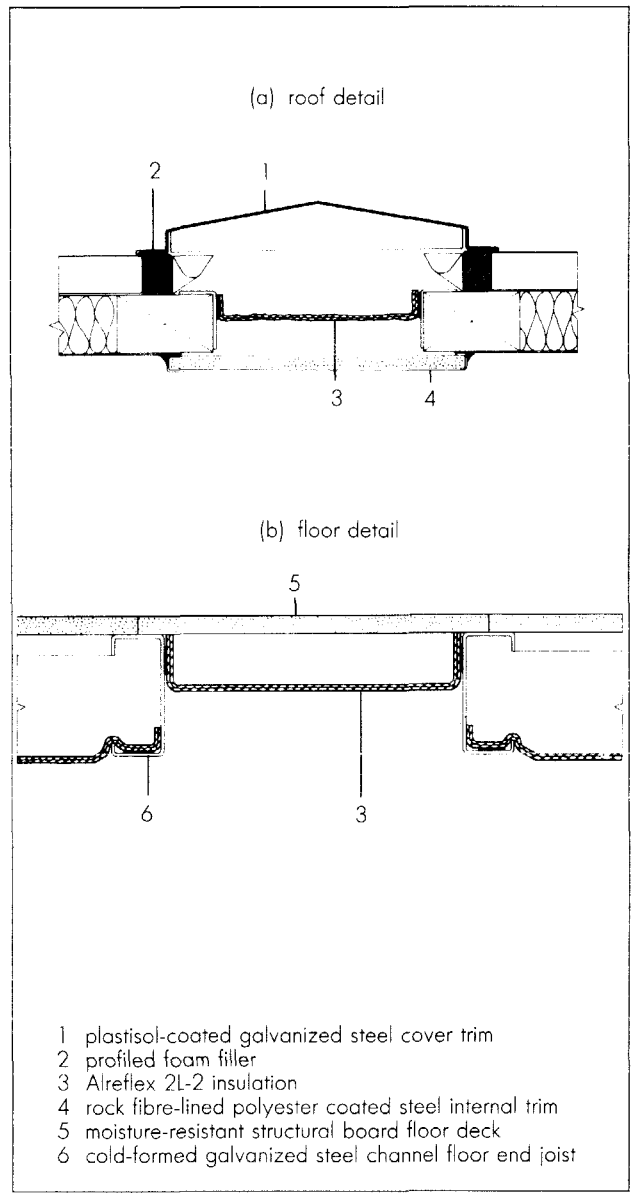
8.5 The roof is designated AA in accordance with the Building Regulations 1991 (England and Wales), Approved Document B, Appendix A, and the Building Regulations (Northern Ireland) 1994 Technical Booklet E.

8.6 The designation of the roof in Scotland must be determined in accordance with Standard D2.5 and the Appendix to Part D of the Building Standards (Scotland) Regulations 1990 (as amended).

8.7 Adequate provision must be made for escape in case of fire.

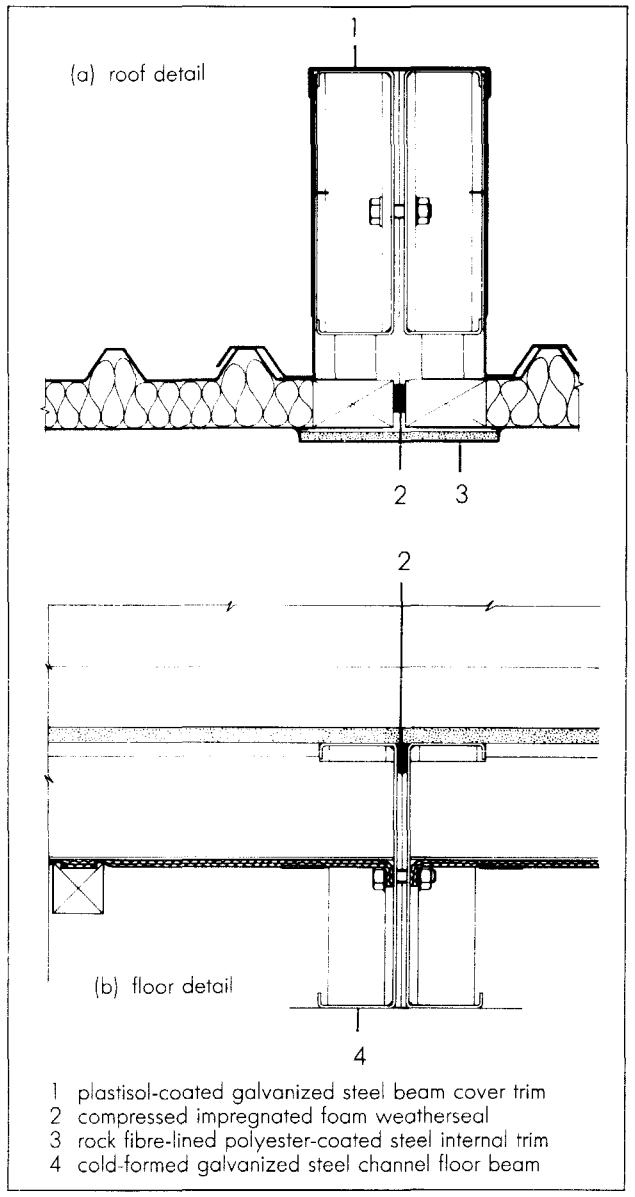
8.8 The regulations dealing with *Fire Spread* (England and Wales) and *Structural Fire Precautions* (Scotland and Northern Ireland) contain limits to the size of compartments in buildings according to the use and, in some cases, height. The BBA and Portakabin Ltd have agreed a list of these limits as they apply to the Duplex Building System.

Figure 5 Section through junction — two modules joined end to end



1 plastisol-coated galvanized steel cover trim
2 profiled foam filler
3 Alreflex 2L-2 insulation
4 rock fibre-lined polyester coated steel internal trim
5 moisture-resistant structural board floor deck
6 cold-formed galvanized steel channel floor end joist

Figure 6 Section through junction — two modules joined side to side



1 plastisol-coated galvanized steel beam cover trim
2 compressed impregnated foam weatherseal
3 rock fibre-lined polyester-coated steel internal trim
4 cold-formed galvanized steel channel floor beam

enabling the complete module to be crane handled. Upper floor modules have an integral locating socket within the bottom of the columns which is used to aid module alignment when linking them to lower modules.

Floors

4.7 Floors comprise 18 mm thick moisture resistant wood chipboard [exceeding the requirements of BS 5669 : Part 2 : 1989 (type C4)] fixed to the galvanized steel joists by self-drilling/self-tapping zinc-coated screws.

4.8 Thermal insulation is provided by an aluminium foil-faced polythene bubble sheet (Alreflex 2L-2) fixed beneath the floor joists and a reinforced, aluminised polyester low emissivity sheet draped between the joists. All joints between the bubble sheet and between the bubble sheet and steel floor joists/beams are sealed with a continuous strip of aluminium jointing tape.

External walls

4.9 External walls are of composite construction having an external skin of Colorcoat HP 200 plastisol-coated galvanized steel sheet (the subject of a BBA Certificate), timber studs and peripheral frame, a galvanized steel bottom rail and an internal lining of 12.5 mm thick gypsum wallboard. The void between the external skin and internal lining is filled with injected, rigid, CFC-free polyurethane insulation.

4.10 All walls are fixed to the perimeter of the galvanized steel floor frame with zinc-plated steel bolts and, in addition, short walls are fixed to the steel columns with zinc-plated self-tapping screws. The wall-to-wall corner joints and the wall-to-roof joints are fixed with plated wood screws.

External roof ceiling panel

4.11 The external roof is of composite construction having an upper profiled (trapezoidal)

14 Services

Electrical and plumbing services are outside the scope of this Certificate; however, in designing and installing these services, precautions must be taken to avoid the possible risk of long-term damage to the structure or the services by, for example, the ingress of water, water vapour or condensate from cold water service pipes.

15 Maintenance

15.1 External cladding requires an occasional washing down with water containing a mild detergent. In some areas, after approximately 10 years of service, it may be necessary to restore the visual appearance of the building by painting, using a paint recommended by Portakabin Ltd (see section 16.3).

15.2 The exposed columns should be repainted in accordance with BS 5493 : 1977.

15.3 In the event of impact or other damage to an external wall, a replacement plastisol-coated steel panel can be fitted over the original panel by Portakabin Ltd. If necessary, damage to the foam core of the wall can be made good before fitting the replacement panel. This will restore the appearance and ensure that the weathertightness and insulation are unaffected.

15.4 Trims or skirt panels can be readily replaced if necessary.

16 Durability

16.1 Available evidence relating to the durability of the materials used in the construction indicates that the Duplex Building System, when correctly maintained, will have a life of at least 25 years.

16.2 Foot traffic over the roof should be restricted to the purpose of maintenance and suitable precautions taken to avoid the risk of damaging the plastisol coating.

16.3 The plastisol coating and galvanizing will be effective for the building's envisaged life. Where a high aesthetic standard is required, maintenance painting may be required after a minimum of 10 years in coastal environments or after longer periods in less aggressive situations.

16.4 The ceiling covering will remain effective for this period. If cleaning is necessary, water and a mild detergent can be used.

16.5 If a suspended ceiling is used, the mineral fibre tiles will be effective for the building's envisaged life, but may require occasional painting. Care must be taken to ensure that any paint coating maintains the Class 0 surface spread of flame of the tiles.

16.6 The vinyl floor covering may require replacement during the building's envisaged life, depending on the use. Should it be necessary to replace or repair the vinyl floor covering, all joints must be welded. Any replacement vinyl floor covering must be to an equivalent specification as the original (see section 4.24).

16.7 The sealants used in the construction of the modules in the factory and to seal between modules on site are concealed and are not subject to excessive movement. They should not normally require replacement during the building's envisaged life.

Installation

17 General

17.1 Buildings must be erected with due regard to any boundary (see sections 8.1 and 8.2).

17.2 Erection is carried out by Portakabin Ltd. The arrangements for erection have been assessed and found to be satisfactory.

18 Preparation

Clients are normally responsible for provision of suitable foundations and services and therefore the following aspects should be subject to supervision and should be checked before the Duplex Building System modules are delivered to site:

(a) setting out and level of foundations

(b) setting out of service connections.

19 Procedure

19.1 The modules are placed by crane by Portakabin Ltd on prepared foundations using purpose-designed lifting points incorporated in the steel frame. Access to the site is required for the crane and this requirement will be agreed with the client.

19.2 Temporary weatherproofing at joints between modules and the open ends of incomplete buildings is provided by Portakabin Ltd to suit the construction sequence.

19.3 Where specified, the building modules must be bolted to the foundations.

19.4 Building modules of the same length can be multi-stacked. The modules are bolted together at the four steel column points.

19.5 The completion of external and internal cladding and trims is carried out on site. Service connections are made and internal subdivisions and finishes completed at joints between modules.

20 Supervision

For the benefit of clients who may wish to carry out their own checks during erection the

Technical Specification

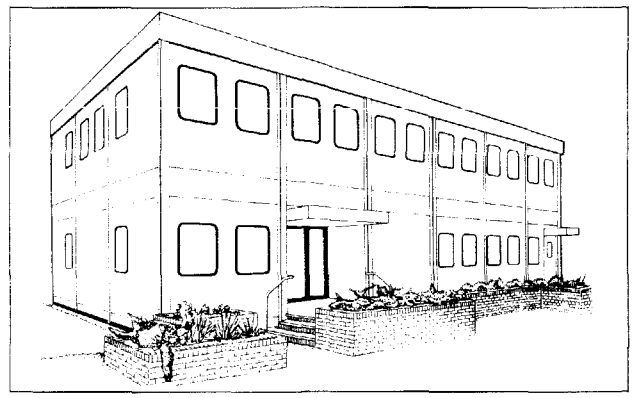
4 Description

General

4.1 This Certificate relates only to the form of construction described below and the Duplex Building Module Technical Specification approved by the BBA, when applied to single-, two-, or three-storey buildings. Both parties maintain and update this specification.

4.2 The Duplex Building System is based on a module consisting of a structural steel framework and composite roof and end wall panels. The modules are used to construct single-, two- or three-storey buildings incorporating walls to suit their location in the building (see Figure 1).

Figure 1 Typical Duplex building



4.3 The modules are available in the range of sizes given in Table 1.

Table 1 Size range

Type	Internal length (m)	Internal width (m)	Internal height (m)
024	7.2	2.94	2.5 or 3.0
032	9.6	2.94	2.5 or 3.0
040	12.0	2.94	2.5 or 3.0

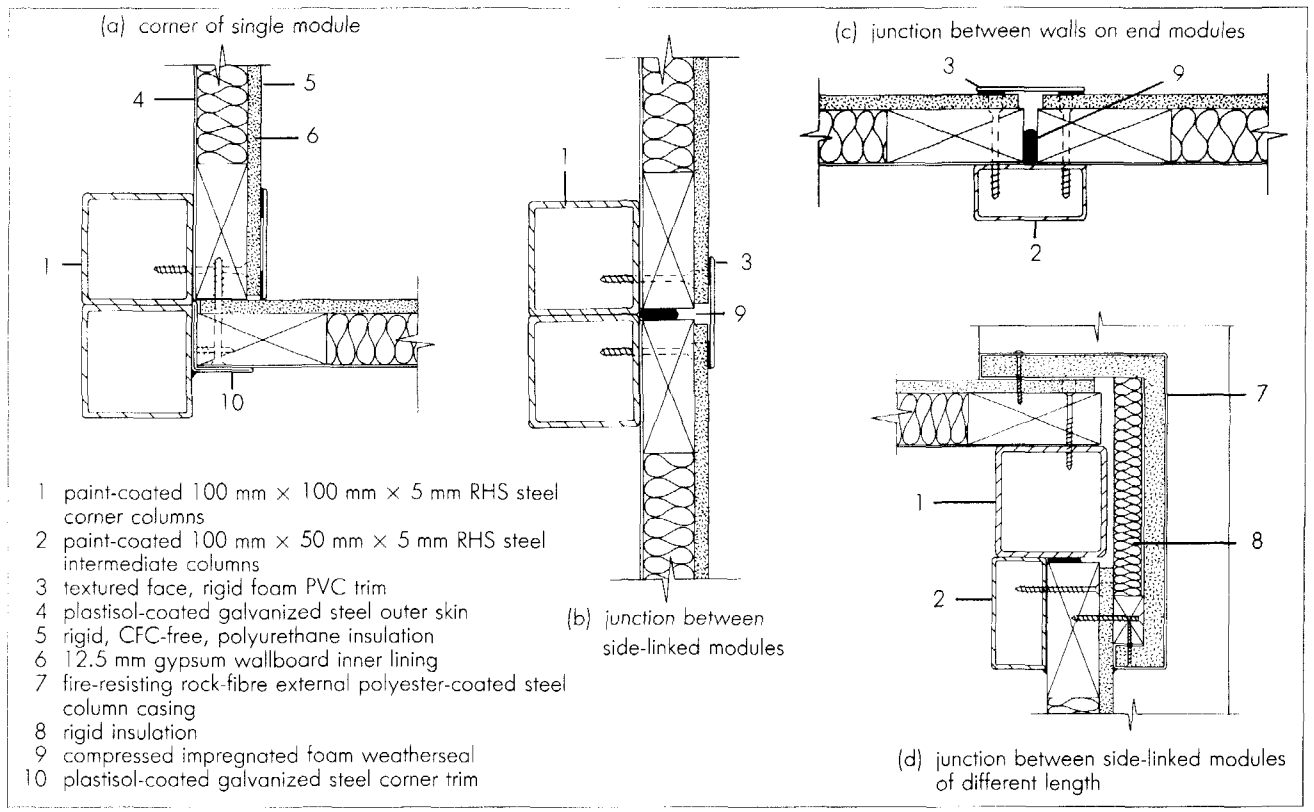
4.4 The full specification and drawings for the materials and components covered by this Certificate have been examined and are retained by the BBA. This section gives only general details of the system. Typical details are shown in Figures 2 to 8.

Structural frame

4.5 The galvanized steel frame for each module comprises four hot-rolled structural steel hollow-section columns, one at each corner of the module, bolted to cold-formed galvanized perimeter steel side beams at floor and roof level. Cold-formed steel floor joists span each module from side to side and are welded to the two floor side beams. Longitudinal timber floor runners are screwed to the steel floor joists to assist in the transportation of the module.

4.6 Each column has an integral lifting point within the top to accept a lifting eyebolt

Figure 2 Details in plan



BS 6399 *Loading for buildings*
Part 1 : 1984 *Code of practice for dead and imposed loads*
Part 3 : 1988 *Code of practice for imposed roof loads*

BS 8004 : 1986 *Code of practice for foundations*

BS EN 10147 : 1992 *Specification for continuously hot-dip zinc coated structural steel sheet and strip. Technical delivery conditions*

CP 3 *Code of basic data for the design of buildings*
Chapter V *Loading*
Part 2 : 1972 *Wind loads*

MOAT No 36 : 1987 *UEAtc Directives for the Assessment of Manufactured Plastic Floorings*

EN 29001 : Part 1 (same as BS 5750 : Part 1 : 1987).

ISO 9001 : 1987 *Quality systems — Method for quality assurance in design/development, production, installation and servicing*

*Replaced by BS EN ISO 9001 : 1987.

Conditions of Certification

23 Conditions

23.1 The system design, the quality of materials and components, the method of manufacture and the erection procedure have been examined and found satisfactory by the British Board of Agrément 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 that:

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

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

23.2 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.

23.3 In granting this Certificate, the BBA makes no representation as to the presence or absence of patent rights subsisting in the product and/or as to the legal right of Portakabin Ltd to market, install or maintain the product.

23.4 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 re-state the requirements of the Health and Safety at Work etc Act 1974, or of any other statutory or Common Law duties of care, or of any duty of care which may in the future exist; nor is conformity with such recommendations to be taken as satisfying the requirements of the 1974 Act or of any other 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 incurred in respect of personal injury arising as a direct or indirect result of the use of this product.

BBA BRITISH BOARD OF AGRÉMENT
ASSESSMENT OF PRODUCTS FOR CONSTRUCTION

In the opinion of the British Board of Agrément, the Duplex Building System is fit for its intended use if used as set out in this Certificate. Certificate No 94/22 is accordingly awarded to Portakabin Ltd.

On behalf of the British Board of Agrément P.C. Hewett

Date of issue: 30th November 1994 **Director**

British Board of Agrément
P O Box No 195, Bucknalls Lane
Garston, Watford, Herts WD2 7NG
Fax: 01923 662133

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BBA BRITISH BOARD OF AGRÉMENT

For technical or additional information, tel: 01923 670844.
For information about Agrément Certificate validity and scope, tel:
Hotline: 01923 662900

BBA BRITISH BOARD OF AGRÉMENT
ASSESSMENT OF PRODUCTS FOR CONSTRUCTION

Designated by Government to issue European Technical Approvals

Portakabin Ltd
Huntington
York YO3 9PT
Tel: 01904 611655 Fax: 01904 611644

DUPLEX BUILDING SYSTEM

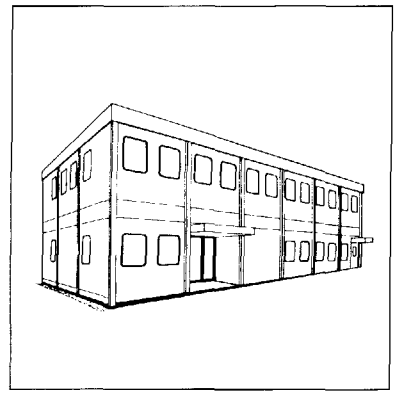
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Building System Agrément Certificate No 94/S22

1038/97

Product

- *THIS CERTIFICATE REPLACES CERTIFICATE No 91/S18 AND RELATES TO THE DUPLEX BUILDING SYSTEM.*
- *The system is for use as single-, two- and three-storey educational, office, institutional, residential and non-residential accommodation other than dwellings.*
- *The system has a design life of at least 25 years.*
- *This assessment does not cover staircases, windows, doorsets, fittings and raised access floors or the adequacy of the plumbing, drainage and electrical services supplied with the buildings or the ventilation of bathrooms and rooms containing sanitary conveniences, which will vary according to use.*
- *The Duplex Building System can be used to construct buildings with a wide variety of individual treatments and plan forms.*
- *Users, or Portakabin Ltd, when specifying plan form, internal subdivision, siting of the buildings, access for the disabled, access for fire services, and means of escape in case of fire, shall ensure compliance with the relevant Building Regulations' requirements.*



Building Regulations

1 The Building Regulations 1991 (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 building systems with the Building Regulations. In the opinion of the BBA, buildings constructed using the Duplex Building System, if used in accordance with the provisions of this Certificate, will meet the relevant requirements.

Requirement		Comments
A1	Loading	The buildings will have adequate strength and stability. See sections 7.1 to 7.11 of this Certificate.
B1	Means of escape	The buildings will meet the relevant requirements within the limitations set out in this Certificate. See sections 8.1, 8.3 to 8.5 and 8.7 of this Certificate.
B2	Internal fire spread (linings)	
B3	Internal fire spread (structure)	
B4	External fire spread	
B5	Access and facilities for the fire service	
C4	Resistance to weather and ground moisture	The buildings are acceptable.
L1	Conservation of fuel and power	The buildings are acceptable. See section 9.2 of this Certificate.
Regulation 7	Materials and workmanship	The buildings are acceptable. See section 16.1 of this Certificate.

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

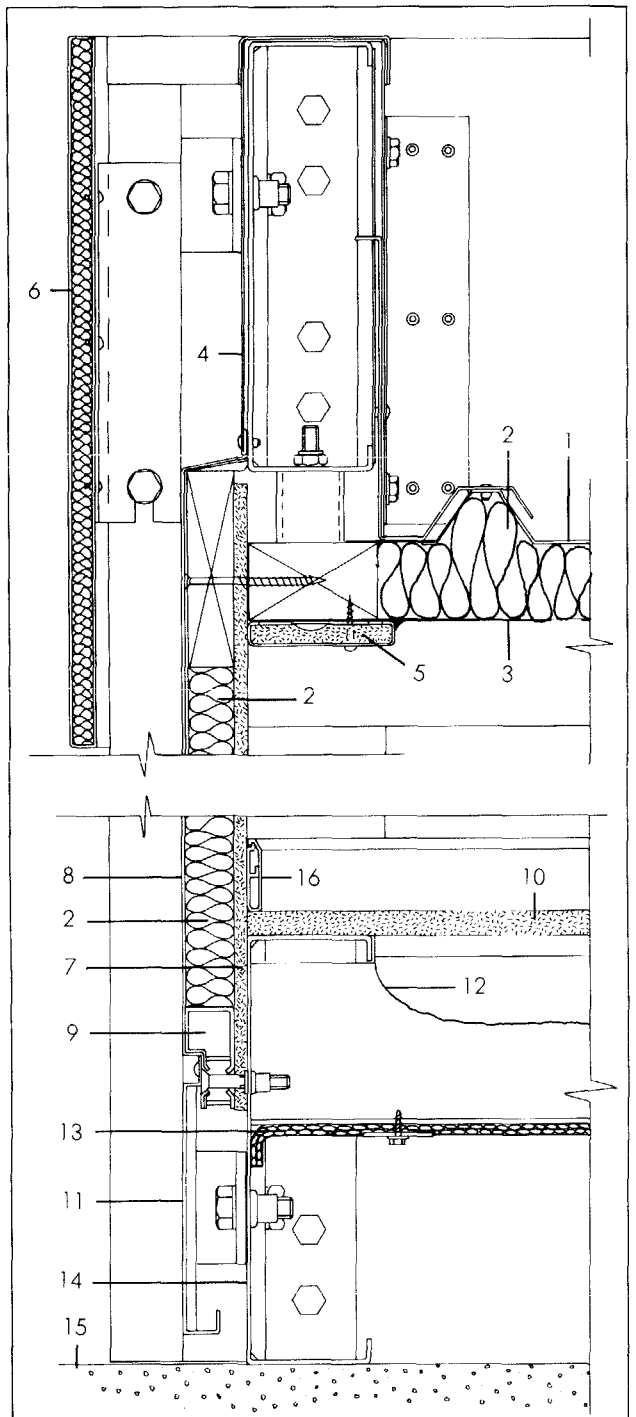
In the opinion of the BBA, the buildings described in this Certificate are capable of satisfying the Building Standards (Scotland) Regulations 1990 (as amended) with regard to the following matters, subject to the qualification contained in this Certificate.

Regulation/Standard		Comments
10	**Fitness of materials**	The buildings are acceptable
B2	Selection and use of materials, fittings, components and other manufactured products	
11	**Structure**	
C2.1	Construction	The buildings will have adequate strength and stability. See sections 7.1 to 7.11 of this Certificate.
12	Structural fire precautions	The buildings will meet the relevant Standards within the limitations set out in this Certificate. See sections 8.2 to 8.4 and 8.6 of this Certificate.
D2	Structural fire precautions	

DETERMINED PLAN

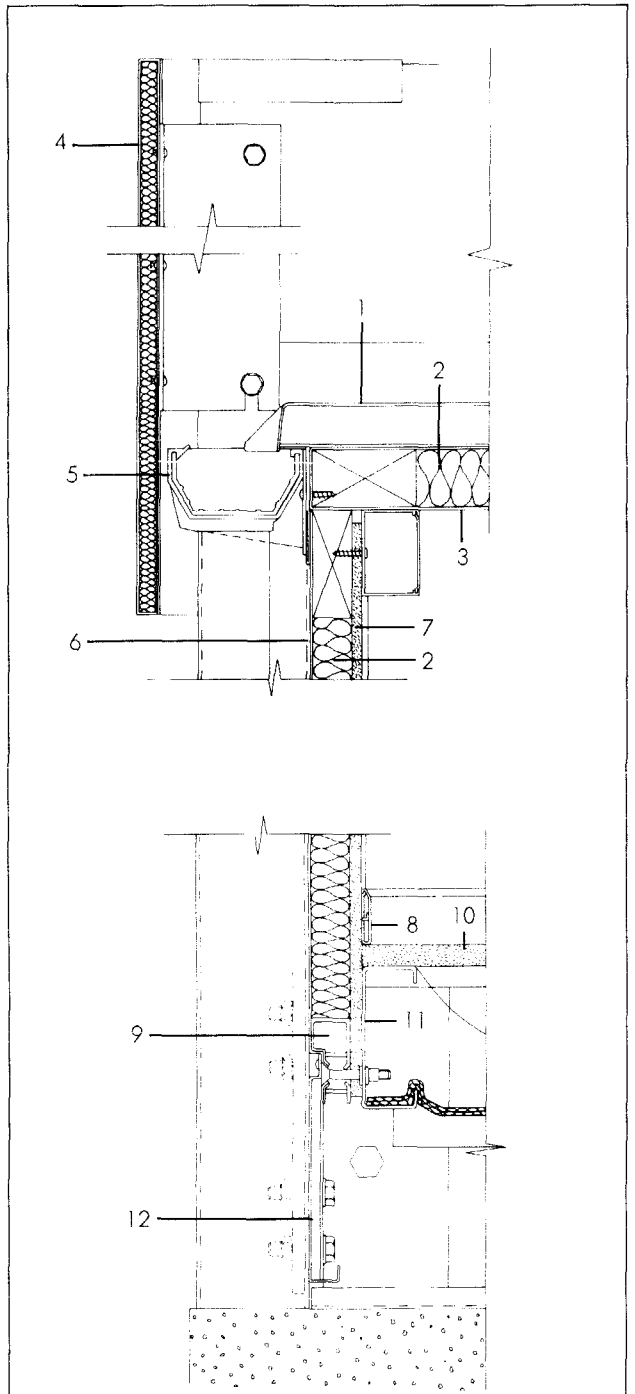
continued

Figure 3 Long wall section



1 profiled plastisol-coated galvanized steel outer skin
2 rigid, CFC-free, polyurethane insulation
3 polyester-coated steel inner lining
4 *plastisol-coated galvanized steel beam cover trim*
5 rock fibre-lined polyester-coated steel internal trim
6 composite fascia panel
7 12.5 mm gypsum wallboard inner lining
8 plastisol-coated galvanized steel outer skin
9 galvanized steel bottom rail
10 moisture resistant structural board floor deck
11 plastisol-coated galvanized steel skirt
12 low emissivity thermal sheet
13 Alreflex 2L-2 floor insulation
14 cold-formed galvanized steel channel floor beam
15 polythene damp-proof course
16 PVC skirting

Figure 4 Short wall section with gutter



1 profiled plastisol-coated galvanized steel outer skin
2 rigid, CFC-free, polyurethane insulation
3 polyester-coated steel inner lining
4 composite fascia panel
5 PVC gutter and downpipe
6 plastisol-coated galvanized steel outer skin
7 12.5 mm gypsum wallboard inner lining
8 PVC skirting
9 galvanized steel bottom rail
10 moisture resistant structural board floor deck
11 cold-formed galvanized steel channel floor end joint
12 plastisol-coated galvanized steel skirt

8.9 Where it is necessary for fittings, services or ducts to penetrate part of the fire-resisting construction, the detailing must ensure that the relevant fire resistance is not impaired, particularly in relation to the integrity requirements.

8.10 The behaviour in relation to fire of any intermediate walls or cavity barriers between modules in either the roof and floor voids (other than where these occur at the perimeter of a module), or windows and doors, or internal stairwells, have not been assessed and are therefore outside the scope of this Certificate.

9 Thermal insulation

9.1 The U value (thermal transmittance measured in $Wm^{-2}K^{-1}$) of the building elements (excluding discrete bridges) can be taken as:

ground floor	—	0.26
external wall	—	0.43
roof	—	0.38
glazing	—	5.7

9.2 It can be shown by calculation that the rate of heat loss through the envelope of a building (with or without discrete bridges) does not exceed *that of a notional building of the same size* and shape which is designed to comply with the Elemental Approach given in Approved Document L1 to the Building Regulations 1991 (England and Wales), Standard J2.2 of the Technical Standards for compliance with the Building Standards (Scotland) Regulations 1990 (as amended), and, Technical Booklet F to the Building Regulations (Northern Ireland) 1994.

10 Condensation

10.1 The buildings are not suitable for use where the internal relative humidity is expected to exceed 70% for any significant length of time since condensation may occur. Assuming normal internal conditions of temperature and humidity, and appropriate ventilation (see section 11.1), it is considered that the amount and duration of any condensation will be insufficient to significantly affect the structural or thermal properties of the building.

10.2 If the floor is penetrated by services, eg soil pipes, the joints between the services and the floor deck and floor insulation must be adequately sealed to prevent the ingress of water and water vapour.

10.3 Equipment producing large quantities of water vapour, for example flueless heaters, must not be used.

10.4 Adequate underfloor ventilation is provided to ensure that any condensation on the steelwork or insulation is effectively dispersed (see section 11.2).

11 Ventilation

11.1 The design of the windows should allow adequate ventilation and is an important factor in reducing the incidence of surface condensation. The windows should be designed so that the amount of openable window ventilation is a minimum of 5% of the floor area or provision of mechanical ventilation considered. Portakabin Ltd should be consulted with regard to the requirements for background ventilation.

11.2 The void beneath the ground floor must have at least 600 mm² of open area per metre run of external wall.

12 Sound insulation

12.1 Tests and assessments in accordance with BS 2750 : Part 3 : 1980 show that the weighted sound reduction index (R_w) of an external panel, with and without a window, was estimated to be 29 dB, and measured to be 31 dB, respectively.

12.2 When tested in accordance with BS 2750 : Part 4 : 1980, the mean standardised Level Difference ($D_{nT,w}$) of four floor/ceiling assemblies was measured to be 48 dB. Flanking transmission varies with the layout of the building and will affect this value.

12.3 Impact sound transmission will depend on the resilience of the floor coverings used in the buildings.

13 Weathertightness and damp-proofing

13.1 The steel supporting columns raise the building clear of the ground, giving it an inherent resistance to rising damp in the walls. A damp-proof course to protect the galvanizing is provided where the galvanized steel contacts the foundations.

13.2 The ground beneath the building should, as a minimum, be effectively cleared of turf and other vegetable matter at least to a depth sufficient to prevent later growth.

13.3 In preparing the site for erection of the building, adequate drainage must be provided, or other precautions taken, to prevent water flowing beneath the building or ponding against the perimeter steelwork. Flower beds should not be positioned so that loose soil can become banked against the building perimeter.

13.4 The roof and external wall surfaces will provide adequate weather resistance. The final weathertightness of the building is dependent upon efficient positioning and sealing of the roof cover strips, the sealing of the horizontal joint between stacked modules and the vertical joints between adjacent modules.

13.5 The buildings are provided with suitable rainwater gutters and downpipes.

13.6 The performance of windows and doors is not covered by this Certificate; however, the perimeter joints between windows and doors and the wall panels have been assessed and are adequate to ensure that water penetration will not occur at these positions.

Building Regulations (continued)

2 The Building Standards (Scotland) Regulations (continued)

Regulation/Standard		Comments
13	**Means of escape from fire, facilities for fire-fighting and means of warning of fire in dwellings**	See section 8.7 of this Certificate.
E2	Means of escape from fire	
16 and 17	**Preparation of sites and resistance to moisture**	The buildings are acceptable.
G2	Preparation of a site and resistance to moisture from the ground	
G3.1	Resistance to precipitation	
22	**Conservation of fuel and power**	The buildings are acceptable. See section 9.2 of this Certificate.
J2.2	Performance standards	

3 The Building Regulations (Northern Ireland) 1994

In the opinion of the BBA, the buildings described in this Certificate are capable of satisfying the Building Regulations (Northern Ireland) 1994 with regard to the following matters, subject to the qualifications contained in this Certificate.

Regulation		Comments
B2	Fitness of materials and workmanship	The buildings are acceptable. See section 16.1 of this Certificate.
C2	Preparation of site and resistance to dangerous and harmful substances	The buildings are acceptable.
C4	Subsoil drainage	
C5	Resistance to ground moisture and weather	
D1	Loading	The buildings will have adequate strength and stability. See sections 7.1 to 7.11 of this Certificate.
D2	Stability	
E2	Means of escape	The buildings will meet the relevant regulations within the limitations set out in this Certificate. See sections 8.1, 8.3 to 8.5 and 8.7 of this Certificate.
E4	Internal fire spread — Linings	
E6	Internal fire spread — Structure	
E8	External fire spread	
E10	Facilities and access for the Fire Brigade	
F2	Conservation of fuel and power	The buildings are acceptable. See section 9.2 of this Certificate.

following checks can be made and are in addition to normal building checks:

(a) Before each ground-floor module is positioned

location of dpc's

positioning of sealing strip between adjacent modules

(b) During positioning of ground-floor modules

no damage is caused to the steelwork protective systems

(c) After each ground-floor module is positioned

fixings between modules

(d) Before each first- or second-floor module is positioned

positions of sealing strip between adjacent modules

(e) After each first- or second-floor module is positioned

fixings between modules

(f) Completion of roof weatherproofing at junction between modules

(g) Satisfactory extension of finishings over joints between modules

(h) Fixing of casings to columns to ensure continuity of fire protective systems

(i) Satisfactory fixing of ground-floor skirt panels to provide ventilation.

Technical Investigations

The following is a summary of the technical investigations carried out on the Duplex Building System.

21 Tests

Tests and data were analysed to determine:

performance in fire
acoustic performance
suitability of three-storey applications.

22 Other investigations

22.1 An examination was made of existing data to assess:

structural strength and stability
behaviour in fire
impact resistance of floor and wall panels
load capacity of roof and floor
physical characteristics of injected, rigid, CFC-free polyurethane insulation
resistance to sound transmission
weathertightness
durability
maintenance requirements.

22.2 Calculations were undertaken and examined in conjunction with the results of the tests referred to in sections 21 and 22, to establish the structural strength and stability.

22.3 Calculations were made and computer simulations carried out to determine the effectiveness of the insulation arrangements and the risk of condensation.

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

Additional Information

The management systems of Portakabin Ltd have been assessed and registered as meeting the requirements of ISO 9001, EN 29001 and BS 5750 : Part 1 : 1987 by SGS Yarsley International Certification Services Ltd (Certificate No 91/444).

Bibliography

BS 2750 *Measurement of sound insulation in buildings and of building elements*
Part 3 : 1980 *Laboratory measurements of airborne sound insulation of building elements*
Part 4 : 1980 *Field measurements of airborne sound insulation between rooms*

BS 5268 *Structural use of timber*
Part 2 : 1991 *Code of practice for permissible stress design, materials and workmanship*
Part 6 *Code of practice for timber frame walls*
Section 6.1 *Dwellings not exceeding three storeys*

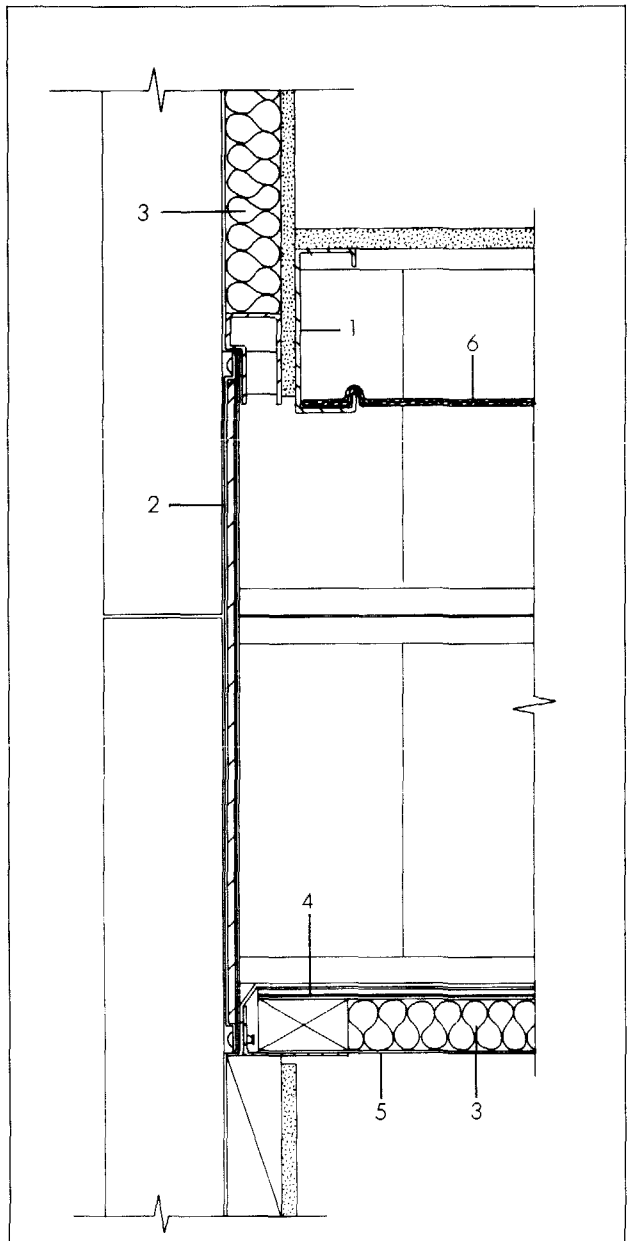
BS 5493 : 1977 *Code of practice for protective coating of iron and steel structures against corrosion*

BS 5669 *Particleboards*
Part 2 : 1989 *Specification for wood chipboard*

BS 5750 *Quality systems*
Part 1 : 1987* *Specification for design/development, production, installation and servicing*

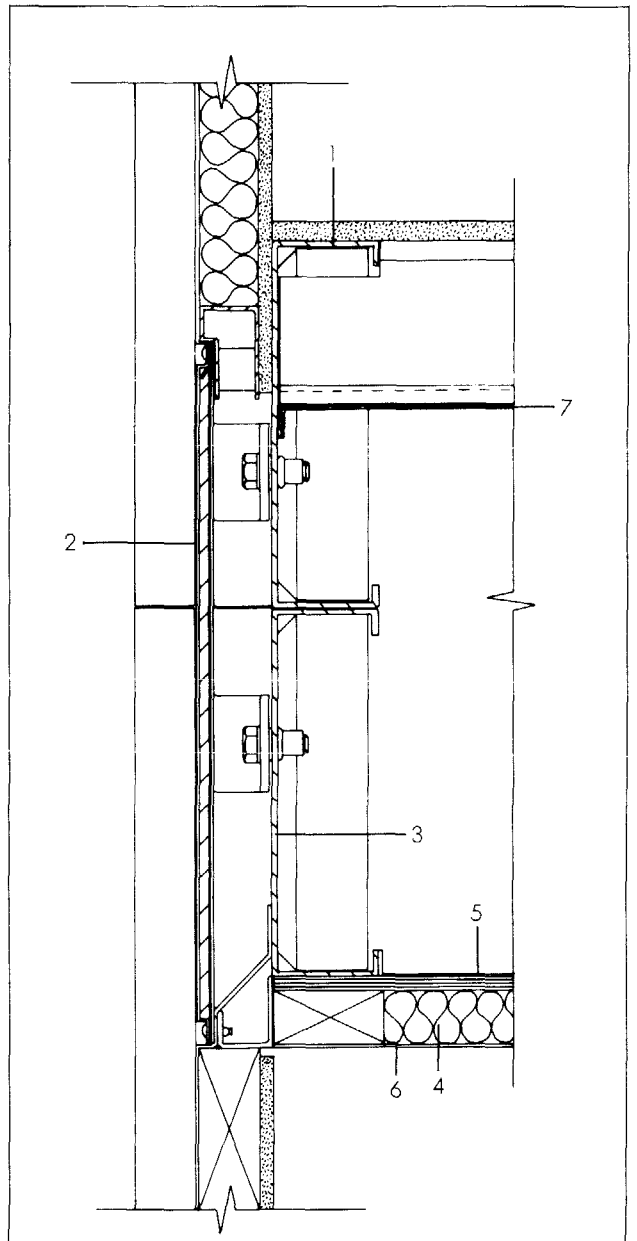
BS 5950 *Structural use of steelwork in building*
Part 1 : 1990 *Code of practice for design in simple and continuous construction: hot rolled sections*
Part 5 : 1987 *Code of practice for design of cold formed sections*

Figure 7 Floor ceiling assembly — short wall section



1 cold-formed galvanized steel channel floor end joist
2 plastisol-coated galvanized steel-faced intermediate panel
3 rigid, CFC-free, polyurethane insulation
4 WBP plywood deck with a waterproof membrane
5 polyester-coated steel lining
6 Alreflex 2L-2 insulation

Figure 8 Floor ceiling assembly — long wall section



1 cold-formed galvanized steel channel floor beam
2 plastisol-coated galvanized steel-faced intermediate panel
3 cold-formed galvanized steel channel roof beam
4 rigid, CFC-free, polyurethane insulation
5 WBP plywood deck with a waterproof membrane
6 polyester-coated steel lining
7 Alreflex 2L-2 insulation

skin of plastisol-coated galvanized steel sheet, rigid polyurethane/plywood composite inserts, softwood peripheral frame and a ceiling lining of polyester coated steel. The void between the upper skin and ceiling lining is filled with injected, rigid, CFC-free polyurethane insulation.

4.12 The external roof is bolted to, and supported by, the two galvanized steel roof side beams so that it has a 1:129 fall along the length of the module.

Intermediate ceiling panels for two or three storeys

4.13 The ceiling panel is of a composite construction having an upper plywood deck, timber studs and peripheral frame, and ceiling lining of polyester coated steel. The void between the upper deck and ceiling lining is filled with injected, rigid, CFC-free polyurethane insulation.

4.14 The ceiling is bolted to, and supported by, the two galvanized steel roof side beams such that the ceiling is in a horizontal plane.

Protection of steelwork against corrosion

4.15 The side beams and floor joists are produced from galvanized steel sheet to EN 10147 : 1992 with a G 600 coating. After fabrication all welds are cleaned off and coated with zinc-rich paint.

4.16 The roof beams are produced from galvanized steel sheet to EN 10147 : 1992 with a G 275 coating. After fabrication, all welds are cleaned off and coated with zinc-rich paint.

4.17 The hot-rolled structural steel columns are shot-blasted and coated with two coats of anti-corrosive primer and finished in slate grey paint.

4.18 The external skin of the building is protected by a 200 micron coating of PVC plastisol applied over a G 275 zinc coating to EN 10147 : 1992.

Finishes

4.19 The external faces of wall panels, wall trims and fascias have a blue grey or silk grey plastisol coating with a leathergrain finish.

4.20 The external face of the roof panel has a white plastisol coating with a leathergrain finish.

4.21 Internal walls have a textured dolomite white vinyl finish.

4.22 The ceiling has a white polyester silk finish.

4.23 Fascias and wall trims made from plastisol-coated steel are fitted to the external corners, the perimeter of the roof, the lower perimeter of all modules, the upper perimeter of modules to be used at ground floor in two- or three-storey buildings and the horizontal junction between modules in two- or three-storey buildings. Fascias and wall trims are fitted after site assembly of the modules is completed.

4.24 In applications where water will be present, ie kitchens or toilets, vinyl floor covering must be used with welded joints, and sealed 100 mm vertical upstands must be provided at all floor/wall interfaces. The vinyl floor covering is classified G4 or better as defined in MOAT No 36 : 1987.

5 Manufacture

5.1 System components are bought in to agreed specifications or in accordance with British Standards or Agrément Certificates.

5.2 Steel-framed components of the system are constructed using conventional metalworking techniques.

5.3 Quality checks are made on the sub-assemblies, such as wall and roof panels and the steel frame, and on the final assembly of the modules. Quality control carried out during manufacture includes checks on dimensions, squareness and welding.

6 Delivery and site handling

6.1 The modules are transported to site on a flat-bed lorry or trailer long enough to fully support the module.

6.2 The modules are unloaded by crane.

6.3 The open sides of the modules are weather-proofed during transit using polythene sheet.

6.4 The modules are normally positioned on the day of delivery, thus site storage is not required.

Design Data

7 Strength and stability

7.1 With certain exceptions described in this section, the design of the Duplex Building System is in accordance with:

BS 5950 : Part 1 : 1990

BS 5950 : Part 5 : 1987

BS 5268 : Part 2 : 1991

BS 5268 Part 6 : Section 6.1 : 1988.

7.2 It is designed to support loads evaluated in accordance with:

BS 6399 : Part 1 : 1984

BS 6399 : Part 3 : 1988

CP 3 : Chapter V : Part 2 : 1972.

7.3 Where required, structural testing has been used to verify the relevant aspects of the design outside the scope of the codes, including resistance of panels to racking, fastening characteristics, interaction of components and effects of thermal cycling.

7.4 The minimum and maximum limitations on the number of modules that can be used is detailed in Table 2.

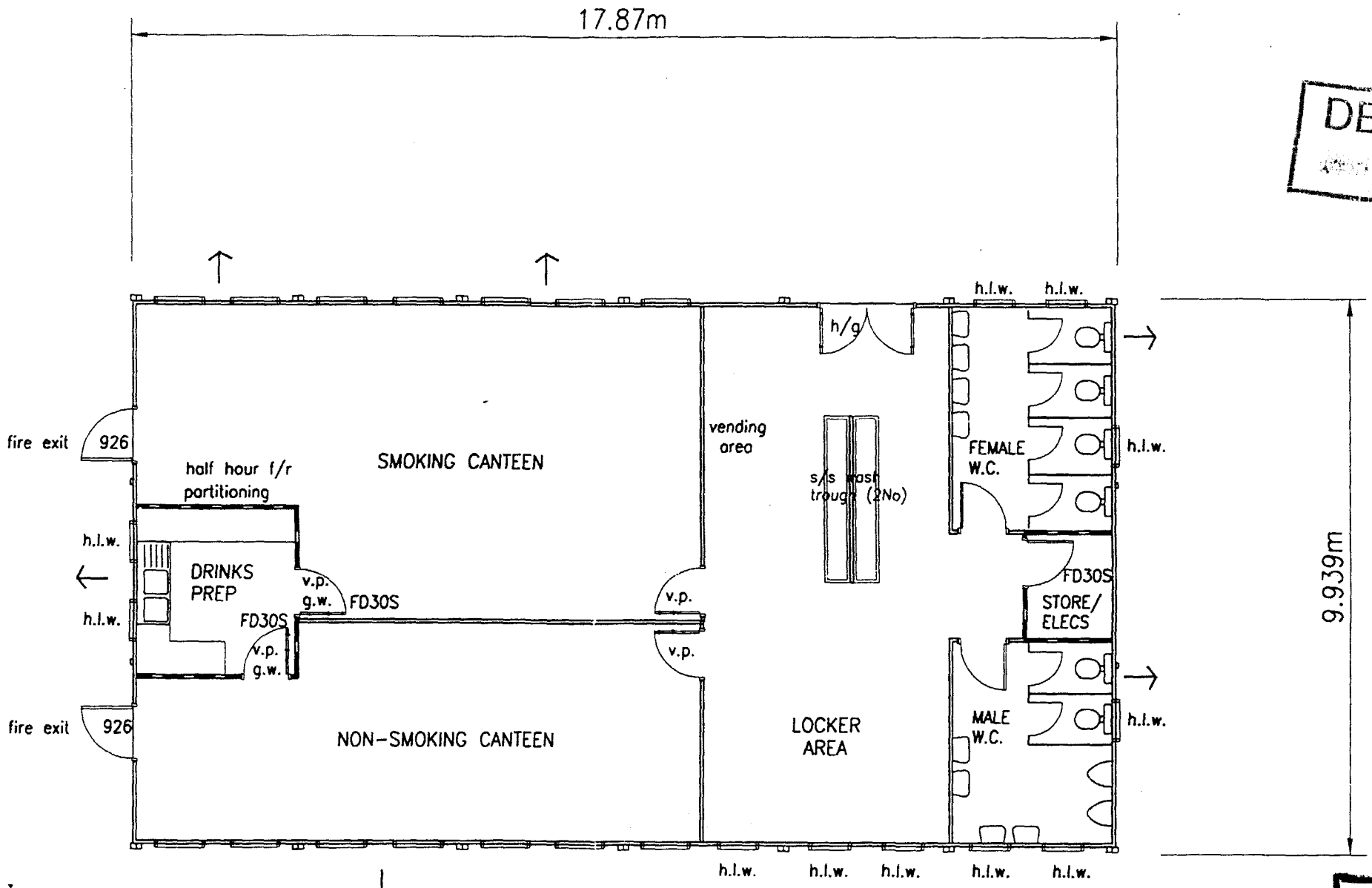
7.5 Two- and three-storey buildings covered by this assessment must be constructed from modules of similar length placed one above the other.

7.6 A multi-span layout, within the scope of this Certificate, is limited to four modules only.

7.7 In certain building configurations the racking resistance of the building is supplemented by internal walls designed generally in accordance with BS 5268 : Part 6 : Section 6.1 : 1988. All changes to internal walls must be agreed by Portakabin Ltd.

7.8 The roof is designed to support a uniformly distributed imposed load of 0.75 kNm^{-2} or a

Do not scale off this drawing. All discrepancies to be reported to Portakabin Limited.



DETERMINED PLAN

PLAN Total Floor Area 169.58m²

SOUTH HOLLAND DC
HOUSING & PLANNING
29 SEP 1997
Ref 1038/97

Note
Under Part M2 Disabled Access of the Building Regulations 1992, a disabled w.c. is necessary.
(Not included in this layout)

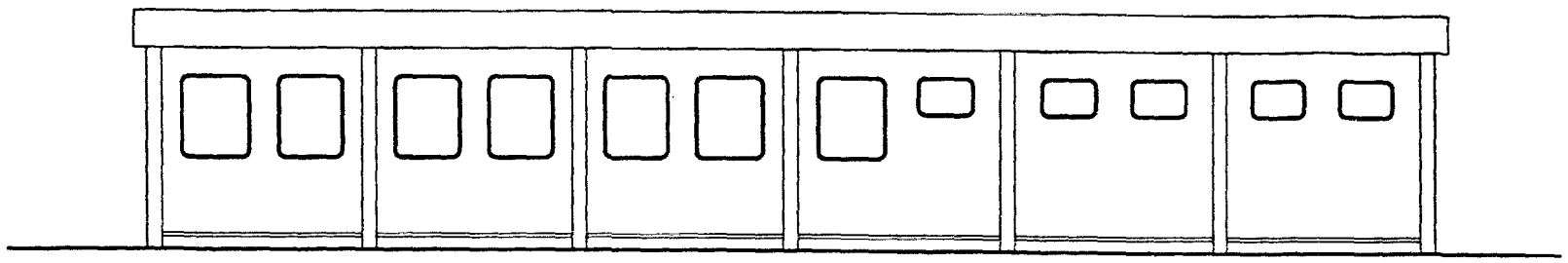
Duplex®
Building System

Portakabin Limited Huntington York YO3 9PT
Telephone 01904 611655 Fax 01904 611644

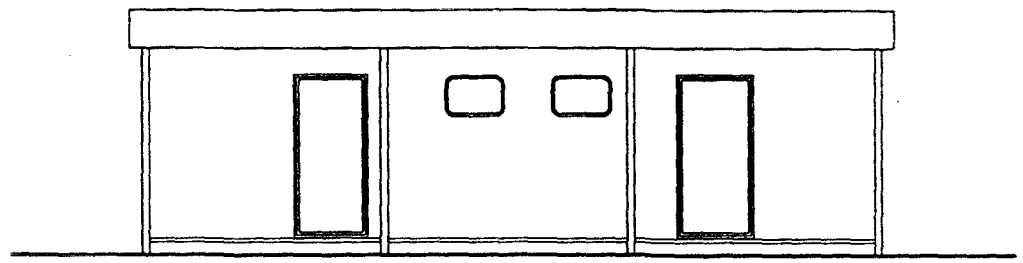
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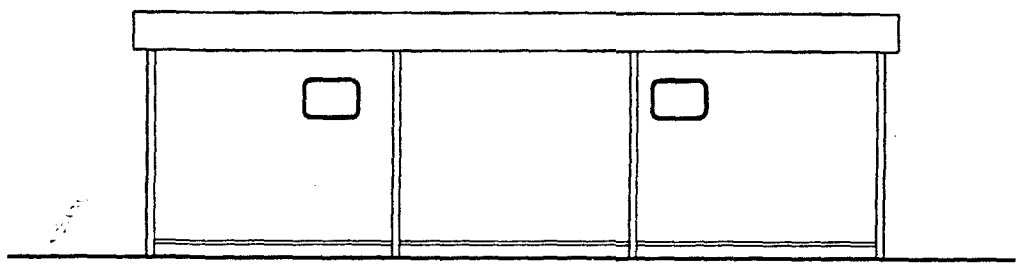
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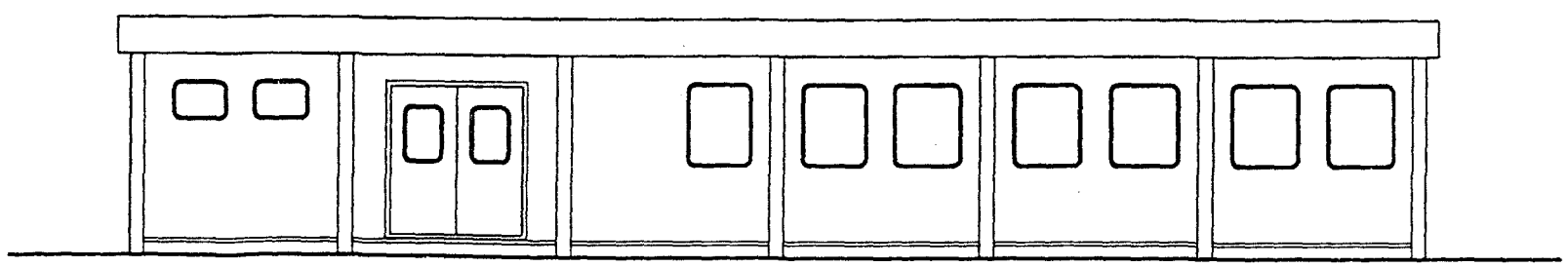
REAR ELEVATION



R/H ELEVATION



L/H ELEVATION



ENTRANCE ELEVATION

DETERMINED PLAN

1038/97

Duplex®
Building System

Portakabin Limited Huntington York YO3 9PT
Telephone 01904 611655 Fax 01904 611644

Client: DGM Growers Ltd

Title: PROPOSED ELEVATIONS

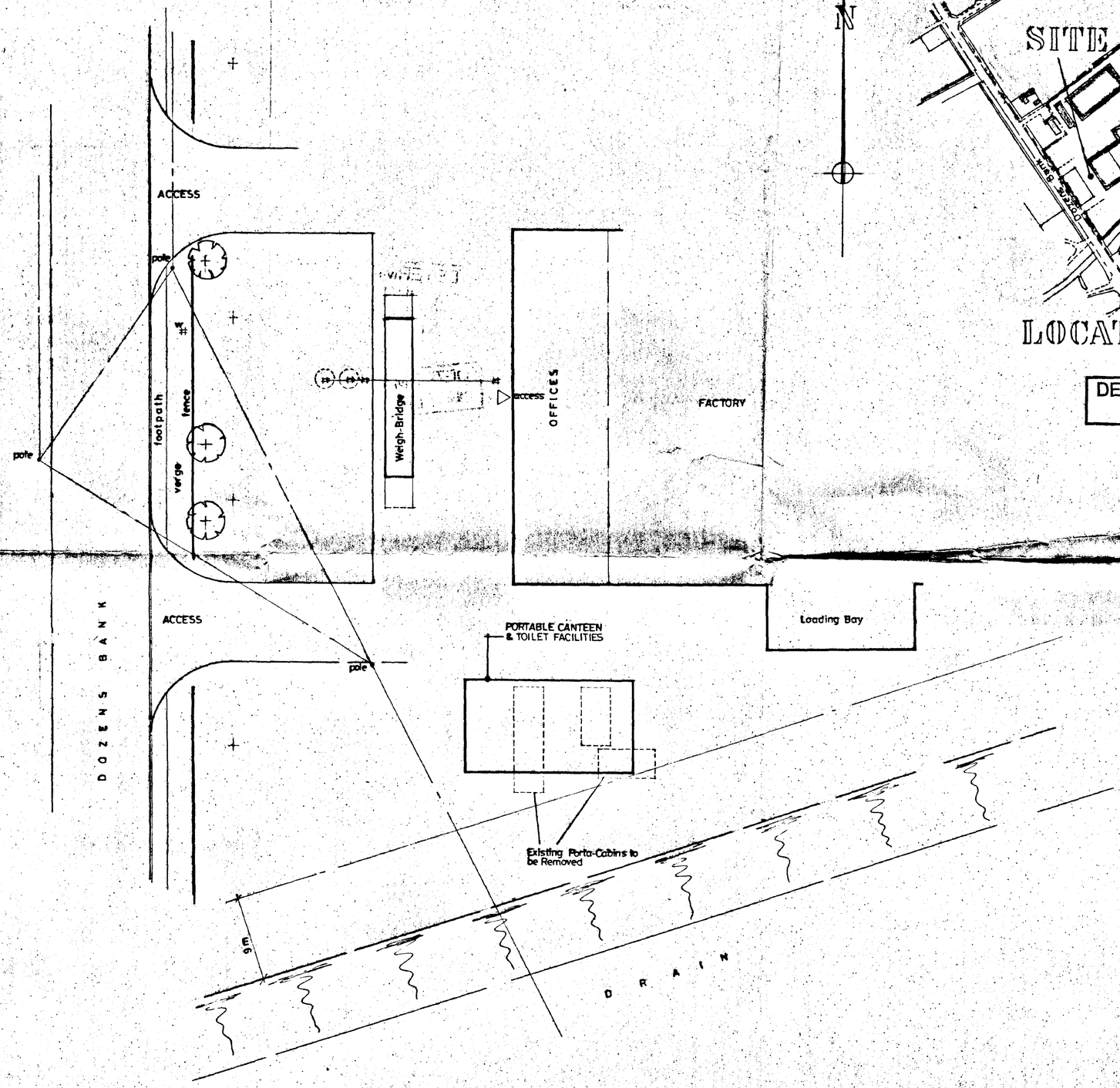
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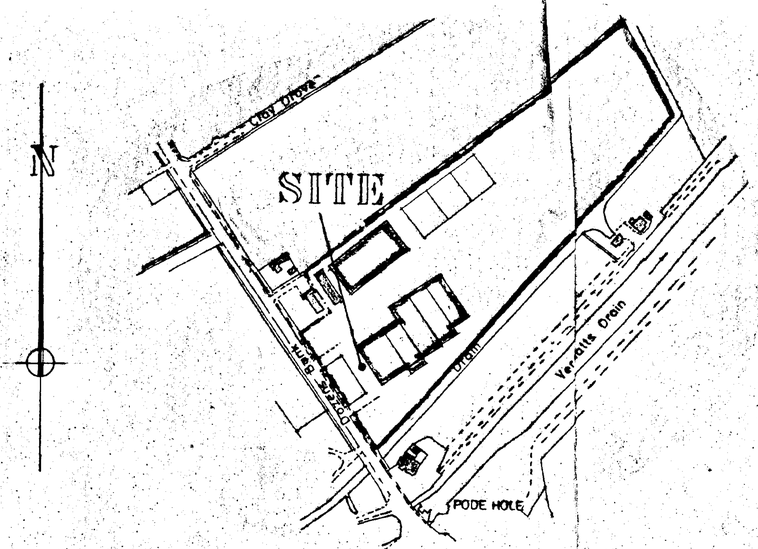
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SITE LAYOUT



LOCATION PLAN

DETERMINED PLAN

SOUTH HOLLAND DC
HOUSING & PLANNING
29 SEP 1997
Ref: 1058/97.

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The General Contractor is to check all dimensions on site and report discrepancies to the Architect.
All details shown on this drawing including foundations are based upon typical site conditions related to the area. No responsibility can be accepted for abnormal conditions which may be discovered during construction unless reported to the Architect so that design amendments may be considered. Site soil surveys are recommended in respect of foundations to establish specific site conditions before foundation work is undertaken.

G. R. MERCHANT
I.ENG AMICE, FIWO,
ARCHITECTURAL, STRUCTURAL & LAND DRAINAGE CONSULTANT
TEL: HOLBEACH (01406) 490800

PROJECT:
IMPROVED STAFF FACILITIES

CLIENT:
DGM GROWERS LTD
PODE HOLE
SPALDING
LINCS

SCALES:	DATE:
1/2500 1/250	*JUNE 1996*

G.R.MERCHANT.	DRAWING No.:
	DGM-G 09/1

REVISIONS: