

Confirmation of Certification

AGREMENT CERTIFICATE 1984/194
(Reappraisal July 2024)

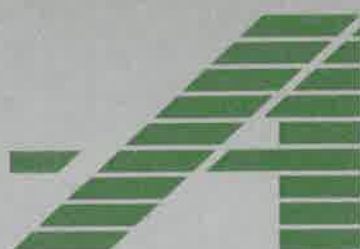
is awarded to:

OHM Asset Holdings (Pty) Ltd

in recognition of:

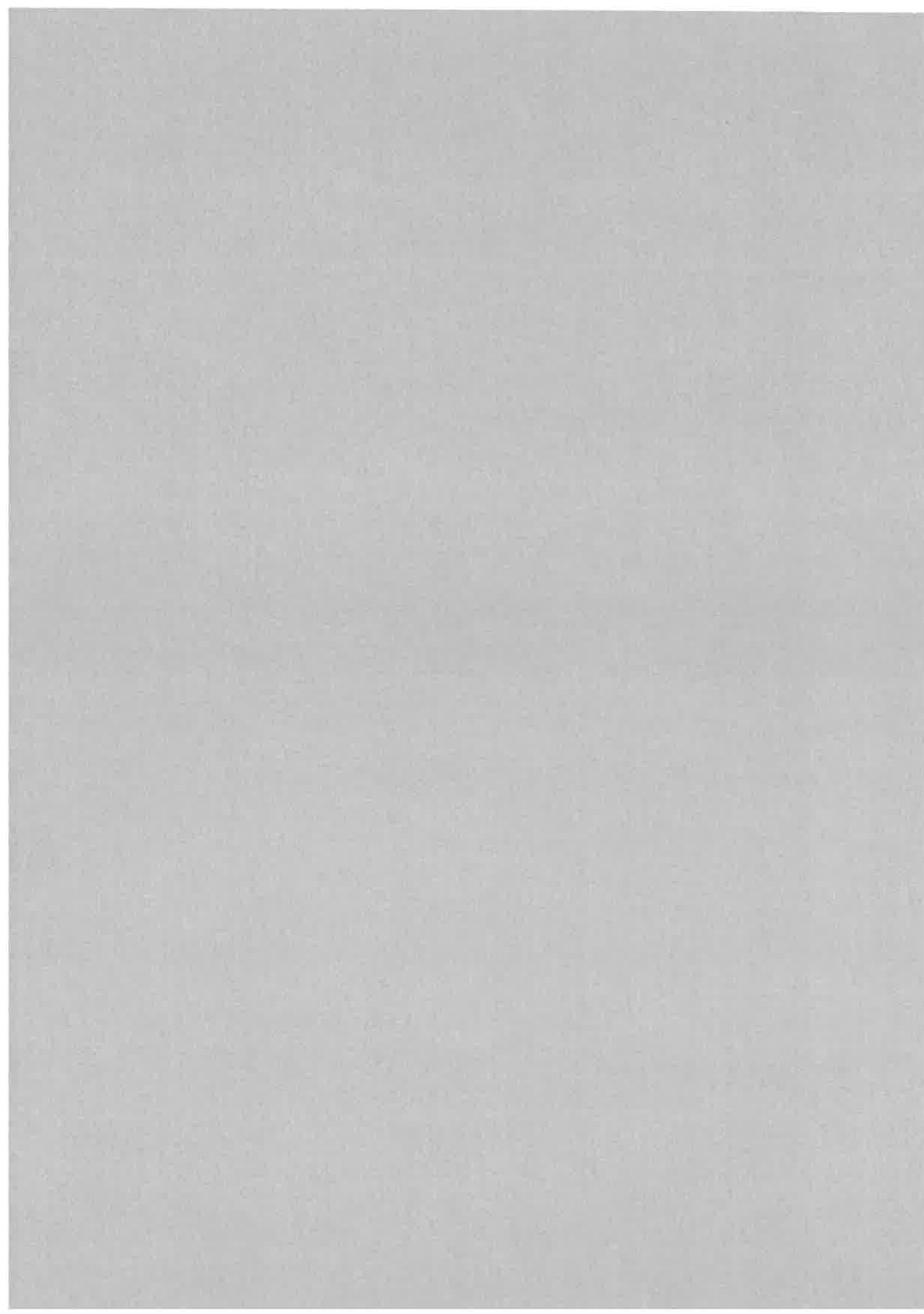
Kwikframe Building System

which certificate provides detailed information on the performance in use and the uses of the subject of the certificate. When presented as proof of certification this document must be accompanied by the abovementioned certificate or by a certified copy of the typescript of the certificate approved by the Board.



CHAIRPERSON

Prof. Jeffrey Mahachi



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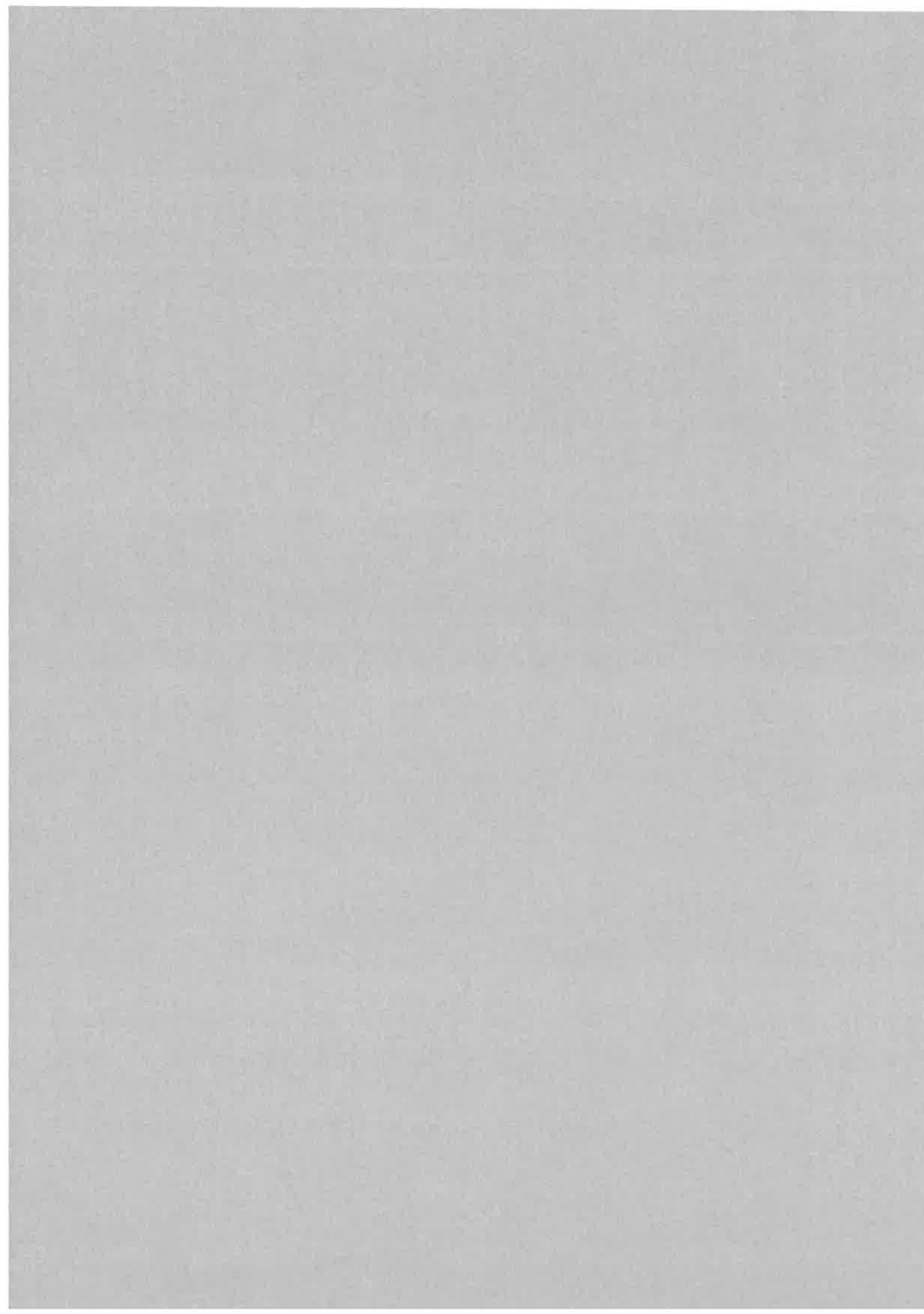
**AGRÉMENT CERTIFICATE
NO 1984/194
(REAPPRAISAL JULY 2024)**

**KWIKFRAME BUILDING
SYSTEM**



innovative construction product assessments

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Africa, July 2024

Subject:

KwikFrame Building System

Certificate holder:

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Website: www.kwikframe.co.za

The master copy of this
document appears on the
website:

<http://www.agrement.co.za>

Validity

Users of any Agrément certificate
should check its status: all
currently valid certificates are
listed on the website. In addition,
check whether the certificate is
[Active or Inactive](#).

The certificate holder is in
possession of a confirmation
certificate attesting to his status.

SANS 10400 (2022): *The application
of the National Building Regulations.*



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Use

The certificate covers the use of KwikFrame Building System in all
regions of South Africa for the erection of single and double-storey
buildings for the occupancy classes (**SANS 10400: Table 1 of Regulation
A20 (1)**) set out below:

- place of instruction (A3)
- low risk industrial (D3)
- offices and day clinics (G1)
- dormitory (H2)
- domestic residence (H3) and
- dwelling houses (H4).

NB. Agrément South Africa assessed Kwikframe Building System for single-
storey buildings. The system may however be used for double-storey
applications **provided an approved competent engineer takes full
responsibility.**

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This certificate and Agrément South Africa's evaluation apply only to
KwikFrame Building System buildings that are designed and erected as
described and illustrated in this certificate, and where the terms and
conditions of certification are complied with.

General description

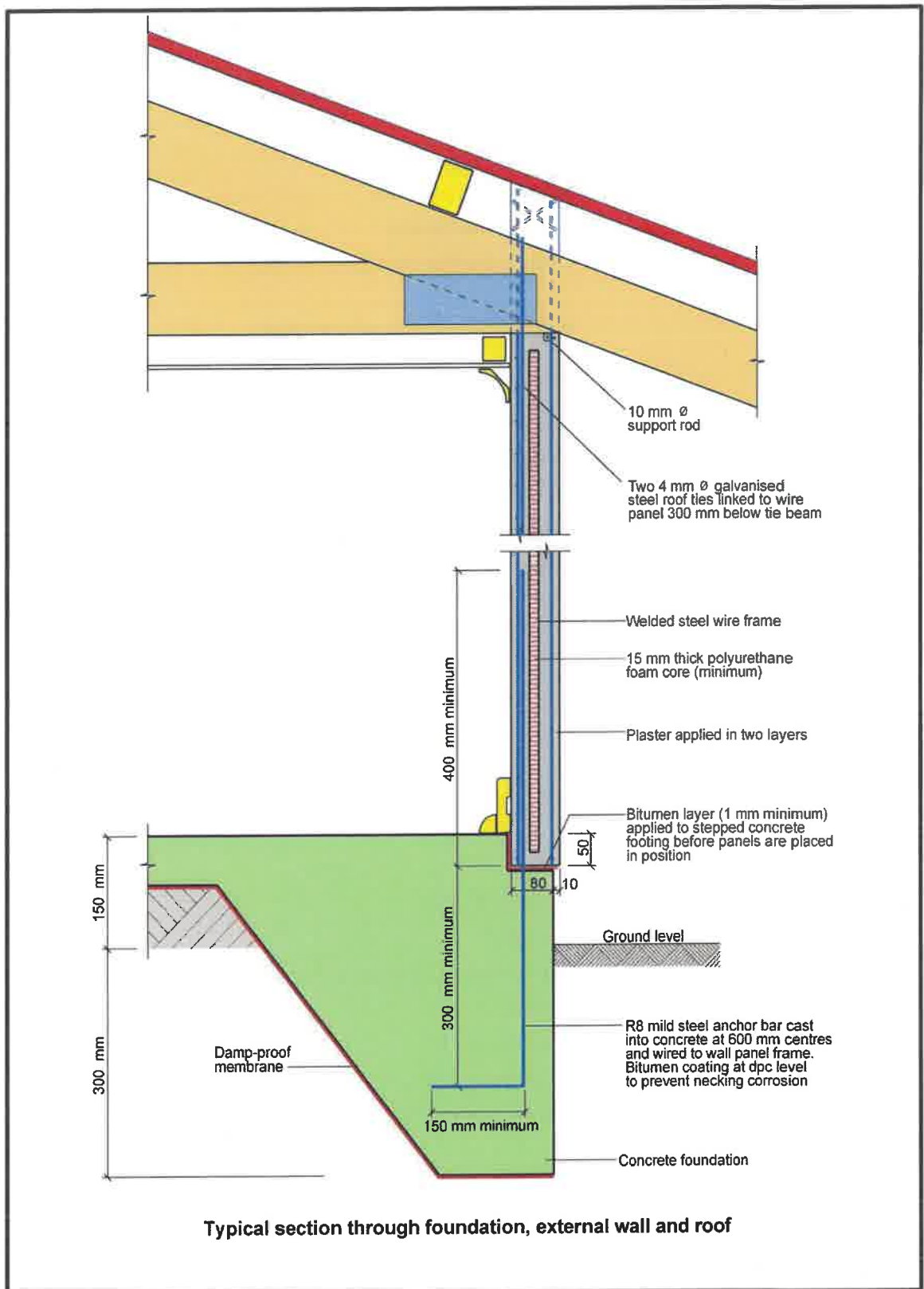
The KwikFrame Building System buildings are single- and double-storey buildings where the manufacture of wall panels and erection of buildings are under the control of a competent person who will:

- ensure that wall panel manufacturing standards are maintained
- ensure the integrity of the entire building and
- adhere to the requirements of this certificate.

The KwikFrame Building System consists of:

- concrete raft foundations with thickened edge beams for external walls and the floor slab thickened under loadbearing internal walls or
- conventional cast *in-situ* strip footings for perimeter walls and conventional cast *in-situ* concrete strip footings or thickened surface beds under internal walls
- KwikFrame superstructure walls that are constructed on and anchored to conventional strip foundations and surface beds. These walls are erected using lightweight, three-dimensional welded wire frames, with or without a central insulating core of polyurethane foam insulation. Once the wire frames are in place, door and window frames, together with roof anchors and any built in services are fixed in place and both faces of the wire frames are plastered to form continuous wall surfaces.

All other aspects of the construction are conventional.



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PREAMBLE

This certificate is issued by Agrément South Africa in terms of Agrément South Africa Act No. 11 of 2015. This certificate:

- has been granted after a technical appraisal of the performance of KwikFrame Building System buildings for the uses covered by the certificate
- is independent of any patent rights that may or may not subsist in the subject of the certificate and
- does not relieve the certificate holder from the obligation to obtain the prior approval of the building authority concerned for the use of the subject.

Agrément South Africa's opinion is that the quality and performance of KwikFrame Building System will be satisfactory, provided that the requirements stipulated in this certificate are adhered to. However, Agrément South Africa does not on behalf of itself, or the State, or any of its employees or agents guarantee such quality or performance.

The certificate holder is responsible for compliance with this certificate's requirements and the quality of the finished buildings.

No action for damages, or any other claim whatsoever, lies against Agrément South Africa, its members, the State or any of its employees should the said components and materials fail to comply with the standard set out in this certificate.

Building authorities or users who are in any doubt about any detail or variation, should contact [Agrément South Africa](#).

The validity of this certificate is reviewed every three years. The certificate shall remain valid as long as Agrément South Africa is satisfied that:

- the certificate holder complies with the general and specific conditions of certification and the technical requirements stipulated in the certificate
- the performance-in-use of the subject is acceptable, and
- any changes in building legislation, regulations, relevant standards or Agrément performance criteria have not invalidated the technical assessment which formed the basis of certification.

Agrément South Africa reserves the right to withdraw the certificate at any time, should reasonable cause exist.

Notices affecting the validity of this certificate will be published in the *Government Gazette*.

PART 1: CONDITIONS OF CERTIFICATION

Licensee - any person or company appointed by the certificate holder and registered with Agrément South Africa to construct KwikFrame Building System in accordance with this certificate and authorized by the certificate holder to claim compliance with the certificate. It is the certificate holder's responsibility to ensure that the licensee carries out the works in compliance with this certificate and in accordance with the approved quality system.

The KwikFrame Building System described in this certificate must:

- be designed and erected by the certificate holder or a licensee under the control of a professional engineer or approved competent person
- be constructed in accordance with the technical description (see [Part 3](#)) and the certificate holder's detailed specifications and quality management documentation and
- comply with the Conditions of Certification.

Any person required to check on details of construction must refer to the documentation listed above, which is available from the certificate holder.

KwikFrame Building System is a combination of innovative and conventional construction. A change to any one aspect could result in one or more of the other aspects no longer complying with Agrément South Africa's performance criteria. For these reasons, no change may be made to KwikFrame Building System as described and illustrated in this certificate unless such change is approved in writing by Agrément South Africa before it is implemented.

SANS 17050-1 (2013) Conformity assessment-Supplier's declaration of conformity Part 1: General requirements.

SANS 17050-2 (2013) Conformity assessment-Supplier's declaration of conformity Part 2: Supporting documentation.

OHM Asset Holdings (Pty) Ltd shall be responsible for the accuracy of the information contained within the Material Data Sheets, Technical Data Sheets and Material Performance Specifications, and all other information pertaining to the supply and application of KwikFrame Building System. OHM Asset Holdings (Pty) Ltd shall submit a COA (Certificate of Analysis) and COC (Certificate of Compliance) in terms of the requirements stipulated in **SANS 17050-1** and **SANS 17050-2**. Should OHM Asset Holdings (Pty) Ltd change or substitute any ingredient in the formulation of the product in question, then a notification shall be addressed to Agrément South Africa immediately.

KwikFrame Building System
Tested and approved fit for purpose when constructed as specified in

CERTIFICATE 1989/194
(Reappraisal July 2024)



General conditions

Marking

A plaque at least 100 mm x 75 mm, with Agrément South Africa's identification logo together with the number of this certificate, as depicted, must be fixed at an appropriate position to an external wall of all KwikFrame Building System buildings.

Validity

The continued validity of this certificate is subject to a satisfactory review by Agrément South Africa every three years.

Quality monitoring

The certificate holder is required to participate in Agrément South Africa's post-certification quality management system, which requires:

- that the certificate holder shall maintain and continuously implement the quality system approved by Agrément South Africa in the assessment of KwikFrame Building System
- the certificate holder to notify Agrément South Africa within 30 days of any change of address of a factory and any new factories brought into operation by the certificate holder, for the purpose of manufacturing the subject of the certificate
- the certificate holder at any time of commencement of each contract, to provide Agrément South Africa with construction sites or structures on which the subject is to be used and
- the co-operation of the certificate holder in facilitating post-certification quality monitoring by Agrément South Africa or its authorised agents.

Reappraisal

- must be requested by the certificate holder prior to making changes to the building system and
- will be required by Agrément South Africa if there are changes to the National Building Regulations or Agrément South Africa's assessment criteria.

This certificate may be withdrawn if the certificate holder or a registered licensee fails to comply with these requirements.

The conventional aspects of the construction are subject to the rules of good building practice (typically as described and illustrated in Agrément South Africa's [Supplement to certificates](#) and in the *Home building Manual* issued by the National Home Builders Registration Council), and must comply with the National Building Regulations.

Requirements of Supplement to certificates that must be met

The [Supplement to certificates: good building practice](#) (revised 2001) applies to those conventional aspects of KwikFrame Building System that have not been specifically assessed (see Part 2: Scope of assessment on next page). Cognisance should be taken of the recommendations contained in the Supplement to certificates to ensure that an acceptable standard of construction is consistently maintained.

On behalf of the Board of Agrément South Africa

Signed


Chairperson

July 2024

PART 2: ASSESSMENT

Scope of assessment

This assessment applies to those innovative aspects of KwikFrame Building System described in [Part 3](#) of the certificate. It also applies to those conventional aspects of the building system which, in the opinion of Agrément South Africa, are influenced by the innovative aspects. The innovative aspects referred to are:

- the method of erecting the walls using three-dimensional KwikFrame wire frames with cement plaster
- the method of anchoring the walls to the foundations
- the method of anchoring the roof to the walls
- the method of providing damp-proof courses
- the use of KwikFrame walls to connect conventional buildings
- the method of constructing an additional storey to conventional single storey buildings.

Assessment

In the opinion of Agrément South Africa, KwikFrame Building System as described in this certificate is suitable for the construction of buildings of the [types specified](#) (page 1).

The performance-in-use of buildings erected with this system will be such that they will satisfy:

- the relevant requirements for safety and health prescribed by Agrément South Africa
- where stated in Table 1, the requirements of the National Building Regulations and
- Agrément South Africa's performance criteria and requirements for durability and habitability.

Agrément South Africa's detailed comments on the assessment are set out in Tables 1, 2 and 3 below. Each aspect of performance was assessed by experts in that field.

For details see Agrément South Africa's [Assessment criteria: building and walling systems](#).

Republic of South Africa. **National Building Regulations**, Government Notice No. R711, Government Gazette No. 34586, Pretoria, South Africa, 09 September 2011.

Compliance with the National Building Regulations

The innovative aspects of KwikFrame Building System relates to the National Building Regulations as set out in Table 1. Any regulation not specifically referred to is considered to be outside the scope of this certificate and must be applied by the local authority in the normal manner.

Table 1: Performance

Aspects of performance	Opinion of Agrément South Africa	National Building Regulations satisfied
<i>Fitness-for-purpose of materials used</i>	The materials described in Part 3 meet the requirements of the National Building Regulations.	A13(1)(a) <i>Materials</i>
<i>Behaviour in fire</i>	External walls are classified type FR (non-combustible), where the different wall types are used in the positions indicated in Part 3 .	K4 <i>Walls</i> T1 (1) (b) and (c) are satisfied as far as the walls are concerned. Comments made in Supplement to certificates must be taken into account when building plans are scrutinized by local authorities to check compliance with Regulations T1 (1) (a), T1 (1) (d) with regard to spread of smoke, and T1 (1) (e). Deemed-to-satisfy rules T4.5.1 and T4.5.2 of Section 3 of SANS 10400 have been met. As defined in deemed-to-satisfy rule T4.2.1 of Section 3 of SANS 10400, the external walls of KwikFrame Building System buildings are classified as type FR (non-combustible) with a fire-resistance rating of 60 minutes. The safety distances as set out in the relevant rules of Part T can therefore be applied.
<i>Structural strength and stability</i>	Satisfactory, provided that the design requirements set out in this certificate are adhered to.	K1, K3 <i>Walls</i> Regulation B1 (1) and (2) are deemed to be satisfied when KwikFrame Building System buildings are built in accordance with the technical specification and description set-out in Part 3. When these conditions are not complied with, the structural design and erection of each building is the responsibility of a registered competent engineer (deemed-to-satisfy rule B4.2.3 of SANS 10400 is applicable). Regulations H4.1.1 and H4.1.2, <i>Foundations</i>, are deemed to be satisfied as follows: • H4.1.1 on non-problematic soils • H4.1.2 in all buildings where foundations are designed by a professional engineer or approved competent person and deemed-to-satisfy rule H4.2.1 applies.
<i>Water penetration and rising damp</i>	Satisfactory. KwikFrame Building System buildings will meet Agrément South Africa's criteria for resistance to rainwater penetration and rising damp throughout South Africa.	J1(4) <i>Floors</i> K2 <i>Walls</i>

Table 2: Habitability

Aspects of performance	Opinion of Agrément South Africa	Explanatory notes
Thermal performance	Satisfactory. Maximum summer temperatures in a KwikFrame Building System dwelling with insulated ceilings will be less than those experienced in a standard brick house.	Agrément South Africa's opinion is based on the calculated likely maximum indoor air temperature in summer in 53 m² Space Frame dwellings erected in Cape Town, Durban and Johannesburg, and the calculated energy required to maintain an indoor temperature of 16 °C in winter, in these dwellings situated in Cape Town and Johannesburg. When assessing the thermal performance of a dwelling, the calculated performance of the subject is compared with that of the standard brick house. This is of similar size, orientation and fenestration as the Space Frame dwellings and has, • external and internal walls constructed from 230 mm thick brickwork and 115 mm thick brickwork respectively, • plastered internal wall surfaces, • a concrete floor, • a sheeted roof that is fitted with a ceiling without insulation.
Energy usage	The energy required to heat a KwikFrame Building System dwelling in winter will be considerably less than that required for a standard brick house.	
Condensation	Satisfactory. KwikFrame Building System dwelling performs similarly when compared with an Agrément standard dwelling.	Condensation is generally a problem in the Southern Coastal Condensation Problem Area (SCCP Area). Agrément South Africa Requires that the minimum standard of performance be equivalent to that of Agrément standard dwelling, which in itself is not immune to condensation problems. NB: Insulated ceilings must be installed in all instances.
Acoustic performance	Satisfactory. Agrément South Africa's performance criteria for sound attenuation between adjacent rooms and dwellings have been met. SANS 10218 (2004): Part 1: <i>Acoustical properties of buildings</i>	Agrément South Africa's opinion was based on a theoretical analysis of the frequency-weighted sound reduction index, R_w. The <i>in-situ</i> airborne sound insulation that is likely to be obtained between adjacent rooms for wall type 2 to 9 is set out in Part 3. This value meets Agrément South Africa's criteria and most of the recommended sound insulation values set out in SANS 10218: Part 1. A description of the degree of acoustic privacy that can be expected between specific rooms for various degrees of sound insulation is given in Supplement to certificates.

Table 2: Habitability (continued)

Aspect of performance	Opinion of Agrément South Africa	Explanatory note
Durability	Satisfactory. Given regular and adequate maintenance, the durability of KwikFrame Building System buildings will be similar to that of conventional buildings.	Agrément South Africa's opinion is based on the performance of KwikFrame Building System buildings inspected over a number of years, the examination and testing of test structures and on knowledge of the materials of construction used in this building method. Minor surface cracks may be expected to occur in the walls. These have no structural significance and should not result in rainwater penetration. Maintenance and painting of the exterior walls should be required at normal intervals (4 to 5 years) in inland areas. This frequency should be increased to every 3 to 4 years in coastal areas. In buildings that are close to the sea, corrosion of the wire space frames may occur. In this event the wall should be repaired expeditiously by a specialist contractor

Table 3: Quality management system

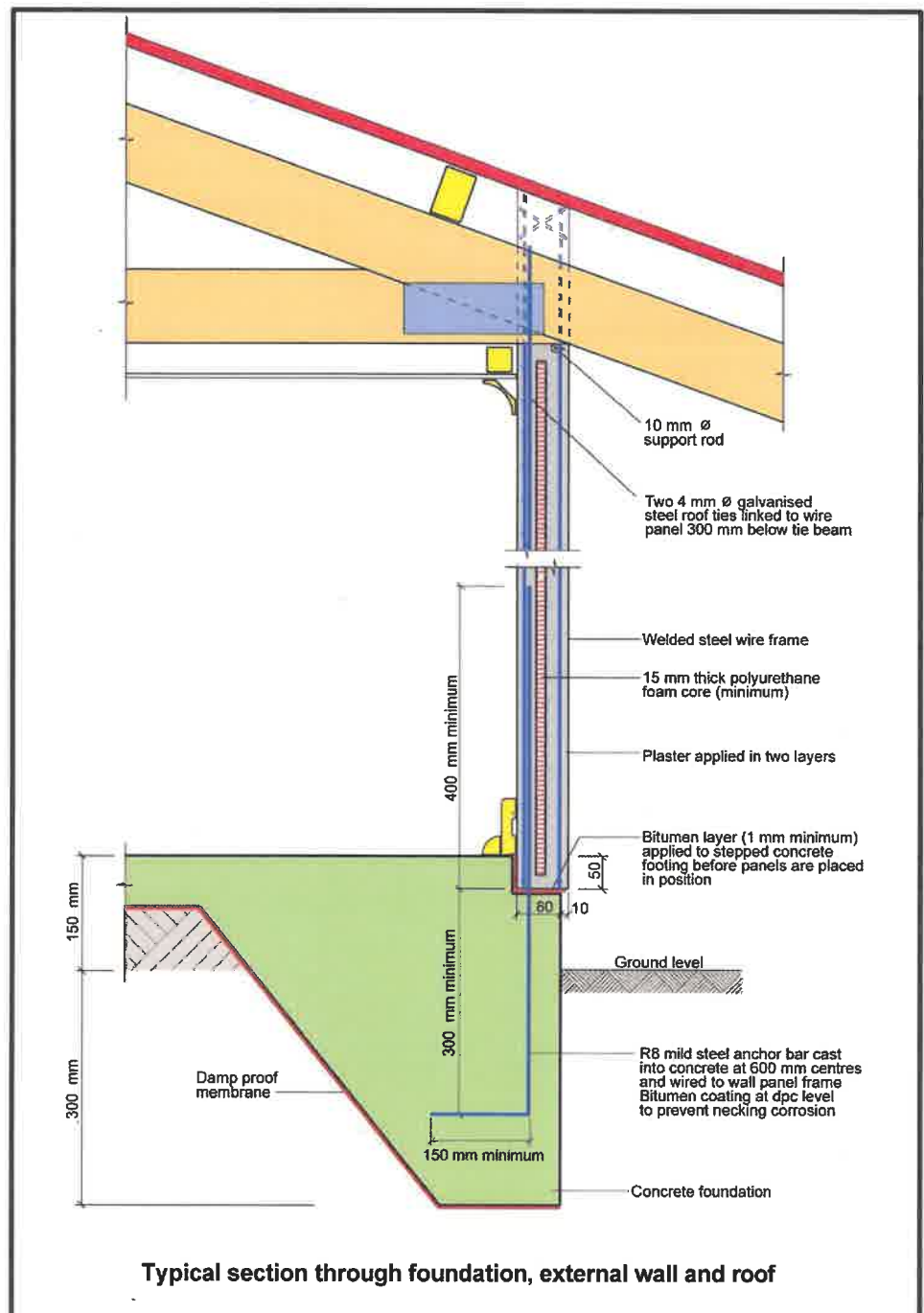
Aspect of performance	Opinion of Agrément South Africa	Explanatory note
Quality management system	The certificate holder's quality management system complies with Agrément South Africa's quality management system's requirements. If properly applied, it will ensure that quality in manufacture and erection of KwikFrame Building System buildings will be consistently maintained.	Agrément South Africa's requirements are based on SANS/ISO 9001. SANS/ISO 9001 (2015) <i>Quality management systems – Requirements</i>

PART 3: TECHNICAL DESCRIPTION

General description

The KwikFrame Building System consists of KwikFrame superstructure walls that are constructed on and anchored to, conventional foundations or surface beds. These walls are erected using lightweight, three-dimensional welded wire frames, with or without a central insulating core of polyurethane foam insulation. Once the wire frames are in place, door and window frames, roof anchors, built-in services are fixed in place and both faces of the wire frames are plastered to form continuous wall surfaces.

All other aspects of the construction are conventional.



Manufacture

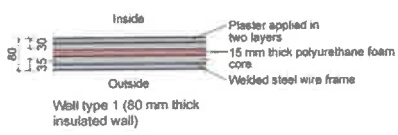
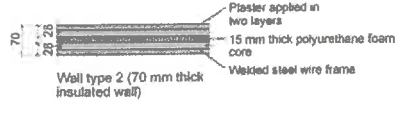
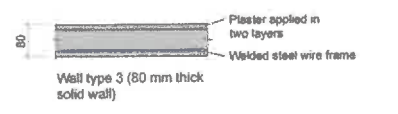
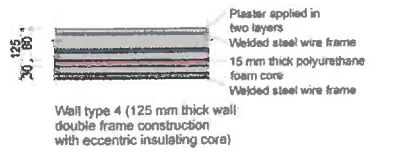
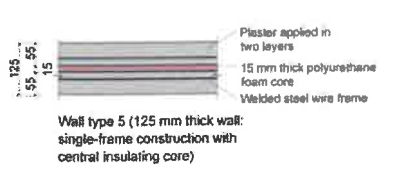
KwikFrame wire frames

The specified wire is machine-cut and welded to form 50 mm thick three-dimensional wire frames. Where the frames will be used in highly corrosive environments, they are epoxy coated or electroplated.

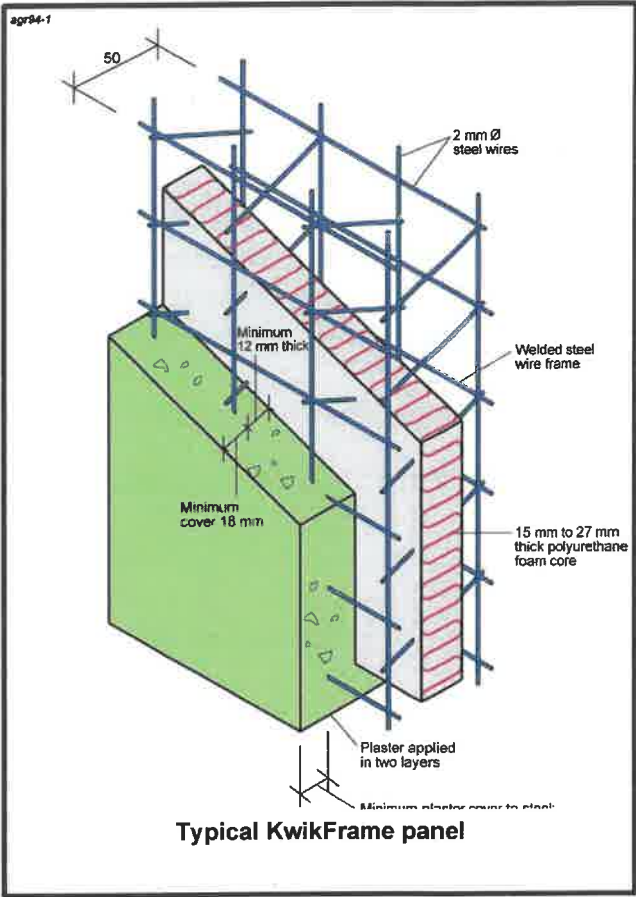
Where the frames require to be provided with a central layer of insulation, they are placed horizontally on a conveyor belt and coarse sand is dumped onto the belt to a controlled uniform depth. Polyurethane is then sprayed onto the surface of the sand and foamed to a depth that is not less than 15 mm and not more than 27 mm. The frame is removed from the belt with the foam centrally placed.

The system uses nine different wall types, seven KwikFrame walls and two brick walls.

Table 4: Description of wall types and where they are used

Wall	FRR (mins)	Airborne sound insulation indices
 Wall type 1 (80 mm thick insulated wall)	30	37
 Wall type 2 (70 mm thick insulated wall)	30	37
 Wall type 3 (80 mm thick solid wall)	60	40
 Wall type 4 (125 mm thick wall double frame construction with eccentric insulating core)	60	44
 Wall type 5 (125 mm thick wall single-frame construction with central insulating core)	60	44

Structure of wall types 1 to 5



The wall types are shown in plan section in the figure.

Wall Type 1 (80 mm thick insulated wall) consists of insulated KwikFrame panels with 30 mm thick plaster on the internal wall surfaces and 35 mm thick plaster on the external wall surfaces.

Wall Type 2 (70 mm thick insulated wall) is similar to Wall type 1 but with 28 mm thick plaster on both sides of the insulating core.

Wall Type 3 (80 mm thick solid wall) has uninsulated wire panels completely filled with plaster and at least 15 mm plaster cover to the wire.

Wall Type 4 (125 mm thick insulated wall of double-frame construction) is constructed by using insulated KwikFrame wire panels in conjunction with uninsulated panels, tying them firmly together and applying 80 mm thick plaster to the side with insulation and 30 mm thick plaster to the other side.

Wall Type 5 (125 mm thick insulated wall of single-frame construction) is identical to Wall type 1 but with a 55 mm thick cement plaster applied to both sides of the insulation

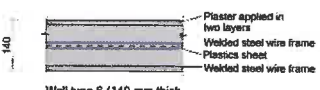
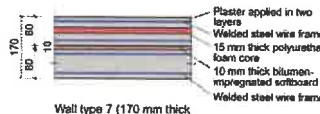
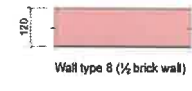
Wall Type 6 (140 mm thick uninsulated wall of double-frame construction) consists of two uninsulated wire frames with a plastic sheet secured between them. Plaster (70 mm thick) is applied to both sides of the plastic sheet to give an effective cover to the wire frames of 20 mm and

Wall type 7 (170 mm thick double wall) comprises two 85 mm thick KwikFrame panels with a 10 mm thick layer of insulation between them.

Table 5: Positions where wall types are used

Occupancy (SABS 0400)	Building type	Wall types	Use							
			External wall	Internal wall	Partition wall	Tenancy separating wall	Internal wall Feeder route	Occupancy separating wall	Division separating wall	Emergency route Internal wall
H4	Detached houses	1	○							
		2		○	○					
		3		○	○					
		4		○	○					
		5		○	○					
		6								
		7								
		8								
		9								
H3	Semi-detached houses and row houses	1	○							
		2		○	○					
		3		○	○					
		4		○	○					
		5		○	○					
		6				○				
		7								
		8		○	○		○	○	○	○
		9				○	○	○	○	○
H2	Hostels	1	○							
		2		○	○					
		3		○	○	○	○	○	○	
		4		○	○	○	○	○	○	○
		5		○	○	○	○	○	○	○
		6				○	○	○	○	○
		7								○
		8		○	○	○	○	○	○	○
		9				○				
G1 D2 D3 D4	Office buildings & industrial buildings	1	○							
		2		○	○					
		3		○	○		○	○	○	
		4		○	○		○	○	○	○
		5		○	○		○	○	○	○
		6					○	○	○	○
		7								○
		8		○	○		○	○	○	○
		9					○	○	○	○
A3	Non-residential school buildings	1	○							
		2		*	*					
		3		*	*		○	○	○	
		4		○	○		○	○	○	○
		5		○	○		○	○	○	○
		6					○	○	○	○
		7								○
		8		*	*		○	○	○	
		9		○	○		○	○	○	○

* Not for walls separating a classroom, office, kitchen, utility-room or toilet from a classroom, an office or a library

Wall	FRR (mins)	Airborne sound insulation indices
 Wall type 6 (140 mm thick wall; double-frame construction, insulated with plastic sheet between)	60	46
 Wall type 7 (170 mm thick double wall construction with bitumen-impregnated softboard between)	120	>50
 Wall type 8 (½ brick wall)	120	40
 Wall type 9 (full brick wall)	240	52

Structure of wall types 6 to 9

The procedure is that Wall Type 1 is constructed as described above, a 20 mm thick layer of insulation (e.g. bitumen impregnated softboard) is applied to the external face of this wall and Wall Type 3 is constructed hard against the insulation.

Wall type 8 consists of a clay brick wall, 115 mm thick (half brick) constructed in a conventional manner with cement mortar. The wall may be fair faced, plastered or bagged.

Wall type 9 is a 230 mm thick version (full brick) of Wall type 8.

Table 5 sets out where the wall types may be used in a KwikFrame building. The test for suitability is the fire resistance requirements set out in **SANS 10400**, Part T, modified in terms of the acoustic performance required by Agrément South Africa, for certain walls in dwelling units and in non-residential school buildings.

Where non-load bearing KwikFrame walls are used in conventional buildings, the wall types are chosen in accordance with Table 5.

In any building where a particular standard of acoustic performance is required, KwikFrame wall types with appropriate fire-resistance ratings are chosen to meet the acoustic performance set out in the latest version of **SANS 10218: Part 1**.

Erection

Foundations, foundation walls and surface bed

Foundation and surface bed designs are the responsibility of a registered professional competent engineer who classifies the site in accordance with the site class designation set out in Table 3 of the South African Institute of Engineering Geologists (SAIEG) publication titled *Guidelines for Urban Engineering and Geological Investigations*.

Two types of foundations are used on non-problematic ground conditions:

Cast *in-situ* concrete strip footings may be plain or reinforced concrete (with a minimum compressive strength of 15 MPa at 28 days).

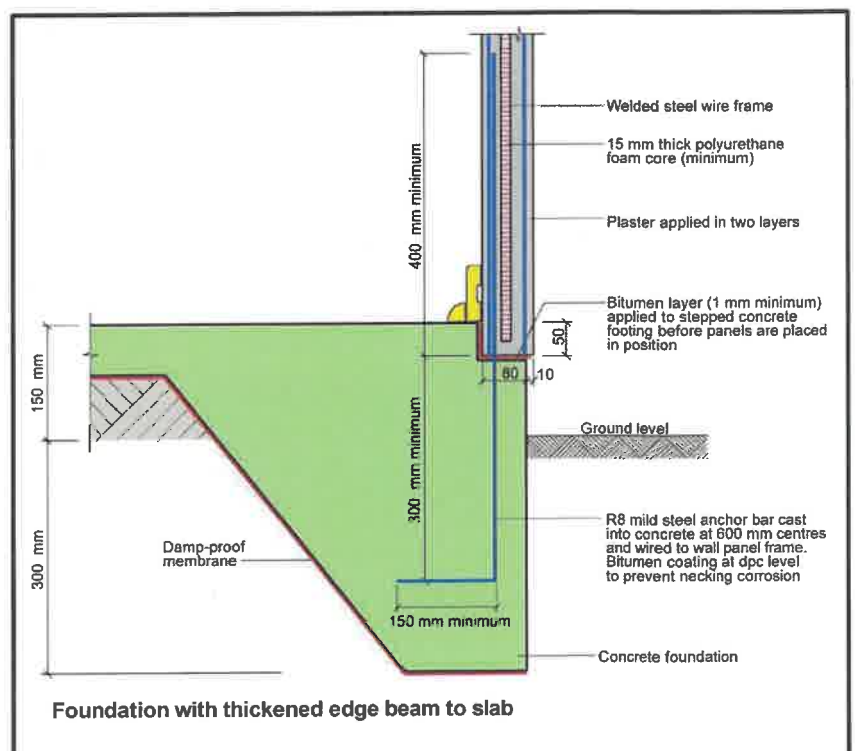
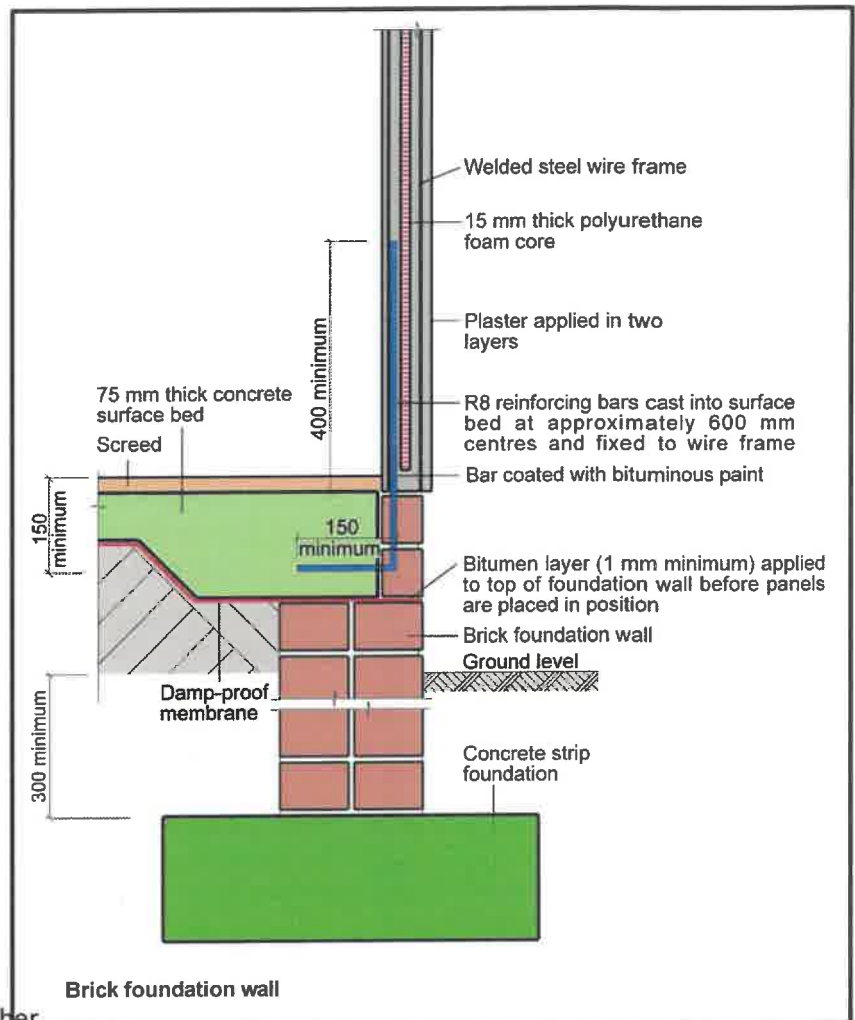
Raft foundations with thickened edge beams and thickened surface bed under loadbearing internal walls are cast integrally with a ground floor slab (normally 75 mm thick) and may be of plain concrete or reinforced concrete (with a minimum compressive strength of 15 MPa at 28 days).

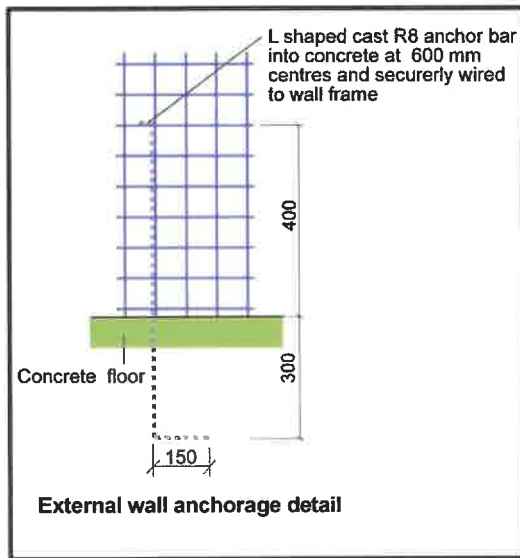
The floor slabs are of cast *in-situ* concrete, either power-floated to a smooth finish or with a sand/cement screed finish. The thickness of the slabs and the reinforcement, if any, depend on ground conditions, the building load and type of foundation used.

The floor slabs may be reinforced and/or thickened under loadbearing walls to bear the weight of internal walls where no footing is provided for these. Foundation walls are built of 230 mm (nominal) thick brickwork.

Wall anchorage and damp-proof membrane

The figures illustrate the method of fixing KwikFrame panels to the 80 mm wide (depending on wall type) x 50 mm deep recess formed in the perimeter of the concrete foundation/floor slab for external walls and thickened floor slab under internal loadbearing walls. An underfloor damp-proof membrane is provided in each case.



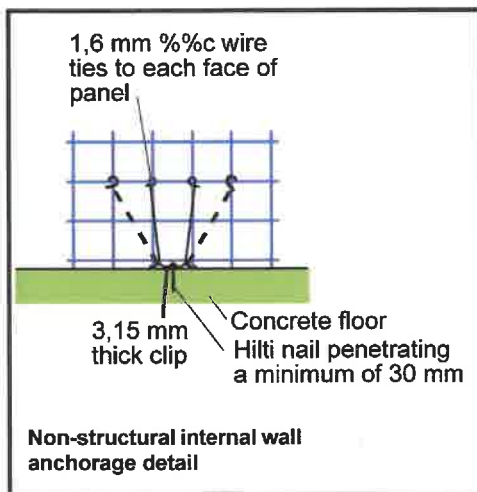


External wall panels are anchored to the perimeter beam with R8 mild steel L shaped anchor bars cast into the concrete at 600 mm centers. The overall length of the bars is 900 mm, with the short leg of the L at least 150 mm long with the bar protruding at least 400 mm above the foundation/floor slab.

The R8 mild steel anchor bars can also be epoxied into holes drilled in the thickened perimeter beam at 600 mm centers. The anchor bars must be epoxied for at least 300 mm into the perimeter beam and project at least 400 mm into the wall panel.

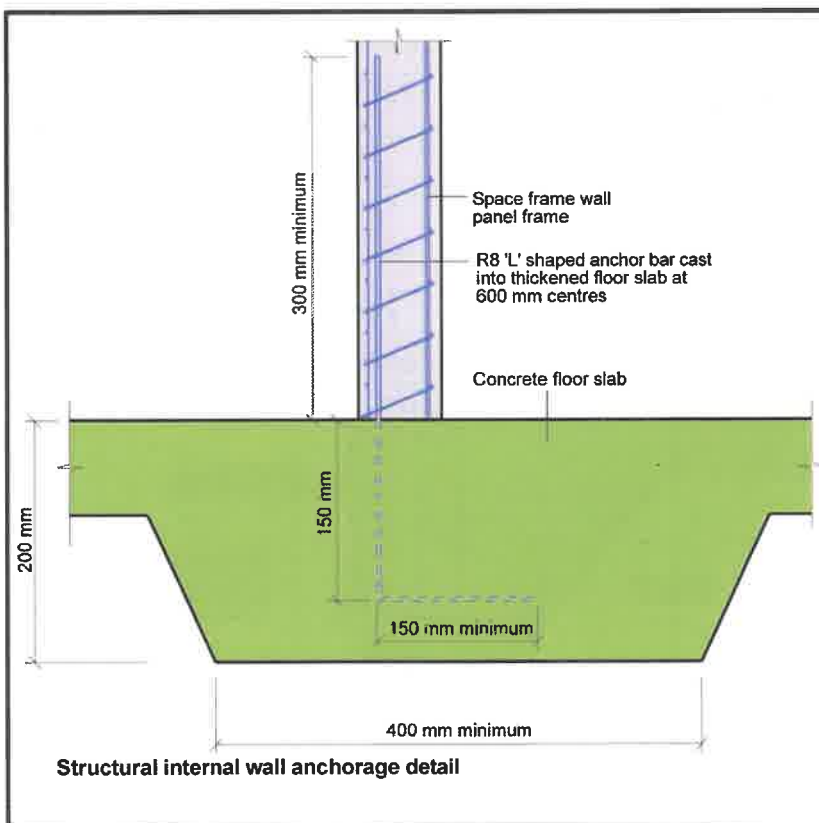
In both cases the anchor bars must be coated with bituminous paint for 25 mm above and below where the bar projects through the concrete to prevent necking corrosion.

A thick bitumen layer (not less than 1 mm) is applied to the stepped concrete footing before the panels are placed and secured in position.



Internal walls serving a structural function (e.g. providing lateral stability to external walls) are anchored to the thickened surface bed with R8 mild steel L shaped anchor bars cast into the concrete. Two R8 bars are provided per panel, each bar having a minimum overall length of 600 mm, with the short leg being 150 mm long and the length of bar above the surface bed at least 300 mm. The bars are epoxy coated 25 mm above and 25 mm into the concrete.

Non-structural internal wall panels are fixed to the concrete floor slab with a metal clip fixed to the slab with a Hilti nail. Galvanised steel wire ties run under this clip and are fixed to the wire mesh on either side of the Kwik Frame panel. At least two clips are provided for each panel.



Construction of KwikFrame walls

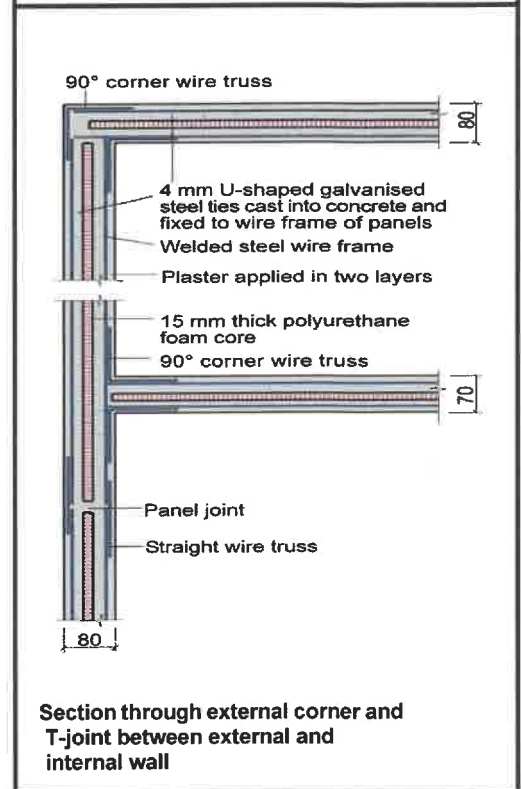
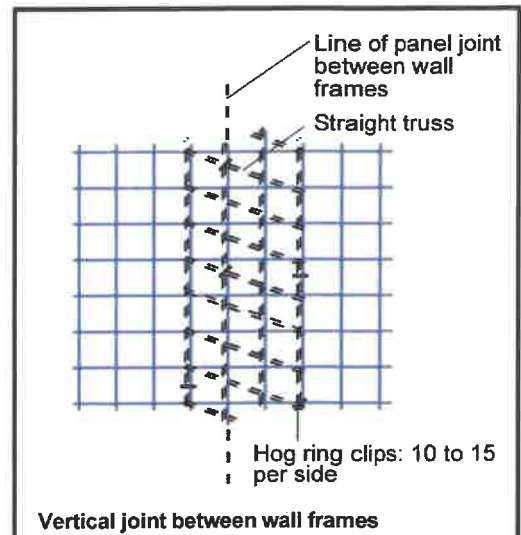
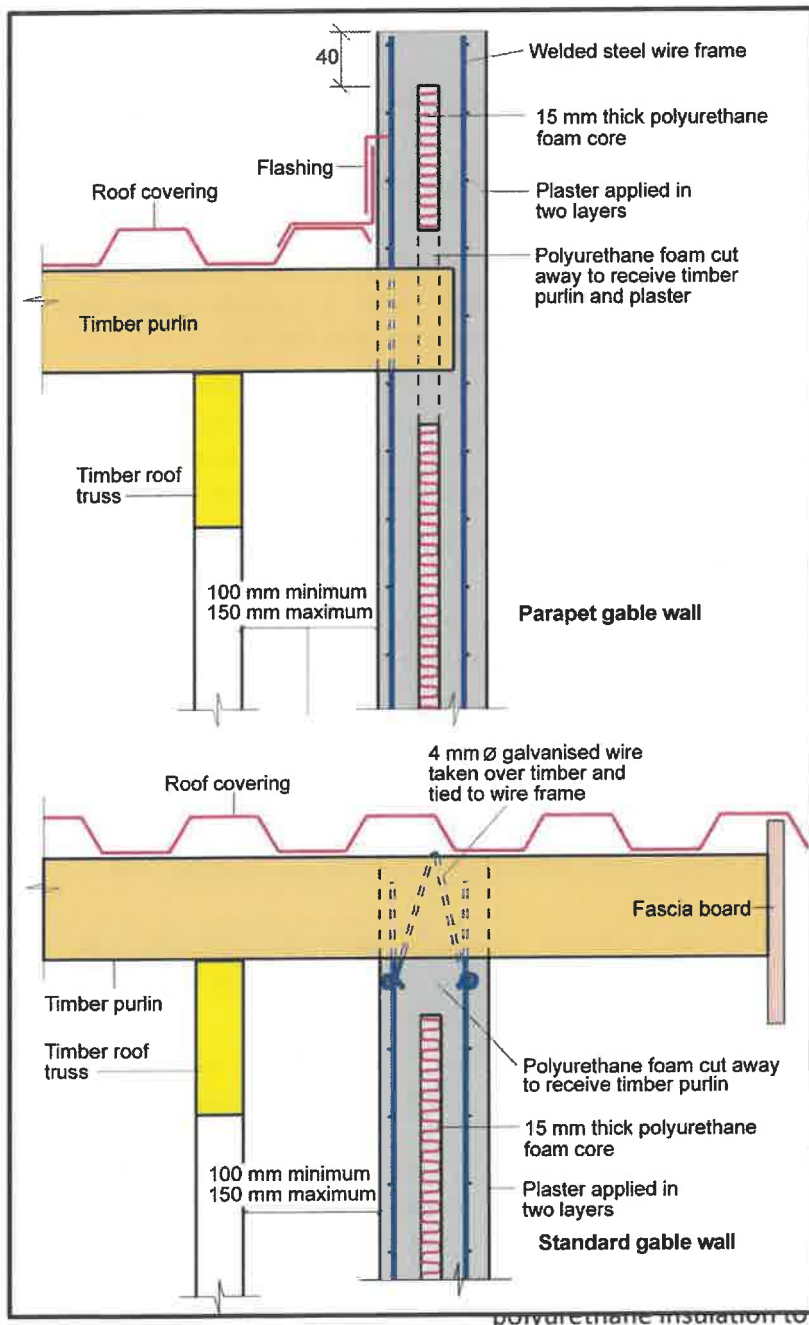
On completion of the foundations and floor slab, the KwikFrame Building System wall panels are placed and stayed in position. Alternatively, a framework of scaffolding can be built on the floor slab to provide a lining and levelling framework.

Once the wall panels have been positioned and supported, the panels are tied to the foundation anchors and the vertical junctions of panels, corner and wall junctions are joined by laying a wire truss across each joint on both sides of the panels. This consists of 2 mm diameter wires at 47 mm centers, making the joint itself structurally slightly stronger than the mesh of the panel where the horizontal wires are at 50 mm centers.

The wire trusses are fixed to the panels with wire staples or steel clips which may be fixed using hand tools or pneumatically operated, hand held machines. About 24 clips are used for each 3 m length of wall joint.

The head of the external wall panels are tailored to fit the roof members that project through it by cutting the minimum number of wires. Roof anchors are fixed in place and a 10 mm diameter non-continuous support rod is wired into position below each roof member.

In the case of insulated walls, the polyurethane foam around the perimeter of the walls, at the edges of openings and where roof members pass through the walls, is broken out a minimum of 25 mm so that it can be completely encapsulated by the cement plaster which is sprayed onto the panels.



Window, door and other openings may be cut out of the erected panels, preformed in the factory, or formed on site using cut panels. Window frames and door frames are fixed in place and service or drainage pipes and electrical conduits, which must be plastered into the walls, are inserted into and tied to the panels.

When the above procedures have been completed, cement plaster is applied to the walls. In the case of insulated walls, the cement plaster is sprayed or hand-applied to the faces of the foamed polyurethane insulation to just below the level of the wire frame.

A second layer of plaster is then applied by hand to the required thickness. Spacer battens are secured to the wall frame to provide the correct plaster thickness. The battens are removed on completion of plastering and the grooves made good. This second coat is hand trowelled to whatever finish is required. In the case of uninsulated walls, the wire panel is filled with cement plaster sprayed or hand-applied against a temporary backing; after an acceptable interval the required wall thickness is achieved by applying a further layer of cement plaster by hand to each face of the panel, commencing with the face against which the temporary backing had been placed. Hand-applied plaster is applied to the roughened face of the sprayed plaster within 24 hours of spraying.

The plaster mixes are carefully controlled and applied by competent operators; long stoppages during the application of the plaster are avoided to prevent cracking at the joints between fresh and old plaster.

SANS 50197-1 (2013) Cement Part 1:
Composition, specifications and conformity criteria for common cements

SANS 50197-2(2013) Cement Part 2:
Conformity evaluation

SANS 1083 (2018) Aggregates from natural sources – aggregates for concrete

SANS 1090 (2009) Aggregates from natural sources – Fine aggregates for plaster and mortar

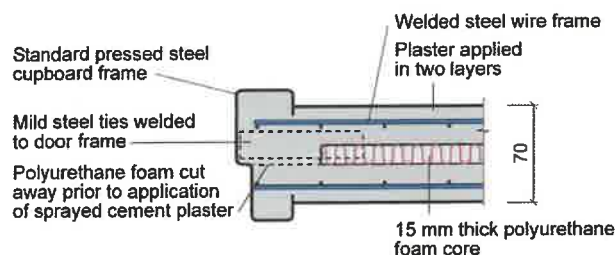
SANS 10155 (2009) Accuracy in buildings

The following conditions are observed:

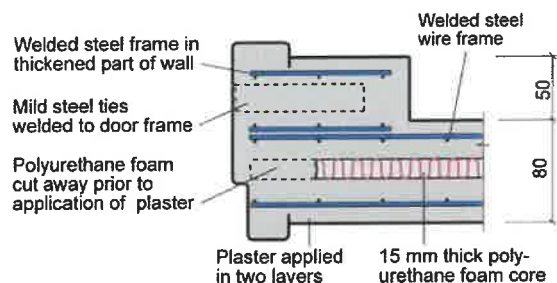
- Cement meets the requirements of **SANS 50197-1, Cem I or Cem IIA**
- the sand used in the plaster is tested at regular intervals to ensure that:
 - the sand used in the sprayed plaster complies with the requirements of **SANS 1083**, Table 1, Column 2 and that the fineness modulus of the sand is not less than 2.5:
 - the sand used in the hand-applied plaster complies with the requirements of **SANS 1090**, Table 1, Column 3 and that the fineness modulus of the sand used in the plaster to the external face of the external walls, is not less than 1.6.
- when the source of sand changes, the mix is re-designed by a competent person or agency
- test cubes made from the plaster that is used in the walls has a characteristic compressive strength of not less than 15 MPa at 28 days
- the plaster cover to the foamed polyurethane is not less than 25 mm
- the plaster cover to the steel wire reinforcement is not less than 12 mm on internal wall surfaces and 18 mm on external wall surfaces.

Deviations with regard to length, height, straightness, verticality and finished surfaces of the walls of structures comply with Grade II accuracy for conventional buildings as defined in **SANS 10155**.

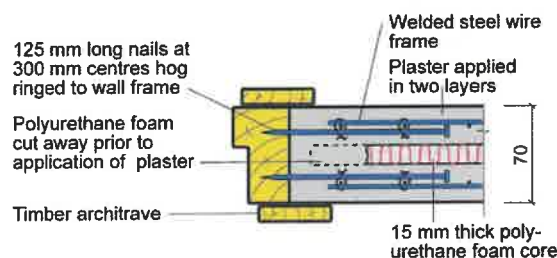
Measures, such as spraying with water for 5 days, covering with plastic, etc, are taken to prevent rapid drying of the plaster to minimise drying shrinkage of the plaster and to ensure firm, hard surfaces for painting. Any plaster surfaces that are porous or honey-combed or that show shrinkage cracks exceeding 0.5 mm in width are stripped and re-plastered.



(a) Cupboard-type steel door frame used internally in wall type 2



(b) Standard steel door frame used externally in wall type 1



(c) Timber door frame used in wall type 2 (door frame can be rawbolted and plugged)

Fixing of door-frames

The profile currently available for steel door frames which is normally used for internal cupboards is available in standard door sizes and fits the 70 mm and 80 mm thick internal walls.

The polyurethane foam is broken out to a depth of 25 mm to 50 mm in the immediate vicinity of the door frame to ensure that the frame is locked into position by the sprayed plaster.

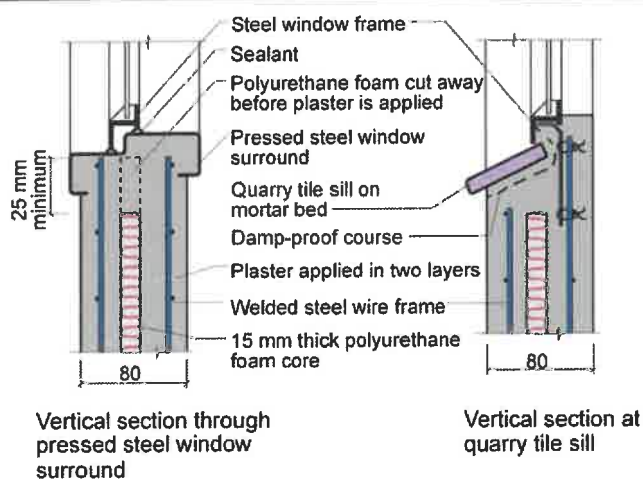
When a standard steel door-frame is used with 70 mm or 80 mm thick walls, the required thickness is made up by fitting an additional piece of KwikFrame panel from which the polyurethane foam has been removed, to the wire frame. These two thicknesses together fill the door-frame.

A temporary frame is fitted to create the correct size of opening for permanent timber door frames. The frames can be nailed as detailed or raw bolted and plugged to the wall panel.

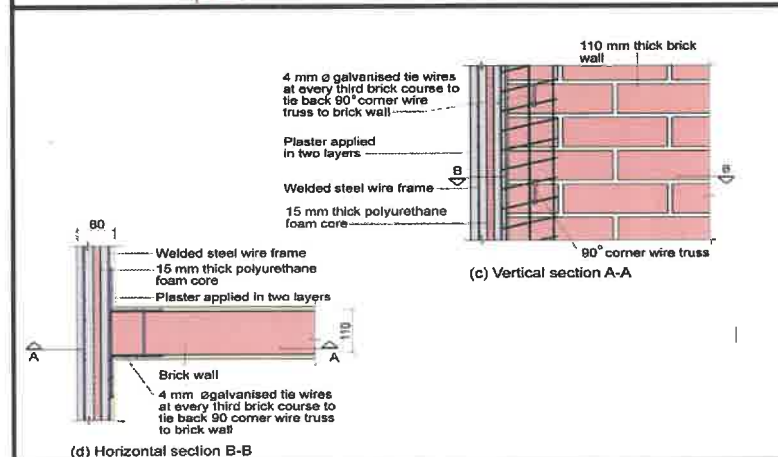
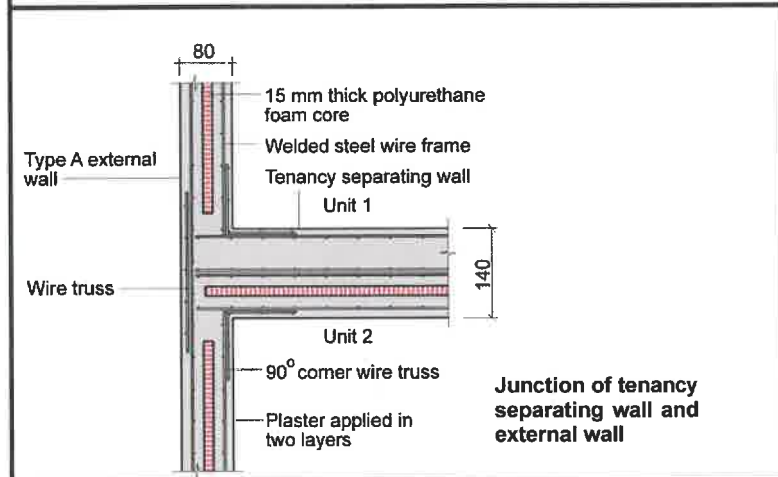
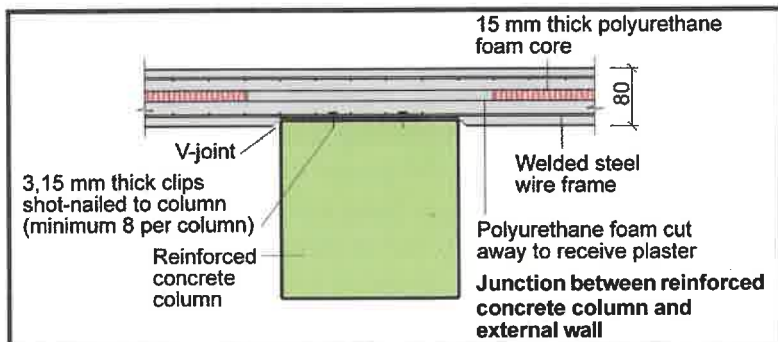
Fixing of window frames

Window frames may be mounted in the same door frame profile used for built-in cupboards. A double angle strip in the head detail acts as a water deflector. The upper edge of the strip is embedded in the plaster.

Alternatively, a standard steel window profile may be used in an 80 mm thick wall. The polyurethane foam is removed for at least 25 mm around the edge of the window frame.



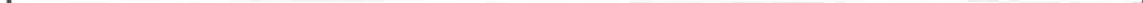
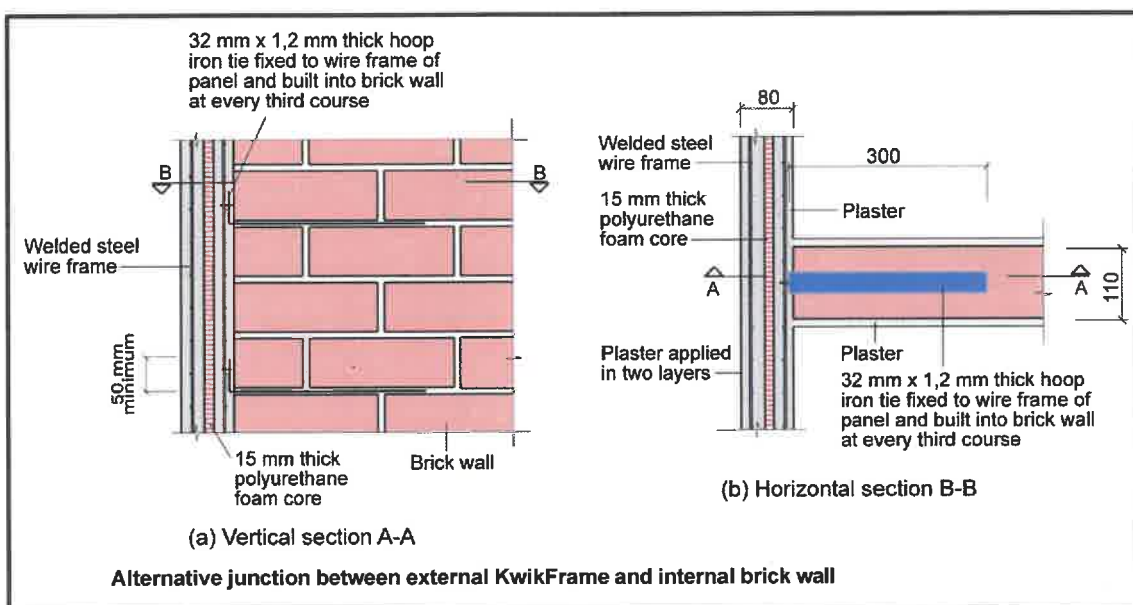
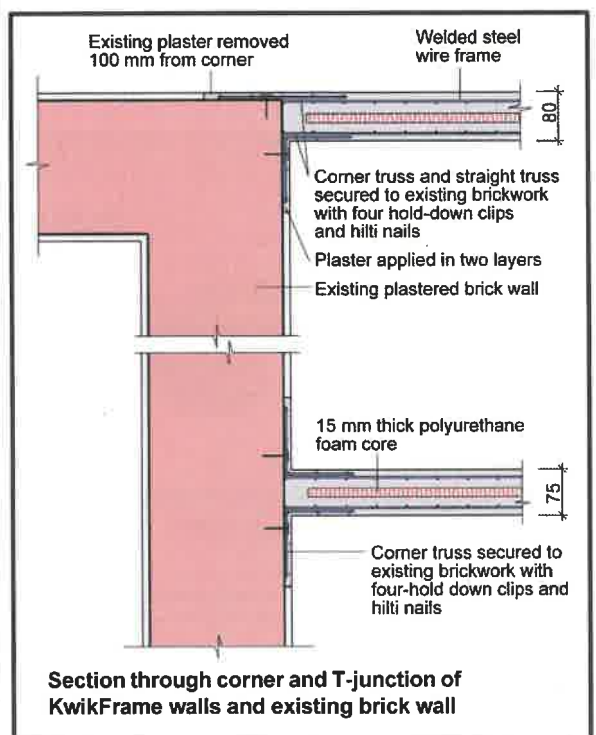
Typical steel window details

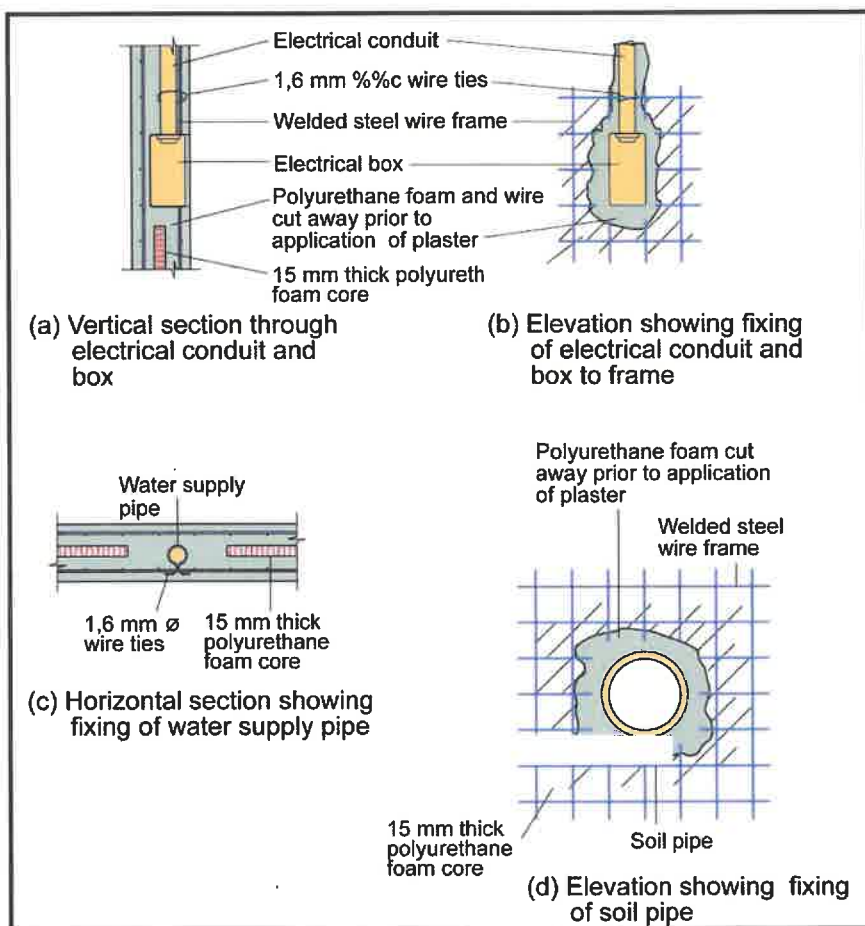


Fixing of KwikFrame walls to concrete columns and to conventional brick walls

KwikFrame Building System wall panels may be used in conjunction with concrete-framed structures and with conventional brick walls. The figures illustrate:

- the fixing detail where KwikFrame walls are to be attached to reinforced concrete columns.
- typical connections between conventional brick walls and KwikFrame wall panels.





Electrical fittings

To fit electrical conduits and switches, the appropriate number of wires are removed from the KwikFrame panel to fit the conduit box; the conduit tubing is inserted from the top of the panel, between the wire frame and the polyurethane foam core and connected to the box. If it is necessary to clip the wires to enable a conduit tube to be fitted, the clipped joint is covered with a wire truss stapled in position after the assembly has been completed.

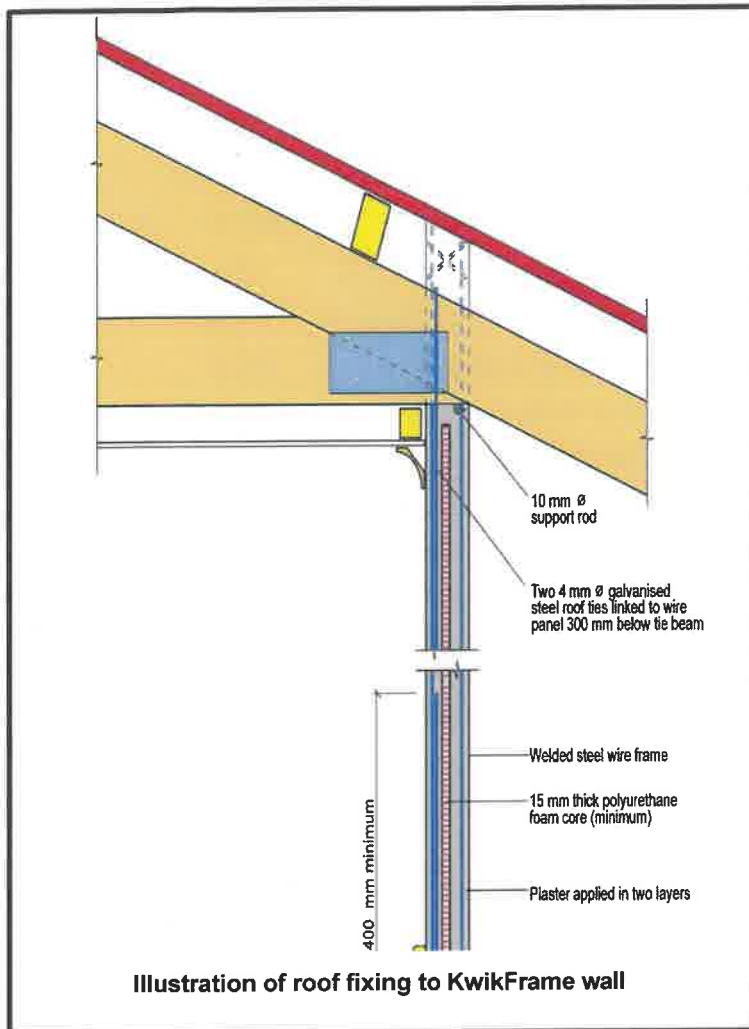
Plumbing

Water piping is installed by cutting away part or all of the polyurethane foam to accommodate the pipe into the wall. The pipe is then secured to one side of the wire mesh panel before the panel is plastered. Generally, domestic water piping can be fitted without removing the polyurethane foam, but it may be necessary to clip the wires along the line of the pipe.

After the pipe has been installed, it is secured to the opposite face and a wire truss is placed over the joint and secured with clips in the normal manner.

Roof structure and roof anchorage

Conventional engineered timber roof trusses are used.



The wires of the KwikFrame panels are cut to the required depth (depending on roof angle) to accommodate the roof truss, and a short length of steel reinforcing bar is wired to the steel wire frame to ensure that the roof truss load is spread over more than two welds. The polyurethane foam is cut away so that the sprayed plaster completely surrounds the portion of the roof truss resting on the wall and encapsulates the polyurethane core to a depth of at least 25 mm. Roof trusses are anchored with two 4 mm diameter galvanised steel wires for lightweight cladding on trusses at 760 mm centres and all heavyweight roof construction.

Lightweight roof cladding on trusses at 1050 mm and 1400 mm are anchored with 30 mm x 1.6 mm galvanised steel straps. All roof ties are positively linked to the KwikFrame panels at least 300 mm below the roof tie beam.

Ceilings

KwikFrame Building System buildings can be completed without ceilings or with conventional ceilings and roof covering materials. Where required, the ceilings are insulated with a 40 mm thick layer of mineral wool or equivalent.

The figure above illustrates the junction of a ceiling with an external wall. The upper 25 mm of the polyurethane foam core at the top of the walls is removed to ensure that the polyurethane foam is encapsulated in the plaster. Conventional ceilings are fitted so that the internal wall protrudes above the ceiling into the roof cavity.

Expansion joints

Expansion joints are formed in KwikFrame buildings at not more than 22 m intervals. These are formed by building two structures 10 to 15 mm apart and sealing the gap with a flexible non-hardening sealant.

Finishes

Floors may be trowelled to a smooth finish or power-floated and then covered with floor coverings to the client's choice.

Internal wall and ceiling surfaces are prepared for painting and normally given one coat of neutraliser, one undercoat and one or two coats of acrylic emulsion paint.

Where areas of walls will be subjected to frequent wetting, these areas are tiled or provided with a finish appropriate to the degree of wetness likely to be experienced. External wall surface finishes depend on the desired appearance and the climatic conditions. Normally one coat of alkali-resistant primer and two coats of external quality acrylic emulsion

paint are applied, or one coat of alkali resistant primer, one undercoat and one coat of roller-applied, textured, synthetic polymer-based emulsion paint are used.

DESIGN REQUIREMENTS

The following dimensional limitations apply:

Maximum roof span	10.0 m
Maximum eaves height above floor level:	3.0 m
Maximum height to top of gable wall	5.0 m
Maximum wall length between lateral supports	5.0 m
Maximum wall length between movement joints	22.0 m
Maximum eaves height in industrial buildings (i.e in non-loadbearing walls between portal frame columns)	3.50 m

Where these dimensional limitations are exceeded and in cases where the KwikFrame Building System is used for the addition of an upper floor to a single storey conventionally constructed house:

- a professional engineer prepares a rational design that:
 - will ensure the structural integrity of the entire building
 - adheres to the construction details dealt with in this certificate.
- the rational design covers all aspects of the works that will be affected by changes to the structural design
- the engineer monitors those aspects of the works that are covered by the rational design, to verify that the design is being correctly interpreted and that the construction techniques that are being used are appropriate to the structural stability of the subject
- the engineer takes full professional responsibility for the rational design and
- all other aspects of the works are carried out in accordance with the requirements of this certificate.

A professional engineer is also responsible for the design of:

- all lintels that carry roof loads
- all lintels where the span is more than the depth of the lintel x 8
- the supporting structure including the column foundations for the first floors of specific double storey houses and
- the integration of KwikFrame partitioning into the overall structural design of conventional buildings.