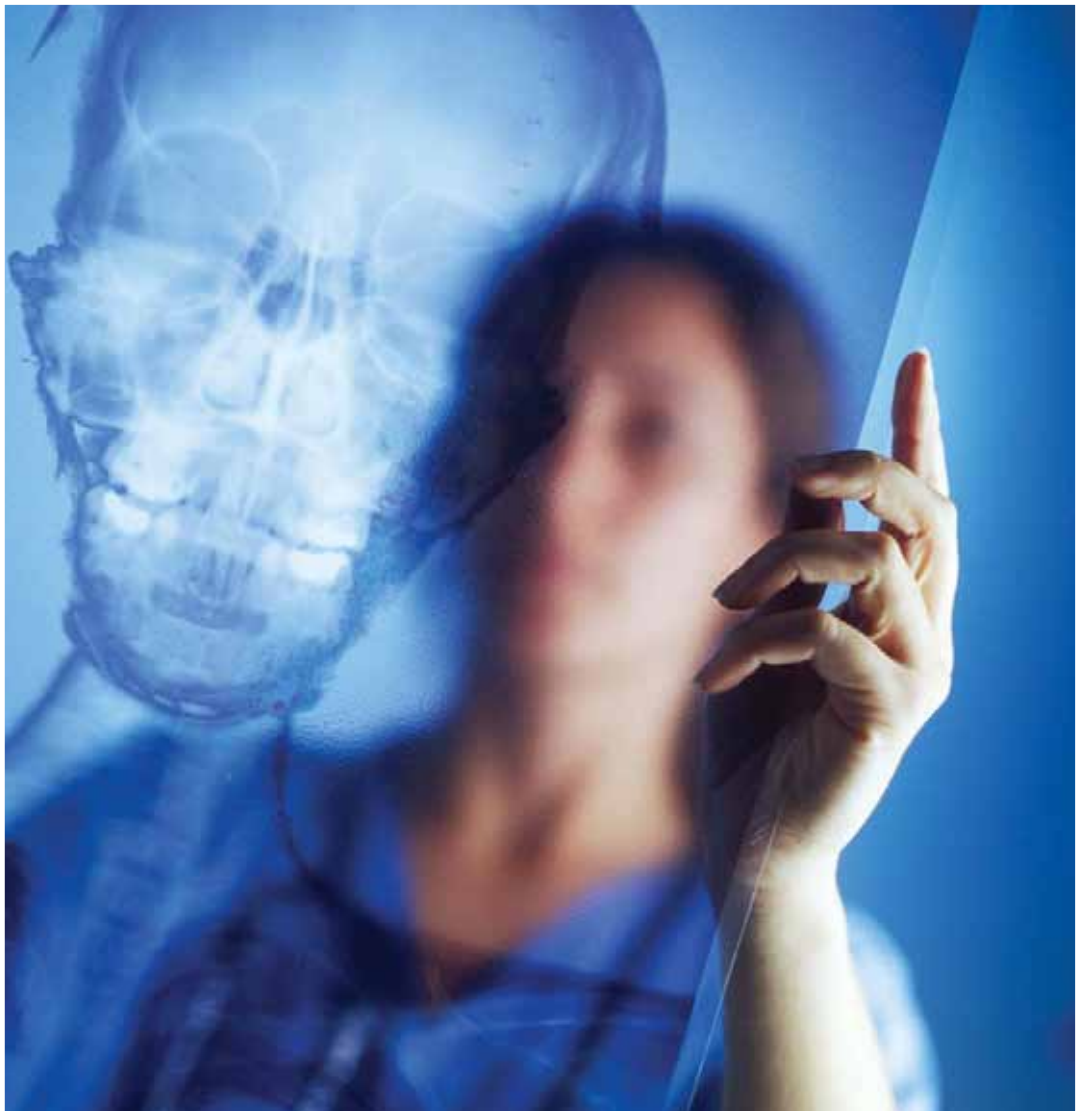


CBI 5113

April 2009

GIB X-Block[®] Radiation Shielding Systems



Lead-free lining solution for Radiation Protection

www.gib.co.nz





Cost Effective X-ray Protection with GIB X-Block[®]

- ✘ A specialist 13mm GIB X-Block[®] containing Barytes and jointing system designed to provide protection from X-ray radiation.
- ✘ Suitable for use in radiography departments, medical facilities, dental clinics and veterinary practices.
- ✘ Achieves an effective radiation barrier without the use of lead, unlike traditional X-ray lining systems.
- ✘ Eliminates complex and costly installation procedures associated with lead based lining systems.
- ✘ Easier to achieve a uniform appearance throughout a facility matching other GIB[®] Plasterboard systems.
- ✘ Performs other critical functions such as noise control and fire resistance ratings.
- ✘ Ideal for renovations or conversions of timber, steel and/or concrete construction where increased X-ray shielding is required.
- ✘ Extensively tested at New Zealand's National Radiation laboratory in accordance with internationally accepted criteria.
- ✘ Shown in laboratory and site tests to exceed the requirements for a primary barrier when installed as a three layer system.
- ✘ Exceeds the requirements for a secondary barrier when installed as a two layer system.
- ✘ The GIB X-Block[®] System is the subject of an invention covered by New Zealand Patent No. 517385 and Australian Patent No. 2003206481

**This publication supersedes
the following publication:**

GIB X-Block[®] October 2007.

GIB X-BLOCK® RADIATION SHIELDING SYSTEMS



Sustainability and the Environment

APRIL 2009

Winstone Wallboards is committed to protecting the environment. Environmental matters are integrated into all business activities:

- All operations of Winstone Wallboards will strive to exceed all environmental regulatory requirements at all times.
- Protection of the environment is a day to day responsibility that we all must accept.
- We will treat the environment equally with all other operations and allocate appropriate management time and resources to address and continuously improve our activities.
- We will achieve our standards of performance through positive action, employee involvement and constant communication with our neighbours, local authorities and customers.



Environmental Choice

Winstone Wallboards is the first manufacturer of plasterboard to have products certified as environmentally preferable through Environmental Choice New Zealand. The Environmental Choice label acknowledges the product as meeting or exceeding the voluntary environmental declaration standard set by the NZ Eco-labelling Trust. The standard is a comprehensive life-cycle assessment which is scientifically and internationally recognised.

The Environmental Choice Label covers all GIB® Plasterboard 13mm and greater in thickness.



Waste Management

Specify GIB® Plasterboard with the Environmental Choice label as this ensures that the product selected minimises the impact on the environment. Consideration should be given to minimising on-site waste when designing and/or installing GIB® Plasterboard systems. For larger projects consideration should be given to the utilisation of Winstone Wallboards cut-to-length service to reduce the volume of waste produced.

GIB® Plasterboard off cuts, if separated from other waste building materials, can be readily recycled. For larger projects the waste can be diverted to compost manufacturers who grind up the GIB® Plasterboard and utilise it in compost. For smaller projects, the GIB® Plasterboard can be ground up and spread around the building site.



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GIB X-BLOCK® RADIATION SHIELDING SYSTEMS



GIB X-Block® Lead-free X-ray Protection

APRIL 2009

Medical X-ray diagnostic rooms require the use of protective barriers to shield operators and occupants of adjacent areas against unacceptable levels of radiation. Radiation exposure may arise from direct exposure to the X-ray beam (primary beam) or by X-rays scattering from the patient, equipment or other fixtures.

Protection usually takes the form of X-ray absorbing sheet material on the walls of the room in which equipment is operated, together with suitably shielded doors and windows. The level of protection required depends on the occupancy of the adjacent areas, the frequency of use of the X-ray equipment, the intensity and energy of the X-rays being generated, and the direction of the primary X-ray beam.

Lead has been the traditional material used for X-ray protection. Shielding for diagnostic X-ray rooms is specified in terms of the thickness of lead necessary for appropriate protection. Other materials, such as GIB X-Block® which contains barytes, also provide X-ray protection and performance is measured in terms of 'lead equivalence'. Lead equivalence of GIB X-Block® varies with X-ray energies, with a greater thickness of GIB X-Block® being necessary at higher X-ray energies.

The National Radiation Laboratory (NRL) specifies that "the lead equivalence must be appropriate to the kilovoltages used in the room". To assist in determining the required thickness of GIB X-Block®, the table below shows the lead equivalence of GIB X-Block® at different X-ray energies.

X-ray energy	13MM GIB X-BLOCK® LEAD EQUIVALENCE (MM)			
	1 layer	2 layers	3 layers	4 layers
80 kVp	0.7	1.6	2.4	3.0
100 kVp	0.7	1.5	2.2	2.8
125 kVp	0.5	1.0	1.4	1.8
150 kVp	0.4	0.7	1.0	1.3

A minimum lead equivalence of 1.0mm at 100 kVp is usually required for walls of general diagnostic X-ray rooms. Shielding of not less than 2.0mm lead equivalence is required where the primary X-ray beam may be routinely directed towards adjacent occupied areas¹. Specialised X-ray rooms may use higher energy X-rays and/or have greater use than general rooms; thus additional shielding may be necessary. For example, for CT rooms shielding is commonly specified as 1.5mm lead equivalent at 120 to 140 kVp.

Advice on X-ray protection for a particular installation must be sought from a Qualified Health Physicist (QHP) to ensure the requirements for occupational and public protection are met. Winstone Wallboards can supply a list of New Zealand QHPs and assist with the selection of cost effective X-ray protection systems that meet your specific needs.

We offer the GIB X-Block® lead-free lining system as well as the ability to laminate lead to GIB® Plasterboard in applications where the use of lead protection is requested.

For Further Information please call GIB® Helpline – Call Free on 0800 100 442

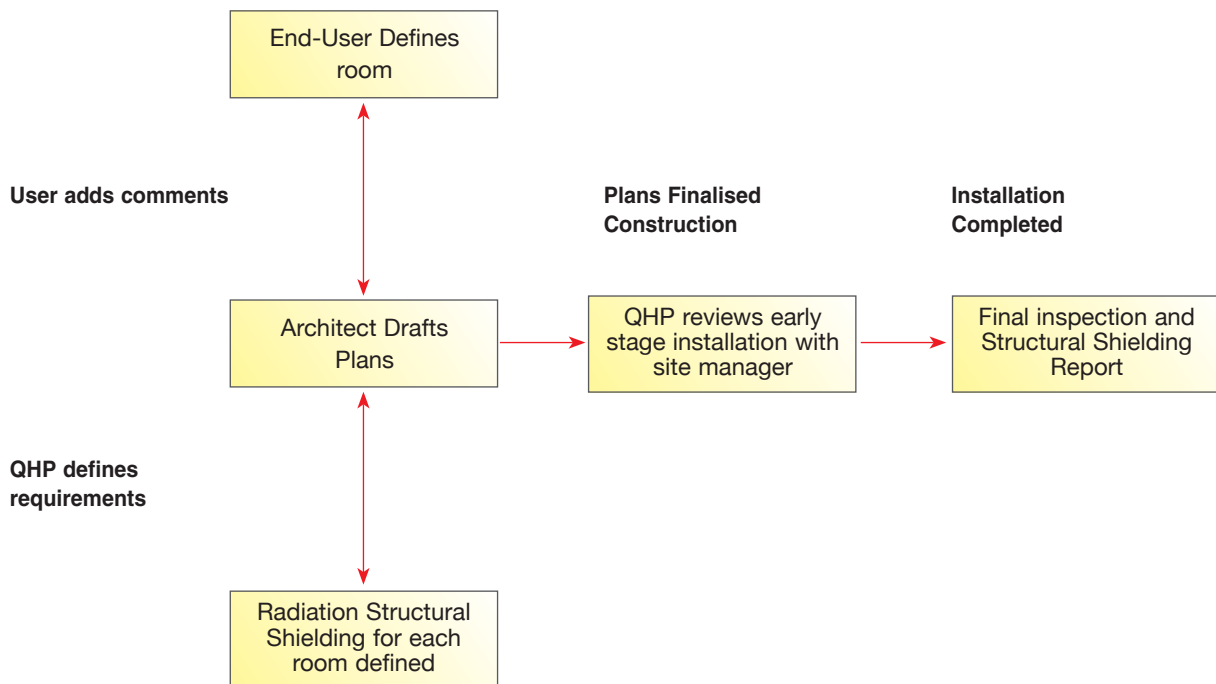
¹ NRL General Guidelines on shielding requirements for medical X-ray diagnostic rooms



Medical X-ray diagnostic rooms require radiation shielding by means of protective barriers. The National Radiation Laboratory (NRL) gives guidelines¹ for primary and secondary barriers as described below. The NRL guidelines are not exhaustive and the Qualified Health Physicist² (QHP) for the facility must approve all shielding specifications³ and their final installation because every installation will have specific requirements with respect to aspects such as,

- the type of X-ray equipment
- the location of X-ray equipment within the room
- types of procedures performed in the room
- the use of the areas surrounding the X-ray room.

The following is a suggested workflow for the design and installation of radiation shielding.



The height of a protective barrier depends on circumstances but must reach 2 metres in all cases. The GIB X-Block® lining system provides full height room protection.

When the X-ray facility is constructed the continuity of the barrier across joints and penetrations is paramount. This document provides a number of standard details ensuring continuity of protection. For further assistance please call the GIB® Information Helpline 0800 100 442.

¹ NRL General Guidelines on shielding requirements for medical X-ray diagnostic rooms

² The NRL holds a register of QHPs

³ Refer 'Code of Practice for the use of X-rays in Medical Diagnosis', NRL, January 1994



PRIMARY BARRIER

A primary barrier is one that intercepts the direct (primary) beam of an X-ray tube. Primary barriers are often built into mammography, CT and fluoroscopy machines and so secondary barrier protection only is usually required for the room construction elements.

In general a primary barrier is required for:

- Any surface routinely in the direct line of the X-ray beam, including parts of the walls, floor and or ceiling (as appropriate) of an X-ray room as well as behind chest stands or wall buckys. The barrier needs to extend at least 300mm beyond each boundary of the area normally exposed to the primary X-ray beam.

An acceptable primary barrier is shown by laboratory and site test to have a minimum lead equivalent of 2mm at an X-ray energy level of 100 kVp.

SECONDARY BARRIER

A secondary barrier is one that shields from scattered X-rays (mainly from the patient) only. The following are examples of areas typically requiring a secondary barrier:

- X-ray room walls and doors into the room, including changing room and toilet doors
- The floor and/or ceiling (as appropriate) of an X-ray room if in a multi-storey building
- Operator barriers, including both the body of the barrier and the viewing window.

For general diagnostic rooms an acceptable secondary barrier is shown by laboratory and site test to have a minimum lead equivalent of 1mm at an X-ray energy level of 100 kVp.

For CT rooms an acceptable secondary barrier is shown by laboratory and site test to have a minimum lead equivalent of 1.5mm at an X-ray energy level of 100 kVp.

Mammography rooms operate at lower energies and less shielding is required. In this case internal walls lined on each side with one layer of 10mm GIB® Plasterboard meet the requirements for a secondary barrier.

NB. Most QHPs and the NRL now recommend a higher shielding requirement.

GIB X-BLOCK® RADIATION SHIELDING SYSTEMS



Compliance with New Zealand Building Code

APRIL 2009

STRUCTURE – CLAUSE B1

The design and material specification for steel and timber framing used in GIB X-Block® systems must be in accordance with the performance requirements of NZBC B1 – Structure.

DURABILITY – CLAUSE B2

When installed and maintained in normal conditions of dry internal use GIB X-Block® systems have a serviceable life in excess of 50 years and satisfy the requirement of NZBC Clause B2 – Durability.

SPREAD OF FIRE – CLAUSE C3

GIB X-Block® Plasterboard systems provide passive fire protection in accordance with the requirements of NZBC Clause C3 – Spread of Fire. When GIB X-Block® is substituted into fire rated systems in place of the equivalent thickness GIB® Standard Plasterboard, the fire resistance rating of the system is maintained. Comparative testing has established that the integrity performance of GIB X-Block® Plasterboard is similar to the same thickness GIB Fyrelite®. However, the increased density of GIB X-Block® results in higher conductivity and an earlier insulation failure. For specific fire requirements please phone the GIB® Helpline on 0800 100 442.

HAZARDOUS BUILDING MATERIALS – CLAUSE F2

GIB X-Block® Plasterboard and jointing compound meets the provisions of NZBC Clause F2 – Hazardous Building Materials. At no stage during handling, installation, or serviceable life do these products constitute a health hazard. Dust resulting from the sanding of stopping compounds may be a respiratory irritant and the use of a suitable facemask is required.

AIRBORNE AND IMPACT SOUND – CLAUSE G6

GIB® Noise Control Systems can be used to provide ratings for Sound Transmission Class (STC) in accordance with the requirements of NZBC Clause G6 – Airborne and Impact Sound. When GIB X-Block® Plasterboard is substituted into GIB® Noise Control systems in place of the equivalent thickness GIB Noiseline®, the STC rating of that system will be maintained. For specific noise control requirements please phone the GIB® Helpline on 0800 100 442.



Other Relevant Standards

AS/NZS 4543.1:1999 Protective devices against medical X-radiation, Part 1: Determination of attenuation properties of materials, broad beam method with minor modifications to geometry and beam qualities [SOP/XRD/001]

BS7817-1:1995 Protective devices against diagnostic medical X-radiation. Method for determination of attenuation properties of sheet materials.

BS 476 Parts 4,6,7,20,21,22 and 23. Fire tests on building materials and structures.

ISO 6308, AS/NZS 2588, ASTM C1396, 1530, 2589.1, AS/NZ ISO 9001:2000.

GIB X-BLOCK® RADIATION SHIELDING SYSTEMS



GIB X-Block® Plasterboard

APRIL 2009

GIB X-Block® Plasterboard has been tested by NRL in accordance with AS/NZS 4543.1:1999 (IEC 61331 - 1:1994) with the following results.

- 13mm GIB X-Block® has been shown to exceed the requirements for a 1mm lead equivalent at 100 kVp installed as a double layer on one side of a steel or timber frame (GBX 1) or as a single layer on each side of a steel or timber frame (GBX 2)
- 13mm GIB X-Block® has been shown to exceed the requirements for a 2mm lead equivalent at 100 kVp installed as a 3 layer system on one side of a steel or timber frame (GBX 3), or a single layer on one side and 2 layers on the other side of the frame (GBX 4)
- 13mm GIB X-Block® has been shown to exceed the requirements for a 1mm lead equivalent ceiling at 100 kVp installed as a double layer on either timber or steel battens (GBX 5).

Detailed system specifications are given in this brochure.

GIB X-Block® Plasterboard features a lead-free modified core formulated to limit the passage of potentially harmful X-rays. The board is manufactured with tapered edges allowing conventional jointing techniques using specifically formulated GIB X-Block® Jointing Compound™.

Sheet thickness	Sheet length*	Sheet weight
13mm	2,400mm	49kg
13mm	3,000mm	61kg

* Other lengths are available on request depending on required quantity

HANDLING AND STORAGE

- GIB X-Block® Plasterboard must be stored under cover, stacked flat and clear of the floor with sufficient support to avoid sagging
- GIB X-Block® must be handled as a finishing material
- Cracked and damaged sheets must not be used.



GIB X-Block® Jointing Compound™

GIB® recommends the use of GIB X-Block® Jointing Compound, a jointing compound specifically designed to give lead equivalent joints on walls and ceilings using GIB X-Block® Plasterboard. GIB X-Block® Jointing Compound is applied to all joints, including joints on inner layers of two layer systems, to prevent the penetration of X-rays at joints.

Alternatively GIB X-Block® Plasterboard sheets may be protected using the conventional method of placing lead strips or GIB X-Block® Plasterboard strips at least 200mm in width behind the joints. In two layer systems use GIB X-Block® Jointing Compound with paper tape for jointing of the top layer. In addition cover all fasteners on the outer layer with at least two coats of GIB X-Block® Jointing Compound to prevent leakage of X-ray energy at these points.

GIB X-Block® Jointing Compound is available in 25kg bags. Each bag contains enough product for approximately 110 lineal metres of joints or 90m² of board.

GIB X-Block® Jointing Compound has the following benefits:

- Eliminates the need for backing joints with lead strips
- Even protection throughout the joint
- Excellent adhesion produces a high strength joint when used in conjunction with paper tape
- Can be finished with any of the other premium finishing compounds in the GIB® range. To achieve a high standard of finish in preparation for painting or wall covering the final coat should be a GIB® finishing compound
- Product can be mixed to the desired consistency on site
- Can be identified by its brown colour.

GIB X-BLOCK® RADIATION SHIELDING SYSTEMS

TIMBER FRAMED WALLS (FIGURES IN BRACKETS APPLY TO LOAD-BEARING SYSTEMS)

Lining Side 1	Lining Side 2		
GIB X-Block®	GIB X-Block®	13mm GIB® Standard Plasterboard	13mm GIB Fyrelite® 13mm GIB Aqualine® 13mm GIB Toughline® 13mm GIB Noiseline®
1 layer	(60)/60/45	N/A	N/A
2 layers	(60)/60/60	(30)/30/30	(60)/60/60
3 layers	N/A	(30)/30/30	(60)/60/60

NON LOAD-BEARING METAL FRAME PARTITIONS

Lining Side 1	Lining Side 2		
GIB X-Block®	GIB X-Block®	13mm GIB® Standard Plasterboard	13mm GIB Fyrelite® 13mm GIB Aqualine® 13mm GIB Toughline® 13mm GIB Noiseline®
1 layer	-/60/45	N/A	N/A
2 layers	-/60/60	-/30/30	-/60/60
3 layers	N/A	-/30/30	-/60/60

Notes:

- All framing and fixing details for fire rated systems must be in accordance with the details specified in 'GIB® Fire Rated Systems, 2006'. Jointing on GIB X-Block® Plasterboard shall be done using GIB X-Block® Jointing Compound™. The lining on the 'other side' shall have jointing details as per the GIB® Fire Rated System technical literature
- Fire Resistance Ratings for other lining combinations can be provided on request.

GIB X-BLOCK® RADIATION SHIELDING SYSTEMS

	GBX1 – Timber or Steel Framed Wall 1mm Lead Equivalent	APRIL 2009
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13mm GIB X-BLOCK® lead equivalence	
X-ray energy	2 Layers
80 kVp	1.6mm
100 kVp	1.5mm

13mm GIB X-BLOCK® lead equivalence	
X-ray energy	2 Layers
125 kVp	1.0mm
150 kVp	0.7mm

SPEC No.	LOAD BEARING CAPACITY	STC	RW	FIRE RESISTANCE RATING	LINING REQUIREMENTS
GBX1-S	NLB	54	54	refer to page 9	2 x 13mm GIB X-BLOCK® one side/ 1 x 13mm GIB® Plasterboard other side
GBX1-T	LB	48	48		

LINING

X-ray Room Side – 2 layers of 13mm GIB X-Block®. Vertical fixing only permitted. Vertical joints of the outer layer are offset by 600mm from those of the inner layer. Sheet joints shall be formed with a 2mm gap. All joints must be formed over framing with linings fixed hard to floor.

Other Side – 13mm GIB® Plasterboard as specified depending on the function required.

Note: The STC and RW values stated above are where R1.8 (75mm) Pink® Batts® glasswool insulation is installed between the studs.

JOINTING

Inner layer – Stop all GIB X-Block® sheet joints, using only GIB X-Block® Jointing Compound™ flushed out between the tapered edges (paper tape not required on the inner layer).

Outer layers first coat – The joints must be reinforced using only GIB® paper tape and GIB X-Block® Jointing Compound™. Ensure that compound is pushed into the gap between sheets. Conventional topping compounds are used to complete the jointing process.

STEEL FRAMING

- Steel**
- Steel stud dimensions to be 63 x 34 x 0.55mm minimum with a 6mm return and spaced at 600mm centres maximum
 - Steel channel dimension to be 63 x 30 x 0.55mm nominal
- Note: In fire rated situations, the steel studs must be placed to allow a 15mm expansion gap at the top of the frame.*

TIMBER FRAMING

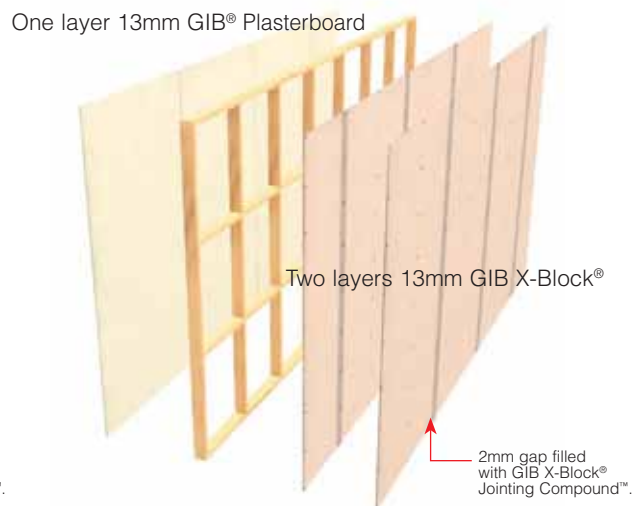
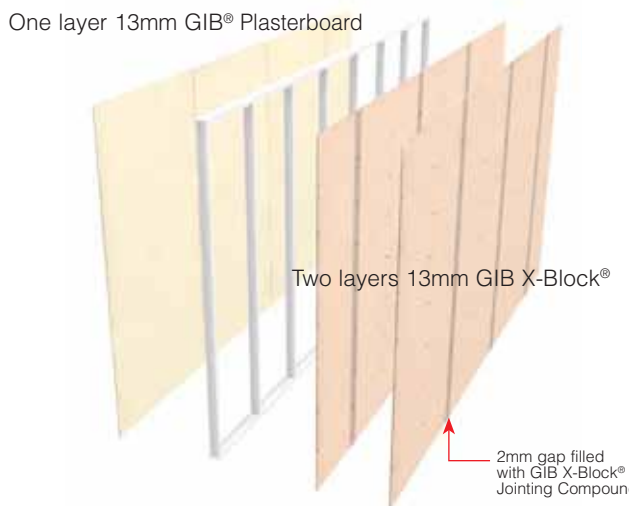
- Timber**
- Framing shall comply with relevant building code and design requirements
 - Nogs are to be set at 800mm centres maximum
 - The moisture content of the timber framing shall be 18% or less at the time of lining.

FASTENING THE LINING FOR STEEL

Fasteners
 Inner layer – 25mm x 6g GIB® Grabber® Self Tapping Drywall screws.
 Outer layer – 41mm x 6g screws as above.
Fastener Centres
 Inner and Outer layers 300mm centres up each stud, 12mm from the sheet edges.
 No fasteners to the top and bottom channels.

FASTENING THE LINING FOR TIMBER

Fasteners
 Inner layer – 41mm x 6g GIB® Grabber® High Thread Drywall screws.
 Outer layer – 51mm x 7g screws as above.
Fastener Centres
 Inner layer – 600mm centres up each stud and to the top and bottom plates.
 Outer layer – 300mm centres around the sheet perimeter and 12mm from the sheet edges.
 Single screws at 300mm centres to the intermediate studs.



GIB X-BLOCK® RADIATION SHIELDING SYSTEMS

GIB GBX2 – Timber or Steel Framed Wall 1mm Lead Equivalent APRIL 2009

13mm GIB X-BLOCK® lead equivalence	
X-ray energy	2 Layers
80 kVp	1.6mm
100 kVp	1.5mm

13mm GIB X-BLOCK® lead equivalence	
X-ray energy	2 Layers
125 kVp	1.0mm
150 kVp	0.7mm

SPEC No.	LOAD BEARING CAPACITY	STC	RW	FIRE RESISTANCE RATING	LINING REQUIREMENTS
GBX2-S	NLB	52	52	refer to page 9	1 x 13mm GIB X-BLOCK® one side/ 1 x 13mm GIB X-BLOCK® other side
GBX2-T	LB	46	46		

LINING

1 layer of 13mm GIB X-Block® each side of the frame. Vertical fixing only permitted.
Offset joints between sheets by 600mm on opposite sides of the frame.

All joints must be formed over framing with linings fixed hard to floor. Sheet joints shall be formed with a 2mm gap.

Note: The STC and RW values stated above are where R1.8 (75mm) Pink® Batts® glasswool insulation is installed between the studs.

JOINTING

Use only GIB X-Block® Jointing Compound™. The joints must be reinforced using only GIB® paper tape. Ensure that compound is

pushed into the gap between the sheets. Conventional topping compounds are used to complete the jointing process.

STEEL FRAMING

- Steel**
- Steel stud dimensions to be 63 x 34 x 0.55mm minimum with a 6mm return and spaced at 600mm centres maximum
 - Steel channel dimension to be 63 x 30 x 0.55mm nominal

Note: In fire rated situations, the steel studs must be placed to allow a 15mm expansion gap at the top of the frame.

TIMBER FRAMING

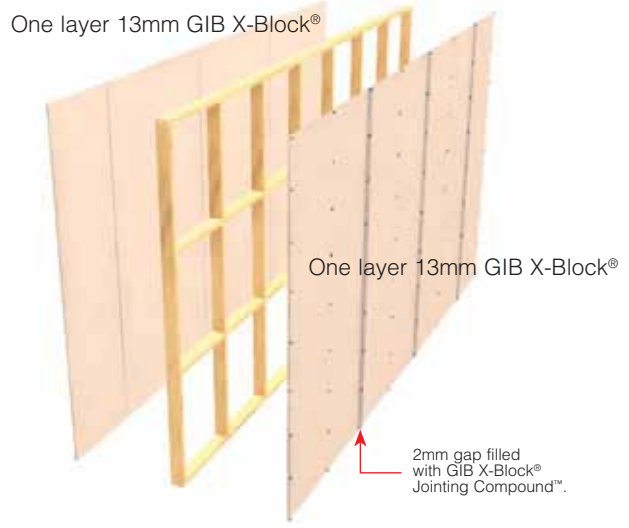
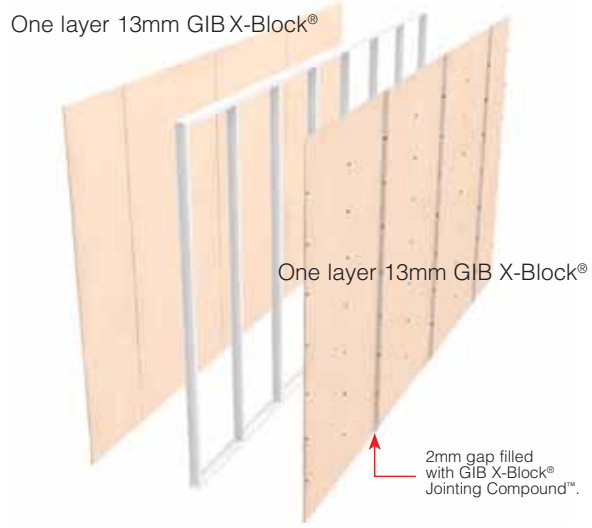
- Timber**
- Framing shall comply with relevant building code and design requirements
 - Nogs are to be set at 800mm centres maximum
 - The moisture content of the timber framing shall be 18% or less at the time of lining.

FASTENING THE LINING FOR STEEL

Fasteners
25mm x 6g GIB® Grabber® Self Tapping Drywall screws.
Fastener Centres
300mm centres up each stud, 12mm from the sheet edges.
No fasteners to the top and bottom channels.

FASTENING THE LINING FOR TIMBER

Fasteners
41mm x 6g GIB® Grabber® High Thread Drywall screws.
Fastener Centres
300mm centres around the sheet perimeter and 12mm from the sheet edges.
Single screws at 300mm centres to the intermediate studs.



GIB X-BLOCK® RADIATION SHIELDING SYSTEMS

	GBX3 – Timber or Steel Framed Wall 2mm Lead Equivalent	APRIL 2009
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13mm GIB X-BLOCK® lead equivalence	
X-ray energy	3 Layers
80 kVp	2.4mm
100 kVp	2.2mm

13mm GIB X-BLOCK® lead equivalence	
X-ray energy	3 Layers
125 kVp	1.4mm
150 kVp	1.0mm

SPEC No.	LOAD BEARING CAPACITY	STC	RW	FIRE RESISTANCE RATING	LINING REQUIREMENTS
GBX3-S	NLB	57	57	refer to page 9	3 x 13mm GIB X-BLOCK® one side/ 1 x 13mm GIB® Plasterboard other side
GBX3-T	LB	51	51		

LINING

X-ray Room Side – 3 layers of 13mm GIB X-Block®. Vertical fixing only permitted. Vertical joints of the outer layer are offset by 600mm from adjacent layers. All joints must be formed over framing with linings fixed hard to floor. Sheet joints shall be formed with a 2mm gap.

Other Side – 13mm GIB® Plasterboard as specified depending on the function required.

Note: The STC and RW values stated above are where R1.8 (75mm) Pink® Batts® glasswool insulation is installed between the studs.

JOINTING

Inner and middle layer – Stop all GIB X-Block® sheet joints, using only GIB X-Block® Jointing Compound™ flushed out between the tapered edges (paper tape not required on the inner layers).

Outer layer first coat – The joints must be reinforced using only GIB® paper tape and GIB X-Block® Jointing Compound™. Ensure that compound is pushed into the gap between the sheets. Conventional topping compounds are used to complete the jointing process.

STEEL FRAMING

Steel

- Steel stud dimensions to be 63 x 34 x 0.55mm minimum with a 6mm return and spaced at 600mm centres maximum
- Steel channel dimension to be 63 x 30 x 0.55mm nominal

Note: In fire rated situations, the steel studs must be placed to allow a 15mm expansion gap at the top of the frame.

TIMBER FRAMING

Timber

- Framing shall comply with relevant building code and design requirements
- Nogs are to be set at 800mm centres maximum
- The moisture content of the timber framing shall be 18% or less at the time of lining

FASTENING THE LINING FOR STEEL

Fasteners

Inner layer – 25mm x 6g GIB® Grabber® Self Tapping Drywall screws.

Middle layer – 41mm x 6g screws as above.

Outer layer – 51mm x 7g screws as above.

Fastener Centres

All layers 300mm centres up each stud, 12mm from the sheet edges.

No fasteners to the top and bottom channels.

FASTENING THE LINING FOR TIMBER

Fasteners

Inner layer – 41mm x 6g GIB® Grabber® High Thread Drywall screws.

Middle layer – 51mm x 7g screws as above

Outer layer – 57mm x 7g screws as above.

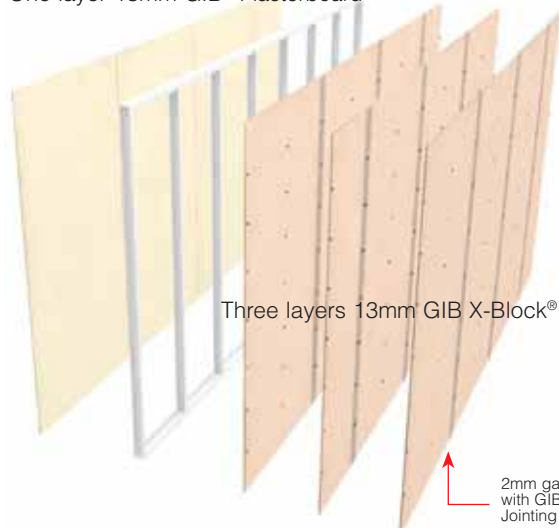
Fastener Centres

Inner layer – 600mm centres up each stud and to the top and bottom plates.

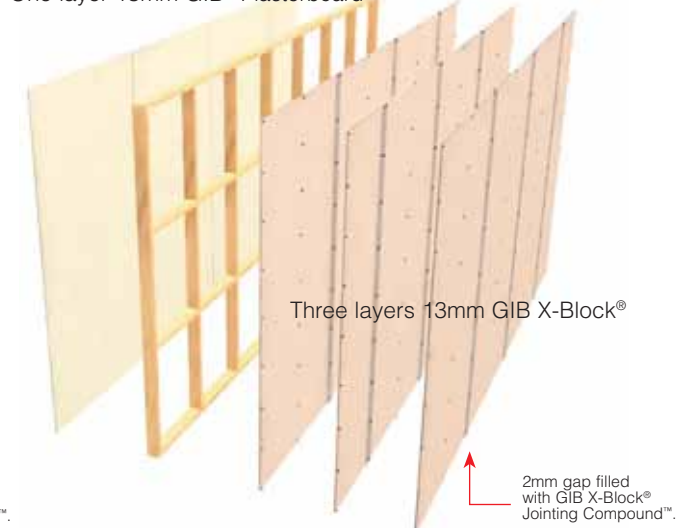
Middle and outer layer – 300mm centres around the sheet perimeter and 12mm from the sheet edges.

Single screws at 300mm centres to the intermediate studs.

One layer 13mm GIB® Plasterboard



One layer 13mm GIB® Plasterboard



GIB X-BLOCK® RADIATION SHIELDING SYSTEMS

GIB GBX4 – Timber or Steel Framed Wall 2mm Lead Equivalent APRIL 2009

13mm GIB X-BLOCK® lead equivalence	
X-ray energy	3 Layers
80 kVp	2.4mm
100 kVp	2.2mm

13mm GIB X-BLOCK® lead equivalence	
X-ray energy	3 Layers
125 kVp	1.4mm
150 kVp	1.0mm

SPEC No.	LOAD BEARING CAPACITY	STC	RW	FIRE RESISTANCE RATING	LINING REQUIREMENTS
GBX4-S	NLB	56	56	refer to page 9	2 x 13mm GIB X-BLOCK® one side/ 1 x 13mm GIB X-BLOCK® other side
GBX4-T	LB	50	50		

LINING

One Side – 2 layers of 13mm GIB X-Block®.
Where double layer linings occur the vertical joints of the outer layer are offset by 600mm from those of the inner layer. All joints must be formed over framing with linings fixed hard to floor.

Other Side – 1 layer of 13mm GIB X-Block®.
Vertical fixing only permitted. Offset joints 600mm from opposite

side of framing. All joints must be formed over framing with linings fixed hard to floor.
Sheet joints shall be formed with a 2mm gap.

Note: The STC and RW values stated above are where R1.8 (75mm) Pink® Batts® glasswool insulation is installed between the studs.

JOINTING

Inner layers – Stop all GIB X-Block® sheet joints, using only GIB X-Block® Jointing Compound™ flushed out between the tapered edges (paper tape not required on the inner layer).

Outer layers first coat – The joints must be reinforced using

only GIB® paper tape and GIB X-Block® Jointing Compound™. Ensure that compound is pushed into the gap between the sheets. Conventional topping compounds are used to complete the jointing process.

STEEL FRAMING

Steel

- Steel stud dimensions to be 63 x 34 x 0.55mm minimum with a 6mm return and spaced at 600mm centres maximum
- Steel channel dimension to be 63 x 30 x 0.55mm nominal

Note: In fire rated situations, the steel studs must be placed to allow a 15mm expansion gap at the top of the frame.

TIMBER FRAMING

Timber

- Framing shall comply with relevant building code and design requirements
- Nogs are to be set at 800mm centres maximum
- The moisture content of the timber framing shall be 18% or less at the time of lining

FASTENING THE LINING FOR STEEL

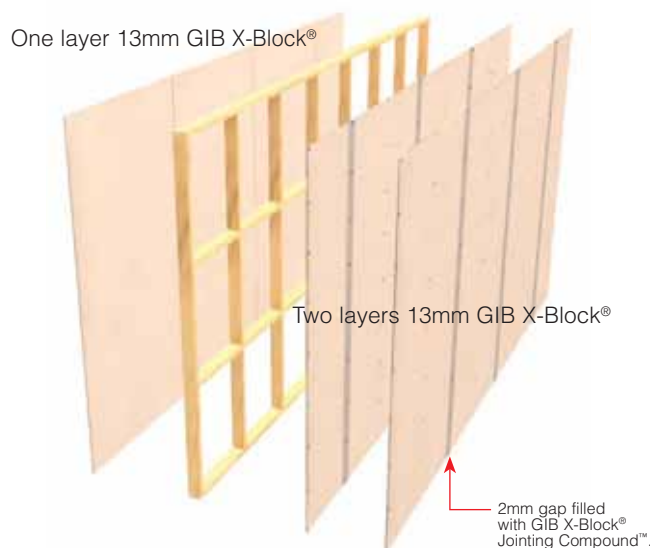
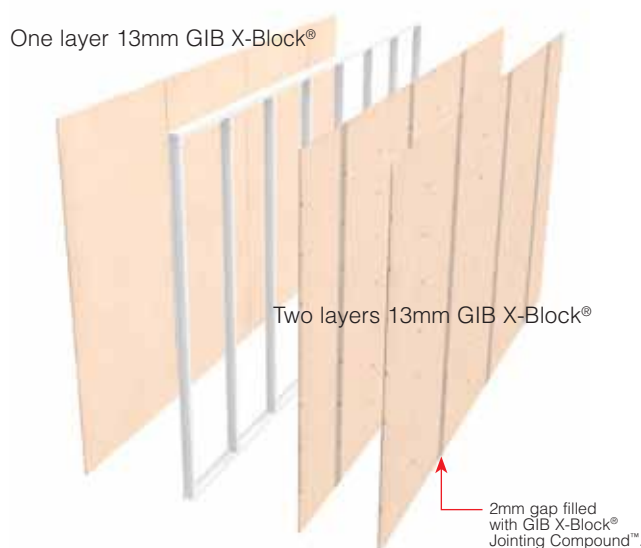
Fasteners
Inner layer and single layers – 25mm x 6g GIB® Grabber® Self Tapping screws.
Outer layer – 41mm x 6g screws as above.

Fastener Centres
All layers – 300mm centres up each stud, 12mm from the sheet edges.
No fasteners to the top and bottom channels.

FASTENING THE LINING FOR TIMBER

Fasteners
Inner layer and single layers – 41mm x 6g GIB® Grabber® High Thread Drywall screws.
Outer layer – 51mm x 7g screws as above.

Fastener Centres
Inner layer – 600mm centres up each stud and to the top and bottom plates.
Outer and single layers – 300mm centres around the sheet perimeter and 12mm from the sheet edges.
Single screws at 300mm centres to the intermediate studs.



GIB X-BLOCK® RADIATION SHIELDING SYSTEMS

	GBX 5 – Floor/Ceiling 1mm Lead Equivalent	APRIL 2009
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13mm GIB X-BLOCK® lead equivalence		13mm GIB X-BLOCK® lead equivalence	
X-ray energy	2 Layers	X-ray energy	2 Layers
80 kVp	1.6mm	125 kVp	1.0mm
100 kVp	1.5mm	150 kVp	0.7mm

SPEC No.	LOAD BEARING CAPACITY	STC	RW	FIRE RESISTANCE RATING	LINING REQUIREMENTS
GBX5-S	LB	54	54	45/45/45	2 x 13mm GIB X-BLOCK® ceiling side/ prescribed flooring other side
GBX5-T		48	48	60/60/60	

CEILING LINING

2 layers of 13mm GIB X-Block® fixed at right angles to the battens. Offset longitudinal sheet joints between layers by 600mm. All sheet end butt joints shall occur on the battens and are also offset between the first and second layers. Sheet joints shall be formed with a 2mm gap.

Note: The STC and RW values stated above are where R1.8 (75mm) Pink® Batts® glasswool insulation is installed between the joists.

JOINTING

Inner layer – Stop all GIB X-Block® sheet joints, using only GIB X-Block® Jointing Compound™ flushed out between the tapered edges (paper tape not required on the inner layer).

Outer layers first coat – The joints must be reinforced using

only GIB® paper tape and GIB X-Block® Jointing Compound™. Ensure that compound is pushed into the gap between the sheets. Conventional topping compounds are used to complete the jointing process.

FLOOR FRAMING

Floor joists shall comply with NZS 3604 and be spaced at 600mm centres maximum and have a depth of 200mm minimum.

Alternative Floor Framing

Use either Origin® I-beams or CHH Hybeam® HJ series designed for strength and serviceability, no less than 240mm deep and spaced at no more than 600mm. Nogs fixed on the flat to receive edges of flooring material shall be 100 x 50mm minimum. Consult

the beam manufacturer regarding construction of the solid blocking contained in floor/ceiling to wall junctions.

Flooring

Minimum flooring shall be nominal 20mm particleboard or minimum 17mm structural plywood fixed to the manufacturer's instructions.

CEILING BATTENS

Ceiling battens shall be GIB® Rondo® steel or 75mm x 50mm timber battens spaced at 600mm centres maximum.

FASTENING THE LINING FOR STEEL BATTENS

Fasteners

Inner layer – 25mm x 6g GIB® Grabber® Self Tapping screws.
Outer layer – 41mm x 6g screws as above.

Fastener Centres (both layers)

200mm centres along each batten and along sheet end butt joints. Place fasteners no closer than 12mm to the sheet edges.

Note: Adhesive fixing is not permitted.

FASTENING THE LINING FOR TIMBER BATTENS

Fasteners

Inner layer – 32mm x 6g GIB® Grabber® High Thread Drywall screws.

Outer layer – 51mm x 7g screws as above.



Two layers 13mm GIB X-Block®



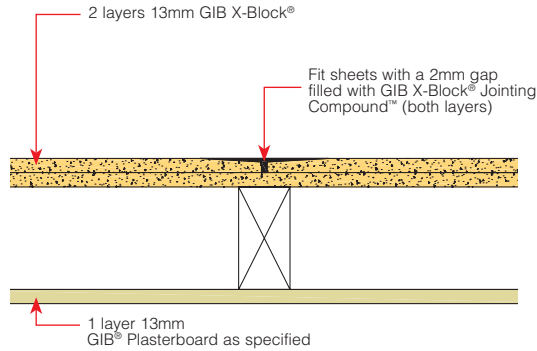
Two layers 13mm GIB X-Block®

GIB X-BLOCK® RADIATION SHIELDING SYSTEMS

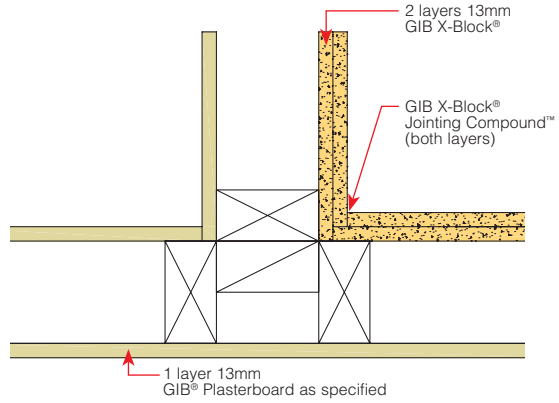
	GBX 1 – Construction Details 1mm Lead Equivalent	APRIL 2009
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Suitable for use between X-ray rooms and non-protected spaces.

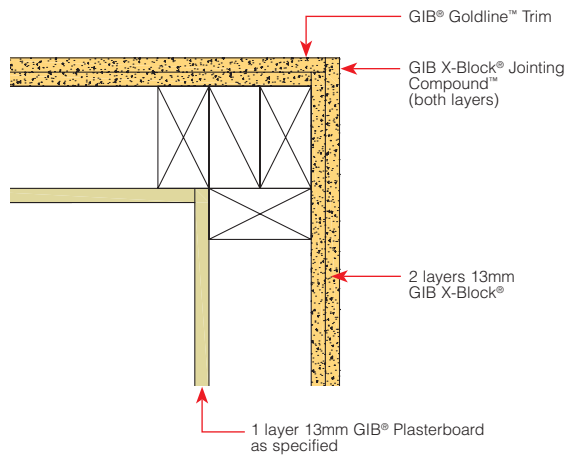
Detail 1 – Typical Section



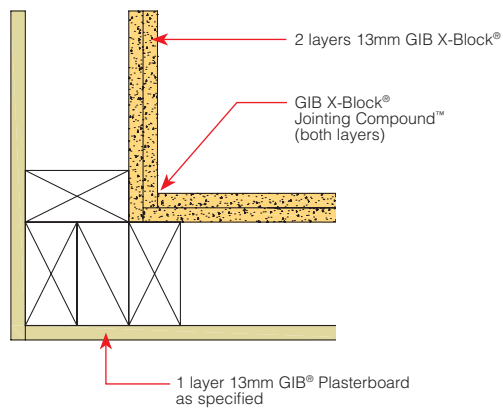
Detail 2 – T Junction



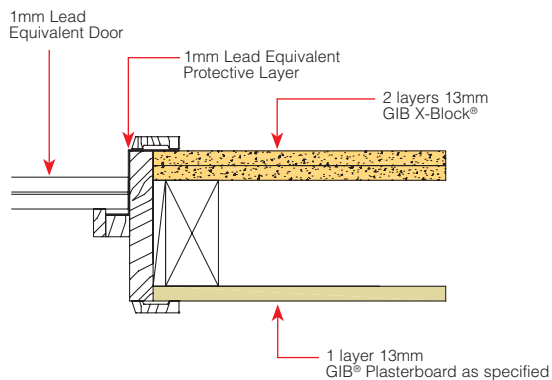
Detail 3 – External Corner



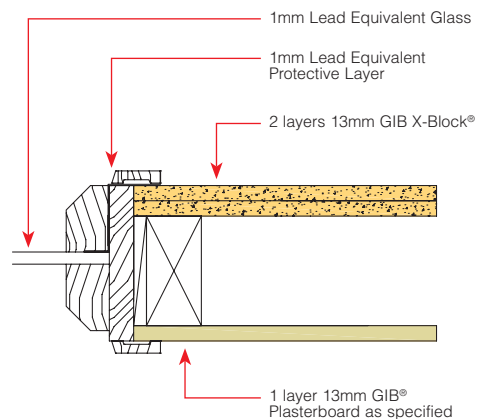
Detail 4 – Internal Corner



Detail 5 – Door Jamb

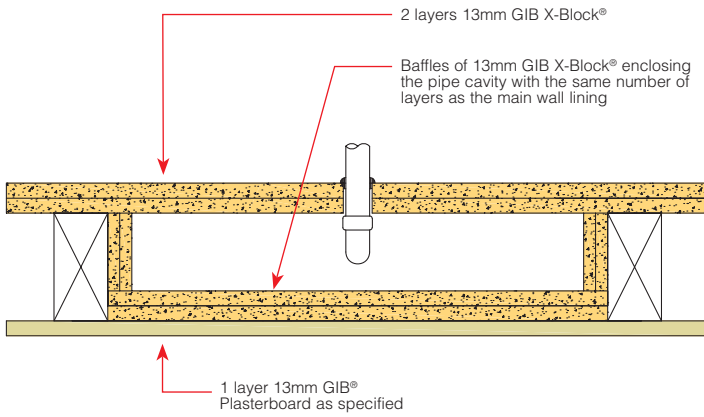


Detail 6 – Window Jamb

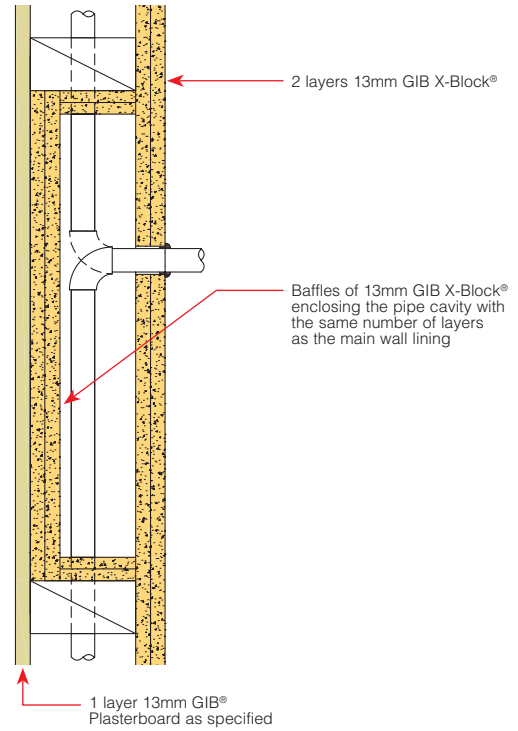


Suitable for use between X-ray rooms and non-protected spaces.

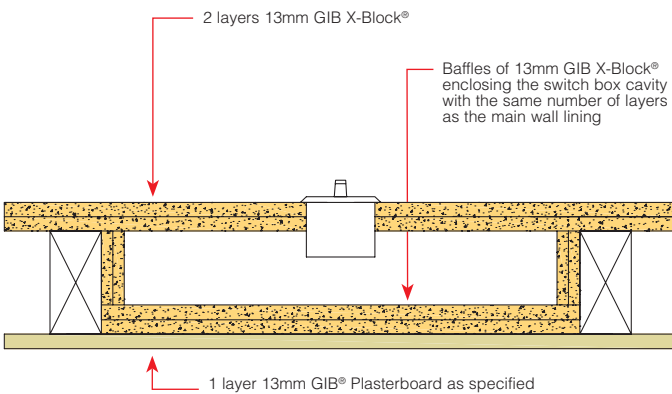
Detail 7 – Plan View Pipe Penetration



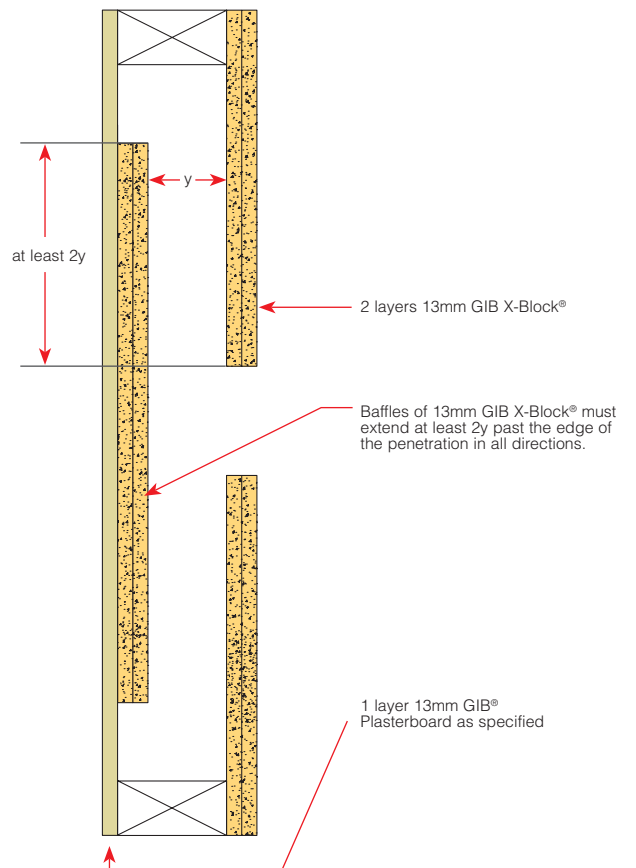
Detail 8 – Section View Pipe Penetration



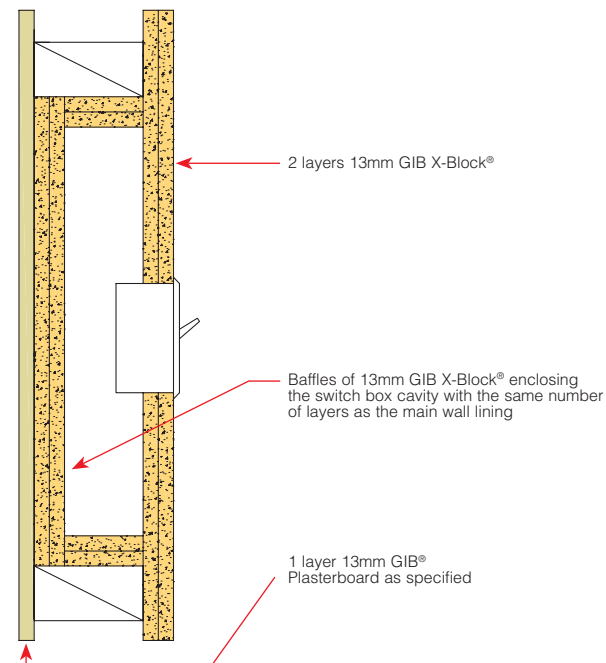
Detail 9 – Plan View Switch Boxes



Detail 11 – Plan View Penetration (non fire rated systems)



Detail 10 – Section View Switch Boxes



GIB X-BLOCK® RADIATION SHIELDING SYSTEMS

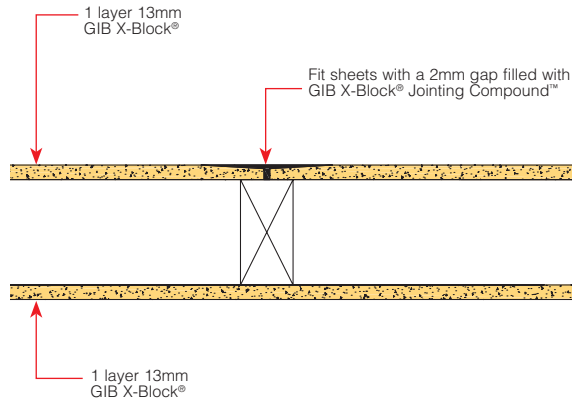


GBX 2 – Construction Details 1mm Lead Equivalent

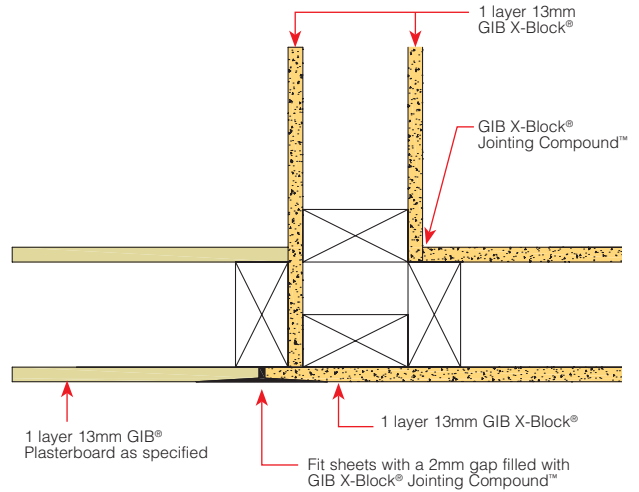
APRIL 2009

Suitable for use between X-ray rooms and non-protected spaces.

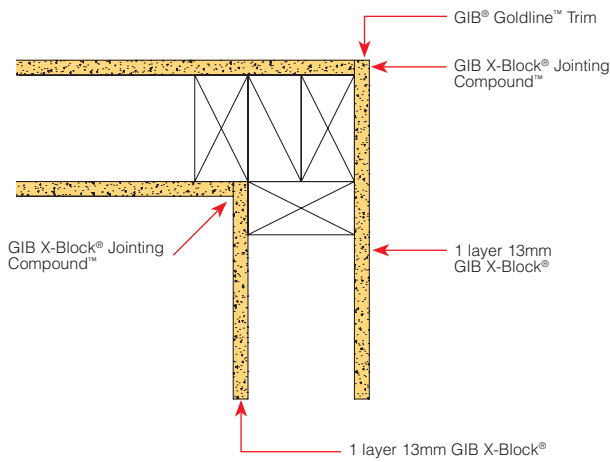
Detail 1 – Typical Section



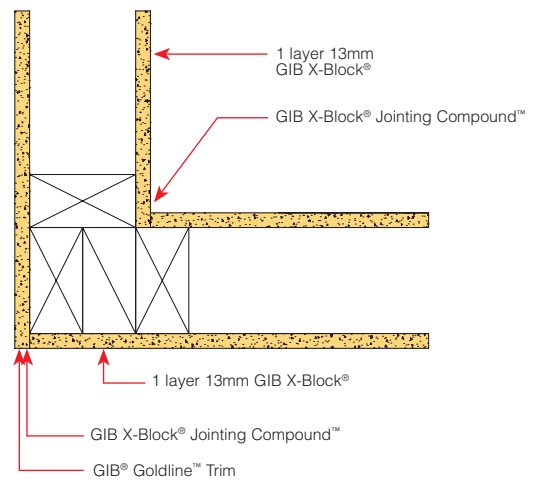
Detail 2 – T Junction



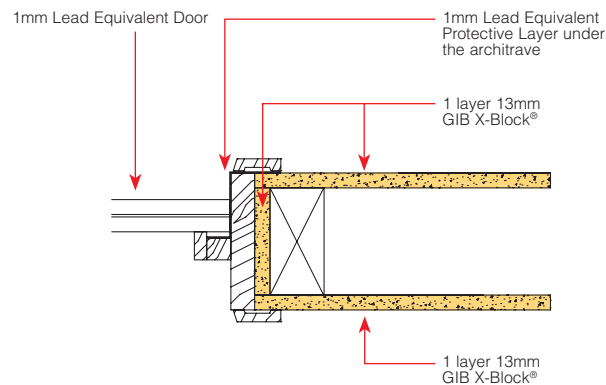
Detail 3 – External Corner



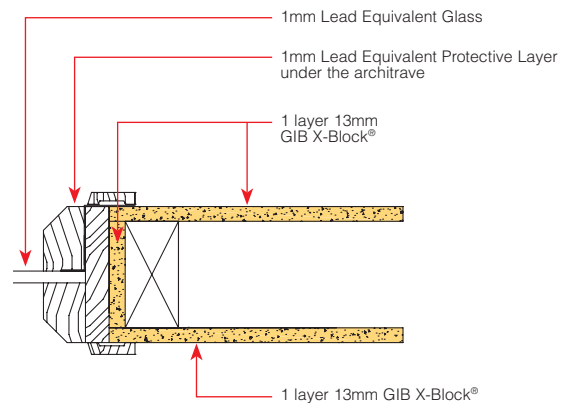
Detail 4 – Internal Corner



Detail 5 – Door Jamb



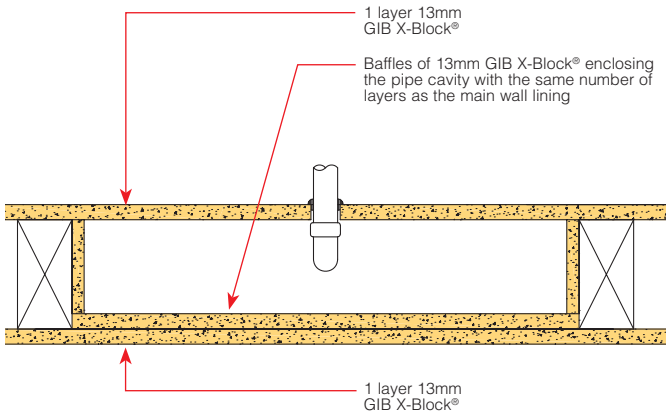
Detail 6 – Window Jamb



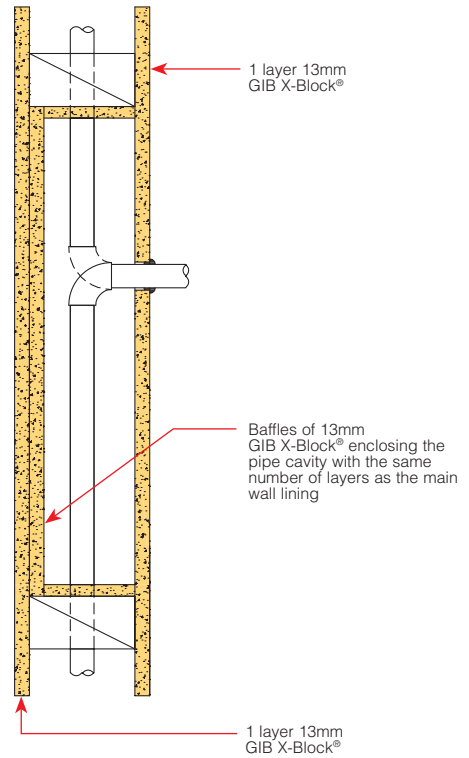


Suitable for use in partitions within X-ray rooms.

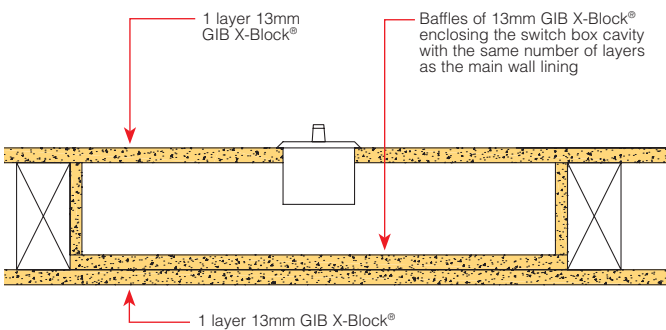
Detail 7 – Plan View Pipe Penetration



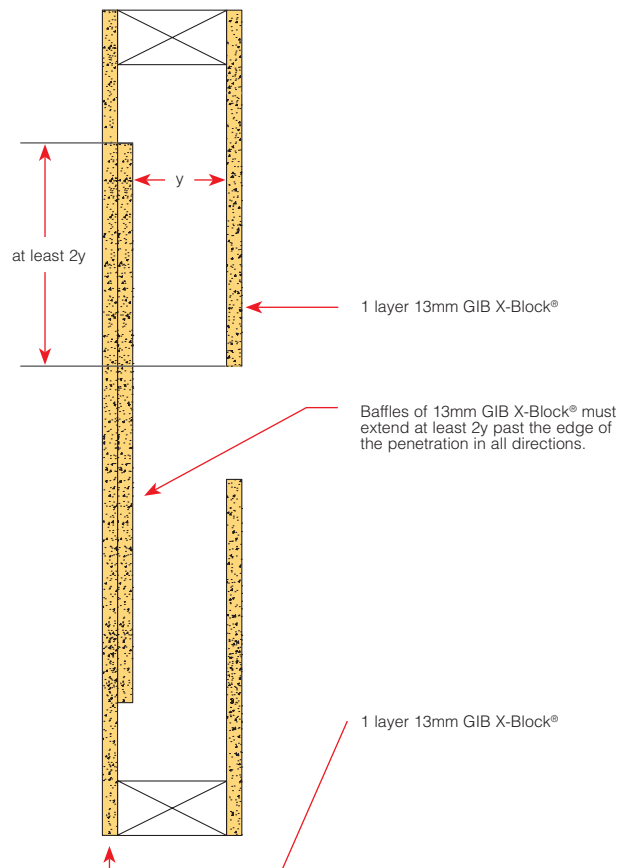
Detail 8 – Section View Pipe Penetration



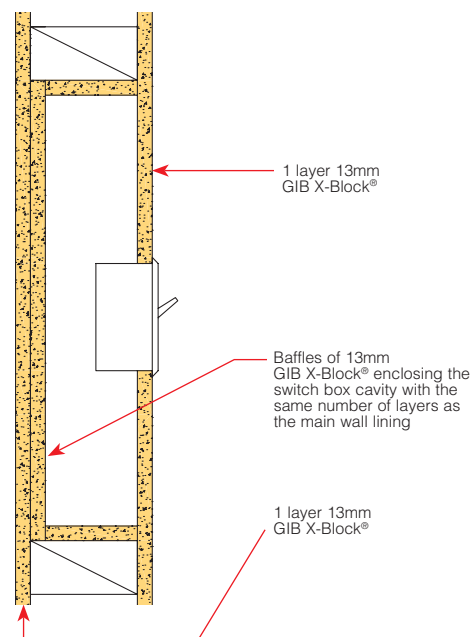
Detail 9 – Plan View Switch Boxes



Detail 11 – Plan View Penetration (non fire rated systems)



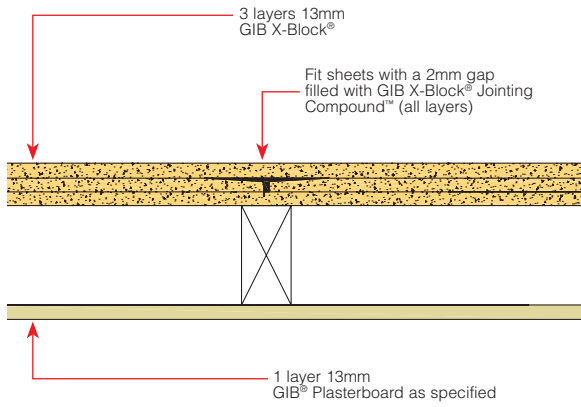
Detail 10 – Section View Switch Boxes



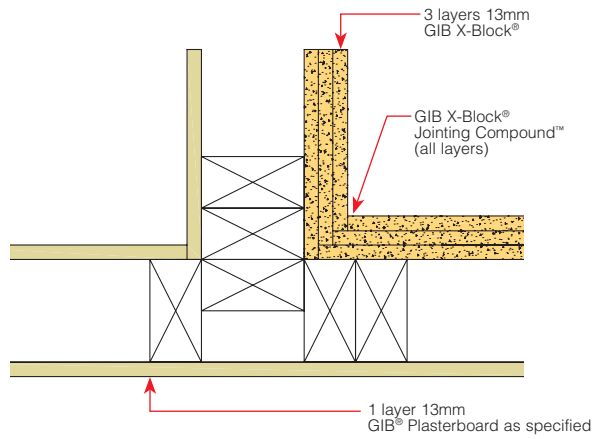
GIB X-BLOCK® RADIATION SHIELDING SYSTEMS

Suitable for use between X-ray rooms and non-protected spaces.

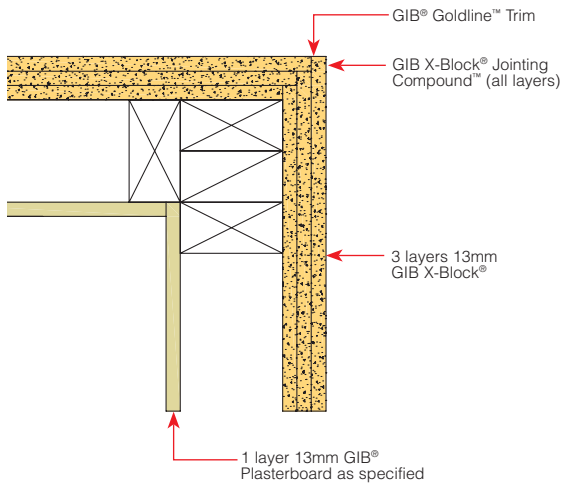
Detail 1 – Typical Section



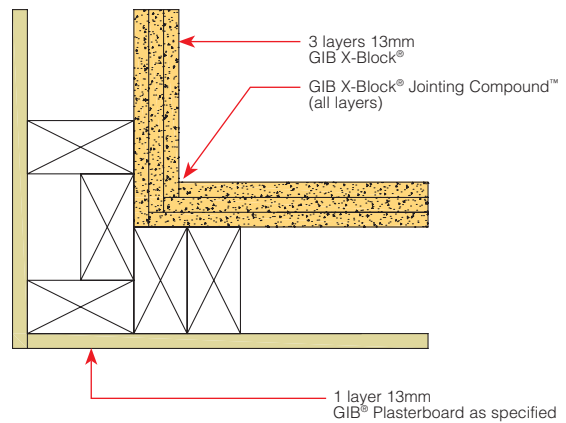
Detail 2 – T Junction



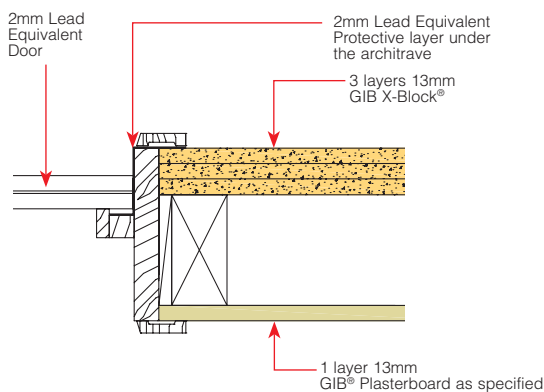
Detail 3 – External Corner



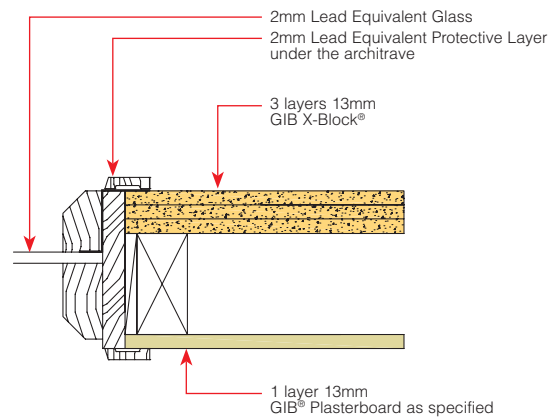
Detail 4 – Internal Corner



Detail 5 – Door Jamb

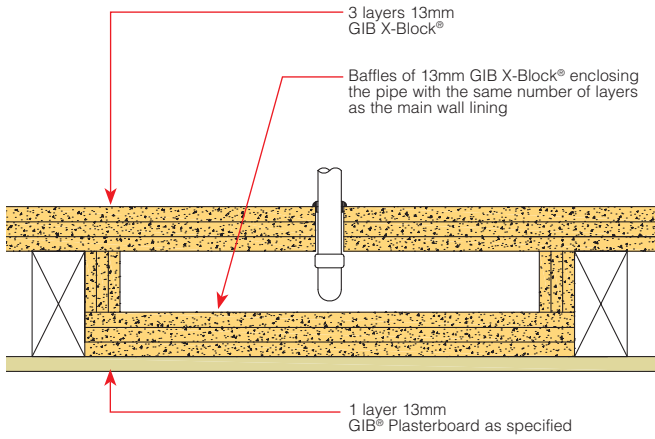


Detail 6 – Window Jamb

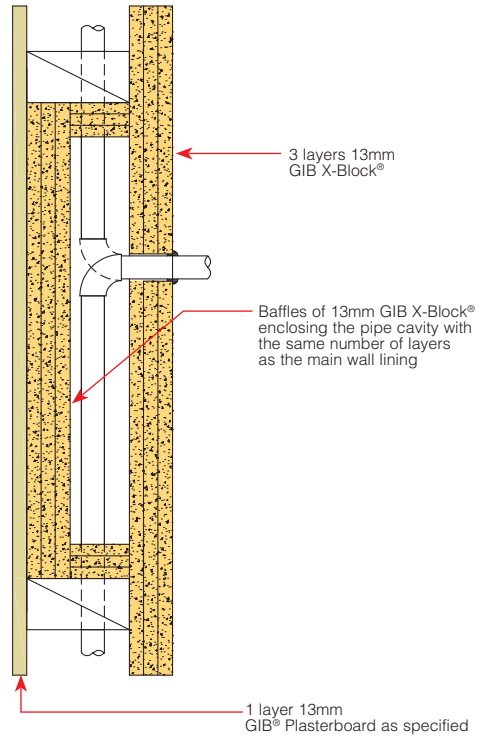


Suitable for use between X-ray rooms and non-protected spaces.

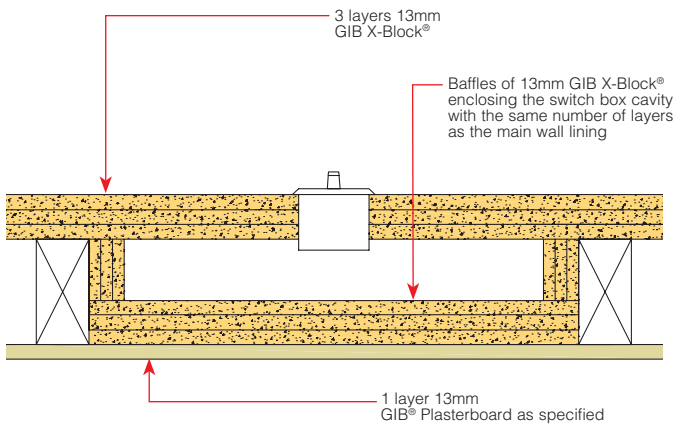
Detail 7 – Plan View Pipe Penetration



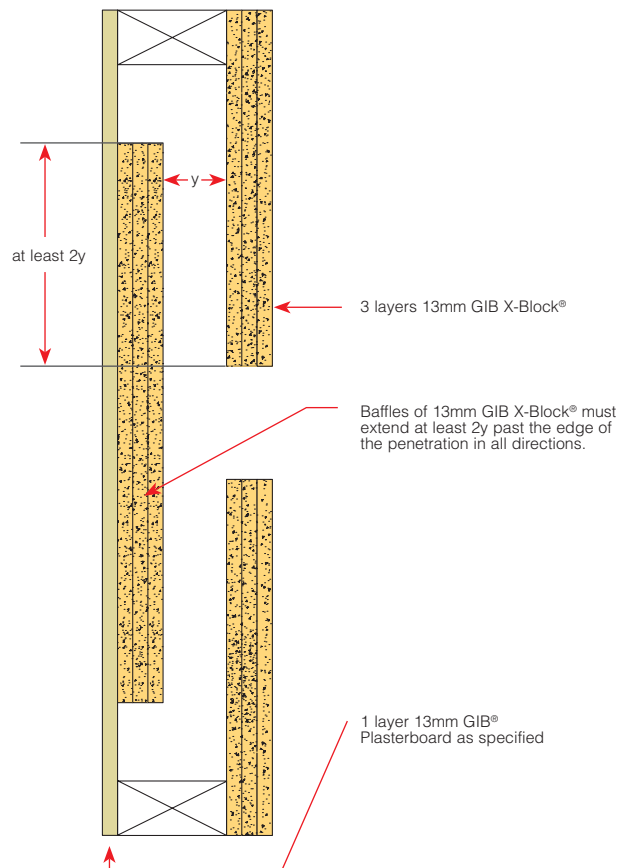
Detail 8 – Section View Pipe Penetration



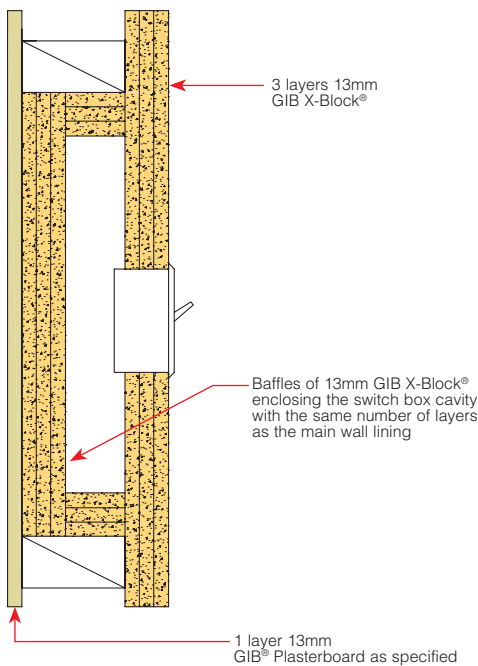
Detail 9 – Plan View Switch Boxes



Detail 11 – Plan View Penetration (non fire rated systems)

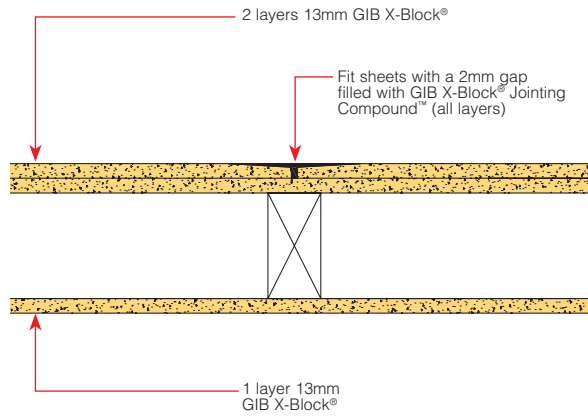


Detail 10 – Section View Switch Boxes

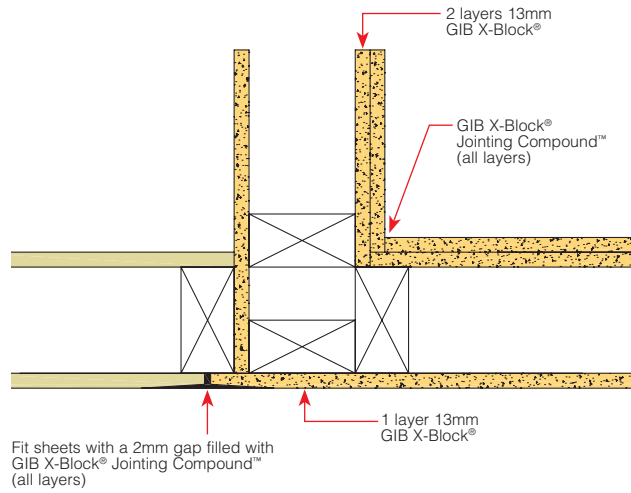


Suitable for use in partitions within X-ray rooms.

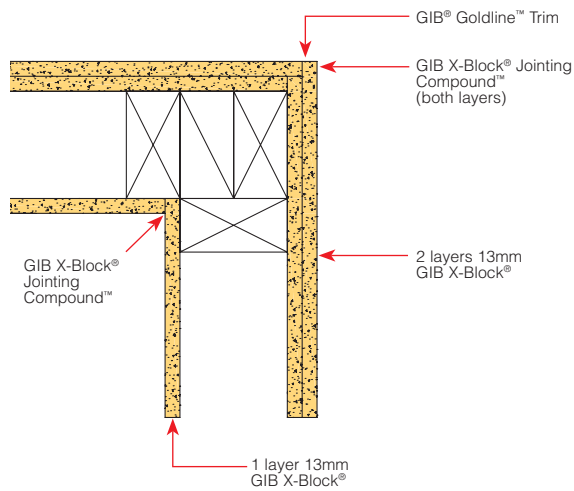
Detail 1 – Typical Section



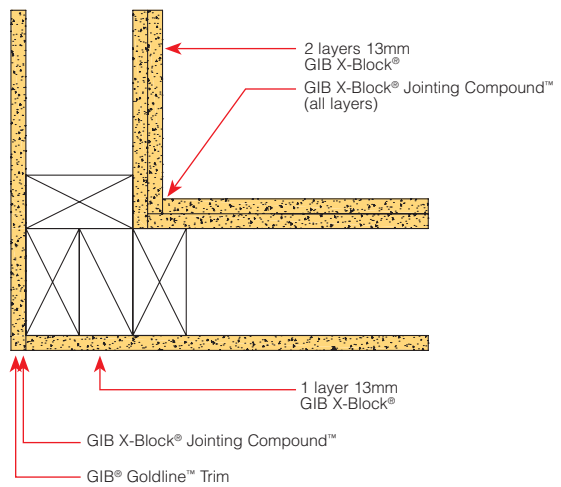
Detail 2 – T Junction



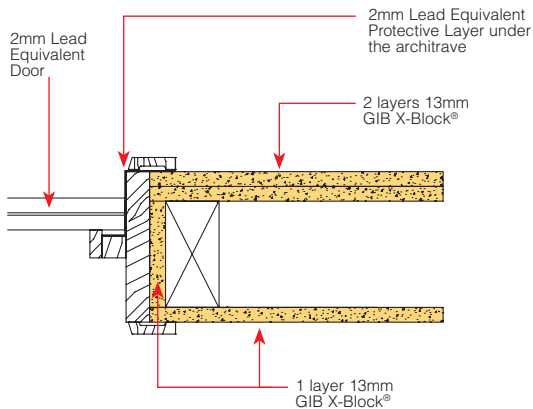
Detail 3 – External Corner



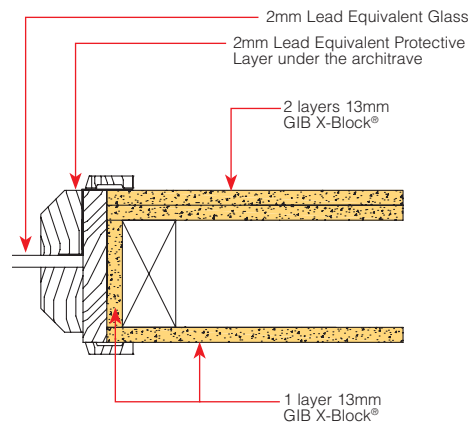
Detail 4 – Internal Corner



Detail 5 – Door Jamb

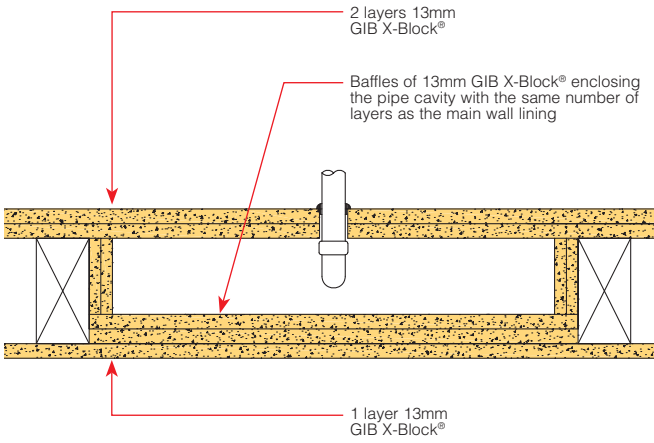


Detail 6 – Window Jamb

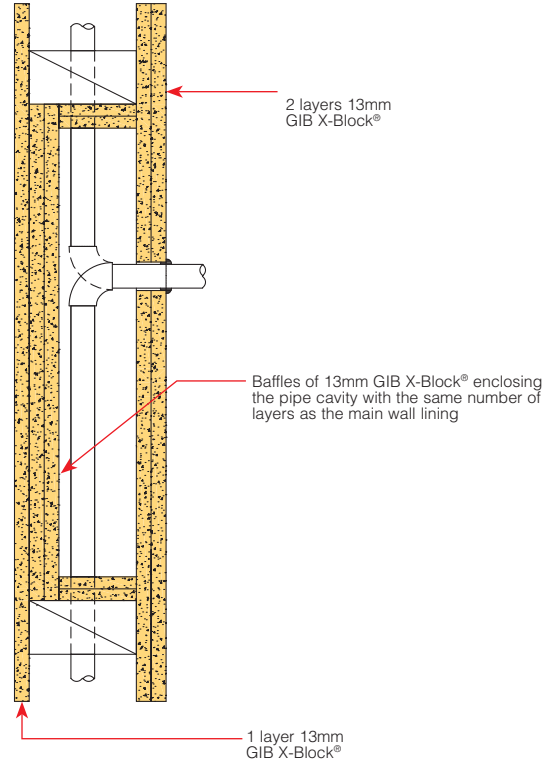


Suitable for use in partitions within X-ray rooms.

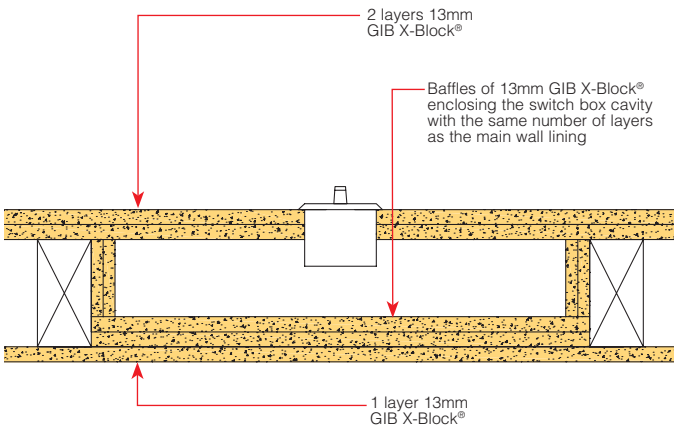
Detail 7 – Plan View Pipe Penetration



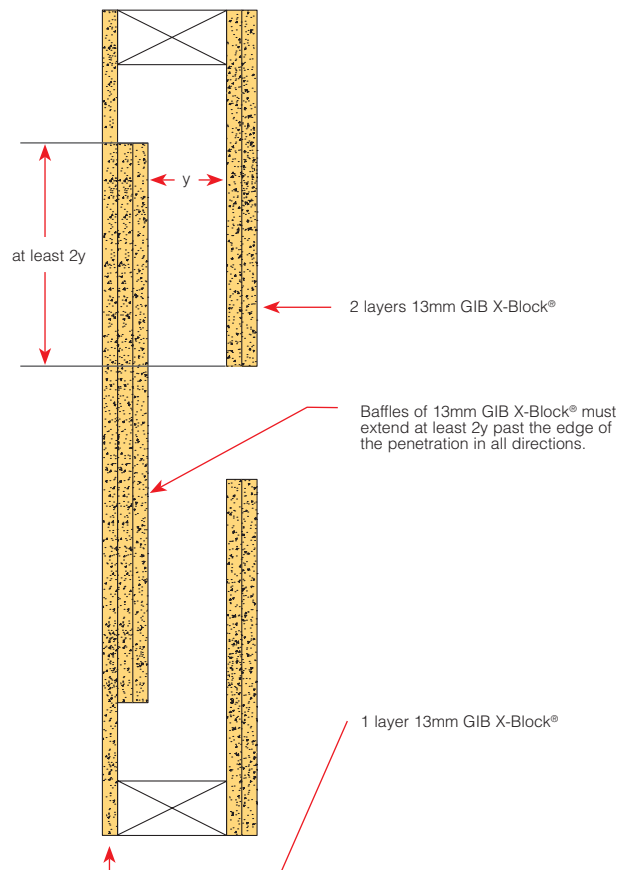
Detail 8 – Section View Pipe Penetration



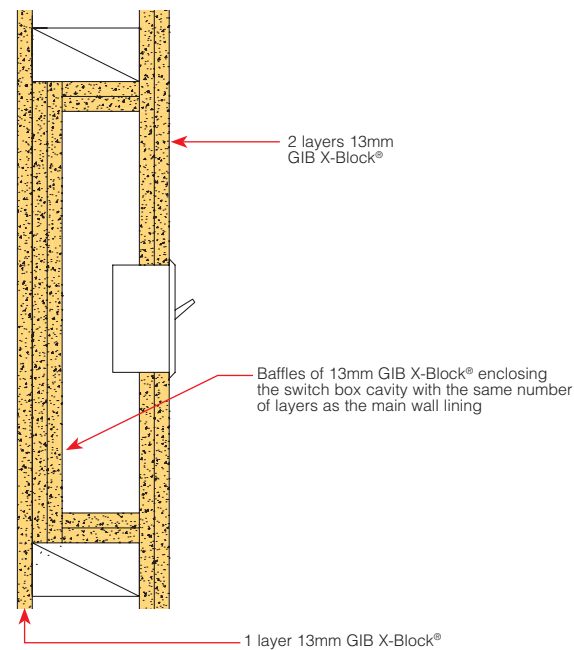
Detail 9 – Plan View Switch Boxes



Detail 11 – Plan View Penetration (non fire rated systems)



Detail 10 – Section View Switch Boxes





Q. What is GIB X-Block®?

A. GIB X-Block® is Gypsum based plasterboard with high levels of Barytes designed to provide lead-free X-ray protection.

Q. Where is GIB X-Block® used?

A. In medical X-ray diagnostic rooms requiring protective barriers to shield operators and occupants of adjacent areas against unacceptable levels of radiation. Radiation exposure may arise from direct exposure to X-ray beams (primary beams) or by X-rays scattering from the patient, equipment or other fixtures.

Q. What are the alternatives?

A. Lead can be applied to the back of the plasterboard or other wall lining materials prior to installation, GIB X-Block® provides a lead-free lining solution.

Q. Why would I want to use GIB X-Block® and not lead lined plasterboard?

A. There are potential health issues with using lead such as handling and disposing of the waste lead. GIB X-Block® is lighter in weight, easier to handle and provides a lead-free lining solution. Also GIB X-Block® Systems may offer a more cost effective solution to radiation shielding than other options.

Q. How is the performance of lead lined plasterboard and GIB X-Block® measured?

A. Shielding for diagnostic X-ray rooms tends to be specified in terms of the thickness of lead required for appropriate protection. GIB X-Block® provides X-ray and gamma ray protection, with performance measured in "lead equivalence". The National Radiation Laboratory (NRL) specifies that "the lead equivalence must be appropriate to the kilovoltages used in the room". The table on page 4 shows the lead equivalence of GIB X-Block® at different X-ray energies.

Q. How will we know what energy levels are required?

A. Advice on X-ray protection for a particular installation must be sought from a Qualified Health Physicist [QHP] to ensure the requirements for occupational and public protection are met. A minimum lead equivalence of 1.0mm at 100 kVp is usually required for walls of general diagnostic X-ray rooms. Shielding of not less than 2.0mm lead equivalence is required where the primary X-ray beam may be routinely directed towards adjacent occupied areas. Specialised X-ray rooms may use higher energy X-rays and/or have greater use than general rooms; thus additional shielding may be necessary.

Q. What if the requirements are higher?

A. Where shielding of high strength X-ray machinery is required, lead lined plasterboard may be the only product that can be used. In these circumstances we recommend the use of lead lined GIB Toughline®.

Q. What are Primary X-ray Shielding and Secondary X-ray Shielding?

A. Primary Shielding is the protection of X-ray from the machine being used, the machine will have some form of protection built in to ensure that the X-ray is guided from the machine to the patient and not leak through other areas. Secondary Shielding is the protection of people outside the X-ray room, i.e. the wall around the room lined with GIB X-Block®.

Q. Is X-ray protection required on the ceiling of the room being treated?

A. X-ray shielding may be required on the floors and/or ceilings (as required) of an X-ray room of a multi-storey building. Consult a QHP to ensure that the requirements for radiation shielding are met.

Q. When multi-layers are used does the inner layer require plastering and what type of compound is used?

A. All joints should be filled using GIB X-Block® Jointing Compound™, a joint compound specifically designed to give lead equivalent joints on walls and ceilings using GIB X-Block® plasterboard. GIB X-Block® Jointing Compound™ is applied to all joints, including the joints on inner layers of multi-layer systems, to prevent the penetration of X-rays through joints.

Q. Is there an issue where the X-ray can travel down the screw or nail head thus causing the system to fail?

A. No, this is not an issue. Metal screws have a greater density than the board and do not themselves provide a radiation path through the board. All fastener heads should be finished and any gaps sealed with GIB X-Block® Jointing Compound™. This can be supported by a report from the National Radiation Laboratory.

Q. Will GIB X-Block® plasterboard and Jointing Compound™ work for every application?

A. In most applications we recommend the GIB X-Block® system, however if lead lined plasterboard is required we recommend the use of lead lined GIB Toughline®.





GIB X-Block® Radiation Shielding Systems April 2009

Winstone Wallboards Ltd accepts no liability if the GIB X-Block® Systems are not designed and installed in strict accordance with instructions contained in this publication.



Use only the current specification

This publication may be superseded by a new publication. Winstone Wallboards accepts no liability for reliance upon publications that have been superseded. You should check the current index of publications contained in your GIB® Technical Manual before using this publication. If you are unsure whether this is the current publication, simply call the GIB® Help Line on 0800 100 442.

GIB® Help Line – Call Free

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