

**pbs**  
**eterpan** base

# BRACING MANUAL



Table of Contents

**1. Results ..... 3**

1.1 4.5mm Eterpan bracing..... 3

1.2 6.0, 7.5 & 9.0mm Eterpan bracing ..... 4

1.3 Cavity fix..... 5

**2. Eterpan ..... 6**

2.1 Compliance ..... 6

2.2 Eterpan sheets ..... 6

2.3 Eterpan repellent surface ..... 6

2.4 Wind loading ..... 6

2.5 Height of bracing panels ..... 6

2.6 Length of bracing panels... ..... 6

2.7 Thickness of Eterpan sheets..... 7

2.8 Sheet orientation ..... 7

2.9 Fixing of the sheets ..... 7

2.10 Sheet penetrations..... 7

2.11 Bracing sheets stopped below top plate ..... 7

2.12 Maximum bracing units ..... 7

**3. Details ..... 8**

3.1 Direct fix on concrete floor ..... 8

3.2 Direct fix on timber floor ..... 9

3.3 Cavity fix..... 10

3.4 Construction details from the Building Code..... 11

**4. Design recommendations ..... 12**

4.1 Timber framing ..... 12

4.2 Structural grade ..... 12

4.3 Dimensions..... 12

4.4 Tolerances ..... 12

4.5 Durability..... 12

4.6 Frame construction ..... 12

4.7 Bottom plate fixing ..... 13

4.7.1 Timber foundation ..... 13

4.7.2 Concrete foundation ..... 13

4.7.3 Holding down straps ..... 13

4.8 Building wrap or Eterpan Base as Rigid air barrier ..... 13

**5. Fixing Requirements..... 13**

**6. Waiver ..... 14**

## 1. Results

The rigid air barrier is the most common direct fix method used to obtain bracing resistance. Review our fire and acoustic resistant systems if required.

### 1.1 4.5mm Eterpan BASE Bracing

Bracing Units		Bracing length (mm)	Brace Code	Thickness sheet (mm)	Remarks	Specimen
Wind	E/Quake					
<b>108</b>	<b>98</b>	1200	BR45.12.1C	4.5	Concrete floor, hold down bolts	2
<b>94</b>	<b>80</b>	1200	BR45.12.2T	4.5	Timber floor, hold down bolts	4,5,6
<b>113</b>	<b>100</b>	2400 Plus	BR45.24.1C	4.5	Concrete floor, hold down bolts	7,8
<b>104</b>	<b>87</b>	2400 Plus	BR45.24.1T	4.5	Timber floor, hold down bolts	9,10

#### Comments:

- Hold down the bolts at 1200 mm centres max.
- End straps are not required.
- Check out the details of each system in paragraph 3.1.

**1.2 6.0 – 9.0mm Eterpan BASE Bracing**

Bracing Units		Brace Length (mm)	Brace Code	Thickness sheet (mm)	Remarks	Specimen
Wind	E/Quake					
<b>112</b>	<b>122</b>	600	BR60.06.1C	6.0	Concrete Floor Connection	11,12
<b>125</b>	<b>120</b>	600	BR60.06.2T	6.0	Timber Floor Connection	13,14
<b>199</b>	<b>187</b>	900-1200	BR60.092BLT	6.0	Timber Floor Connection + Gib Braceline	16
<b>158</b>	<b>151</b>	1200	BR60.12.2T	6.0	Timber Floor no hold downs	18,19,20
<b>100</b>	<b>98</b>	1200-2400	BR60.18.1T	6.0	Timber floor no hold downs	ST359
<b>100</b>	<b>98</b>	1200-2400	BR60.18.1C	6.0	Concrete floor connection	ST359
<b>106</b>	<b>102</b>	2400 plus	BR60.24.1T	6.0	Timber floor no hold downs	ST359
<b>106</b>	<b>102</b>	2400 plus	BR60.24.1C	6.0	Concrete floor connection	ST359
<b>112</b>	<b>122</b>	600	BR75.06.1C	7.5 & 9.0	Concrete Floor Connection	11,12
<b>125</b>	<b>120</b>	600	BR75.06.2T	7.5 & 9.0	Timber Floor Connection	13,14
<b>199</b>	<b>187</b>	900-1200	BR75.092BLT	7.5 & 9.0	Timber Floor Connection + Gib Braceline	16
<b>158</b>	<b>151</b>	1200	BR75.12.2T	7.5 & 9.0	Timber Floor no hold downs	18,19,20
<b>100</b>	<b>98</b>	1200-2400	BR75.18.1T	7.5 & 9.0	Timber floor no hold downs	ST359
<b>100</b>	<b>98</b>	1200-2400	BR75.18.1C	7.5 & 9.0	Concrete floor connection	ST359
<b>106</b>	<b>102</b>	2400 plus	BR75.24.1T	7.5 & 9.0	Timber floor no hold downs	ST359
<b>106</b>	<b>102</b>	2400 plus	BR75.24.1C	7.5 & 9.0	Concrete floor connection	ST359

**Comments:**

- Hold down the bolds at 1200 mm centres max.
- End straps are not required
- Check out the details of the systems in paragraph 3.2

**1.3 Cavity fix**

Systems using a cavity have the same or better bracing resistance than the same direct fixed systems. The minimum bracing length is 1200 mm. We include here the results on VentClad plaster system with 4.5 and 9.0 mm thick Eterpan Base sheets.

Bracing Units		Brace Length (mm)	Brace Code	Thickness sheet (mm)	Remarks	Specimen
Wind	E/Quake					
94	80	1200	EB45.12.1CF	4.5	Cavity Fix	VentClad
150	150	1200	EB90.12.1CF	9.0	Cavity Fix	VentClad

**Comments:**

- Valid for concrete floor and timber floor – refer to the details in section 12.0
- End straps are not required
- Check out the details of the systems in paragraph 3.3

## 2. Eterpan Base Sheeting

### 2.1 Compliance

All PBS products described in this technical manual have been tested at the Branz laboratories in accordance NZS 3604 : 1999 P21 racking test procedures. PBS bracing systems satisfy the NZ Building Code clause B1 Structure, clause B2 Durability and clause E2/AS1 External moisture, when installed and maintained in accordance to PBS technical specification requirements.

### 2.2 Eterpan Sheet (Eterpan has a durability of 15 years uncoated.)

Eterpan sheets are produced with the FLOW-ON production process that creates a truly monolithic layer of fibre cement. As a consequence the water, humidity, frost and delamination resistance of the sheet is superior. Eterpan is available in version with a sanded surface, called Eterpan Refined and a version with an un-sanded surface, used for rigid air barriers and called Eterpan Base. Eterpan has a durability of 15 years uncoated.

### 2.3 Eterpan Repellent Surface (Coated or uncoated)

For rigid air barriers, PBS offers Eterpan Base with or without a water-repellent surface. We do not require the surface of the Eterpan Base rigid air barrier to be coated, but in situations where the barrier is either exposed for an extended length of time during the build or when the designer has specified it to be coated we recommend to install a water-repellent Eterpan sheet to avoid water absorption. Both the repellent or standard sheet will have similar vapour permeability. For more information why this matters, check out [www.pbs.co.nz/rigidairbarrier](http://www.pbs.co.nz/rigidairbarrier)

### 2.4 Wind Loading Requirements

PBS Eterpan bracing systems are suitable for use in all wind zones as defined in NZS 3604. For rigid air barriers we refer to the maximum wind loads specified in the tables under 1.1, 1.2 and 1.3. For wind speeds above 3.9 kPa a specific engineering design must be undertaken by the designer to calculate the bracing capacity required.

### 2.5 Height Restrictions

PBS bracing systems have a standard height of 2.4m. For bracing panels larger or smaller than 2.4m, the bracing rating has to be adjusted with a factor  $2.4/H$ , where H is the bracing panel height. Maximum height of the bracing system is 4.8 m (clauses 8.3.1.4 (a) and (b) of NZS 3604). For bracing elements smaller than 1.8m high, the multiplication factor shall be limited to 2.4/1.8 only.

### 2.6 Bracing Panel Length

There is no limit to the length of bracing panels along a wall although buildings with a floor area exceeding 300 m2 require a specific engineering design. Control joints or constructions joints in

walls have to be considered and must work in conjunction with cladding or structural requirements.

## 2.7 Thickness of Eterpan Base sheets

Sheets are available in 4.5, 6.0, 7.5 and 9.0mm thicknesses

Bracing resistance increases with increasing thickness. The bracing resistance of a 9.0 mm sheets will therefore surpass the resistance of a 7.5 mm sheet. Maximum bracing resistance as specified under paragraph 2.8 limits the bracing resistance.

## 2.8 Sheet Orientation

All flat sheets in the PBS bracing systems must be fixed vertically. Full-height sheets without joints must be used for walls up to 3000mm in height. When walls exceed 3000mm in height, only one horizontal sheet joint is permitted within the element height. The maximum height is limited to 4800mm as specified in paragraph 2.5.

## 2.9 Fixing of the Sheets

Always respect the minimum edge distances specified for the fixing of nails to the edge of the sheet. Always ensure that the sheet joint is on the centre line of the stud or nog to achieve sufficient cover of fixings. The sheets must be held hard against the framing during nailing to minimise sheet break-out at the back of sheet. Drive all nails flush with the sheet surface and do not nail the nail head below the sheet surface as it reduces the nail's holding power. Fix all sheets from the centre working towards outer edges.

## 2.10 Sheet Penetrations

No window/door penetrations are allowed, but holes/penetrations up to 100 x 100mm positioned no closer than 200mm to the edge of lining or another hole, are allowed for services without significantly affecting the bracing rating of the lining/cladding.

## 2.11 Bracing Sheets stopped below top plate

Where a bracing sheet is stopped below the top plate an extra row of nogs must be installed below the top plate to facilitate the cladding fixing.

## 2.12 Maximum Bracing Units

The capacity of concrete foundation slabs and anchors etc. limit the maximum bracing resistance. A maximum of 150 BU/m can be achieved for any bracing system for a construction within the scope of NZS 3604.

## 2.13 Internal Applications

In applications where the bracing is required internally use a double bottom plate with the hold down bolts or straps fixed through both bottom plates. Fix with nail patterns as shown in details.

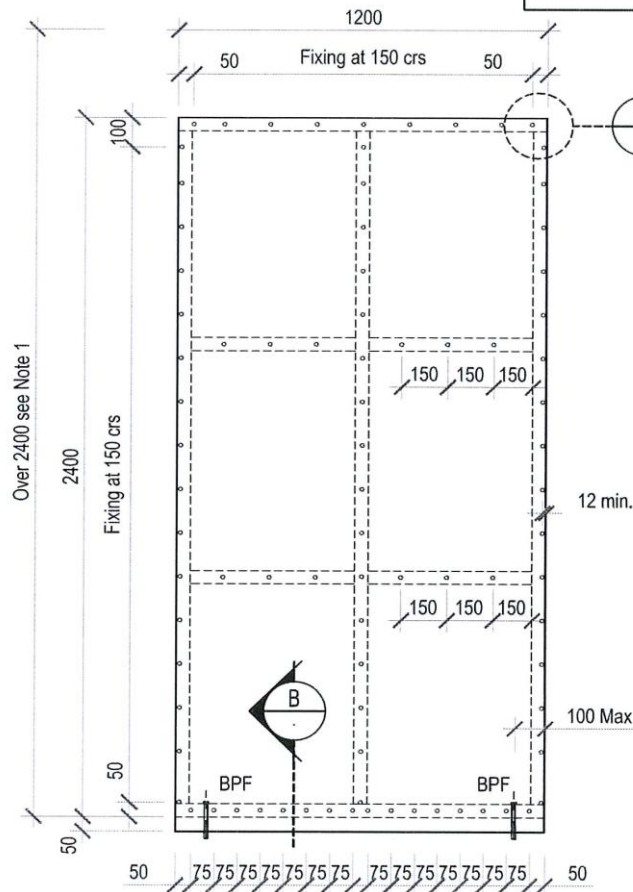
### 3. Details

#### 3.1 Details of direct fix on concrete floor

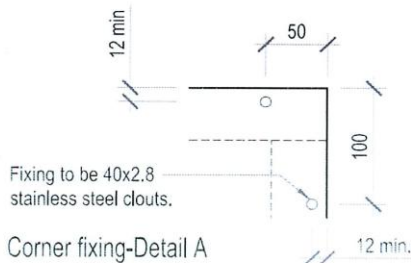
Eterpan Base 4.5mm Structural Bracing  
 BRANZ report ST0455  
 Bracing Units: 108 units/meter Wind  
 98 units/meter Earthquake

Eterpan meets the performance requirements of the NZBC, B2 Durability for 50 years; E2 External moisture and is non-hazardous material in terms of clause F2 Hazardous Building material.

Note 1  
 Divide 2.4 by height of wall to be braced, times BU to give new BU rating.

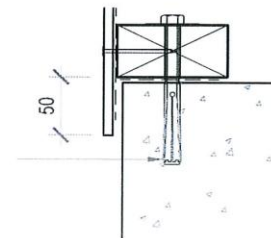


Note 2  
 Bottom Plate hold down bolts are additional to NZS 3604 requirements



Bottom plate fixing, provide M12 hold down 125x12mm minimum, masonry anchors with 50x50x3mm square washers at 1200 centres maximum.

Concrete Floor-Detail B

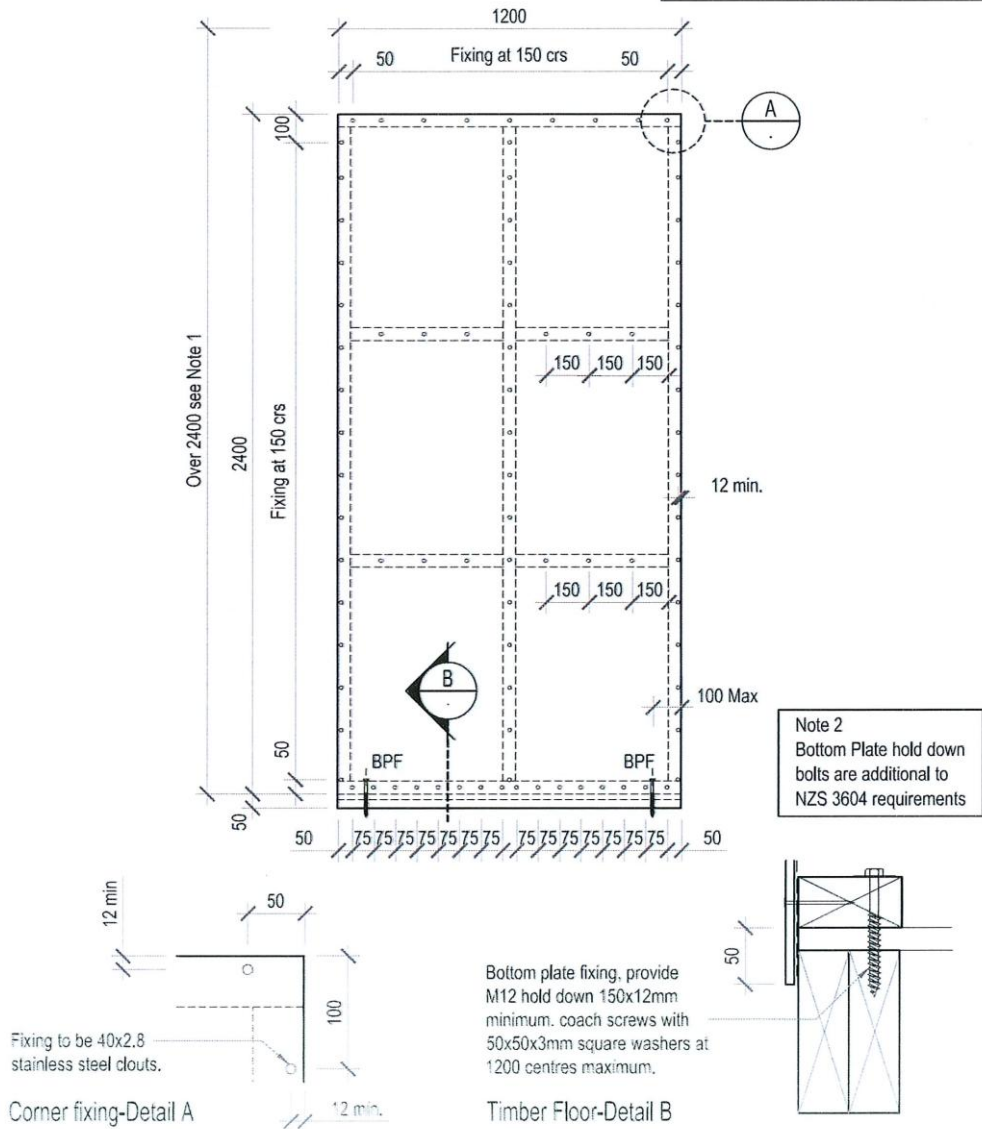


## 3.2 Details on direct fix on timber floor

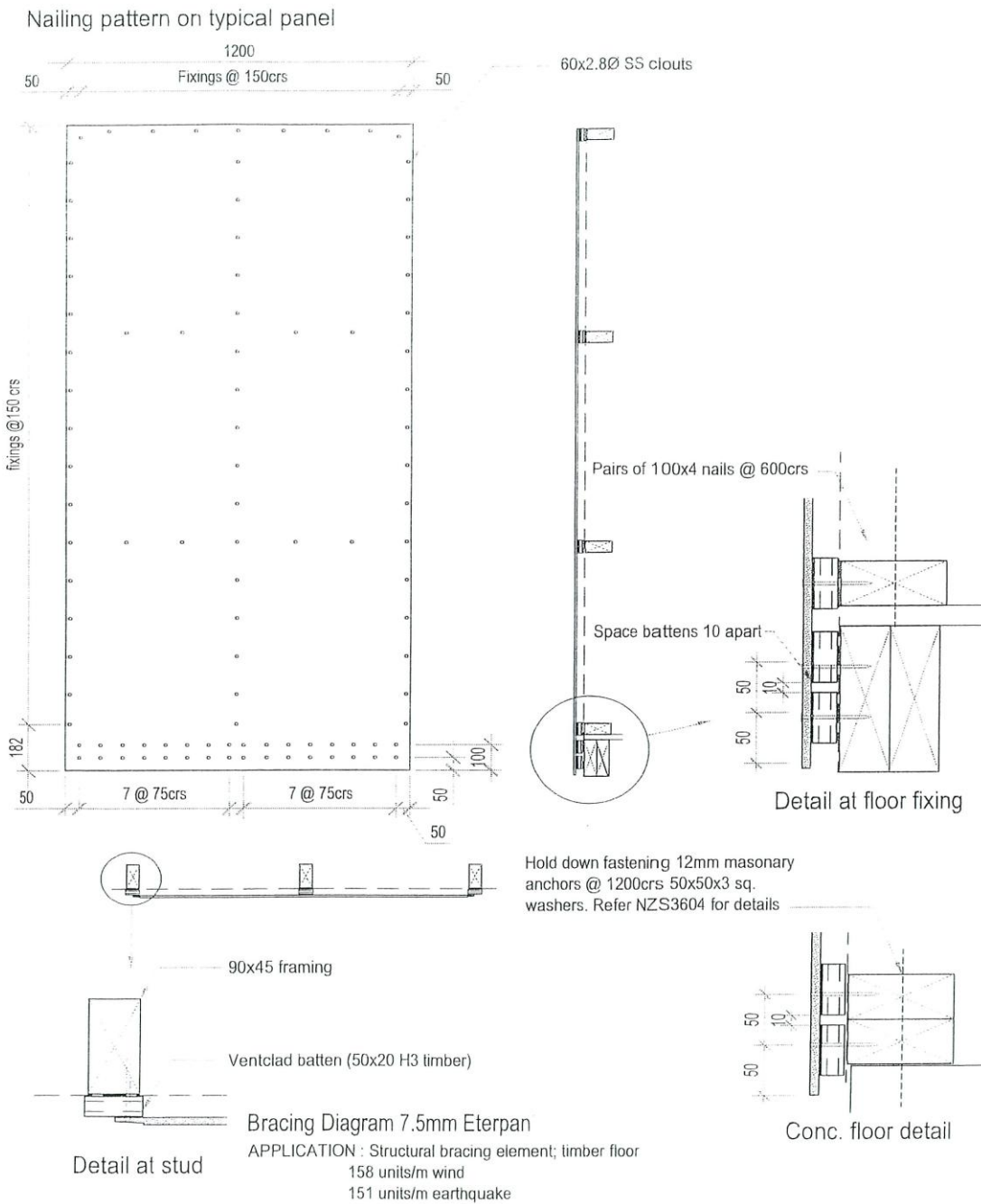
Eterpan Base 4.5mm Structural Bracing  
 BRANZ report ST0455  
 Bracing Units: 108 units/meter Wind  
 98 units/meter Earthquake

Eterpan meets the performance requirements of the NZBC, B2  
 Durability for 50 years; E2 External moisture and is non-hazardous  
 material in terms of clause F2 Hazardous Building material.

Note 1  
 Divide 2.4 by height of wall to be braced,  
 times BU to give new BU rating.



### 3.3 Details of cavity systems



## 4. Timber Framing

### 4.1 General

PBS bracing systems are can only be used with timber framed buildings. The timber framing must comply with the minimum requirements of NZS 3604: 1999 Section 4 'Timber Framed Buildings'. When the framing is specific engineering design, the framing performance must be equal to or more than the performance requirements of NZS 3604: 1999 Section 8.

### 4.2 Structural Grading of Timber

Minimum timber grade requirement is No. 1 framing grade or MSG6 as per NZS 3604. The grading of timber should comply with NZS 3631 and AS/NZS 1748 requirements. Higher stress grades such as MSG8 or MSG10 can be used where needed.

### 4.3 Dimensions

A minimum 50 mm wide stud is required for bracing systems. Refer to PBS product technical specification for specific framing requirements.

### 4.4 Tolerances

In order to achieve an acceptable finish, it is paramount that the framing is straight and plumb. Tolerances in framing must comply with the requirements of NZS 3604. All framing shall be finished flush.

### 4.5 Durability

The external framing must be treated to a minimum H1.2. Refer to NZBC Acceptable Solution B2/AS1 'Durability' for further information about the durability requirements. For further information on timber treatment and acceptable moisture content please refer to NZS 3602 (Timber and Wood-Based Products for use in Buildings) and NZS 3640 (Chemical Preservation of Round Sawn Timber) for minimum treatment and selection requirements.

### 4.6 Frame Construction

Timber framing must comply with NZS 3604 Section 8 and provided as per the following requirements.

Refer to framing manufacturers' specifications before installation.

- Studs must be provided at maximum 600mm crs
- Nogs or dwangs must be provided at maximum 1200mm crs
- When a cladding is fixed over the Ventclad cavity system, the nog spacing is required to be provided at maximum 800mm crs

Refer to Section 9.1.8.5 of E2/AS1.

#### 4.7 Bottom Plate Fixing

Bottom plate fixing must be in accordance with the requirements of NZS 3604. Any additional bottom plate fixing needed by the individual bracing system's requirements must also be provided. Refer to bracing systems details for more information.

##### 4.7.1 For Timber Foundations

For fixing framing to timber joists / foundations or floors, the bottom plate must be fixed in accordance to Table 8.19 of NZS 3604. Coach screws or hold down straps may be needed in addition by the specific bracing system. Refer to the bracing system details for more information.

##### 4.7.2 For Concrete Foundation

For fixing the framing to concrete floors, the bottom plates must be fixed as per Figure 6.16 of NZS 3604. Coach screws or hold down straps may be needed in addition by the specific bracing system. Refer to the bracing system details for more information.

##### 4.7.3 Holding Down Straps

When holding down straps are to be used, these must be fixed at the end of each bracing element length, but no further than 4.8m apart. The holding down strap must be 25 x 0.9 x 400mm fixed with 30mm x 2.5mm hot-dip galvanised flat head nails.

Holding down straps can be rebated into the framing to avoid any kick out in claddings or linings.

#### 4.8 Building wrap or Eterpan Base as rigid air barrier

Building wrap used must comply with the performance requirements of Table 23 of E2/AS1. The wrap must be installed in accordance with E2/AS1 and their manufacturer's requirements.

In buildings within the scope of NZS 3604, Eterpan Base as Rigid Air Barrier can also be used to replace building wrap. Eterpan Base as Rigid Air Barrier has been tested and complies with the requirements of Table 23 of E2/AS1. Walls which are not lined on inside face e.g. an air barrier behind the wall cladding. Eterpan Base as Rigid Air Barrier is suitable for use in these applications.

### 5. Fixing Requirements

For External cladding applications all nails must be must be Grade 316 stainless steel in accordance with NZS 3604.

Coach screws and holding down (HD) bolts, where used, must be M12 hot-dipped galvanized steel fitted with 50 x 50 x 3mm galvanised washers. These must have a protective coating as per Table 4.2 of NZS 3604.

For Internal dry area internal applications hot dipped galvanised nails can be used.

**For Internal wet area internal applications stainless steel nails must be must be Grade 316 stainless steel in accordance with NZS 3604.**

## 6. Waiver

The specifier or other party responsible for the project must run through a risk matrix analysis as per E2/AS1 to determine which construction method is applicable to install the external cladding on a project. The designer must also ensure that the bracing capacities published in this specification are appropriate for the intended application. The designer is responsible to calculate the bracing requirement for a building. The designers must also ensure that the intent of their design meets the requirements of NZBC.

Substitution of PBS fibre cement product with any other similar product will change the bracing capacity of a system and may not provide the required bracing for a building.

All dimensions shown are in millimeters unless noted otherwise.

All New Zealand Standards referenced in this manual are current edition and must be complied with.

PBS conducts stringent quality checks to ensure that any product manufactured falls within our quality spectrum. It is the responsibility of the builder to ensure that the product meets aesthetic requirements before installation. PBS will not be responsible for rectifying the obvious aesthetic surface variations in product after its installation.

See the PBS website [www.PBS.co.nz](http://www.PBS.co.nz) for the most up to date details on waivers and any other technical information.