# IMPORTANT NOTICE

## HITEX DIAMOND CAVITY PLASTER CLADDING SYSTEM

Hitex Diamond cavity plaster system (often called by its generic name EIFS) was manufactured between 2003 and 2010 by Hitex Building Systems Limited in response to the 'leaky building' crisis.

Hitex Diamond achieved a number of aims. The diamond cavity provided the first 2 'D's, Drainage and Drying, the undersill trays and detailing achieved better weathertightness the 3rd 'D' called Deflection and builders were requested to use decay resistant framing the 4th 'D' Durability.

During 2003-2005 cavity battens became included in Acceptable Solutions as one way of providing Drainage and Drying. Other detailing introduced better weathertightness and Standards clarified where fungicide treated framing should be used.

This notice is to provide a 'balanced' view. Some people have been obtaining building reports from inspectors and experts unfamiliar with the attributes of plaster claddings like Hitex Diamond Cavity System.

**Statement:** Hitex had no power over the treatment of the timber framing, or the quality of the many weathertightness detailing like roofs, gutters, soffits, windows, penetrations, garage door openings and finished ground lines. Likewise Hitex has no control over other systems that may also cause leaks like showers, wet areas, decks, plumbing and water pipes. Some buildings had more than one cladding. Hitex has no control over maintenance or alterations that may have been done since the cladding was installed.

**Recommendation:** It is our strongest recommendation that at a minimum owners, prospective purchasers, building inspectors and experts undertake what is termed 'invasive tests' before making comments on whether the building is 'leaking' or not. Invasive tests are the minimum inspection recommended because it provides the important 'Evidence' in making decisions:

- Whether the framing is adequately treated with an approved fungicide which excludes H1 and UTKD: Despite code changes we still found UTKD as late as 2010
- Are the weathertightness details working properly as if not framing could already be decayed and cause scan and Thermal misses
- Get moisture content readings in winter when rainfall is at peak to determine whether ALL the claddings, roof, gutters, windows and cladding(s) are functioning correctly.
- Has maintenance already been done and if so was the framing checked as it may already be decayed, but now dry because leaks have been fixed?

You cannot assume just because you have had someone inspect the building, or use a scanner or Thermal camera, even if they attest the inspections to have been done to NZS 4306:2005 that you are protected. This is a visual Standard although S4.2 does provide for special purpose reports including weathertightness reports but for some reason inspectors and experts do not invoke this requirement meaning the inspection falls well short of the Standard and protection you expect.

Invasive testing can be done in a way it does not damage the claddings.
Go to www. moisturedetection.co.nz

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# Fax

To: Jan Holyoak. Company: Hotex Plastering

Fax No: 09 274 0937 Date: 28th Jan 2004

From: Bob de Leur

Total number of pages including this coversheet:

Subject: Cladding Register.

Hi Jan, copy of register for your information

Regards Bob de Leur.

# Register of Monolithic Cladding Systems

The cladding systems contained in this register have been assessed for suitability for use in residential construction within the scope of their specification.

The register does not contain current approved claddings systems under the acceptable solutions.
Assessment has been based on standard detailing provisions, which may as a best practice change subject to further information on cavity systems.

Detailing contained within the manuals pertaining to these systems is also general in terms of application. Further detailing maybe required where the design of the building does not permit the use of standard details.

**Note,** as further information becomes available the cladding systems contained in this register may change.

## Cladding Systems approved to date:

| APPROVAL NUMBER | DATE OF APPROVAL | SYSTEM | NOTES/COMMENTS |
|---|---|---|---|
| | | | |
| 1 | | Putz Technick Mineral Technology 300 | |
| 2 | | Plaster Systems Insulclad | |
| 3 | | Mineral plaster Technologies 300 | |
| 4 | | Poly Clad | |
| 5 | | Hitex with 20mm cavity | |
| 6 | 7 October 03 | Diamond Hitex | |
| 7 | | Hardies Monotech cavity system | |
| 8 | | Vent Cladd Progressive Building System | |
| 9 | 20 October 03 | Iron Cladd with 40mm cavity | Per BRANZ appraisal TP 1015 |
| 10 | | 3D Lightweight cocnrete panels | Verification of internal cladding required from cladding manufacturer if applied directly to internal face of concrete panel |
| 11 | | Sto cavity plaster system | |
| 12 | | Stucco on cavity only using either ridged or non ridged backing. | |
| 13 | 19th Jan 04 | Nu Age Plaster | CavityY Systems |

## Systems not approved

1. Exopanel, walls and floors, based on the Jury wall system 22/9/03

# HITEX DIAMOND CLADDING SYSTEM

## An *Alternative Solution* under NZBC E2/AS1

The New Zealand Building Code (NZBC) External Moisture Clause E2/AS1 allows for an Exterior Insulation and Finish System (EIFS) as an Acceptable Solution for direct fixing to framing over a building wrap for a Risk score of 0 -6 calculated from the weathertightness building risk matrix. For higher risk scores (7 - 20), a 20 mm battened cavity behind the EIFS cladding is required to remain as an Acceptable Solution.

The Hitex Diamond cladding has the unique feature of a grooved (15 mm wide by 10 mm deep) diamond pattern on the interior polystyrene surface to assist as a drainage plane and in the drying of building elements within the wall. When the Hitex Diamond cladding is direct fixed to framing over a building wrap for risk scores 7 – 20, then this becomes an ***Alternative Solution***. It is proposed by Hitex that this proprietary product used in conjunction with Specific Weathertightness Designs (SWD's) be recognised and accepted for cladding as an ***Alternative Solution.***

Verification Method E2/VM1 is included in the E2 document as a method to determine compliance with NZBC E2.3.2 of windows, door and cladding systems. However this test method *is only applicable to claddings with a 20 mm nominal cavity behind the cladding*. Consequently Hitex have developed alternative means to demonstrate the weathertightness performance of the Hitex Diamond EIFS cladding and SWD's.

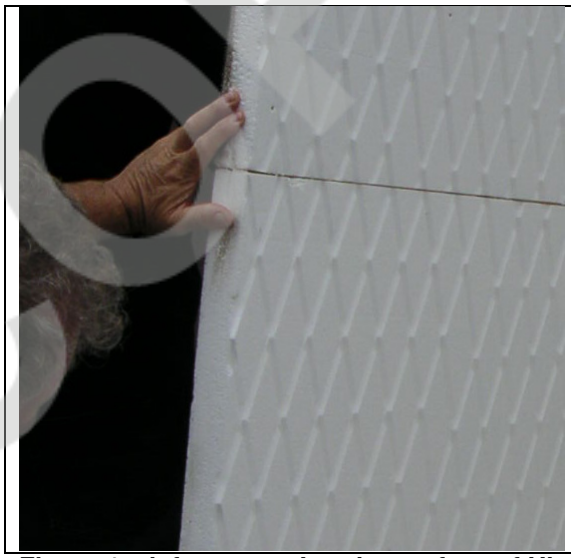

**Figure 1 – left** **Interior surface of Hitex Diamond cladding panels and**
**Figure 2 – right** **close up of interconnecting diamond pattern on Hitex Diamond cladding**

Hitex Building Systems Ltd seeks acceptance of the Hitex Diamond EIFS cladding with Specific Weathertightness Designs (SWD's) as an ***Alternative Solution*** that meets the performance requirements of the NZBC E2 Clause : External Moisture. Table 1 summarises the Building envelope risk matrix taken from E2. The maximum risk score total for the green highlighted risk severity values is 6 and would therefore fall within the definition as an Acceptable Solution and not require a 20 mm batten cavity. When the risk score includes the yellow highlighted values the maximum risk score is 14. Hitex propose that on the basis of the available test data and *in situ* monitoring of performance that the Hitex Diamond system be allowable as an ***Alternative Solution*** when direct fixed over a building wrap to framing. However when those risk severity values that are highlighted in pink are included in the overall risk score then a competent review of the cladding and SWD's is required and this may require on-going monitoring or redesign.

**Table 1 : E2 External Moisture – Building envelope risk matrix**

| Risk Factor | Risk Severity | | | |
|---|---|---|---|---|
| | LOW | MEDIUM | HIGH | VERY HIGH |
| Wind zone | 0 | 0 | 1 | 2 |
| Number of storeys | 0 | 1 | 2 | 4 |
| Roof/wall intersection design | 0 | 1 | 3 | 5 |
| Eaves width | 0 | 1 | 2 | 5 |
| Envelope complexity | 0 | 1 | 3 | 6 |
| Deck design | 0 | 2 | 4 | 6 |
| **Total** | **0** | **6** | **15** | **28** |

Hitex documentation in support of the Hitex Diamond Cladding EIFS includes:

- Hitex Producer Statement , 1st Nov 06
- Hitex Diamond & NZBC E2 External Moisture Specification version 3 Nov 1st 06
- Hitex Technical information including Bulletins, SWD's, Warranty and Maintenance available on the Hitex web site, www.hitex.co.nz

Hitex Building Systems Ltd have undertaken testing to demonstrate the performance of the Diamond EIFS system. This testing has included support of a research study to better understand the wall micro-climate (also referred to as the wall signature psychrometric analysis during 2003-2005, on –going research with Auckland University , in –house testing , and for the last 3 years *in situ* monitoring of timber in buildings.

The initial research at the University of Auckland has been reported and included a peer reviewed paper *In-situ Building Wall Microclimate Investigation* presented at *Proceedings of joint SCENZ/FEANZ/SMNZI Conference (member of IPENZ)*. Hitex have also provided views of weathertightness originating from the research

projects on the Hitex web site.

The Hitex in-house testing has included a :

- 4 Litre Drainage Test,
- 4 Litre Leak Test to north and south elevation walls in a building,
- 5 Day Drainage Test, and a
- Rain Event Test.

The inability to use the Verification Method E2/VM1 because of the limitations on the test conditions, namely the lack of 20 mm batten cavity, has meant an alternative testing regime was necessary to be able to monitor weathertightness performance. While compliance with the NZ Building Code is supposed to result in buildings that meet the performance requirements it would seem that emphasis is directed to the consequences of failure and subsequent impact on critical building elements, i.e. structural framing. Methodology such as VM1 is undertaken under controlled conditions and takes no account of variables that arise including from installation and workmanship or from the influence of time or maintenance.

The *in situ* monitoring of timber framing moisture contents in houses uses moisture probes (Mdu) permanently installed in timber that are then periodically monitored. This data provides factual and realistic information by measuring moisture contents and trends in timber of external walls. Such data is not influenced by artificial or controlled laboratory conditions/test parameters so can provide a 'real world' snapshot of actual moisture content variations in actual buildings. In carrying out such monitoring it is also possible to include the performance of SWD's which do not form part of the VM1 test that are used as part of the Hitex Diamond cladding system. No other cladding system including those meeting the E2 definitions of an Acceptable Solution would appear to have such collaborating performance data available in the public domain at this time.

Testing has included comparative testing with other cladding types, e.g. stucco and fibre cement including those with a cavity. The results from all the testing indicate the Hitex Diamond cladding;

- Has a higher dew point differential meaning there is less chance of condensation within the wall than others within E2 defined as Acceptable Solutions
- The Hitex Diamond cladding does allow drainage of water exceeding that of other Acceptable Solutions within E2
- Allows and promotes drying naturally so that the wall and cladding (polystyrene) does not retain (accumulate) moisture.

The *in situ* monitoring using Mdu probes permanently inserted into the bottom plate in houses has provided confirmation of the drying of timber following construction and lining of internal walls. It has shown the bottom plate then remains dry (< 18% moisture content). However where buildings have leaks, the

Mdu probes have also detected elevated moisture readings. The installation of probes has been targeted at measuring the timber moisture content in bottom plates as known areas where moisture accumulates. Studies are also on-going to ensure the use of the Mdu probes provides accurate reliable readings without bias from the timber properties, installation or operational variables.

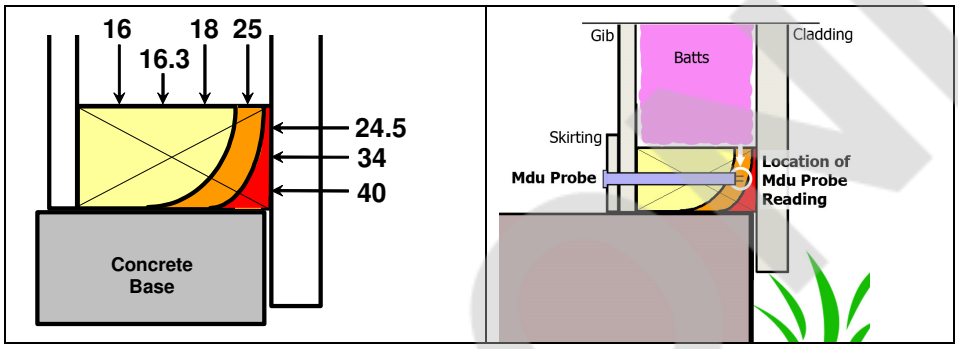


**Figure 3 – left** **Example of measured % moisture content values showing gradient in bottom plate (stucco house).**

**Figure 4 – right** **Positioning of Mdu probe fitting into the higher risk moisture content zone where moisture tends to accumulate**

The Mdu monitoring programme has been a means of taking direct moisture readings which are repeatable, without destructive analysis of a wall and so avoiding disruption to the wall microclimate to monitor moisture content trends over time and thus compliance. Locations of Mdu's in houses are assessed on a case-by-case basis with reference to the BRANZ Weathertightness Identification of Leaks poster, the locations of Specific Weathertightness Designs (SWDs), site considerations and identification of historical risk leak areas. The moisture probes have typically been utilised as an investigatory tool in buildings with leaks or defects. Elevated moisture readings or changes in readings developing trends have proven useful in identifying risk areas.

Moisture Detection (as a separate company) plan further research programmes with the probes now installed in buildings of varying ages, cladding types and weathertightness history. This has provided on-going information for benchmarking of the Hitex Diamond Cladding system as an ***Alternative Solution*** that can meet the Performance requirements of NZBC Clause E2 – External Moisture.

The moisture readings from probes in ten buildings previously selected up to three years ago and representative of a range of building designs and SWD's with risk scores up to 20, have been reviewed. The probe readings have detected the trend of preconstruction moisture contents in bottom plates reducing over time to significantly less than 18% m.c. and remaining low. This

illustrates the cladding and SWD's comply with the performance requirements of E2/AS1.

The Hitex Diamond EIFS cladding system has been shown by the different experimental approaches to allow drainage and drying within walls. SWD's have also been demonstrated to deflect or to facilitate drainage.

The relevant clauses are:

**E 2.3.2** ***Roofs and exterior walls shall prevent the penetration of water that could cause undue dampness, or damage to building elements.***

This has been demonstrated by the:

- 4 Litre Drainage test – no water retention,
- 5 Day Leak Test – walls were able to dry out,
- 4 Litre Leak Test – walls were able to dry out (North and South elevations),
- Rain Event Test – walls were able to dry out,
    - after 5 days of continuous rain, the bottom plate dried out within 5 days, and
- In-situ moisture monitoring with Mdu probes shows the bottom plate remains below 18% m.c. when risk scores exceed 7 and the cavity is provided by the integral diamond grooves on the back face of the polystyrene sheet.

**E 2.3.5** ***Concealed spaces and cavities in buildings shall be constructed in a way which prevents external moisture being transferred and causing condensation and the degradation of building elements.***

This has been demonstrated by the:

- Hitex Wall signatures showing walls do not support mould growth and
- Auckland University work showing the risk of condensation in Hitex Diamond walls is less than other Acceptable Solution cladding systems tested.
- Mdu probes showing low moisture content in timber in external walls.

Figure 5 as an example shows a house that has had moisture probes in place since it was built two years ago. The three moisture readings that have been taken over two years are shown in Figure 6. The Risk scores vary from 8 -13 on this building (Table 2) . The references to either NZBC Clause E2 or to the Hitex web site for the SWD's is also included in the table.

**Figure 5 (above) : House at Hxxxx Bxx, Dairy Flat, built in September 2004**

**Figure 6 (right) : Moisture readings over two year period.**

| Probe No. | 23 Nov 2004 | 23 Apr 2005 | 22 Sep 2006 |
|---|---|---|---|
| 1 | 13.8 | 9.8 | 11.0 |
| 2 | 18.4 | 10.5 | 10.4 |
| 3 | 18.7 | 9.7 | 10.7 |
| 4 | 13.2 | 9.1 | 10.9 |
| 5 | 11.7 | 8.8 | 11.1 |
| 6 | 14.2 | 9.9 | 10.6 |
| 7 | 21.1 | 10.2 | 11.7 |
| 8 | 18.9 | 12.1 | 12.4 |
| 9 | 12.9 | 9.5 | 10.2 |
| 10 | 14.3 | 10.6 | 11.8 |
| 11 | 14.0 | 10.6 | 11.6 |
| 12 | 16.7 | 11.1 | 13.6 |
| 13 | 19.9 | 12.6 | 14.6 |
| 14 | 16.9 | 10.7 | 12.4 |
| 15 | 17.2 | 11.1 | 12.3 |
| 16 | 18.6 | 13.7 | 15.0 |
| 17 | 20.6 | 13.9 | 13.4 |
| 18 | 21.3 | 13.5 | 12.8 |
| 19 | - | 9.2 | 9.8 |

**Table 2: Moisture probes in relation to E2 Figures and Hitex SWD's in a Dairy Flat house**

| | Detail | | Risk Score |
|---|---|---|---|
| Probe | E2 drawing reference | Hitex drawing reference | |
| 1 | Fig 127 & 128 | WI-03,04,05 v1.0 | 9 |
| 2 | Fig 62 | DE-01,02,03,04,05 v1.0 | 13 |
| 3 | Fig 62 | DE-01,02,03,04,05 v1.0 | 13 |
| 4 | | DO-01 v1.0 | 9 |
| 5 | Fig 65 | BL-01 v1.0, DO-02 v1.0 | 9 |
| 6 | Fig 127 & 128. * note 1 | DO-02 v1.0 | 13 |
| 7 | Fig 127 & 128. * note 1 | DO-02 v1.0 | 13 |
| 8 | Fig 127 & 128. * note 1 | DO-02 v1.0 | 13 |
| 9 | Fig 127 & 128. * note 1 | DO-02 v1.0 | 13 |
| 10 | Fig 127 & 128. * note 1 | DO-02 v1.0 | 9 |
| 11 | Fig 127 & 128. * note 1 | DO-02 v1.0 | 13 |
| 12 | Fig 127 & 128. * note 1 | DO-02 v1.0 | 8 |
| 13 | | | 13 |
| 14 | Fig 127 & 128 | WI-03,04,05 v1.0 | 8 |
| 15 | Fig 127 & 128 | WI-03,04,05 v1.0 | 8 |
| 16 | Fig 127 & 128 | WI-03,04,05 v1.0 | 9 |
| 17 | Fig 127 & 128, Fig 65 | BL-01 v1.0, WI-03,04,05 v1.0 | 9 |
| 18 | Fig 127 & 128, Fig 65 | BL-01 v1.0, WI-03,04,05 v1.0 | 9 |
| 19 | Fig 127 & 128. * note 1 | DO-02 v1.0 | 8 |

Note 1 - Sill does not apply to these probes because detail is over door

**E 2.3.6** ***Excess moisture present at the completion of construction, shall be capable of being dissipated without permanent damage to building elements.***

This has been demonstrated with Mdu's in walls clad with the Hitex Diamond cladding with Risk scores in the 14 -17 range. The use of Mdu's has provided an opportunity for the ongoing monitoring of buildings, e.g. house at Cxxxxxxx Place, Maraetai (Figure 7) where the initial moisture content in some of the timber was high at construction then was shown to reduce over time to well below 18% moisture content (Figure 8) . More recent moisture content readings in 2006 (Table 3) have picked up an increase at some probe positions and this is now being investigated. The rise in moisture content is presently under investigation. The are 8 possible leak sources to look at (Figure 9).

**Figure 7 (above): Photograph of house at Cxxxxxxxx Place, Maraetai**

**Figure 8 (right): Moisture readings over two year period**

| Probe No. | 19 Oct 2004 | 18 Nov 2004 | 23 Apr 2005 | 18 Sep 2006 | 25 Sep 2006 |
|---|---|---|---|---|---|
| 1 | 17.9 | 13.2 | 10.1 | 11.1 | 14.0 |
| 2 | 21.9 | 13.9 | 10.3 | 11.0 | 12.7 |
| 3 | 21.5 | 17.2 | 14.6 | 12.8 | 15.8 |
| 4 | 26.8 | 19.8 | 15.0 | 15.2 | 18.3 |
| 5 | 24.7 | 18.4 | 12.6 | - | 16.1 |
| 6 | 32.2 | 20.5 | 14.1 | 13.7 | 15.1 |
| 7 | 22.9 | 16.7 | 13.3 | 13.6 | 16.9 |
| 8 | 26.3 | 17.2 | 10.3 | 12.1 | 15.5 |
| 9 | 26.6 | 15.9 | 10.9 | 12.8 | 14.0 |
| 10 | 21.6 | 14.8 | 11.9 | 8.8 | 14.6 |
| 11 | 24.2 | 15.9 | 10.7 | 11.8 | 14.0 |
| 12 | 20.1 | 13.8 | 11.0 | 11.7 | 13.7 |
| 13 | 18.4 | 11.2 | 8.2 | 10.4 | 11.8 |
| 14 | 15.4 | 11.7 | 9.1 | 10.6 | 10.9 |
| 15 | 16.1 | 12.8 | 9.3 | 10.9 | 13.0 |
| 16 | 15.2 | 12.4 | 9.5 | 10.5 | 12.6 |
| 17 | 17.8 | 11.6 | 8.6 | 9.5 | 12.5 |
| 18 | 15.8 | 12.8 | 10.2 | 11.1 | 12.9 |
| 19 | - | - | 13.2 | 11.1 | 11.5 |
| 20 | - | - | 12.9 | 11.1 | 11.4 |
| 21 | - | - | 12.6 | 10.3 | 10.5 |
| 22 | - | - | 11.4 | 10.8 | 11.1 |
| 23 | - | - | 13.7 | 10.3 | 10.5 |

**Table 3 : Moisture probes in relation to E2 Figures and Hitex SWD's in Maraetai building**

| Probe | E2 drawing reference | Hitex drawing reference | |
|---|---|---|---|
| 1 | Fig 65, Fig 62, Fig 8 | BL-01 v1.0, WA-13 v1.0, DE-01 v1.0 | 17 |
| 2 | Fig 127 & 128. * note 1, Fig 65, Fig 124, Fig 8 | BL-01 v1.0, WA-13 v1.0, DO-02 v1.0, WA-05 v1.0 | 17 |
| 3 | Fig 127 & 128. * note 1, Fig 65, Fig 8 | BL-01 v1.0, WA-13 v1.0 | 16 |
| 4 | Fig 127 & 128, Fig 65, Fig 124, Fig 8 | BL-01 v1.0, WI-03,04,05 v1.0, WA-13 v1.0, WA-05 v1.0 | 16 |
| 5 | Fig 127 & 128, Fig 65, Fig 124, Fig 8 | BL-01 v1.0, WI-03,04,05 v1.0, WA-13 v1.0, WA-05 v1.0 | 16 |
| 6 | Fig 65, Fig 124, Fig 8 | BL-01 v1.0, WA-13 v1.0, WA-05 v1.0 | 16 |
| 7 | Fig 127 & 128, Fig 65, Fig 124, Fig 8 | BL-01 v1.0, WI-03,04,05 v1.0, WA-13 v1.0, WA-05 v1.0 | 16 |
| 8 | Fig 124, Fig 8 | WA-13 v1.0, WA-05 v1.0 | 16 |
| 9 | Fig 127 & 128. * note 1, Fig 65, Fig 8 | BL-01 v1.0, WA-13 v1.0, DO-02 v1.0 | 16 |
| 10 | Fig 127 & 128. * note 1, Fig 65, Fig 8 | BL-01 v1.0, WA-13 v1.0, DO-02 v1.0 | 14 |
| 11 | Fig 65, Fig 8 | BL-01 v1.0, WA-13 v1.0 | 14 |
| 12 | Fig 65, Fig 8 | BL-01 v1.0, WI-03,04,05 v1.0, WA-13 v1.0 | 14 |
| 13 | Fig 127 & 128, Fig 62, Fig 8 | DE-01,02,03,04,05 v1.0, WI-03,04,05 v1.0, WA-13 v1.0 | 17 |
| 14 | Fig 62, Fig 8 | DE-01,02,03,04,05 v1.0, WA-13 v1.0 | 17 |
| 15 | Fig 127 & 128, Fig 62, Fig 8 | DE-01,02,03,04,05 v1.0, WA-13 v1.0, WI-03,04,05 v1.0 | 17 |
| 16 | Fig 127 & 128, Fig 62, Fig 8 | DE-01,02,03,04,05 v1.0, WA-13 v1.0, WI-03,04,05 v1.0 | 17 |
| 17 | Fig 127 & 128, Fig 124, Fig 8 | WA-05 v1.0, WI-03,04,05 v1.0, WA-13 v1.0 | 17 |
| 18 | Fig 127 & 128, Fig 124, Fig 8 | WA-05 v1.0, WI-03,04,05 v1.0, WA-13 v1.0 | 17 |
| 19 | Fig 127 & 128, Fig 65, Fig 8 | BL-01 v1.0, WI-03,04,05 v1.0, WA-13 v1.0 | 17 |
| 20 | Fig 127 & 128, Fig 65, Fig 8 | BL-01 v1.0, WI-03,04,05 v1.0, WA-13 v1.0 | 17 |
| 21 | Fig 65, Fig 8 | BL-01 v1.0, WA-13 v1.0 | 17 |
| 22 | Fig 65, Fig 8 | BL-01 v1.0, WA-13 v1.0 | 17 |
| 23 | Fig 65, Fig 8 | BL-01 v1.0, WA-13 v1.0 | 17 |

Note 1. Sill does not apply to these probes because detail is over doors

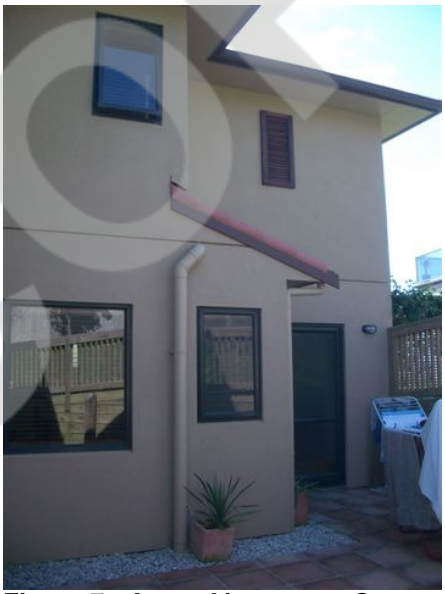

**Figure 7: Area of house at Cxxxxxxxx Place, Maraetai where several possible leaks source are being investigated.**

In summary, the attention to alleviating weathertightness risks appears to focus on the risk matrix and E2 directions to the choice of cladding type and a 20 mm batten cavity inferring an 'answer' where the risk score exceeds '6'. However it is more likely it is the SWD's that would fail. However the E2 AS/VM1 is not about testing the weathertightness nor robustness of detailing. Methods such as Mdu are more appropriate. Therefore the Hitex approach of seeking compliance as being a measure of 'actual as built' (to test installation, workmanship and details *in situ* ) is the only practical means presently available for proof of performance "on reasonable grounds".

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