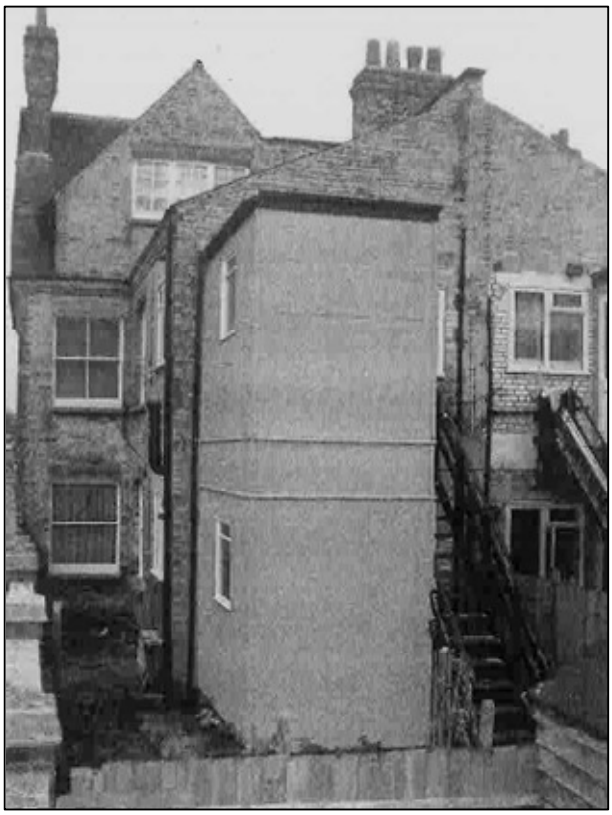


Feasibility Report for

HOMES FOR HARINGEY

Noel Park Conservation Area – Decent Homes & POD replacements

By

John Rowan & Partners LLP

Summary

The Noel Park Estate is a designated conservation area consisting of a series of different house types. During the 1970s, pre-fabricated bathrooms "PODS" were added to the rear of 217 dwellings. The PODS have survived far in excess of their intended design life, and are now showing a large number of significant defects; notably movement of the foundations, damp and a latent asbestos issue.

Most of the estate properties do not meet the government's "Decent Homes" standards. Homes for Haringey (HfH) require a delivery plan to carry out the necessary decent homes work on the estate and concurrently overcome the issues relating to the PODS. It is proposed that a pilot scheme will be carried out, based upon the recommendations of this report. It is the intention to then roll out a full programme of decent homes and POD works to the remainder of the estate, capturing any learning form the initial pilot project.

HfH have instructed John Rowan & Partners (JRP) to prepare this feasibility report, in respect of the pilot properties, identifying the available courses of action and the relative benefits, or drawbacks, of each POD remedial option. For each alternative, the following key factors have been considered and compared: Initial Capital Cost; Life Expectancy; Life Cycle Cost; Duration of work; Disruption to Residents; Remaining Health Hazards post completion; Access to the rear gardens; Implications for arranging resident decants; Space Utilisation; Build quality and finish of the end product.

Within the estate there are 28 tenanted houses with POD bathrooms, designated "P4 archetypes". We recommend demolition and removal of these pods and reconfiguring the internal ground floor layout to dispense the need of replacing the POD (Option E). This work can be phased without the need to decant residents and will potentially save HfH over 500k in comparison to replacing the structure.

Our recommendation is to replace all of the PODS (except P4 archetypes) with Pre-fabricated PODS, secured on an alloy helical pile foundation system (Option D). The capital costs of this method are comparable to those for replacing the POD with out buildings constructed using traditional methods. Crucially, Option D requires no decanting of the residents and would shorten the duration of the estate wide improvement works by approximately 18 months. Both options will deliver consequential savings to HfH in terms of management resource, legal costs and the need to provide alternative accommodation.

Contents

1 Existing Housing Stock

1.1 Designated Pilot Properties

HfH produced a report in November 2004 categorising the Noel Park POD properties into 4 generic archetypes. It has been proposed that the pilot projects will select the following stock.

Unit	Address	Property Type	POD Archetype
1	183 Gladstone Avenue, N22 6LB	Ground Floor Maisonette Flat	P1
2	183a Gladstone Avenue, N22 6LB	First Floor Maisonette Flat	P1
3	t.b.c.	3 bedroom house	P4

JRP carried out a full measured survey and condition report of units 1 & 2 in October 2009. The findings of those investigations are utilised within this report. Since the address of unit 3 is still to be confirmed, we are unable to comment upon the condition of the property.

1.2 General Defects

We have been advised that the PODS were built in several batches over a period of approximately 5 years. Although the construction details may vary between batches, the typical defects can be summarised as follows:

- The raft foundations are generally insufficient for purpose; with many now demonstrating failures due to settlement and/or subsidence
- The PODS are freestanding on the rafts, with little or no tie-back restraints to the original building. The PODS are frequently seen to be 'falling away' from the main building with gaps of over 150mm between the original buildings and POD structures being observed
- Concern is highlighted that further movement could rupture or sever services between the main building and the POD
- The construction materials and make-up of the PODS are not thermally efficient and do not comply with current building regulations
- Internal condensation to walls and ceilings due to insufficient ventilation is common
- Rotting timbers to window and door components
- Damp and rotting floor joists; frequently deflecting due to loss of structural bearing strength
- Internal damp due to roof leaks
- Fixings of internal fittings failing due to consequential degradation from damp and corrosion

- De-laminating of plywood cladding panels and failure of fixings; panels coming loose
- Peeling of external painting and textured coatings
- Ponding of water on flat roofs; consequential leaking
- Gutter and down pipe connections becoming loose due to movement etc.

In addition to the above the HfH report highlights that the construction of the POD walls are timber frame, containing rockwool insulation, sandwiched between asbestos boards (chrysotile and amosite fibres). The external asbestos insulation board is overclad. The report also highlights the likelihood of asbestos fibres within the vinyl flooring. Consequently, any remedial solution should make full consideration of the management of this health hazard. In some instances, the separation of the POD structures has exposed asbestos materials; increasing the risk of release of harmful fibres.

The Haringey Council Design & Engineering Services Group advised in their report of October 2004 that underpinning the raft foundations was an unreasonable consideration bearing in mind the remaining life expectancy of the POD structures. The memo recommended the demolition of these structures and replacing the existing foundations with new ones suitable for the ground conditions and purpose.

2 POD Remedial Works – Available Options

The following POD solutions have been investigated:

OPTION

A. Repair and refurbish the existing bathroom pod, including underpinning the existing foundations

B. Demolish and remove the existing pre-fabricated POD. Construct new bathroom extension using traditional in-situ construction methods.

C. Demolish and remove existing pre-fabricated POD. Install new in-situ concrete strip foundations. Install new pre-fabricated bathroom POD extension.

D. Demolish and remove existing pre-fabricated POD. Install alloy metal helical pile foundations. Install new pre-fabricated bathroom POD extension.

E. In respect of P4 archetype – demolish and remove existing bathroom POD. Re-configure original internal space to negate the need to occupy the outgoing POD footprint.

2.1 OPTION A - Refurbishment

The internal condition of the PODS is generally poor and the bathrooms largely fail to meet the minimum requirements for 'Decent Homes'. The asbestos panelling is integral to the external envelope structure. No guarantee could be made as to the remaining structural integrity of the POD if the asbestos was to be first removed. It is very likely that removing the asbestos panelling would weaken the structure to such an extent that removal of the hazard is not practical. Consequently, practical solutions for increasing the thermal efficiency of the PODS are largely limited to over-cladding of the unit.

Over cladding could also assist in improving water-tightness of the unit, but is unlikely to improve the structural stability of the units. Generally, the condition of windows and doors are poor and replacement is necessary. We estimate a cost of approximately £17k per unit to carry out the necessary essential repairs to the PODS. HfH estimated that repair works could

potentially prolong the life of the PODS by another 15 years. At that point it would be wise to assume that demolition and replacement would be the only viable course of action.

As there is only one bathroom in each dwelling, residents would have to be de-canted while the internal bathroom replacements take place.

2.2 OPTION B - POD Replacement with Traditional Construction

Demolish and remove existing structure, safely remove asbestos, traditional strip concrete foundations. Flat roof extension to existing footprint of POD, insulated cavity walls, double skin blockwork with rendered finish similar to existing PODS, uPVC windows.

A number of properties have nearby trees; affecting foundation design. In some cases, new foundations will have to exceed 3m depth in order to comply with building control. The in-situ foundations may subsequently require temporary shoring works to provide earth support during the excavations. Deep excavations can increase the level of precautionary measures required to comply with health and safety and increase risk of party wall matters.

Due to access restrictions, the demolition (including asbestos) materials shall be removed off-site through the building. Alternatively, rear gardens can be converted into temporary access routes, however this comes with cost and legal rights of access implications. New materials shall be delivered by the same means. This will dictate a slow and labour intensive construction process. The necessary working at height will require scaffold erection, the delivery of which could be complicated by access restrictions.

The new construction would be compliant with current building regulations and insulated, as a minimum, to achieve the current U-value standards. Greater thermal efficiencies can be designed into the proposal.

Again, existing bathroom provisions dictate residents de-canting while works progress, the relatively long on-site phase leading to longer decant periods for residents.

As with any form of on-site construction, the working environment is inconsistent. This can lead to issues in the quality of workmanship. Life expectancy for the new-build extension is 60 years.

2.3 OPTION C - Off-Site Manufactured POD Replacement (Traditional Foundations)

Demolish and remove existing structure, safely remove asbestos, traditional strip concrete foundations. Supply and install new pre-fabricated bathroom POD.

The constraints in respect of demolition, asbestos removal and groundworks will be the same as those in OPTION B. It would be envisaged that the pre-fabricated POD would be craned into position over the property. JRP and HfH have been discussing the viability of pre-fabricated PODS with Target Fixings. Target do not envisage any issues in being able to site mobile cranes to install PODS to any of the Noel Park POD properties. If required, PODS could be delivered as flat packs with the final assembly carried out on site; although this is not envisaged necessary.

Again, existing bathroom provisions dictate residents de-canting while works progress. The consistent production environment conditions associated with factory assembly provide greater probability of delivering good quality workmanship.

The Pre-fabricated POD would be compliant with current building regulations and insulated, as a minimum, to achieve the current U-value standards. As with Option B, the thermal efficiency can be increased prior to manufacture. The life expectancy of the POD is 60 years; the same as that for the traditional construction.

2.4 OPTION D – Off-Site Manufactured POD Replacement (Helical Pile Foundations)

Target fixings have offered their patented 'Helipile' system. This aluminium alloy piling system requires no curing time prior to follow on works being commenced.

Using Target's helipile system and their pre-fabricated PODS, the entire demolition, removal of the existing structure, asbestos removal, and installation of the new POD could be carried out in approximately 4 hours.

Targets propose to encapsulate the existing PODS and lift them off-site, intact. The existing foundations can then be punctured to facilitate the installation of the helipiles. Once in place, the new POD can be crane lifted into position. As previously noted, Target do not envisage any issues in being able to site mobile cranes to install PODS to any of the Noel Park POD properties.

Due to the bathroom POD being replaced within a day, there is no need to decant residents. The consistent production environment conditions associated with factory assembly provide greater probability of delivering good quality workmanship. The method of this POD option causes the least disruption to residents of any replacement alternatives.

The Pre-fabricated POD would be compliant with current building regulations and insulated, as a minimum, to achieve the current U-value standards. The life expectancy of the POD is 60 years; the same as that for the traditional construction. In respect of this option and Option C, the residents may require extensive consultation so that they fully appreciate that the new PODS, whilst pre-fabricated, are of a much higher build quality than the existing units and that their life expectancy and quality are on a par (if not better) with that of Option B.

Copies of technical information from Target fixings are included in Appendix C

2.5 OPTION E – Internal Reconfiguration (P4 Archetype only)

Archetype P4s are small 3 bedroom houses with a single storey POD extension. Concerns have been raised by HfH as to the suitability of the existing kitchen spaces for installing a 'Decent Homes' kitchen. Volumetric storage requirements for kitchens are defined under the CLG guidelines as those appropriate to the size and type of property. In these P4 type properties, the bedrooms are all on the first floor. JRP propose that the ground floor space is re-designated such that the current rear dining rooms are converted in use to kitchen diners. This will enable a decent homes kitchen of suitable storage volume to be installed. The space previously occupied by the small kitchen can now host a new bathroom, hence removing the need to replace the bathroom POD. The existing POD can therefore be removed off-site providing greater garden space for the resident and lower future maintenance costs for HFH.

The new layout will be smaller in floor area than the existing plan, but we believe that the additional storage will facilitate a greater amount of usable space for the resident. The new bathroom will remain directly off the kitchen as is currently the situation. The layout allows for the provision of a washing machine, fridge/freezer and cooker. The layout does not require demolition of any load bearing structures.

Removal of the external building results in a life expectancy which matches (or effectively exceeds) that of a replacement bathroom shell.

A plan of the proposed kitchen layout is enclosed in Appendix A.

2.6 Summary of Options

Item	Criteria	OPTION A Refurbishment	OPTION B POD Replacement with Traditional Construction	OPTION C Off-Site Manufactured POD (Traditional Foundations)	OPTION D Off-Site Manufactured POD (Helical Pile Foundations)	OPTION E Internal Reconfiguration (P4 Archetype only)
1	Life expectancy of external envelope	15yrs	60yrs	60yrs	60yrs	n/a
2	Access requirement through neighbours' gardens or through dwelling	Yes	Yes	Yes	No	Yes
3	Decant of resident for works	Yes	Yes	Yes	No	No - Possible to sequence works without decanting resident
4	Duration of works (1 shortest, 5 longest)	4	5	3	1	2
5	Risk of Planning Constraints (1 lowest, 3 highest)	1	3=	3=	3=	2
6	Advantages	No HfH obligation to refit leaseholders bathrooms	New construction	Quality Assurance of Final Product due to factory conditions	Quality Assurance of Final Product due to factory conditions Zero Decant – minimal resident disruption	Reduced Initial Capital Cost Reduction in future maintenance regime for external envelope
7	Disadvantages	Underpinning will not resolve alignment/settlement issues Only a short term interim solution	Increased risk of leaseholder challenges due to highest cost and disruption levels	Slow foundation construction method negates potential time savings, reduced preliminary costs and zero decant	Potential resident resistance to replacing an existing 'pre-fab' with another pre-assembled product.	Managing resident expectation due to reduced floor area
8	Scaffolding Requirement	Yes	Yes	No	No	No

Item	Criteria	OPTION A Refurbishment	OPTION B POD Replacement with Traditional Construction	OPTION C Off-Site Manufactured POD (Traditional Foundations)	OPTION D Off-Site Manufactured POD (Helical Pile Foundations)	OPTION E Internal Reconfiguration (P4 Archetype only)
9	Environmental Impact of new construction element (5 lowest, 1 highest)	4	1	2	3 – no need to remove existing foundations	5
10	Extent of required resident liaison and decant management resource	High	High	High	Low	Medium
11	Asbestos presence following works	Yes – POD intact	None (PODS)	None (PODS)	None (PODS)	None – POD removed

3 Pod Option Costs

3.1 Pilot Scheme Construction Costs

The following table summarises the comparative construction costs for the various POD options for the pilot scheme properties together with an allowance for the necessary decent homes works:

	OPTION A Refurbishment	OPTION B POD Replacement with Traditional Construction	OPTION C Off-Site Manufactured POD (Traditional Foundations)	OPTION D Off-Site Manufactured POD (Helical Pile Foundations)	OPTION E Internal Reconfiguration (P4 Archetype only)
Bathroom Pod Cost	16,938	32,916	36,060	31,336	13,017
Kitchen Cost	7,752	7,752	7,752	7,752	7,752
Central Heating & HCWS	4,780	4,780	4,780	4,780	4,780
Ext doors, windows and repairs	6,202	5,584	5,584	5,584	6,202
Renew rainwater goods and repairs (UPVC)	3,454	3,454	3,454	3,454	3,454
Scaffolding	667	667	667	667	667
Total	**39,793**	**55,153**	**58,297**	**53,573**	**35,872**

The above costs are the cost per dwelling and exclude professional fees and VAT.

3.2 Life Cycle Costs

Below is a summary table of relative life cycle costs (over a 60 year period) for each of the alternative bathroom POD options including a single bathroom and kitchen, window and external door replacement for the front and rear etc. A more detailed breakdown of the calculations is included in Appendix B of this report.

	Lifecycle Cost Summary	Assumed 60 Years Life Cost Per Dwelling
1	**Option A**: Repair and refurbish the existing bathroom pod, including underpinning the existing foundations	**£206,000**
2	**Option B**: Demolition and construction of new bathroom extension in traditional construction	**£208,000**
3	**Option C** : Demolish POD, concrete strip foundations and pre-fabricated POD	**£211,000**
4	**Option D**: Demolish POD, helical pile foundation and pre-fabricated POD (i.e as per Target Fixing's Proposal)	**£206,000**
5	**Option E**: Demolish and remove existing bathroom POD. Re-configure original internal space to negate the need to occupy the outgoing POD footprint.	**£189,000**

The costs in respect of the pre-fabricated bathroom PODS (options C & D) have been based upon the indicative costs supplied by Target fixings and referred to in Appendix C. They have indicated that their costs would be likely to reduce by approximately 20% if they were successful in securing the entire POD replacement programme.

In respect of our proposed Option E, we anticipate that the potential initial capital cost saving of approx £500,000 for the P4 archetypes.

4 Retrofit

This report aims to provide recommendations as to the most suitable remedy to the current solutions surrounding the selection of the most beneficial POD improvement/replacement alternative.

Generally, most of the Noel Park properties do not comply with the decent homes requirements for thermal efficiency etc. There are a number of strategies which can be implemented to reduce the energy consumption of the dwellings within the estate. The extent to which energy efficiencies can be incorporated, or retrofitted, into the estate properties would be greatly under the optimum if consideration was only given to the PODS themselves.

We appreciate the aspirations of HfH to use Noel Park as a trial project to research how environmental retrofit solutions can reduce the carbon footprint and provide sustainable alternatives within the borough. We would therefore recommend that the review of the Noel Park Estate's retrofit potential is looked at on a wider basis than that of the POD extensions. A study of the available products and approaches within this estate could be developed into a design standard for the entire housing stock of the ALMO.

5 Conclusion and Recommendations

The general condition of the housing stock within the Noel Park Estate is below the Government's Decent Homes Minimum standard. The lack of capital investment within the estate over recent years has increased the need for improvement works to be carried out.

The internal condition of the bathrooms is being affected and compromised by the defects and undesirable factors displayed by the physical fabric of the POD building envelopes. Fundamentally, major works need to be implemented to resolve these problems. The costs of the POD corrective works, irrespective of the option, are significant and it must be ensured that the recommended solutions deliver value for money over their lifetime. Hence the option with the lowest initial capital cost may not be the best value solution over the 60 year period. Our results in section 3, confirm that this is true. Any solution should also take consideration of the disruption which will be caused to residents and seek to minimise it.

The consequential problems resulting from the inadequate foundations (ie. the leaning of the of the PODS) will not be rectified by underpinning the existing foundations. Similarly the existing POD wall constructions are not thermally efficient and are a contributory cause to the cold and damp internal spaces which exist. In 2004, HfH's own design team recommended that the PODS were replaced with new structures because they had already exceeded their design life and they were exhibiting the aforementioned problems. On the basis of the current data, we fully support that view.

On balance, there is minimal cost difference between traditional construction (Option B) and pre-fabricated POD with helical piles (Option D), however, the time and resource savings, lack of decant requirement and reduced disruption of Option D will generate additional cost savings to HfH's organisation. In respect to Option E (Remove POD and reconfigure internal layout), we envisage an initial cost savings to amount of £17,000 per unit over option B. This would equate to over £500,000 gross savings if applied to all P4 properties within Estate.

We therefore recommend that HfH progress the pilot schemes using Option D (Pre-fabricated PODS with Helical Pile system) for the double storey pilot maisonettes in Gladstone Avenue. Option D will provide the least disruptive replacement solution for the resident whilst providing an end product of at least equal quality to Option B. Over the course of a programme of estate wide improvements, the project POD replacements could be potentially reduced from the anticipated 2.5 years (If Option B was chosen) to 1 year

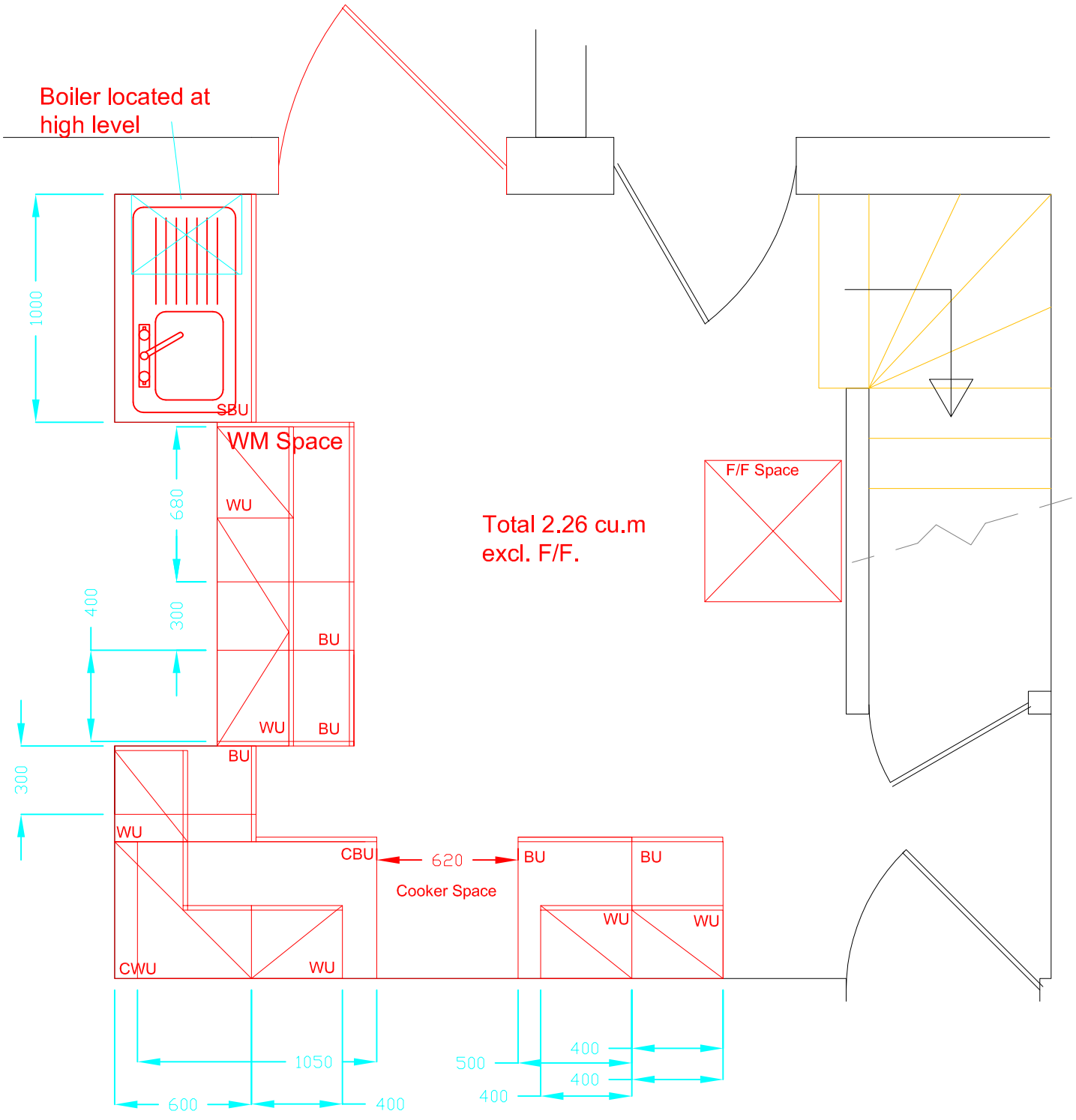
(Option D) by dispensing the need to decant the residents. The lack of the decanting requirement is likely to be appreciated by the affected residents.

Option E (Only applicable to P4 House archetypes) provides significant cost savings over Option D and through careful planning of the sequencing of the works, the need to decant residents can be avoided. We therefore recommend that the pilot P4 archetype (address t.b.c.) property is improved using Option E (Internal configuration).

Both our recommended solutions for the pilot properties will reduce the levels of disruption and inconvenience to the residents.

Appendix A

Pod Archetype 4 – Proposed Alternative Internal configuration



Title: P4 Archetype - 'Options'	Scale: NTS	Date: 09/11/10	
Client: Homes for Haringey	Drawn: CRB	Checked:	
Project: Noel Park Pods - Pilot Schemes	Drawing No.:	Revision:	

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1: All errors and omissions should be reported to the Surveyor.
2: This Drawing is the Copyright of John Rowan & Partners.
3: This drawing should not be scaled.

Appendix B

Life Cycle Costs – Comparative Options

Appendix B

	Lifecycle Cost Summary	60 Years Life Cost Per Unit
1	**Option A**: Repair and refurbish the existing bathroom pod, including underpinning the existing foundations	**£206,000**
2	**Option B**: Demolition and construction of new bathroom extension in traditional construction	**£208,000**
3	**Option C** : Demolish pod, concrete strip foundations and pre-fabricated pod Type P1	**£211,000**
4	**Option D**: Demolish pod, helical pile foundation and pre-fabricated pod Type P1 (i.e as per Target Fixing's Proposal)	**£206,000**
5	**Option E**: Demolish and remove existing bathroom POD. Re-configure original internal space to negate the need to occupy the outgoing POD footprint.	**£189,000**

	Pilot Properties Cost	Option A	Option B	Option C	Option D	Option E
	183 Gladstone Avenue, N226LB Ground Flr	£39,793.08	£55,152.67	£58,296.59	£53,572.78	N/A
	183a Gladstone Avenue, N226LB 1st flr	£39,793.08	£55,152.67	£58,296.59	£53,572.78	N/A
	TBC, 3 Bedroom House	£39,793.08	£55,152.67	£58,296.59	£53,572.78	£35,871.78

Notes
For comparison, the cost allows for a single bathroom and kitchen
Assumed rate of inflation at 2%
Kitchen to be refitted every 20 years
Bathroom to be refitted every 30 years
Rainwater goods to be renewed every 30years
Windows and doors to be renewed every 20 years
The capital cost also allows for the replacement of windows and doors, central heating, rainwater goods and repairs, full rewire etc, MC's ohp and prelims
It is assumed that HFH will procure and manage the supply & installation of the pods directly

Homes for Haringey

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Life cycle Costing for Pod Alternatives

Refurbish the existing pod and underpinning as necessary

Year	Re-fit Kitchen	Refit-bathroom	Rain water goods	Windows & Doors	Miscellaneous	Total £
0	**Initial capital cost**					£39,793
1						£0
5					£221	£221
10			£122		£244	£366
15	**Pod replacement (As Option D)**					£66,597
20						£0
25					£328	£328
30		£8,339			£362	£8,701
35	£20,827		£200	£9,702	£400	£31,129
40					£442	£442
45			£244		£488	£731
50					£538	£538
55	£30,948		£10,088	£14,417	£594	£56,047
60					£656	£656
						£205,550

Demolition and construction of new bathroom extension in traditional construction

Year	Re-fit Kitchen	Refit-bathroom	Rain water goods	Windows & Doors	Miscellaneous	Total £
0	**Initial capital cost**					£55,153
1						£0
5					£221	£221
10			£122		£244	£366
15					£269	£269
20	£15,475		£149	£7,209	£297	£23,129
25					£328	£328
30		£8,339	£6,149		£362	£14,850
35					£400	£400
40	£22,995		£221	£10,712	£442	£34,369
45					£488	£488
50			£269		£538	£807
55					£594	£594
60	£34,169	£15,105	£11,138	£15,918	£656	£76,986
						£207,960

Homes for Haringey

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Life cycle Costing for Pod Alternatives

Demolish pod, concrete strip foundations and pre-fabricated pod

Year	Re-fit Kitchen	Refit-bathroom	Rain water goods	Windows & Doors	Miscellaneous	Total £
0	**Initial capital cost**					£58,297
1						
5					£221	£221
10			£122		£244	£366
15					£269	£269
20	£15,475		£149	£7,209	£297	£23,129
25					£328	£328
30		£8,339	£6,149		£362	£14,850
35					£400	£400
40	£22,995		£221	£10,712	£442	£34,369
45					£488	£488
50			£269		£538	£807
55					£594	£594
60	£34,169	£15,105	£11,138	£15,918	£656	£76,986
						£211,104

Demolish pod, helical pile foundation and pre-fabricated pod (i.e as per Target Fixing's Proposal)

Year	Re-fit Kitchen	Refit-bathroom	Rain water goods	Windows & Doors	Miscellaneous	Total £
0	**Initial capital cost**					£53,573
1						
5					£221	£221
10			£122		£244	£366
15					£269	£269
20	£15,475		£149	£7,209	£297	£23,129
25					£328	£328
30		£8,339	£6,149		£362	£14,850
35					£400	£400
40	£22,995		£221	£10,712	£442	£34,369
45					£488	£488
50			£269		£538	£807
55					£594	£594
60	£34,169	£15,105	£11,138	£15,918	£656	£76,986
						£206,380

Homes for Haringey

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Construction Consultants

Life cycle Costing for Pod Alternatives

Demolish and remove existing bathroom POD. Re-configure original internal space to negate the need to occupy the outgoing POD footprint.

Year	Re-fit Kitchen	Refit-bathroom	Rain water goods	Windows & Doors	Miscellaneous	Total £
0	**Initial capital cost**					£35,872
1						
5					£221	£221
10			£122		£244	£366
15					£269	£269
20	£15,475		£149	£7,209	£297	£23,129
25					£328	£328
30		£8,339	£6,149		£362	£14,850
35					£400	£400
40	£22,995		£221	£10,712	£442	£34,369
45					£488	£488
50			£269		£538	£807
55					£594	£594
60	£34,169	£15,105	£11,138	£15,918	£656	£76,986
						£188,679

Appendix C

Target Fixings – Letter of Introduction and Technical Information

Target Fixings Ltd.

CONSTRUCTION SOLUTIONS

Unit 6,
Hungerford Trading Estate,
Smitham Bridge Road,
Hungerford,
Berkshire.
RG17 0QP.
Tel: +44 (0) 1488 686311
Fax: +44 (0) 1488 681535
Email:info@targetfixings.com

Mr. Phil Hall.
John Rowan & Partners LLP.
CP House,
97 - 107 Uxbridge Road,
London.
W5 5TL

3rd November 2010

Dear Mr. Hall,

Re: Extensions at Noel Park Estate, Haringey.

Further to our telephone conversation yesterday I am writing with further information on our Heli Pile and eXtension systems as requested.

I understand your client has some reservations regarding our Heli Pile, the thermal efficiency of our buildings and the life span of the end product including our foundations.

I would like to begin with the Heli Pile. This is a very unique product and has won a Smart Award from the Department of Trade & Industry and a Millenium Product award from the former Prime Minister, Mr. Tony Blair MP. It is specified by the National Trust, English Heritage and British Waterways as well as numerous local authorities, housing associations, independent engineers, architects and private self build clients.

The Heli Pile is manufactured from die cast Aluminium Alloy Grade AlSi7Mg0.5. This material is mainly used where good mechanical properties are required in castings of a shape or dimensions requiring an alloy of excellent castability in order to achieve the high levels of quality required. This alloy is also used where resistance to corrosion is an important consideration, particularly where high strength is also required.

Consequently the material used for the Heli Pile also finds applications in the food, chemical, marine, electrical and many other industries, above all, in road transport vehicles where it is used for wheels, cylinder blocks and other engine and body castings. It is also used in nuclear energy installations and for aircraft parts. It is, in practice, the general purpose high strength casting alloy.

Because of it's high usage around the world there is a wealth of test data available for AlSi7Mg0.5 from independent test houses. Norwegian test house SINTEF found that AlSi7Mg0.5 has a corrosion rate of less than 40 microns per year in a natural sea salt environment. Therefore where our Heli Pile is used in tidal marine locations it will loose less than 2.4mm of it's diameter during a 100 year period.

Continued,

Of course with a foundation that lasts so long there is the question of what can people do with it in the future. During installation of the Heli Pile there is no excavation and in future years the pile can be extracted with hydraulic equipment and either reused or smelted down and recycled into a new product, and all without the need for excavation, landfill or concrete.

The Heli Pile is manufactured in the United Kingdom and in the Czech Republic. From the UK we supply the home market along with exports to Ireland, France, Belgium and Holland. From CZ we supply it's own market and Germany, Austria, Italy etc.

Within the group of companies there is Target Stati-Cal and Target Structural and you may come across these names when looking on the Internet for the Heli Pile. You may also find other companies that we approve to install the piles.

Every Heli Pile that is installed is proof load tested in-situ on site, I do not know of any other foundation that can boast this level of testing. We believe that this on site testing is key to the fact we have never had a failure of any project we have installed.

Since the late 1990's so many people have tried to copy what we have. Thanks to a Registered Design and Patent this has not happened but there are a lot of products that have used "helical pile" or similar wording to get in front of specifiers.

Remember if it's not alloy and not helical along it's full length it's not a Heli Pile®.

The whole concept of our eXtensions system grew over a period of about five years. We knew there was a need for high quality buildings that could be produced in a controlled environment and supplied more cost effectively than traditional methods. The key was not to be delayed by the effects of our weather system or unknowns on site.

Between 2001 and 2007 we provided Heli Pile foundations for Sutton Housing Partnership (SHP) and their own flat pack extension system. Although our Heli Pile foundation system was very quick to install and provided a cost effective solution, often installed in less than 2 hours, the flat pack system for the structure was costly and time consuming often leaving residents without facilities for days, this was not acceptable and the project was halted in 2007.

As we knew of the problems SHP were facing and had ideas of a system that would over come the difficulties they faced we offered our services, our proposal was welcomed and we started a nine month research and development programme to bring the 5 years of ideas to life. During this time one of our Directors visited Canada to see the Light Gauge Steel Framing (LGSF) in use and was very impressed with it's low carbon footprint, accuracy and strength. Some of the buildings were up to seven stories high. The spray applied insulation was also adopted as it has very high levels of insulation for it's thickness (when compared to all other current methods available) and also provided excellent air tightness, so no draughts or loss of heat.

Our standard wall sections include insulated frames of 64mm, 90mm and 140mm in thickness. These provide U-Values of 0.29, 0.20 and 0.15 respectively. By combining a 140mm and 90mm section to provide a wall section 230mm thick the U-Value achieved is 0.09 W/(m^2K), this is better than the average passive house value.

One resident of SHP has checked her utility bills for a 12 month period before and after we fitted a new extension to her house and has reported savings in excess of £20 per month on her heating bills.

In addition to the insulated light gauge steel frame we use other products such as low smoke and fume wiring, all of which is placed in conduit. The plumbing and drainage is Hepworth Hep^{2}O, HepRain and HepWaste. We have contract accounts with Lecico and Roca for vitreous china and steel baths, Gerflor for all our flooring needs and Deva for taps and showers. We also have the ability to purchase from other manufacturers should the client have a particular requirement.

Internal and external finishes to walls, lights, switches and sockets are all to the clients choice. Pitched roof coverings are also to the clients choice. For a flat roof (1:40 fall, we never do completely flat) we use Firestone Rubber Roof System, fitted by our own fully trained and certified personnel, as this has a Class 1 fire rating and has exceeded 50 years without defect on commercial buildings.

Our structures, including their Heli Pile foundations, are the subject of a NHBC Building Control Type Approval and should be considered as a building rather than a pod. The technology, products and methods employed allow us to build to any footprint size and up to 7 storey's high.

For the project at Haringey I have studied the soil investigation reports you kindly supplied me with and would expect to pile to a depth of 3 metres for single storey units and 4 metres for two storey units. In areas where there are trees nearby we would refer to NHBC and BRE guidelines and may need to pile deeper so as to benefit from soils unaffected by the influence of such trees.

With regard to the costs of trial units I would be prepared to revise our costs if we are not to be producing the planning drawings, design and specification. It may be more beneficial for us to provide a cost for each unit and then discuss costs relating to investigation and enabling works separately. If this is the case I would expect the first trial units to be under £30,000 each.

If we were to provide Heli Piles for a structure made by others with a footprint size of 2m x 3m I would expect a one off unit to cost in the region of £1920.00 + VAT.

Once again I would like to invite yourself and Haringey Homes to visit our offices in Hungerford where construction of the units can be seen and Sutton in Surrey where a site installation could be viewed.

I trust the above covers all the points discussed during our telephone conversation and if I can be of any further assistance please do not hesitate to contact me.

Yours sincerely,

Trevor Straffon.

Target Fixings Ltd

Heli Pile

Foundation Systems

INTRODUCTION

The need for a quick and simple lightweight piling system was determined in the early 1990's. It was not until the middle of that decade that this desire, with the help of a "Smart Grant" from the DTI, bore fruit. The result was the "Millennium Product" award winning Heli Pile.

Since the introduction of the Heli Pile at the Civils Exhibition in 1998, it has lead the way in modern mini piling concepts and techniques.

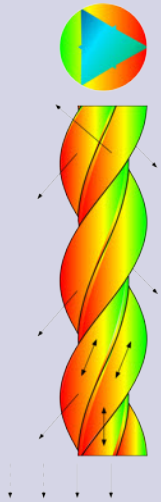
Originally developed as a lightweight piling system for remedial works to housing affected by subsidence, its versatility has allowed the applications to be much wider and more varied than first imagined.

Used in combination with the Bar Flex masonry reinforcement system, the Heli Pile can be designed and used as a standard "pile and beam" repair method. The system is very quick and easy to install giving an efficient and cost-effective solution.

New build applications are not forgotten, and as such, new foundations may also be cast or bolted on to the previously driven Heli Piles. The lightweight equipment ensures that there is little disruption, even on the wettest or most difficult sites. Because of its unique design, it is very effective in tension. This allows it to be used for retaining wall stabilisation and mobile telephone mast and tower base foundations to name just a few.

A series of Standard Details are available showing the various uses and giving a full method statement. Full specification details can also be supplied.

PERFORMANCE



The Heli Pile is installed using lightweight driving equipment and transmits the induced loads via the wedge-shaped fins at an angle into the substrate. The shape compresses the substrate and increases the effective diameter of the pile. The skin friction is greatly enhanced by compression and the mechanical effect of the fins. The end bearing load is greatly enhanced by the 'cone' effect of the compression.

MATERIALS

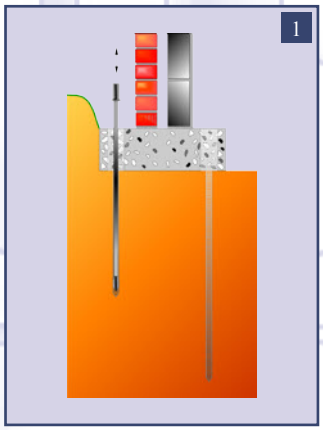
The Heli Pile is now manufactured in-house in two diameters, 60 mm and 100 mm. Both sizes are die cast from Grade LM25 (Al – Si_7Mg) Aluminium Alloy. This alloy finds application in the chemical, marine, construction and many other industries, above all, in road transport vehicles where it is used for wheels, cylinder blocks and other engine and body castings. It is, in practice, the general purpose high strength casting alloy. It is also used in nuclear energy installations and for aircraft parts. It is recyclable and part of its chemical composition includes up to 10% of recycled aluminium. The "green" credentials are clear to see.

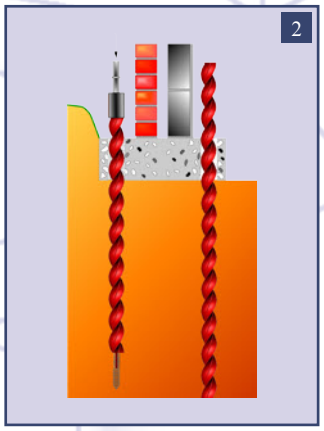
SPECIAL FEATURES

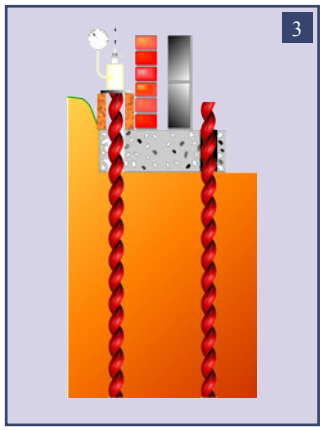
Millennium Product award winner
Quick and cost-effective installation
Clean alternative to traditional methods
Achieves loads of up to 200 kN
Compliments the Bar Flex beaming system
In-situ on site proof testing
Easily installed in poor access areas
Reusable and recyclable
Minimal disruption

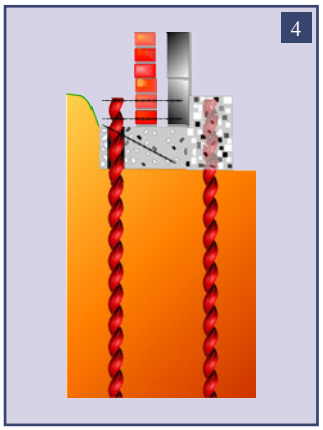
INSTALLATION PROCEDURE

1. Inspect and Scan area for services.
2. Mark out positions of Heli Piles, avoiding any services.
3. Create a pilot hole using the Heli Spike with a sacrificial Heli Cone.
4. Extract the Heli Spike leaving the pilot hole ready for the Heli Pile.
5. Start Heli Pile in the pilot hole by hand.
6. Secure Drive Head Washer to top of pile and drive the first metre.
7. Remove the Drive Head Washer and attach another section of Heli Pile. Replace Drive Head Washer.
8. Continue 7 to required depth.
9. For tensile testing, place load spreaders local to the installed Heli Pile.
10. For compression testing, attach beam across other installed Heli Piles.
11. Attach Heli Pile Load Test Unit and load test Heli Pile. If there is a shortfall in the loading, repeat 7 or allow a period of time for strength gain.
12. After testing, drive Heli Pile to final position.
13. For remedial work, as shown below, ensure masonry is clean and install Bar Flex as per the project-specific Standard Detail.
14. Shutter local area to Heli Pile and pour concrete to size and strength detailed on the project-specific Standard Detail.









SITE TESTING

Site testing is achieved by means of a small hydraulic testing kit and, to suit all site conditions, it may be performed either in tension, for soil stabilisation, or compression where it is utilised as a pile. Because of the ease of testing, it is also possible to use a correlation between tensile test and a compressive load. Instead of working to "characteristic" loadings, which have been attained in laboratory conditions, the capability of simple in-situ testing allows the Heli Pile to be tested in the actual site conditions in which it is installed. Proof testing gives the specifier confidence in the Heli Pile to cope with the imposed loads and permits a much lower factor of safety to be utilised.

Heli Pile mast bases for the telecommunications industry have become widely accepted by the major networks. The in-situ proof testing of the Heli Pile and insurance backed guarantee have been a major influence on this market. The fact that the Heli Pile can be uprated or even extracted at a later date is also seen as a major green credential.

RESEARCH & DEVELOPMENT

In addition to the data recorded from sites around the World, additional independent testing of the tensile, compressive and ductile strength, cyclic loading, pile cap design and general performance of the Heli Pile has been carried out by the Universities of Bath and Plymouth in the UK as well as the CEBTP in France.

Further technical information, including the above reports, is available on request.

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Target Fixings Ltd

Bar Flex

Masonry Repair Material

INTRODUCTION

Bar Flex is a Grade 304 austenitic stainless steel reinforcing material that has many unique properties. Being rolled from a plain round wire, the fins are work-hardened to a very high level whilst the core remains relatively soft. The subsequent tensioned, free-twisting process places the hardened fins in tension and the soft core into compression. The tensile strength of the base material is more than doubled during the manufacturing process. The deformation of the fins makes the bonding characteristics of Bar Flex far superior to alternative standard reinforcing materials.

TECHNICAL

The University of Bath School of Architecture and Civil Engineering has performed independent tests on the Bar Flex material to ascertain its tensile and shear loadings. A full report of this testing, including the methods employed, is available on request, but a summary is given in the table below. One of the properties of the Bar Flex material is that it performs in a similar manner to a coiled spring when it is stressed within its elastic limit. All of the load calculations for design are based within this elastic limit.

Bar Flex	Tensile kN	Shear kN	Cross-Sectional Area mm²
6 mm	9.75	8.1	> 8.2
8 mm	11.67	9.2	> 11.2
10 mm	14.51	10.5	> 14.2

SIZES

Bar Flex is available in four different diameters of 4.5 mm, 6 mm, 8 mm and 10 mm for use in different applications. Lengths are available up to 10 metres long.

The uses for Bar Flex are both wide and varied and it can be utilised in new build and for many specialised refurbishment requirements.

In general terms, the 6 mm Bar Flex is used for the reinforcing of existing masonry structures. By combining the Bar Flex with Bond Flex XL cementitious grout, beams that can span over openings, as a lintel, or over soft areas of ground when footings have failed, can be installed into existing masonry with very little disturbance. Crack stitching can be achieved by using 1 m lengths of Bar Flex.

The 8 mm Bar Flex is used for new build masonry reinforcing. The larger dimensions gives it a far better bond into a standard building mortar than the alternative round section wire. The increase in the tensile strength during the manufacturing process also requires less overall material to be used.

For heavy duty applications, the 10 mm Bar Flex is in a class of its own. Very strong in tensile and shear, when combined with the bonding capabilities makes this a truly versatile, high strength product.

TECHNICAL

Grade 304 austenitic stainless steel
Excellent bonding capabilities
Coiled spring properties within elastic limit
High stress material
No sudden or catastrophic failure point
Lengths up to 10 m - less wastage
Less intrusive than standard repairs

Target Fixings Ltd

Bond Flex

Cementitious grout

INTRODUCTION

Bond Flex XL cementitious grout is a non-shrink, pumpable, thixotropic, high-performance, cement-based grout suitable for injection with a hand applicator. Supplied in a 16 litre bucket, Bond Flex XL contains the dry powder to make either 3 or 6 litres of injectable grout.

The low liquid to powder ratio ensures a thixotropic grout, which develops its compressive strength rapidly. It is designed to fill all voids into which it is injected and the bond stress is greatly enhanced by its expansive properties.

TECHNICAL

Bond Flex XL is suitable for bonding metal components into most masonry substrates including concrete, brick, stone, blocks and most masonry materials. It is designed for use with the other Target products Bar Flex, Cem Flex, and Retro Flex as a bonding agent. Further details are given in those product brochures.

Bond Flex XL has been found to be an ideal alternative product to polyester resin and is particularly useful when fire risks are an issue - replacement wall ties on high-rise structures is a good example. Being non-flammable and odourless, Bond Flex does not have the inherent drawbacks of many resin-based alternatives.

PACKAGING

The packaging of Bond Flex XL ensures that consistent results are obtained with every mix. There is nothing to leave out, and more importantly, nothing to add. Contractor error has been eliminated.

Although packaged in the same 16 litre bucket for a clean mix every time, for extra convenience Bond Flex XL is available in two different sizes. XL3 contains enough mixture for 3 litres of grout, whilst XL6 contains two packs of each XL3 component and hence produces 6 litres of usable grout.

STORAGE

Bond Flex XL buckets may be stacked up to 4 high and should be kept in dry conditions. A temperature range of 5°C to 35°C is ideal and should be maintained.

PERFORMANCE DATA

The typical compressive strength development at 20°C, 100 mm cubes under restraint and wet cured is given in the table below.

1 Day	3 Days	7 Days	28 Days
20 N/mm²	25 N/mm²	30 N/mm²	40 N/mm²

SPECIAL FEATURES

Thixotropic. Will not drip when used overhead
Non-shrink property increases bond stress
Fully packaged for consistent mixing
Easily pumpable over long distances
Fills voids when injected
Non-flammable material

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Cem Flex

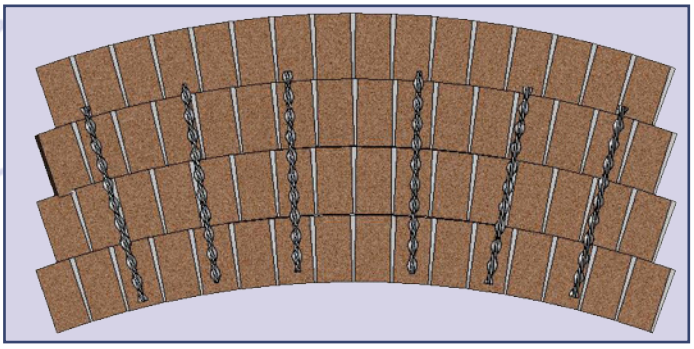
Solid Masonry Connector

INTRODUCTION

Originally developed in conjunction with British Rail, the Cem Flex method of pinning delaminating rings in masonry arches has now become widely accepted as a simple and economic solution.
Cem Flex ties are also used in standard construction repair techniques for bonding across cracks in masonry and as a restraint for bowing solid walls.
The 8 mm diameter austenitic Grade 304 stainless steel helical reinforcing rod is combined with Bond Flex XL, a unique formula of pumpable, but thixotropic, non-shrink cementitious grout.
As the installation of Cem Flex is via a 12 to 16 mm diameter drilled hole, the potential disfiguration to the structure can be minimised, and the installation time is greatly reduced - this is especially important where access and working times are restricted.

PERFORMANCE REQUIREMENTS

Because of the method of installation, it is not possible to perform random, non-destructive site testing. Bond strengths can, however, be checked prior to the full installation programme. An overlong Cem Flex can be installed as normal, leaving a short length (50-75 mm) proud of the surface.
A Target Load Test unit can be used to determine the tensile loading. The full cure time for the Bond Flex XL grout is 28 days, but limited testing can generally be performed after 24 to 48 hours. To check the flow of Bond Flex XL grout into any voids requires destructive testing methods and is normally only performed in critical situations.

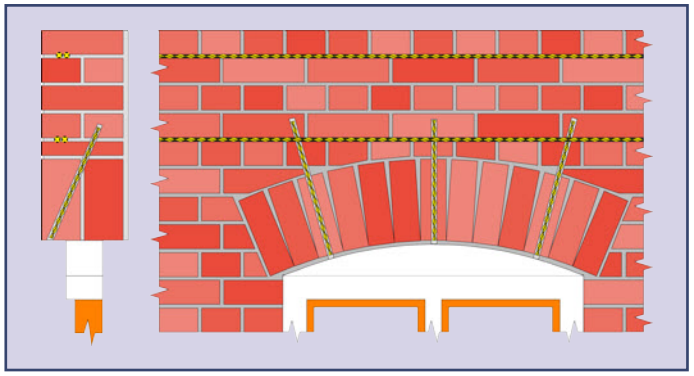


FIXING DETAILS

The only restriction on the length of Cem Flex that may be fixed is the length of hole that can be drilled. In general terms this is restricted to 1.5 m. The insertion hole is varied from 12 to 16 mm diameter and is usually formed with a SDS-plus hammer drill. To ensure a good bond strength between the Bond Flex XL cementitious grout and the substrate, it is necessary to thoroughly wet the drilled hole before the installation of the tie.
Installation of the tie is performed very simply by the use of a hand-held grout injection gun kit. The Bond Flex XL grout is installed under hand pressure and flows readily under light pressure to fill any voids in the masonry structure. Full installation details are given overleaf.

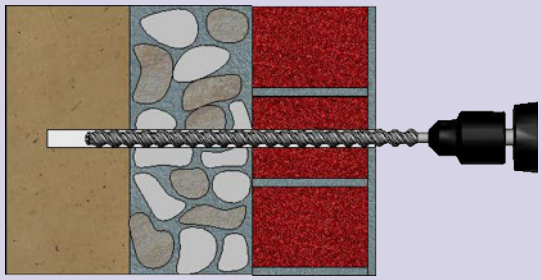
Special Features

Quick and easy to install
Cementitious grout fills any voids
Minimal disfiguration to structures
Strong yet flexible connection
Lightweight installation equipment
Corrosion-resistant materials



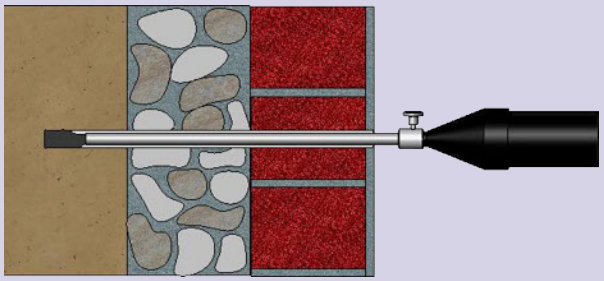
INSTALLATION PROCEDURE

1



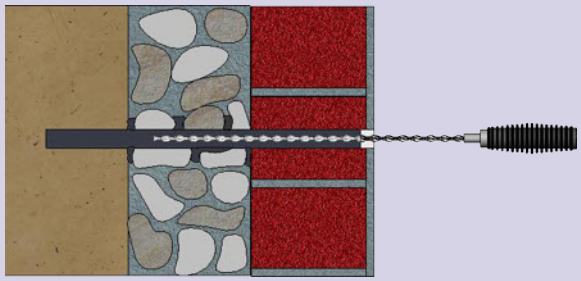
1. Drill a 12 to 16 mm diameter hole to the required depth.
2. Blow out any debris.
3. Thoroughly wet the hole.

2



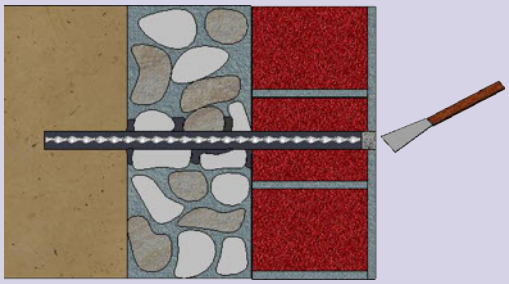
4. Insert the grout gun nozzle to the bottom of the drilled hole and pressure inject the Bond Flex.

3



5. Using the Cem Flex insertion tool, push the Cem Flex tie into the grout-filled hole.

4



6. Remove any excess Bond Flex cementitious grout and finish the hole in the desired manner.

THE MATERIALS

The compatibility of the Bond Flex XL and the 8 mm Cem Flex have been assessed and approved to work together. Whilst the Bond Flex XL cementitious grout is a very high strength material - ≈ 40 N/mm² - by incorporating the flexible and elastic Cem Flex, the treated structure is permitted a degree of movement. Experience has shown that allowing continual but controlled movement in a structure is very beneficial to its long term life. A heavy duty anchor that attempts to stop movement altogether has been shown to store up potential problems, and may even end in a sudden and catastrophic failure.

Bond Flex XL cementitious grout is formulated to produce a thixotropic material that flows readily under pressure - allowing rapid void filling in deep holes - but will not drip if used overhead.

The initial cure time is very rapid, and a non-shrink agent ensures that a good even bond is achieved. It is supplied as a complete material in either 3 or 6 litre packs offering a consistent mixture time after time.

The contractor does not need to add any extra material, and has a clean mixing bucket for each mix. The working life of the material can be extended by re-agitation and will be in excess of 30 minutes

Cem Flex is a Grade 304 austenitic stainless steel material with a very pronounced profile to ensure a good bond with the Bond Flex XL cementitious grout. Being stainless steel, the issue of 'coverage' requirements does not arise.

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Bow Flex

Lateral Restraint Tie

INTRODUCTION

The cause of bowing walls in many old buildings may well be due to the fact that there was no mechanical connection between the floor and ceiling joists and the masonry. The traditional method of connection has been to rely on friction due to gravity. When this frictional resistance is released, due to movement over the years within the timbers or masonry, it can leave a freestanding wall of considerable height that is very susceptible to bowing.

The problem of bowing walls has been addressed in the past by the use of S or X ties bonded right through the building with bars to connect the front and rear walls or the two side walls together.

The Bow Flex tie uses the same principles as this proven, but unsightly, method of restraint for bowing walls. The advantage of the Bow Flex is that it can be installed invisibly and externally and uses the existing structural members to provide the necessary stability.

The current method of standard repair is to introduce a galvanised strap tying the floor to the wall. Although the product is very cheap the distribution involved during the installation - removing furniture. Carpets, skirting and floorboards, the chasing out of plaster, the fixing with plugs and screws or nails and the subsequent making good - make this a very expensive in-place option which relies on the holding capacity of one plastic plug and a screw.

THE SYSTEM

The Bow Flex system of wall restraint is available in 8 mm material. Installation is performed from outside the building through a 12 mm hole in the building fabric. It must be emphasised that s check must be made for any services that may run through the floor/ceiling cavity. It is quite common for wiring to be present and is certainly not unknown to have water pipes for the heating system or even a mains water pipe in this location. It is recommended that checks are made in this area with the use of a boroscope.

The connection to the wall is either made into the second floor joist, if they run parallel with the wall, or Into the ends of the floor joists if they run into the wall. A proof test of the connection into the timber can be made immediately after installation using a Target Load Test Unit.

UTILISING STRUCTURAL ELEMENTS

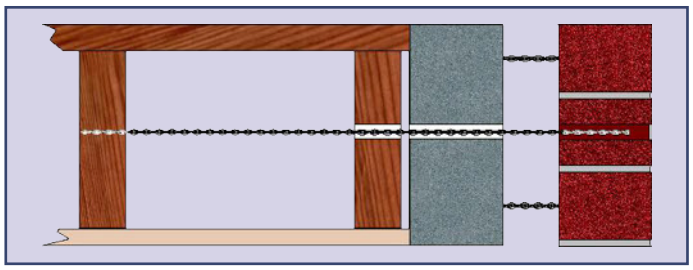
By utilising the existing structural elements of the building, the solution is simple, cost-effective, less disruptive and much quicker to install.

If the Bow Flex tie is fitted into the side of the second floor joist, the strength and load sharing is achieved via the floor boards on top of the joists crossing from one joist to the next. The old X or S connecting bar is effectively replaced by the floor and ceiling boards already in place.

When the joists run into the wall and sit in pockets within the masonry, the fixing is achieved with a short Bow Flex tie being fixed into the end grain of each joist. If the joist is continuous through the property, a fixing at each end should produce the required effect. Care must be taken to ensure that any unconnected overlaps, perhaps on a central load bearing wall, are structurally jointed to allow continuity through the full joists.

A series of standard details are available.

The full installation process is described overleaf.



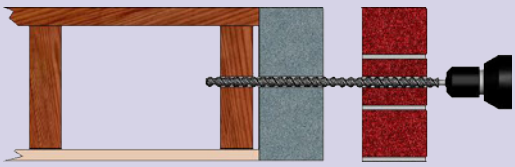
SPECIAL FEATURES

One piece design - no moving parts to lose
Easily tested after installation
Quick and easy installation
Minimal disruption to building occupants
Fixes into end grain and side grain
Virtually invisible and unobtrusive

INSTALLATION PROCEDURE

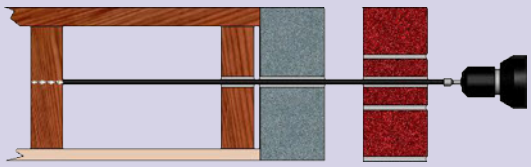
1 Before carrying out any works, check in floor and wall cavities for any services.

2



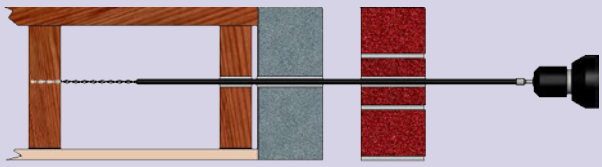
Drill a 12 mm hole through the wall and through the first floor joist.

3



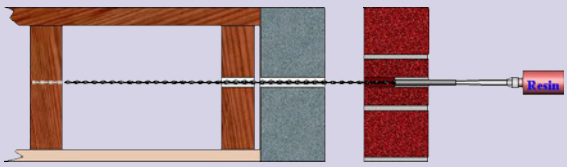
Insert the Bow Flex tie into the Power Support tool, push the tool and tie into the drilled hole and, using the SDS-plus hammer drill set on hammer, drive the Bow Flex tie into the second floor joist.

4



Remove the Bow Flex Power Support tool from the hole. Note: At this stage a tensile test may be performed to proof test the fixing of the tie.

5



Target polyester resin is used to bond the Bow Flex tie to the wall to complete the installation.

THE MATERIALS

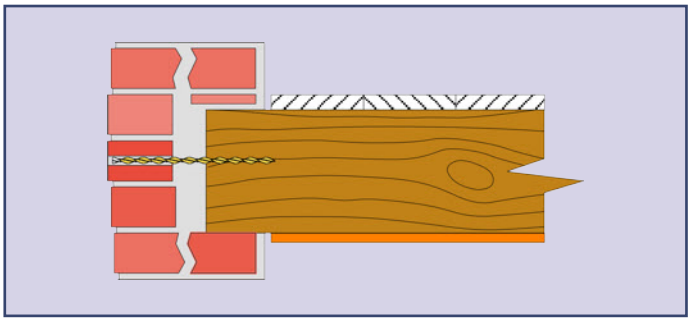
Bow flex ties are manufactured from Grade 304 austenitic stainless steel. The 8 mm diameter Bow Flex has a tensile strength in excess of 11 kN. The manufacturing process produces very hard fins that are able to cut a thread into the timber and a soft and flexible core. The near leaf fixing is achieved by the use of Target polyester resin.

TESTING

It is recommended that each Bow Flex tie is proof tested using a Target Load Test Unit. The actual tensile loading required for stabilising a bowed wall is surprisingly low.
For example, considering a wall of 5 m of height and bowing outwards at it's mid point by 50 mm, it is straightforward to calculate, by using a triangle of forces, that a horizontal load of 1 kN is sufficient to withstand a vertical load of 50 kN or 5 tonnes! With Bow Flex ties fixed at 600 mm centres, a load resistance in excess of 80 kN per metre run is easily achieved.

USES

The ability to test after installation makes this a versatile and effective repair method for stabilising bowed walls. It must be borne in mind that Bow Flex will NOT pull a bowed wall back to it's original position; it is designed to stabilise walls in their current positions. Bow Flex is recommended for use in bowed walls of two storey properties that have moved no more than 50 mm from the perpendicular. More severe conditions can be accommodated for but the opinion of the manufacturer or a suitably qualified engineer should be sought.
Proof testing requirements have been discussed more fully under the “Testing” heading, but a loading of around 1 kN should be sufficient for most situations. It must be understood that this is a PROOF load and not a test to failure. If higher loading are required this can be achieved by introducing more Bow Flex ties.



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Target Fixings Ltd

Retro Flex

Remedial Wall Tie

INTRODUCTION

During the 1970's, research was conducted into the need for replacement wall ties. The actual durability of the protective zinc or galvanised coatings of the original built in wall ties was studied and this now affects the design and use of walls ties for both new build and replacement. The results of the research was found to be quite beyond any previous expectations:

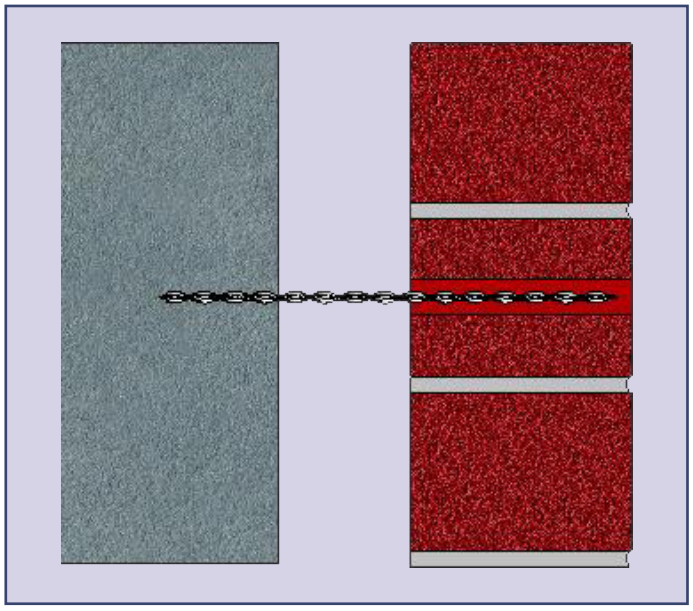
1. Vertical twist ties ("fish tails") were found to have a life expectancy of only 30 years - half of that originally intended.
2. Wire ties ("butterflies") were found to have a service life of only 15 years.
3. Mortar is alkaline, which actually protects and enhances the working life of wall ties
4. A reaction between mortar and the air causes a process called carbonation, which turns the mortar acidic, which then attacks the wall ties.

Early attempts at producing a method for replacing existing wall ties highlighted many of the pitfalls that were to be encountered. The expansion type of tie has been found to induce additional stresses into the masonry - similar to the expansion caused by the existing, rusting walls ties - and were costly to make and fit. The use of heavy section re-bars was soon outlawed because of the need for flexibility to allow the necessary differential horizontal and vertical movement between each leaf. Generally, a connection between each leaf using a bar of 8 mm diameter or above was found to act like mini crowbars and would eventually work themselves loose. The introduction of BSI DD140, BRE Digest 329 and the more recent BRE Digest 401 at last gave guidance for manufacturers and specifiers of remedial wall ties.

THE SYSTEM

The Retro Flex system of wall tie replacement is available in three different diameters of 6 mm, 8 mm and 10 mm. It offers the advantages of a non-expanding mechanical fixing on the far leaf and a polyester resin or cementitious grout fixing on the near leaf.

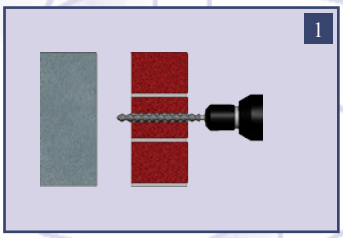
Proof testing of the far leaf using a Target Load Test Unit can be performed randomly as installation proceeds. Because the fixing method employed does not induce additional stresses into the substrate, Retro Flex can be used in many and varied materials, from poured concrete columns to Aircrete blocks, with satisfactory results and there is no concern to achieve the vital edge distance spacing necessary with any expansion fixing. The design of the Retro Flex remedial tie ensures that any potential for installer error can be minimised. The multiple drip design of each fin allows the Retro Flex to be installed at an angle of up to 25° towards the inner leaf without the possibility of any water transfer across the cavity. It is recommended that each Retro Flex is installed horizontally.



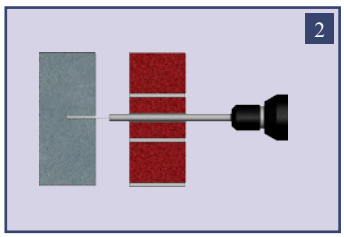
SPECIAL FEATURES

One piece design - no moving parts to lose
Immediate proof testing of connection
Multiple drip points to deter water transfer
Flexible design allows natural building movement
Fixes through insulation material
Minimal disfiguration to buildings
Fixes into all commonly found building materials
Quick and easy installation

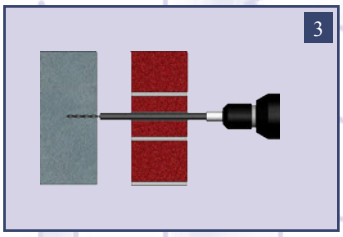
INSTALLATION PROCEDURE



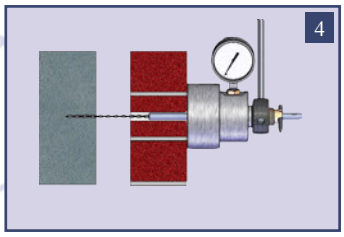
Drill a 10 mm or 12 mm hole through the near leaf using a SDS-plus hammer drill. The hole should be 25 mm from the end of a brick and on its horizontal centre line.



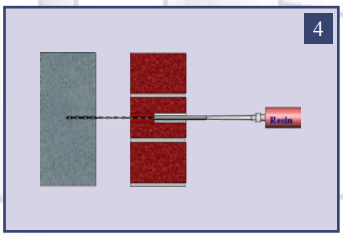
Push the Pilot Drill and Drill Extension through the previously drilled hole and drill a pilot hole into the far leaf.
Note: If the far leaf is a soft material, this procedure may be omitted.



Insert the Retro Flex tie into the Power Support tool. Insert the combination through the hole in the near leaf and, using a SDS-plus hammer drill, drive the Retro Flex tie into the pilot hole in the far leaf.



Once the Retro Flex tie is installed into the far leaf pilot hole, the holding capability can be checked using a Target Load Test Unit. As a general rule, about 1 kN loading in tension is an adequate bond.



After an acceptable proof test is performed, the near leaf connection is made using Target Polyester Resin or Bond Flex XL Cementitious Grout. The drilled hole may then be colour matched for an excellent finish.

Retro Flex Power Support Tool

THE MATERIALS

Retro Flex ties are manufactured from Grade 304 austenitic stainless steel. The 6 mm diameter Retro Flex has a tensile strength in excess of 9.7 kN. The manufacturing process produces very hard fins that are able to cut a thread into the hardest concrete, but maintains a very soft and flexible core. The near leaf fixing can be achieved by the use of Target Polyester Resin material or Bond Flex Cementitious Grout. Bulk mix epoxy resins are not recommended for normal installation, as it has been noted that many of these resins are not reliable due to their accurate mixing requirements.
Where there is a need for a fire resistance in excess of 30 minutes, only Bond Flex Cementitious Grout should be used.

FIXING DENSITIES

In general terms, the fixing densities for Retro Flex remedial wall ties would be the same as new build - 2.5 per m² or 450 mm vertically and 900 mm horizontally in a domino five pattern. This density would, however, be subject to on site testing to ensure that the required tensile loadings are being achieved.

It should also be borne in mind that around all openings - doors and windows - ties should be installed at no more than 300 mm vertical centres and no more than 225 mm from the edge of the opening. BRE Digest 401 gives more information.
If the masonry is so weak or friable that the required proof test load for standard density fixings cannot be achieved, it is quite acceptable to increase the density of fixings to ensure that the overall loading per m² is achieved. Lowering the installation density below the standard is not recommended.

TESTING

It is recommended that testing is performed in accordance with the requirements of BRE Digest 401. This publication gives a wind zone chart and the various proof test requirements for different parts of the country in differing situations. Most of the information is in table form, which negates the need for complicated calculations. It must be understood that wall ties are designed as load sharing devices and as such there is no necessity to have a high point loading on any individual tie. Only in exceptional circumstances does the proof test load requirement exceed 1 kN.

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Dri Flex

Remedial Wall Tie

INTRODUCTION

During the 1970's, research was conducted into the need for replacement wall ties. The actual durability of the protective zinc or galvanised coatings of the original built-in wall ties was studied, and this now affects the design and use of walls ties for both new build and replacement. The results of the research was found to be quite beyond any previous expectations:

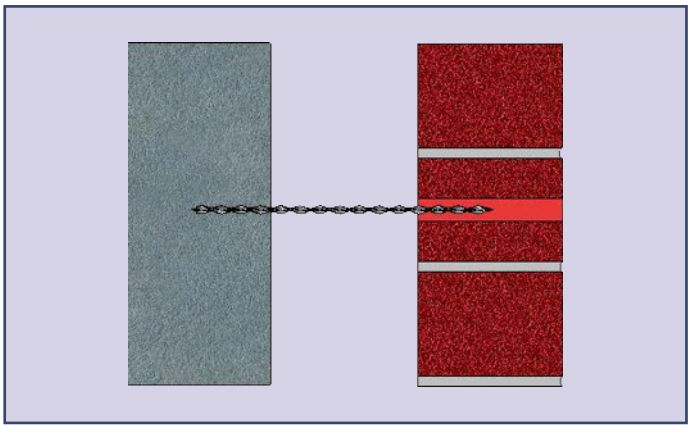
1. Vertical twist ties ("fish tails") were found to have a life expectancy of only 30 years - half of that originally intended.
2. Wire ties ("butterflies") were found to have a service life of only 15 years.
3. Mortar is alkaline which actually protects and enhances the working life of wall ties
4. A reaction between mortar and the air causes a process called carbonation which turns the mortar acidic which then attacks the wall ties.

Early attempts at producing a method for replacing existing wall ties highlighted many of the pitfalls that were to be encountered. The expansion type of tie has been found to induce additional stresses into the masonry - similar to the expansion caused by the existing, rusting walls ties - and were costly to make and fit. The use of heavy section re-bars was soon outlawed because of the need for flexibility to allow the necessary differential horizontal and vertical movement between the two leafs of the wall. Generally, a connection between each leaf using a bar of 8 mm diameter or above was found to act like mini crowbars and would eventually work themselves loose. The introduction of BSI DD140, BRE Digest 329 and the more recent BRE Digest 401 at last gave guidance for manufacturers and specifiers of remedial wall ties.

THE SYSTEM

Dri Flex ties were developed as a result of the identified need to drill smaller holes in masonry to control the amount of spalling caused when drilling the near leaf. A large hole drilled through a brick using a SDS-plus hammer drill can result in up to half of it spalling away. This material can cause bridging of the cavity and moisture transfer, and leaves a much reduced fixing thickness for the near leaf connection. Drilling for the Dri Flex tie requires hole sizes reduced to between 5 mm and 7 mm, which dramatically reduces the spalling of the brick. Dri Flex offers the advantage of a non-expanding mechanical fixing to both the far and near leaf. Pre-installation testing should be performed to the requirements of local standards and technical help and advice is available. Because the fixing method employed does not induce additional stress into the substrate, Dri Flex can be used in many and varied materials, from poured concrete columns to Aircrete blocks, with satisfactory results. Edge distance spacings, so critical with any expansion-type fixing, are not a requirement with Dri Flex.

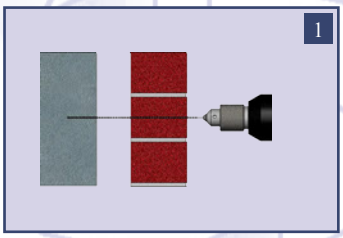
The design of Dri Flex remedial tie ensures that any potential for installer error can be minimised. The multiple drip design of each fin allows the Dri Flex to be installed at an angle of up to 25° towards the inner leaf without the possibility of any water transfer across the cavity. It is recommended that each Dri Flex is installed horizontally.



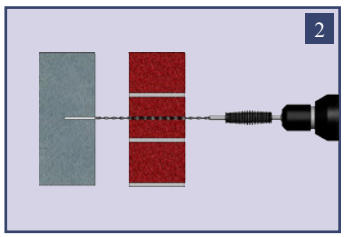
SPECIAL FEATURES

One piece design - no moving parts to lose
Immediate proof testing of connection
Multiple drip points to deter water transfer
Flexible design allows natural building movement
Fixes through insulation material
Minimal disfiguration to buildings
Fixes into all commonly found building materials
Quick and easy installation
Three different diameters for all applications

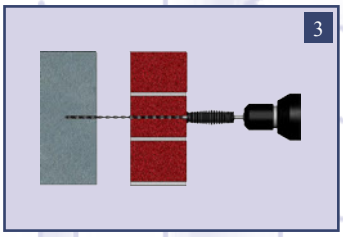
INSTALLATION PROCEDURE



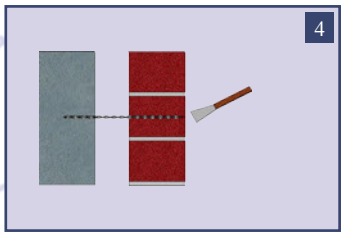
Drill a 5 mm to 7 mm pilot hole through the near leaf and into the far leaf, 15 mm deeper than the length of the Dri Flex tie being installed, using a rotary percussion drill. The hole should be 25 mm from the end of any brick and on its horizontal centre line.



Insert the Dri Flex tie into the Power Support Tool, offer the free end of the tie up to the hole in the near leaf and, using a SDS-plus hammer drill, drive the Dri Flex tie into the pilot hole.



Once the Dri Flex tie is installed into the near leaf pilot hole, it will proceed across any cavity and into the far leaf. The Dri Flex Power Support Tool is designed so that the end of the Dri Flex tie is set below the surface of the near leaf.



The near leaf pilot hole may then be filled with a mastic material and/or colour matched for an excellent finish.

THE MATERIALS

Dri Flex ties are manufactured from Grade 304 austenitic stainless steel. The 8 mm diameter Dri Flex has a tensile strength in excess of 10 kN. The manufacturing process produces very hard fins that are able to cut a thread into the hardest concrete, but maintains a very soft and flexible core. Dri Flex ties may also be used where there is a need for a fire resistance in excess of 30 minutes.

FIXING DENSITIES

In general terms the fixing densities for Dri Flex remedial wall ties would be the same as new build - 2.5 per m² or 450 mm vertically and 900 mm horizontally in a domino five pattern. This density would, however, be subject to on site testing to ensure that the required tensile loadings are being achieved. It should also be borne in mind that around all openings - doors and windows - ties should be installed at no more than 300 mm vertical centres and no more than 225 mm from the edge of the opening. BRE Digest 401 gives more information on the proof load test requirements.

If the masonry is so weak or friable that the required proof test load for standard density fixings cannot be achieved, it is quite acceptable to increase the density of Dri Flex ties to ensure that the overall loading per m² is achieved.

Lowering the installation density below the standard is not recommended.

The compact and balanced Dri Flex support tool

TESTING

Because Dri Flex ties cannot be randomly tested on site, it is necessary to perform comprehensive pre-installation tests.

There are several different methods of performing tests, but the most straightforward way is to drill into both leafs as described in the Installation Procedures section above. The near leaf hole may then be over-drilled to 12 mm. The Dri Flex tie should then be installed into the far leaf and a test performed using the Target Load Test Unit. The fixing capability into the near leaf material may ascertained by drilling into the near leaf as in the Installation Procedures section above and inserting the tie to a maximum depth of 80 mm and then test using a Target Load Test Unit. It is recommended that testing is performed in accordance with the requirements of BRE Digest 401. Only in exceptional circumstances does the proof test load requirement exceed 1 kN.

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Target Fixings Ltd

Resi Flex

Remedial Wall Tie

INTRODUCTION

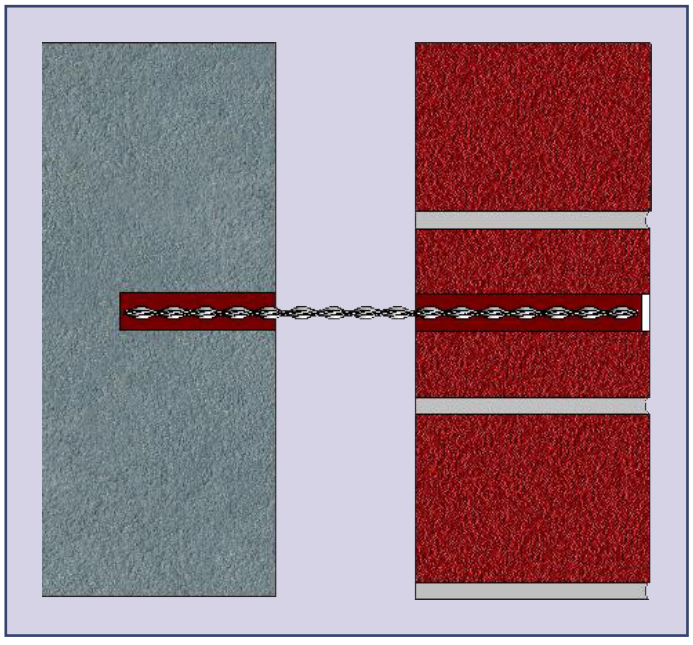
During the 1970's, research was conducted into the need for replacement wall ties. The actual durability of the protective zinc or galvanised coatings of the original built-in wall ties was studied and this now affects the design and use of walls ties for both new build and replacement. The results of the research was found to be quite beyond any previous expectations:

1. Vertical twist ties ("fish tails") were found to have a life expectancy of only 30 years - half of that originally intended.
2. Wire ties ("butterflies") were found to have a service life of only 15 years.
3. Mortar is alkaline which actually protects and enhances the working life of wall ties
4. A reaction between mortar and the air causes a process called carbonation which turns the mortar acidic which then attacks the wall ties.

Early attempts at producing a method for replacing existing wall ties highlighted many of the pitfalls that were to be encountered. The expansion type of tie has been found to induce additional stresses into the masonry - similar to the expansion caused by the existing, rusting walls ties - and were costly to make and fit. The use of heavy section re-bars was soon outlawed because of the need for flexibility to allow the necessary differential horizontal and vertical movement between each leaf. Using bars of 8 mm diameter or above was found to act like mini crowbars, and would eventually work themselves loose. The introduction of BSI DD140, BRE Digest 329 and the more recent BRE Digest 401 at last gave guidance for manufacturers and specifiers of remedial wall ties.

THE SYSTEM

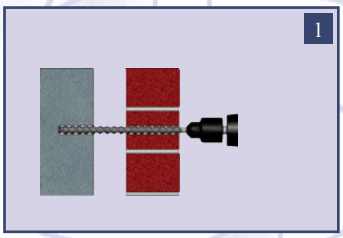
The Resi Flex system of wall tie replacement is available in 4.5 mm and 6 mm diameter. It offers the advantages of a non-expanding resin fix on both near and far leaf through a 10 mm rotary-percussion drilled hole - eliminating spalling of the brickwork. Proof testing of the far leaf using a Target Fixings Load Test Unit can be performed randomly as installation proceeds. Because the fixing method employed does not induce additional stresses into the substrate, Resi Flex can be used in many and varied materials, and by drilling with a rotary-percussion drill - a three jaw chuck - any spalling of the masonry is minimised thus eliminating the need for cavity clearance.
The design of the Resi Flex remedial tie ensures that any potential for installer error can be minimised. The multiple drip design of each fin allows the Resi Flex to be installed at an angle of up to 25° towards the inner leaf without the possibility of any water transfer across the cavity. It is recommended, however, that each Resi Flex is installed horizontally.



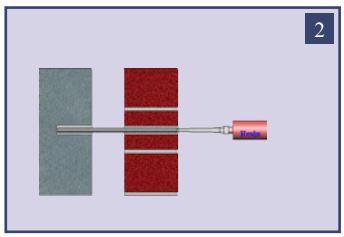
SPECIAL FEATURES

One piece design - no moving parts to lose
Simple proof testing of connection
Multiple drip points to deter water transfer
Flexible design allows natural building movement
Minimal disfiguration to buildings
Fixes into all commonly found building materials
Quick and easy installation
One diameter for all applications

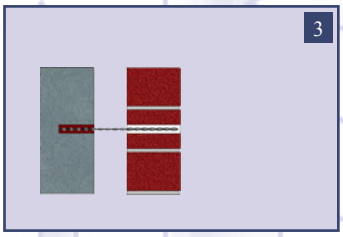
INSTALLATION PROCEDURE



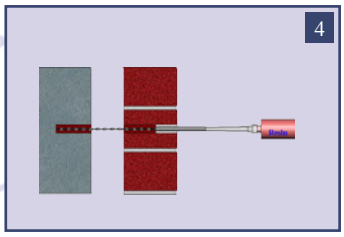
1. Drill a 10 mm hole for the 6 mm tie or a 8 mm hole for the 4.5 mm tie using a rotary percussion drill. The hole should be 25 mm from the end of any brick and on its horizontal centre line and penetrate 55 mm into the far leaf.
2. Thoroughly clean the holes in the near and far leaf using a hand pump to blow out debris.



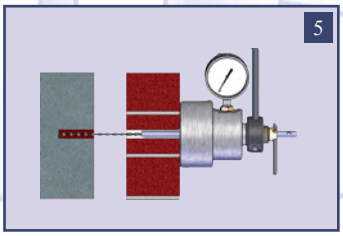
3. Using a resin nozzle extension inject Target Polyester Resin across the cavity and into the far leaf hole until it is full.



4. Insert the Resi Flex tie through the near leaf hole and into the far leaf hole allowing it to rotate as it is installed.



5. After leaving to gel for about 20 minutes, the holding capability can be checked using a Target Load Test Unit.
   As a general rule, a proof test load of about 1 kN in tension is an adequate bond.



6. After an acceptable proof test is performed, the near leaf connection is made using Target Polyester Resin. The brick may then be colour matched for a near-invisible finish.

THE MATERIALS

Resi Flex ties are manufactured from Grade 304 austenitic stainless steel. The 6 mm diameter Resi Flex has a tensile strength in excess of 1 kN. The manufacturing process produces fins that act as multiple drip points across the length of the tie, and a flexible core to allow normal movement. The fixing in both leafs may also be achieved by the use of Bond Flex XL cementitious grout. Where there is a need for a fire resistance in excess of 30 minutes, only Bond Flex XL Cementitious Grout should be used. Epoxy resins are not recommended for normal installation as it has been noted that many of these resins are not reliable due to their accurate mixing requirements. Epoxy resins should only be used when fixing into diamond drilled holes.

FIXING DENSITIES

In general terms, the fixing densities for Target Resi Flex remedial wall ties would be the same as new build - 2.5 per m² or 450 mm vertically and 900 mm horizontally in a domino five pattern. This density would, however, be subject to on-site testing to ensure that the required tensile loadings are being achieved.

It should also be borne in mind that around all openings - doors and windows - ties should be installed at no more than 300 mm vertical centres and no more than 225 mm from the edge of openings. BRE Digest 401 gives more information on the proof test load requirements. If the masonry is so weak or friable that the required proof test load for standard density fixings cannot be achieved, it is quite acceptable to increase the density of fixings to ensure that the overall loading per m² is achieved. Lowering the density below the standard is not recommended.

TESTING

It is recommended that testing is performed in accordance with the requirements of BRE Digest 401. This publication gives a wind zone chart and the various proof test requirements for different parts of the country in differing situations. Most of the information is in table form which negates the need for complicated calculations. It must be understood that wall ties are designed as load sharing devices and as such there is no necessity to have a high point loading on any individual tie. Only in exceptional circumstances does the proof test load requirement exceed 1 kN.

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Target Fixings Ltd

Cemen Flex

Brief

INTRODUCTION

During the 1970's, research was conducted into the need for replacement wall ties. The actual durability of the protective zinc or galvanised coatings of the original built in wall ties was studied and this now affects the design and use of walls ties for both new build and replacement. The results of the research was found to be quite beyond any previous expectations:

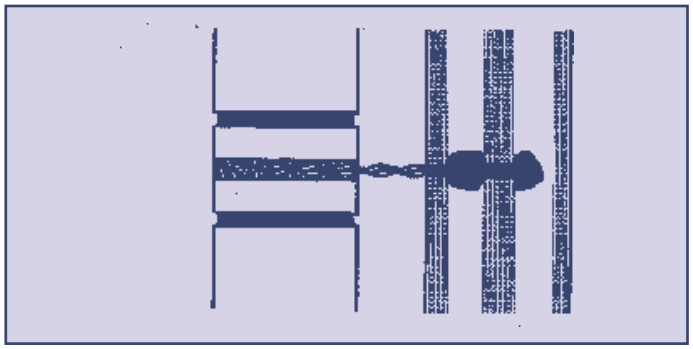
1. Vertical twist ties ("fish tails") were found to have a life expectancy of only 30 years - half of that originally intended.
2. Wire ties ("butterflies") were found to have a service life of only 15 years.
3. Mortar is alkaline, which actually protects and enhances the working life of wall ties
4. A reaction between mortar and the air causes a process called carbonation, which turns the mortar acidic, which then attacks the wall ties.

Early attempts at producing a method for replacing existing wall ties highlighted many of the pitfalls that were to be encountered. The expansion type of tie has been found to induce additional stresses into the masonry - similar to the expansion caused by the existing, rusting walls ties - and were costly to make and fit. The use of heavy section re-bars was soon outlawed because of the need for flexibility to allow the necessary differential horizontal and vertical movement between each leaf. Generally, a connection between each leaf using a bar of 8 mm diameter or above was found to act like mini crowbars and would eventually work themselves loose. The introduction of BSI DD140, BRE Digest 329 and the more recent BRE Digest 401 at last gave guidance for manufacturers and specifiers of remedial wall ties.

THE SYSTEM

The Cemen Flex system of wall tie replacement is available in 8 mm diameter. It offers the advantages of a contained cement grout fixing on the far leaf and a cement grout fixing on the near leaf. Proof testing of the far leaf using a Target Load Test Unit can be performed randomly 24 hours after installation. Because the fixing method employed does not induce additional stresses into the substrate Cemen Flex can be used in many and varied hollow materials, such as clay pots, with satisfactory results and there is no concern to achieve the required edge distance spacings necessary with any expansion fixing.

The design of the Cemen Flex remedial tie ensures that any potential for installer error can be minimised. The multiple drip design of each fin allows the Retro Flex to be installed at an angle of up to 25 towards the inner leaf without the possibility of any water transfer across the cavity. It is recommended that each Cemen Flex is installed horizontally.



TESTING

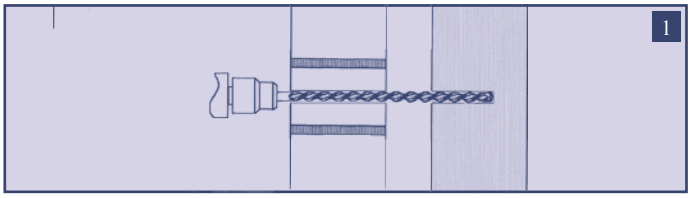
It is recommended that testing is performed in accordance with the requirements of BRE Digest 401. This publication gives a wind zone chart and the various proof test requirements for different parts of the country in differing situations. Most of the information is in table form which negates the need for complicated calculations. It must be understood that wall ties are designed as load sharing devices and as such there is no necessity to have a high point loading on any individual tie. Only in exceptional circumstances does the proof test load requirement exceed 1 kN.

SPECIAL FEATURES

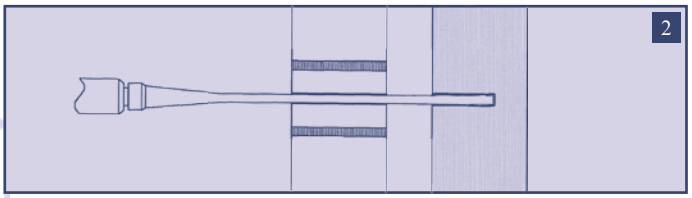
One Piece design - no moving parts to lose
Random Proof testing of connection
Multiple Drip points to deter water transfer
Flexible design allows natural building movement
Minimal disfiguration to buildings
Fixes into all commonly found building materials
Quick and easy installation
One diameter for all applications.

INSTALLATION PROCEDURE

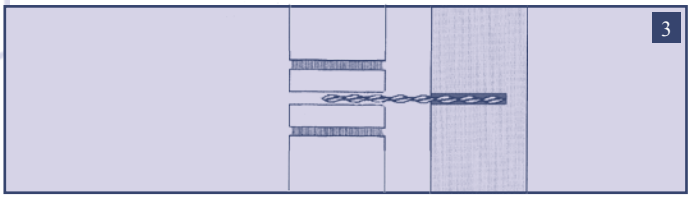
1. **Drill a 12-13 mm hole for the 8 mm tie using a SDS hammer or rotary percussion drill. The hole should be 25 mm from the end of any brick and on its horizontal centre line and penetrate 70 mm into the far leaf.**
2. **Thoroughly clean the holes in the near and far leaf using a hand pump to blow out debris and wash out with clean water.**



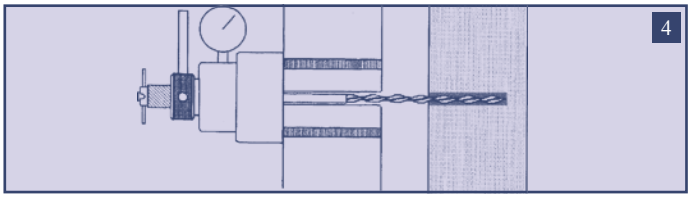
3. **Using a Cem Flex extension nozzle inject Bond Flex Cementitious Grout across the cavity and into the far leaf hole until it is full.**



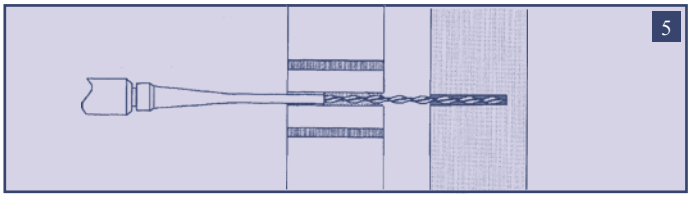
4. **Insert the Cemen Flex tie through the near leaf hole and into the far leaf hole using the special tool allowing it to rotate as it is installed.**



5. **After leaving to cure for 24 hours the holding capability can be checked using a Target Load Test Unit. As a general rule, a proof test load of about 1 kN in tension is an adequate bond.**



6. **After an acceptable proof test is performed the near leaf connection is made using Bond Flex Cementitious Grout. The brick may then be colour matched for a near invisible finish.**



FIXING DENSITIES

In general terms, the fixing densities for Cemen Flex remedial wall ties would be the same as new build - 2.5 per m² or 450 mm vertically and 900 mm horizontally in a domino five pattern. This density would, however, be subject to on site testing to ensure that the required tensile loadings are being achieved. It should also be borne in mind that around all the openings - doors and windows - ties should be installed at no more than 300 mm vertical centres and no more than 225 mm from the edge of the opening. BRE Digest 401 gives more information on the proof test load requirements.

If the masonry is so weak or friable that the required proof test load for standard density fixings cannot be achieved, it is quite acceptable to increase the density of fixings to ensure that the overall loading per m² is achieved. Lowering the density below the standard is not recommended.

THE MATERIALS

Cemen Flex ties are manufactured from grade 304 austenitic stainless steel. The 8 mm diameter Cemen Flex has a tensile strength in excess of 11.5 kN. The manufacturing process produces fins that act as multiple drip points across the length of the tie, and a flexible core to allow normal movement.

Where there is a need for a fire resistance in excess of 30 minutes, only Bond Flex XL Cementitious Grout should be used. This is usually the case with high rise and multi-occupied buildings.

NOTE:

Bond Flex Cementitious Grout should not be used in diamond drilled holes as the smooth edges will not allow sufficient bonding.

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Target Fixings Ltd

Tim Flex

New Build Timber Frame Wall Tie

INTRODUCTION

Timber framed buildings have always presented a need to re-think how external skins of masonry are attached to the inner leaf i.e. the timber frame. Lack of, or inadequate fixing of ties, has been one reason why this method of construction attracted much adverse publicity in the past.

The Tim Flex tie overcomes a number of the problems that occurred due to ties being attached solely to the sheathing, ties fixed with plasterboard nails instead of screws or ties fixed in incorrect positions for bedding into mortar joints. The Tim Flex either fixes correctly or does not fix at all and is installed as the brickwork progresses.

The increased speed of construction using the timber frame system is complemented by using the Tim Flex tie. During the construction of the outer leaf, the Tim Flex tie is laid over the top of the masonry and hammer-driven into the timber frame. Where insulation panels are to be included within the wall cavity an insulation retaining clip is easily attached to the Tim Flex and 'wound' along the tie to hold the insulation panels securely in position.

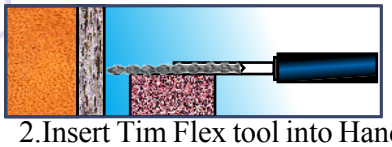
Both the design and manufacturing process of the Tim Flex ensure that flexibility of the tie is maintained to accommodate all normal building movements, yet is capable of transferring imposed loads in both tension and compression in cavity widths of up to 140 mm at normal densities.

For information regarding use of the Tim Flex ties in cavities over 140 mm please contact our Technical Department.

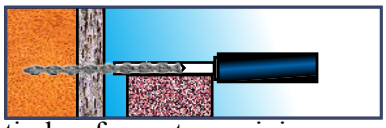
THE SYSTEM

The Tim Flex system of timber frame wall tie installation offers the advantages of a non-expanding mechanical fixing on the far leaf and a mortar fixing on the near leaf. Proof testing of the far leaf using a Target Fixings Universal Test Unit can be performed randomly as installation proceeds. Because the fixing method employed does not induce additional stresses into the substrate and it has a small diameter core, the Tim Flex complies with current timber codes and overcomes the possibility of splitting timbers.

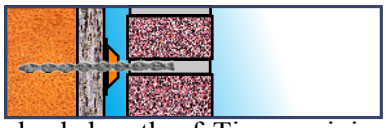
The design of the Tim Flex remedial tie ensures that any potential for installer error can be minimised. The multiple drip design of each fin allows the Tim Flex to be installed at an angle of up to 25° towards the inner leaf without the possibility of any water transfer across the cavity. It is recommended that each Tim Flex is installed horizontally.



1. Build up outer leaf to the level at which the wall tie is required.
2. Insert Tim Flex tool into Hand Support Tool and place horizontal on top of outer leaf masonry.



3. Use hammer to **gently** drive Tim Flex Tie into Inner leaf timber frame to a minimum penetration of 40 mm.



4. Remove Hand Support Tool leaving tie in place and check length of Tie remaining on outer leaf masonry. A minimum of 70 mm embedment is required in mortar joint.
5. Apply mortar to bed joint, covering Tie, and continue to build up until next level of Ties is required.

TESTING

It is recommended that testing is performed in accordance with the requirements of BRE Digest 401. This publication gives a wind zone chart and the various proof test requirements for different parts of the country in differing situations. Most of the information is in table form, which negates the need for complicated calculations. It must be understood that wall ties are designed as load sharing devices and as such there is no necessity to have a high point loading on any individual tie. Only in exceptional circumstances does the proof test load requirement exceed 1 kN per tie.

SPECIAL FEATURES

One piece design - no moving parts to lose
Immediate proof testing of connection
Multiple drip points to deter water transfer
Flexible design allows natural building movement
Fixes through insulation material
Quick and easy installation

Target Fixings Ltd

Fast Flex

Timber / Aircrete Fixings

INTRODUCTION

Fast Flex fixings offer the ease of use of a nail but the fixing capabilities of a screw and plug. They are available in two diameters - 6 mm and 8 mm - and a range of lengths from 50 mm. When fixing timber to Aircrete (ACC) blocks, using the 8 mm diameter Fast Flex, there is generally no need to pre drill.
Fast Flex may also be used for fixing into hard materials. A small pilot hole may be drilled through the timber and into the brickwork or concrete behind, the Fast Flex 6 mm is then simply driven home.
Because of their design, there is minimal finishing required once they are driven home. The Grade 304 stainless steel ensures that there is no unsightly staining or streaking of surface finishes, and they are not affected by any aggressive timber treatments.

PERFORMANCE REQUIREMENTS

Loading requirements to resist the wind suction based on CP3, Chapter V, Part 2, 1972, are given in the tables on Information Sheets TBF1 & TBF2, along with the minimum penetration depths, timber thickness and spacing guidance.
Testing of Fast Flex is possible using THE Target Load Test Unit to ensure that the correct tensile loading is achieved.

FIXINGS DETAILS

Fast Flex fixings can be used to fix battens, skirting, dado rails or door frames on to Aircrete blocks. They may be painted directly without fear of staining.
Fast Flex are also to be recommended when fixing through insulation materials. They offer a 'stand-off' fixing that will not crush the insulant even if they are over hit; and being stainless steel they may be used externally at will offering a good method of increasing thermal insulation on solid walls.
Battens for vertical tiling may be fixed either directly to the bricks / blocks or through the insulation material. Generally, the batten thickness will need to be a minimum of 25 mm, although 19 mm can be used in special circumstances. This not only ensures a good 'pull-through' value at the batten / fixing connection, but also allows an 'improved' nail to be used to additionally fix into the batten.
The fixing embedment into the brick, block or concrete will depend on the strength of the material, the wind loading and the weight to be supported. As a rule of thumb, concrete requires 30 mm, brick; 50-70 mm and Aircrete; 70+ mm. Reference should be made to Information Sheets TBF1 & TBF2, and the use of a load test unit should be considered.

SPECIAL FEATURES

Direct one-piece fixings into masonry
Drive like nails - grip like screws
Excellent end-grain fixing
Bridges gaps - no need for packing
Fixes firmly through insulation

ADDITIONAL USES

Fast Flex can be used in many unique and fascinating ways. They may be driven into the bottom of posts to fix them securely into a poured concrete base. Their design allows them to be placed very close to edges without danger of splitting the timber.
When fixing timber posts for gates or fences to brickwork, the Fast Flex offers an easy solution. A 5-6 mm pilot hole is drilled through the post and into the masonry whilst holding the post securely up against the wall, and then hammering the Fast Flex straight into the hole. Because they are stainless steel, there is no finishing requirement to resist and future possible corrosion.
Fast Flex may also be used to fix softwood noggins or rails into timber frames without splitting the timber or requiring and drilling.
Door frames can be similarly fitted to Aircrete blocks by staggering the fixings up it's length without danger of splitting the blocks as can occur with expansion type fixings.

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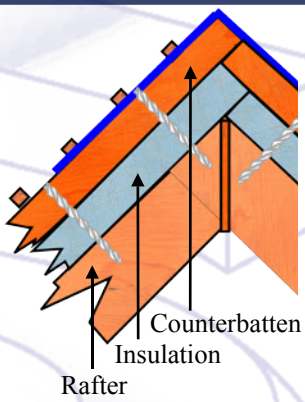
Target Fixings Ltd

Skew Fast

Warm Roof Fixings

INTRODUCTION



The pitched warm roof method of insulation has established itself very rapidly. With insulation fixed over the rafters, using counterbattens to hold it in place, the whole of the loft area is kept warm and dry. The need for water tanks and pipes to be additionally insulated is no longer necessary.

By using the Target Fixings Skew Fast insulation fixings to fix the counterbattens over the insulation, the counterbattens effectively become the rafters. Tile or slate battens can be fixed back to the counterbattens in the standard, and accepted, manner - subject to the relevant timber codes.

With a very small effective core diameter, the Grade 304 stainless stainless steel Skew Fast can be used in timber widths of 30 mm or below. The diameter does not increase with length, still allowing conformation with CP112:1972, something not possible with a conventional nail of equivalent length.

PERFORMANCE REQUIREMENTS

There are two basic elements that need to be considered when designing the fixing detail of warm roofs. The wind suction loading is determined by the location of the structure within the UK, the slope of the surrounding land and the structure's overall height. Because of the crushable nature of the insulation material, there is an inherent sliding load. The factors that determine the sliding loads are the thickness of the insulation, the slope of the roof and the weight of the roof covering materials. The fixing design will need to address all these factors.

FIXING DENSITY TO RESIST WIND LOADS

C.P. 3 Chapter V, Part 2, 1972 and amended in 1986, describes a wind exposure chart which is reproduced in Figure 1.

Wind zones A, B and C are defined as follows:

Wind zone A - Basic wind speed up to 44 m/s

Wind zone B - Basic wind speed of 44 to 52 m/s

Where the structure is in excess of 15 m high, the fixing density must be factored by 1.52.

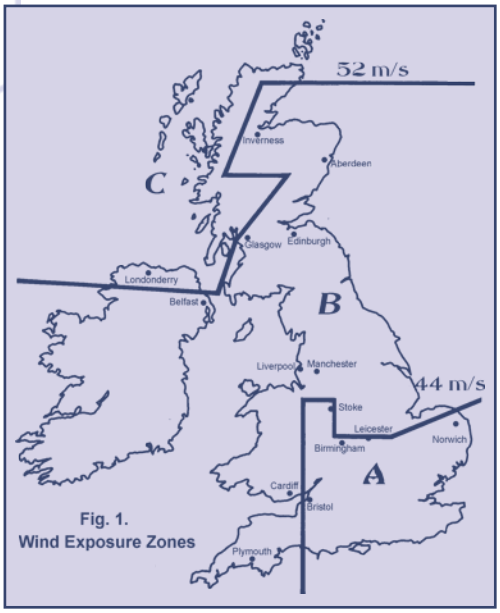


Fig. 1.
Wind Exposure Zones

FIXING DETAILS

The length of the fixing is calculated by the total thickness of material build-up above the rafter plus an additional 35 mm for softwood rafters, or 25 mm for hardwood rafters. Additional length must be allowed for if the rafters have a bow - as is common in barn conversions.

The Skew Fast is driven like an ordinary nail, but screws through the counterbatten and into the rafter as it is driven.

The thickness of the **counterbatten** will need to be carefully considered. If the thickness of 37+ mm is selected, the tile batten may be fixed using an ordinary clout nail. For 25 mm to 36 mm thickness, an improved nail (e.g. 'ring shank') must be used. For counterbattens less than 24 mm thick, consideration should be given to fixing through the tile batten and counterbatten in one single fixing operation using a longer Skew Fast.

The tendency for any **sliding load** may be decreased by the introduction of a **stop-batten**, usually at eaves level. The stop-batten would need to be the same thickness as the insulation material and is inserted in place of the insulation and is then structurally fixed to the rafters. The counterbattens are then fixed directly on top of the stop-batten. If the roof is long, over 8 m from eaves to ridge, an additional stop-batten should be introduced at the mid point.

A stop-batten allows the use of much thicker insulation materials without the need for a greatly increased fixing density.

Table 1 - Number of Skew Fast per m² required to resist Wind suction

Wind Zone	Slope of Land within 1 km	Suction kN/m²	Batten Thickness mm		
			25	37	50
A	Up to 1:20	2.5	4.0	3.0	2.0
	1:20 to 1:12.5	3.5	6.0	3.5	2.5
	No Limit	4.7	7.5	5.0	3.5
B	Up to 1:20	3.5	6.0	4.0	3.0
	1:20 to 1:12.5	4.3	7.0	4.5	3.5
	No Limit	6.6	11.0	7.0	5.5
C	Up to 1:20	4.1	6.0	4.5	3.0
	1:20 to 1:12.5	5.0	8.0	5.5	4.0
	No Limit	7.6	12.5	8.5	6.0

The wind suction Table 1 takes account of the effects of the slope of the land within 1 km.
In the figures given, no account is taken of the positive effect of the weight of the roof covering.

Table 2i - Number of Skew Fast per m² required to resist Sliding Loads

FOR ROOFS WITHOUT STOP-BATTENS

Laid Tile Weights kg/m²	Insulation Thickness 36 - 50 mm								Insulation Thickness 51 - 75 mm								Insulation Thickness 76 - 150 mm							
	Roof Pitch								Roof Pitch								Roof Pitch							
	20°	30°	40°	50°	60°	70°	80°	90°	20°	30°	40°	50°	60°	70°	80°	90°	20°	30°	40°	50°	60°	70°	80°	90°
10	3.0	4.0	4.0	3.0	2.0	1.0	1.0	1.0	5.5	7.5	7.0	5.5	4.0	2.0	2.0	2.0	11.0	15.0	14.0	11.0	8.0	4.0	4.0	4.0
20	3.5	4.5	4.5	4.0	3.0	2.0	2.0	2.0	6.0	8.5	8.0	7.0	5.5	3.5	4.0	4.0	12.0	17.0	16.0	14.0	11.0	7.0	8.0	8.0
30	3.5	5.0	5.0	5.0	4.0	3.0	3.0	3.5	6.5	9.0	9.5	8.5	7.0	5.5	5.5	6.0	13.0	18.0	19.0	17.0	14.0	11.0	11.0	12.0
40	4.0	5.5	6.0	5.5	5.0	4.0	4.0	4.5	7.5	10.0	10.5	10.0	9.0	7.0	7.5	7.5	15.0	20.0	21.0	20.0	18.0	14.0	15.0	15.0
50	4.5	6.0	6.5	6.5	5.5	5.0	5.0	5.0	8.0	11.0	12.0	11.5	10.5	9.0	9.5	9.5	16.0	22.0	24.0	22.0	21.0	18.0	19.0	19.0
60	4.5	6.5	7.0	7.0	6.5	6.0	6.0	6.5	8.5	12.0	13.0	13.0	12.0	11.0	11.5	11.5	17.0	24.0	26.0	26.0	24.0	22.0	23.0	23.0
70	5.0	7.0	8.0	8.0	7.5	7.0	7.5	7.5	9.0	13.0	14.0	15.0	13.5	13.0	13.5	13.5	18.0	26.0	28.0	30.0	27.0	26.0	27.0	27.0
80	5.5	8.0	8.5	9.0	8.5	8.0	8.5	8.5	9.5	14.0	15.0	17.0	15.0	15.0	15.5	15.5	19.0	28.0	30.0	34.0	30.0	30.0	31.0	31.5
90	6.0	8.5	9.5	9.5	9.5	9.0	9.5	9.5	10.0	15.0	16.0	18.0	17.0	17.0	18.0	18.0	20.0	30.0	32.0	36.0	34.0	34.0	36.0	36.0
100	7.5	9.0	10.0	10.5	10.5	10.0	10.5	10.5	10.5	16.0	17.0	19.0	19.0	19.0	20.0	20.0	21.0	32.0	34.0	38.0	38.0	38.0	40.0	40.0

Table 2ii- Number of Skew Fast per m² required to resist Sliding Loads

FOR ROOFS WITH STOP-BATTENS

Laid Tile Weights kg/m²	Insulation Thickness 36 - 50 mm								Insulation Thickness 51 - 75 mm								Insulation Thickness 76 - 150 mm							
	Roof Pitch								Roof Pitch								Roof Pitch							
	20°	30°	40°	50°	60°	70°	80°	90°	20°	30°	40°	50°	60°	70°	80°	90°	20°	30°	40°	50°	60°	70°	80°	90°
10	3.0	4.0	4.0	3.0	2.0	1.0	1.0	1.0	3.0	4.0	4.0	3.0	2.0	1.0	1.0	1.0	5.5	7.5	7.0	5.5	4.0	2.0	2.0	2.0
20	3.5	4.5	4.5	4.0	3.0	2.0	2.0	2.0	3.5	4.5	4.5	4.0	3.0	2.0	2.0	2.0	6.0	8.5	8.0	7.0	5.5	3.5	3.0	3.0
30	3.5	5.0	5.0	5.0	4.0	3.0	3.0	3.5	3.5	5.0	5.0	5.0	4.0	3.0	3.0	3.5	6.5	9.0	9.5	8.5	7.0	5.5	5.0	4.0
40	4.0.	5.5	6.0	5.5	5.0	4.0	4.0	4.5	4.0.	5.5	6.0	5.5	5.0	4.0	4.0	4.5	7.5	10.0	10.5	10.0	9.0	7.0	7.0	6.0
50	4.5	6.0	6.5	6.5	5.5	5.0	5.0	5.0	4.5	6.0	6.5	6.5	5.5	5.0	5.0	5.0	8.0	11.0	12.0	11.5	10.5	9.0	8.5	8.0
60	4.5	6.5	7.0	7.0	6.5	6.0	6.0	6.5	4.5	6.5	7.0	7.0	6.5	6.0	6.0	6.5	8.5	12.0	13.0	13.0	12.0	10.5	10.5	9.5
70	5.0	7.0	8.0	8.0	7.5	7.0	7.5	7.5	5.0	7.0	8.0	8.0	7.5	7.0	7.5	7.5	9.0	13.0	14.0	15.0	13.5	11.0	11.0	10.0
80	5.5	8.0	8.5	9.0	8.5	8.0	8.5	8.5	5.5	8.0	8.5	9.0	8.5	8.0	8.5	8.5	9.5	14.0	15.0	17.0	15.0	14.0	13.0	11.0
90	6.0	8.5	9.5	9.5	9.5	9.0	9.5	9.5	6.0	8.5	9.5	9.5	9.5	9.0	9.5	9.5	10.0	15.0	16.0	18.0	17.0	16.0	14.0	12.0
100	7.5	9.0	10.0	10.5	10.5	10.0	10.5	10.5	7.5	9.0	10.0	10.5	10.5	10.0	10.5	10.5	10.5	16.0	17.0	19.0	19.0	17.0	16.0	15.0

Table 3 - Densities of Skew Fast per m² for Different Fixing Centres

Fixing Centres for Counterbattens or Tile Battens Gauge mm	Counterbatten / Rafter Centres mm			
	400	450	600	1200
100	25.0	22.0	16.6	8.0
125	200	17.5	13.0	6.5
150	16.5	14.5	11.0	5.5
175	14.0	12.5	9.5	4.5
200	12.5	11.0	8.0	4.0
225	11.0	9.5	7.0	3.5
250	10.0	8.5	6.5	3.0
275	9.0	8.0	6.0	3.0
300	8.0	7.0	5.5	2.5
325	7.5	6.5	5.0	2.5
350	7.0	6.0	4.5	2.0
375	6.5	5.5	4.5	2.0
400	6.0	5.5	4.0	2.0

Notes:

1. For insulation thickness of less than 36 mm, the 36-50 mm insulation thickness figures may be halved.
2. Calculations can also be performed online: www.targetfixings.com/**skewfastcalc**

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Corrosion properties of aluminium castings for automotive and marine applications

Astrid Bjørgum and Anne Lise Dons
SINTEF Materials Technology

Introduction

Due to high material thickness corrosion is not considered as a big problem for aluminium castings. Usually, corrosion resulting in small pits and discolouring in the outer surface can be accepted as long as the mechanical properties are not affected. Additionally, nice surface appearance is not questioned. Corrosion properties of aluminium castings are therefore not investigated to the same extent as wrought aluminium alloys, and few systematic investigations are available.
Due to global warming and other environmental problems, weight reduction of vehicles has become a demand. Weight reduction is achieved by introduction of light metal components resulting in an increased use of aluminium in the automotive industry. In future vehicles further weight loss reduction can be achieved by reducing the material thickness. Thus, corrosion properties will be of vital importance for the properties and life time of such components.
In the NorLight project Shape Castings of Light Metal corrosion properties of aluminium casting alloys of interest for the automotive industry are investigated. The effect of alloy composition, variation in microstructure and surface properties are focused.

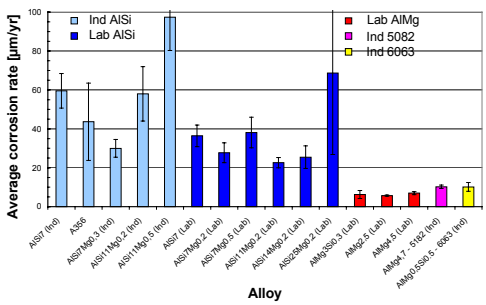
Test materials

Alloy	Foundry alloys		Laboratory cast alloys			
	DC cast alloys	Net shape castings	Unmodified variants	P(Cu) - modified	Sr modified	Mg content
AlSi	AlSi7 AlSi11	AlSi7 AlSi11	AlSi5 AlSi7 AlSi11 AlSi14 AlSi25	AlSi7 AlSi11 AlSi14 AlSi25	AlSi7	0,2 0,01 - 0.5 0,2 0,2 0,2
Alloy	DC cast alloys	Net shape castings	Laboratory variants	Si content	Mn content	
AlMg(Si)	AA6063 AA5082	AlMg3	AlMg2.5 AlMg4.5	0.1 - 0.8 0.2 - 1.2	0.2 - 1.0 0.3 - 1.3	

Corrosion testing
Corrosion testing is carried out by immersion in natural sea water and in an acetic acid acidified synthetic sea water solution (ASTM G85). Corrosion susceptibility is evaluated by weight loss measurements and pitting corrosion studies.

Results

Corrosion of AlSi and AlMg in natural sea water



As expected, AlMg(Si) alloys had low corrosion rates in natural sea water. The corrosion rate of AlSi castings were higher. The effect of Si on corrosion susceptibility of AlSi was not clear.

Addition of Mn and Si had a minor effect on corrosion susceptibility of AlMg(Si) although a distinct difference in microstructure was observed.

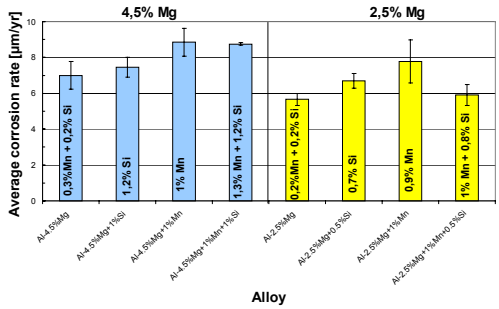
The effect of increased Mg content (0 - 0.5%) on AlSi alloys was negligible. Modification of AlSi had a minor effect on the corrosion susceptibility. An apparently increase in corrosion rate for P(Cu) modified alloys is probably resulted by the increase in Cu content.

Effect on environmental conditions on corrosion of AlMg and AlSi net shape castings

Differences in surface morphology had a negligible effect on corrosion susceptibility of AlSi in natural sea water. A more porous microstructure was probably the main reason for higher corrosion rate of net shape AlMg castings compared to machined AlMg castings.

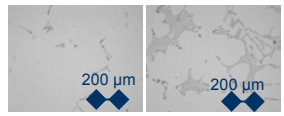
Exposure in the acidified SWAAT solution resulted in increased corrosion rates, particularly for the AlMg castings. The protective Mg containing oxide resulting in high corrosion resistance for such alloys in natural sea water, is not stable in acidic

Effect of Si and Mn on corrosion of AlMg(Si) in natural sea water

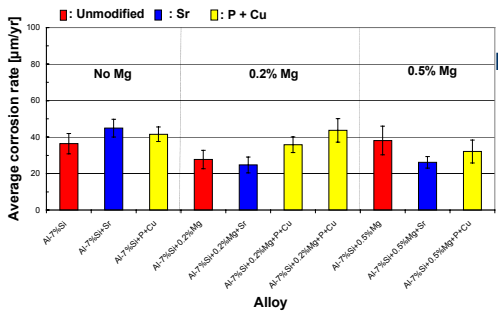


Microstructure of AlMg4.5

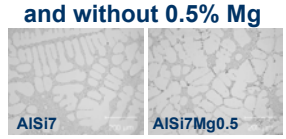
0.2% Si+0.3% Mn1% Si+1% Mn



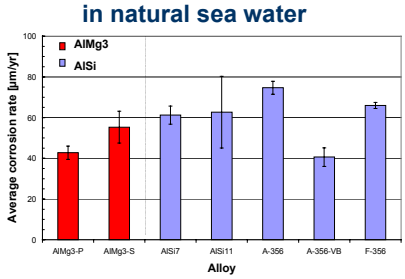
Effect of Mg and modification on corrosion of AlSi7 in natural sea water



Microstructure of AlSi7 with and without 0.5% Mg



Corrosion of net shape castings in natural sea water



Corrosion of net shape castings in SWAAT solution