

# **AIREY PRC HOUSES**

## **Reconstruction of PRC Houses Designated In 1984 Defective Houses Act**

PRC Repair Specification Number: 1.00  
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PRC House Type: Airey  
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## **SECTION 0 INTRODUCTION**

0.1 The objective of the Repair Works is to remove and replace precast concrete elements that form the external walls of the house with modern brick and block insulated cavity walls.\*

This will entail careful propping and demolition of the external walls, adjusting the width of the foundations and laying bricks and blocks with insulation and inserting new insulated windows and doors where the windows and doors formerly existed.

Some internal elements are to be replaced if found necessary on detailed inspection, however it is considered likely that the Party wall will be able to be retained between properties and that precast concrete spine walls will be retained subject to informed inspection and verification.

It is intended that the external walls will be built with facing brickwork for their full height.

There is no structural objection to the walls being of alternative facing materials e.g. block and render but mortgage providers have indicated a preference for a simple brick-clad elevation. It is intended that when the repair has been completed the result will be that the structure is adequate for continued use as a domestic dwelling for its normal life, subject to continued property inspection and maintenance.

0.2 The original construction consists of foundations of insitu concrete supporting external and load-bearing internal walls and flues.

The external walls consist of precast concrete closely-spaced storey-height wall columns (104mm x 57mm in cross section) reinforced longitudinally with a small diameter hollow steel tube, with thin concrete cladding panels fastened with copper wire to the columns, which were bedded onto the foundation slab. There is an internal spine wall constructed similarly with columns of 75mm x 57mm cross section. The first floor and roof structure is bolted to the columns.

The Party walls are of similar design to the external walls where precast concrete posts are placed at close centres. The ground floor is of solid concrete ground bearing construction.

The first floor is of Metsec joists and boarding with plasterboard ceiling. The ends of the joists are bolted to the columns. Timber pitched roof trusses at 1200mm centres form the roof construction spanning from the front to the rear external walls giving support to tiles and battens and ceiling in the form of timber purlins and timber intermediate rafters and ceiling joists in a traditional form of construction.

The vertical loading actions are resisted mainly by the columns in compression and the lateral racking forces by the cladding panels acting as shear walls.

The nature of the problem identified by BRE in the late 1970's /early 1980's relates to longitudinal cracking in the columns caused by carbonation of the precast concrete and subsequent corrosion of the steel tubes in the external Severe Exposure classification conditions. Expansion of corroded steel results in spalling and break-down of the concrete and loss of load bearing capability. In internal conditions (i.e. where the concrete elements are not subject to external weathering) a relatively low level of risk of corrosion of embedded steelwork exists even where the concrete cover to the steel is fully carbonated. Whilst significant levels of chloride ions have only been found in a small proportion of the external concrete cladding panels (and not in the concrete columns forming the external walls) it is recommended that a few of the retained (e.g. Party Wall) concrete columns should be checked for chloride ion content.

\* BRO29 "The structural condition of Airey prefabricated reinforced concrete houses"

## **SECTION 1 SCOPE**

1.0 The existing condition of the Airey house will be investigated by visual inspection and assessment of obvious distortion or deterioration, cracking of columns, particularly at the base of columns where they are visible in bathroom and kitchen windows etc., and recorded photographically and in writing, complete with measurements .

1.1 The system is for use on single houses of a pair, or each of a pair of houses. All external precast reinforced concrete (PRC) elements are to be removed and replaced. Internal elements in the Spine and Party Walls will be retained.

1.2 The system can apply where there are internal load-bearing and non-load-bearing walls of masonry or timber construction. Such walls will not require modification except to tie them to the new external wall construction.

1.3 The system can allow occupants to remain in residence. Whilst the impact of the repairs on the dwelling's habitability can be significant, decanting may not be necessary and will depend on the preferences of the residents.

1.4 Any additional works commissioned e.g. porches, extensions or the like fall outside the remit of this repair scheme.

1.5 The system **does** require statutory Building Regulations approval and may or may not require Planning Approval depending on the local requirements related to the appearance/elevations of the building. Building Regulations standards will be applied to all replacement elements of construction.

1.6 An Appointed Contractor will be referred to as the "Repairer". A Registered Practitioner (as defined by the PRC scheme) will be referred to as the "Designer". Where the Designer appoints the Repairer under direct contract, the Repairer must comply with the rules of the BRE Global certification scheme for the repair of PRC homes.

1.7 Should alterations be envisaged to his standard Repair Specification the Registered Practitioner will submit a modified Repair Specification for approval by BRE Global.

1.8 It is anticipated that this repair will take approximately 7 weeks to complete, with the major structural works taking 4-5 weeks and making good internally occupying the final 2 weeks.

1.9 It should be stressed that the effectiveness of this repair system and its ability to provide the intended future life for the property is dependent upon property inspection and maintenance being carried out, following completion of the repair works

1.10 If the visual inspection detailed in Section 2.0 reveals deterioration and/or significant structural related movement of parts of the building not covered by the PRC repair system, then a suitably qualified person must produce a scheme of works designed to rectify the problem.

1.11 Items which are not included in the repair system:-

- a) Insulation to roof spaces
- b) Kitchen fittings
- c) Bathroom fittings
- d) Central heating
- e) Re-roofing
- f) Internal decoration
- g) Internal door-sets/doors
- h) Plumbing
- i) Electrics
- j) Timber treatment
- k) Landscaping
- l) Garden walls/gates

**SECTION 2 INVESTIGATION AND TESTING**

2.0 If a Registered Practitioner requires it, investigation and testing may be carried out to verify the suitability of the repair system prior to the implementation of the works.

2.1 A visual inspection by the Registered Practitioner is to be performed in order to establish that no variation from the standard design has been carried out that is likely to affect the proposed repair method described in this document.

2.2 An appraisal of the property is required before the start of the remedial works. This appraisal will determine if there is any internal cracking of finishes, the degree of distortion of door frames, and the degree of deflection in the first floor construction, so that these can be compared to those on completion of the reconstruction work.

2.3 An investigation of the existing foundation details should be undertaken to determine foundation depths and widths. This will be done by excavating trial holes at the front and rear of the building and on the gable wall in order to expose the foundation profile and depth of concrete. This will determine whether the foundation has a raft or a strip footing (which, in either case, requires the foundation to be widened using the method shown on the drawing 8.3).

2.4 The following visual survey checklist shall be used:-

Description	Remarks
Is distress/differential settlement visible to any part of external envelope?	
Are the existing walls out of plumb and if so by how much?	
Is the external wall foundation a strip or part of a raft slab?	
Is distress/bowing/deflection visible in ground or first floors internally?	
Are internal door heads level? Are there any cracks across ceilings or above door heads?	
Is upper triangle of gable wall of timber frame with cladding or PRC construction?	
Is there any evidence of distortion/distress in the spine wall at ground and first floor levels and is the Party Wall in each storey and in the roof space giving evidence of deterioration/distress?	

### **SECTION 3 METHOD STATEMENT**

3.0 Full details of a Repairer's proposals for temporary support to the first floor and roof structures are to be submitted for approval by a Registered Practitioner prior to the use of propping on site. While a Repairer retains responsibility for the propping of the house, a Registered Practitioner will, where appropriate, inspect and advise as to the efficacy of the propping works.

3.1 As necessary a Repairer will disconnect plumbing, heating, gas and electrical services. Rising mains, meters/switch gear etc., in the vicinity of external walls shall be protected. The existing drains are to be tested for watertightness and any defective runs noted for repair by others or as an extension of the agreed works. Referring to Clause 1.3 above if the residents do desire to remain in occupation during the works the disconnection of services may prove to be a significant factor in their ability to remain in-situ.

3.2 A Repairer will remove and store all fixtures and fittings connected to external walls including sanitary-ware and kitchen fittings. See comment above and reference to Clause 1.3.

3.3 A Repairer will remove any lean-to structure or outbuilding with connecting roofs to external walls. These may be replaced by others or by the Repairer as an extension of the agreed works.

3.4 After widening the existing foundations as proves necessary, the external walls consisting of precast concrete cladding panels and precast concrete columns are to be carefully de-constructed and subsequently removed from site in an agreed sequence ensuring that the structure remaining is adequately propped.

3.5 The external walls will be rebuilt, in an agreed sequence, in masonry brick and block with an insulated cavity. The existing first floor joists and roof plates will be retained and supported on the new blockwork inner leaf utilising the bespoke steel ledger brackets to provide sound bearings before proceeding to the next wall in the agreed sequence (refer to Drawing No 8.2). Existing windows and both front and rear doors will be removed and new units installed together with all necessary DPC's and lintels. Attention is once again drawn here to Clause 1.3 and the habitability of the dwelling. All works are to be in accordance with the attached Drawing No. 8.2.

3.6 As new or widened foundations are used in the repair existing services and drains are to be bridged with concrete lintels and where necessary rainwater gullies and soil and vent pipe connections are to be repositioned.

3.7 A Repairer will reconnect plumbing, heating, gas and electrical services, rising mains, meters/switch gear as required.

3.8 A Repairer shall be required to maintain a photographic record of the works undertaken including as follows:-

- a) Trial hole excavations
- b) Existing front, rear and side elevations
- c) Any existing internal cracking around door heads and across ceilings
- d) Steel dowel pins used to connect new foundation concrete to the existing concrete footing and ground bearing slab as existing, and showing the trench widening.
- e) DPCs in walls near ground and above window and door heads
- f) New flexible sealant around windows and doors

3.9 A Repairer will remove all construction waste and leave the site clean and tidy.

## **SECTION 4 SPECIFICATION FOR MATERIALS AND CLADDING**

### **4.1 Foundations**

Trial Holes will be dug to ascertain the foundation profiles. Any degradation of the foundation concrete after 50 years of the life of the building so far, will be apparent. It would be on the basis of an examination of the degradation present that, for example, the Building Control Officer (BCO) could request that sulphate resisting cement should be used, or from a local knowledge of the presence of claystone. Foundation concrete shall be typically Grade 20/25 with a minimum cement content of 350 kg/m<sup>3</sup> and a maximum aggregate size of 20mm. The concrete grade used for foundations may be varied by the BCO to address aggressive ground conditions if necessary. Details of any grade change and the decision shall be noted on the foundation drawings.

Anchor bars between the existing and new foundation and existing are to be 12mm austenitic stainless steel dowel bars with a minimum content of 3% molybdenum 400mm long, and resin-cement grouted into existing foundations at 450mm centres.

### **4.2 Bricks.**

a) In addition to the requirements of b) below, clay bricks shall comply with BS EN 771-1. Common bricks, facing bricks and engineering bricks shall, depending on their use be considered as load bearing. Facing bricks shall in addition have a coloured and/or textured face as specified. Once a sample of these bricks has been approved by the Registered Practitioner, all subsequent bricks supplied to the site shall be of the same appearance and quality.

b) Before orders for clay bricks are placed, the Repairer shall satisfy the Registered Practitioner that the saturation rate of the brick, when determined according to the method set out in Special Publication No 56 by the British Ceramic Research Association does not exceed 1.5kg/m<sup>2</sup> minimum or that the Repairer is able to adjust the saturation rate so as not to exceed this value.

### **4.3 Mortar**

a) Cement: The cement used in mortars shall be:- Portland; Portland blast-furnace; or sulphate-resisting to conform to the requirements of BS EN197-1. Masonry cement shall not be used.

b) Lime: The lime used in mortar shall be high-calcium lime or semi-hydraulic lime to conform to the requirements of BS EN 459-1

c) Sand: The sand used in mortars shall comply with the requirements of BS EN 13139. Sand which has been in contact with sea-water shall not be used.

d) Water: Water shall be clean and free from any harmful impurity.

### **4.4 Admixtures**

Calcium chloride or additives based on calcium chloride, or any other chloride shall not be used.

### **4.5 Pigments**

Pigments shall conform to the requirements of BS EN 12878 and shall be premixed with the cement or the ready-mixed lime:sand, so as not to exceed 10% by weight of the cement in the mortar. Care should be taken to ensure that the strength of the mortar is equal to the requirements of BS EN 1996. Colouring agents based on carbon black shall not be used.

### **4.6 Plasticisers**

The use of plasticisers shall not be permitted unless approved by the Registered Practitioner.

### **4.7 Compressive Strength**

Tests on the compressive strength of site controlled mortars shall be carried out in accordance with the requirements of BS EN 1996

#### 4.8 Preparation

The proportions of the constituents in all mortars for brickwork shall be those given in BS EN 1996. Mortars other than cement mortar shall be prepared either by using a lime:sand mixture (coarse sand zone 2) or by mixing cement, dry hydrated lime and sand immediately before the water is added. Where practicable the constituents shall be made up by weight taking 1 m<sup>3</sup> of cement as 1440kg, 1 m<sup>3</sup> of lime as 575kg and 1 m<sup>3</sup> of dry sand as 1520kg. When the constituents are not batched by weight, gauge-boxes shall be used. Whichever method the Repairer chooses, it shall be used for the site control tests as specified below

When dry hydrated lime is used, whether batched by weight or by volume, the content of lime may be increased if desired by up to 50%.

Lime : Sand mixture (coarse) shall be made up in the proportions given in BS EN 1996 by thoroughly mixing dry hydrated lime:sand and water and it shall be protected from drying out. Ready mixed lime:sand for mortar, delivered wet to the site and complying with BS EN 998-2, may be used in accordance with the guidance notes given in Appendix A to that standard.

Cement and Lime:Sand: Immediately before the mortar is used, cement and lime:sand mixture shall be thoroughly mixed together in the proportions given in BS EN 1996 with sufficient water to give the workability required by the bricklayer. Wet ready-mixed retarded cement:lime:sand mixtures shall not be used.

Reconstitution: Mortars shall be used before the initial set takes place.- (normally this is within 2 hours of the cement and water being added). Any mortar left after this time shall be discarded; on no account shall mortars be reconstituted.

Cleanliness: All plant and equipment used for mixing and transporting shall be kept clean. All such containers shall be thoroughly washed out whenever mixing ceases or whenever there is a change of mix.

Mixing: All mortars shall be thoroughly mixed together by mechanical means. Mortars mixed by hand shall not be used.

#### 4.9 Ancillary Components

Ancillary components shall conform to the requirements of BS EN845-1.

Wall ties shall be stainless steel double twist type, unless otherwise stated. The ties shall be of sufficient length to ensure a minimum embedment of 50mm in the outer and inner leaves of the cavity walls

Damp proof courses shall be to BS 6515 as shown on the Registered Practitioner's drawings.

#### 4.10 Storage of Materials

Bricks and blocks shall be carefully unloaded to minimise damage and placed on the site in different stacks according to strength and marked accordingly, on prepared areas free from clinker or ashes. The stacks or packs shall be protected from rain and snow.

Cement shall be stored off the ground in a dry structure so as to permit inspection and use in the order of delivery. Separate storage, clearly marked, shall be provided for different cements. Cement which has been adversely affected by dampness shall not be used.

Hydrated lime shall be stored in the same way as cement.

Sand shall be stored separately, according to type on hard paved areas where it will not become contaminated.

The Lime:Sand mixture shall be stored separately according to type, on hard paved areas where it will not become contaminated and it shall be protected from drying out.

Rolls of DPC materials shall be so stored to avoid damage and distortion.

#### 4.11 Accuracy of Construction

Horizontal dimensions shall be set out with steel tape supported throughout its length. Angles set out by measurement or by builder's square shall be checked by theodolite. Where components such as windows and doors are not built in as the work proceeds, the openings to receive such components shall be accurately formed by using jigs and templates. If the residents remain in occupation during the works (Clause 1.3) leaving door and window openings without the window and door components built in will not be possible. All brickwork and blockwork shall be built to the tolerances given below. The method of controlling accuracy and setting out shall be in accordance with BS 5606:

- a) Length: Up to and including 5m  $\pm$ 10mm; over 5m up to and including 10m  $\pm$ 15mm
- b) Level of bed joint (at story height):
  - In any 3m length of wall  $\pm$ 10mm, In any wall  $\pm$  20mm
  - Errors of level are not to be cumulative over the height of a building
- c) Height: Up to 6m  $\pm$  20mm
- d) Straightness: In any 5m (not cumulative)  $\pm$  7mm
- e) Verticality: In any 600mm  $\pm$  5mm, In any 3m  $\pm$ 10mm

No brickwork or block-work shall deviate more than 30mm from the vertical in its full height.

#### 4.12 Bricklaying

Brickwork should be installed in accordance with the requirements of BS EN 1996-1

When the saturation rate of clay bricks exceeds 1.5kg/m<sup>2</sup> minimum, the suction rate of such bricks shall be adjusted by light wetting so as not to exceed 1.5kg/m<sup>2</sup> minimum, care should be taken to avoid frost damage during very cold weather.

All bricks shall be laid on a full bed of mortar. All cross joints, perpends and collar joints (those parallel to the outside face) shall be solidly filled with mortar. Single-frogged bricks shall be laid frog uppermost and double frogged bricks shall be laid with the deeper frog uppermost. All frogs shall be filled with mortar.

Brickwork built with standard 65mm bricks shall rise at the rate of four courses to 300mm. The height of brickwork built in a day shall not exceed 1.5m (twenty courses of standard bricks) without prior permission of the Registered Practitioner.

Cutting of bricks shall be kept to a minimum and special or standard - special bricks shall be used to maintain bond. When cutting of units is necessary, a bolster shall be used in preference to a trowel. No cutting of high strength perforated bricks shall be allowed except by the use of a carborundum wheel.

Sleeves and holes through walls shall, as far as possible be provided during the building of brickwork. Chasing of completed walls or the cutting of holes through walls shall be carried out only in positions specified by the Registered Practitioner or agreed by him in writing and then only by using a tool designed to cut the bricks cleanly. No horizontal or diagonal chases shall be permitted.

Ties shall be placed as the work proceeds and set level or with a slight downward slope toward the outside leaf.

The cavity shall be kept clear of mortar or detritus as the work proceeds by the use of battens. Mortar droppings reaching the base of the cavity shall be removed daily through temporary openings. Cavity trays must not be damaged when cleaning mortar from temporary openings.

Where cavity DPC's are incorporated weep holes shall be provided through the outer skin at intervals not greater than 900mm horizontally. Weep holes shall be formed by building-in proprietary plastic weep-holes in perpends.

All damp-proof courses shall be bedded on a thin bed of mortar in accordance with BS EN 1996-1.

#### 4.13 Protection Against Weather

Frost: The Repairer shall be responsible for avoiding the harmful effects of frost. The Repairer shall use air-entraining agents only when specified by the Registered Practitioner. Frost-resisting additives based on calcium chloride, shall not be used.

Rain: Brickwork shall be protected to prevent rain falling directly on its top surface or water being channeled into it until the work has its finally intended protection. It is particularly important to ensure that perforations and frogs are not allowed to fill with water. In any period of interruption through rain, and at the completion of each day's bricklaying, freshly laid brickwork and block-work shall be suitably protected.

#### 4.14 Site Control tests

When requested, the Repairer shall prepare mortar cubes and arrange for their testing by an independent laboratory.

Four 100mm mortar cubes shall be prepared on site from mortar taken from the mixer, when requested. The Repairer shall record the date of preparation and the position in the work to which the samples relate. Specimens shall be made, stored and tested for strength in accordance with BS EN 1015, half at 7 days and half at 28 days.

Requirements to pass are based on the 28 day tests the results of which shall be deemed to pass if the average strength exceeds the site value for this stage given in BS EN 1996.

In the event of the 28 day site sample failing to meet the requirements, the Repairer, shall, if required by the Registered Practitioner, take down and rebuild any work affected.

When the average strength of the site samples tested at 7 days exceeds the appropriate 7 day strength in BS EN 1996, the work may proceed while awaiting the results on the 28 day tests.

In the event of the 7 day strengths failing to meet this requirement by a margin not greater than 10%, the Repairer may elect to continue work at his own risk while awaiting the results of the 28 day tests, or take down the work affected.

**SECTION 5 INSPECTION SCHEDULE**

Inspection Schedule for Registered Practitioner (Inspector)

The inspection schedule is divided into three site visit sized sections and critical stages of construction.

Description	Remarks
<p><b>FIRST VISIT</b>            Is ground bearing adequate where new foundations are required?</p> <p>Have existing/drain/services been properly bridged or repositioned.</p> <p>Have all fixtures and fittings connected to external walls been removed/made safe?</p> <p>Have adjacent lean-to structures/outbuildings been removed?</p> <p>Have 100mm x 100mm head and sole plates with Acrow props at max 950mm centres been installed? Are the upper storey props located directly above the lower storey props? Are they positioned adjacent to the load bearing elements to be removed? Is propping adequate to the situation?</p>	
<p><b>SECOND VISIT</b>            Have new foundations been correctly excavated and concreted to the approval of the Building Inspector and in accordance with the drawings?</p> <p>Have first floor joists been securely fixed to inner skin blockwork via timber plate and steel bracket?</p> <p>Have DPC's been properly provided?</p> <p>Is cavity insulation fixed securely to ensure residual clear cavity?</p> <p>Have roof timbers been soundly located on to new inner skin blockwork?</p> <p>Have steel lintels been provided with cavity tray DPC's and windows surrounded with vertical DPC's?</p>	
<p><b>THIRD VISIT</b>            Have windows and door frames been properly weatherproofed with a suitable sealant?</p> <p>Have Acrow props been removed?</p> <p>Are there any new settlement cracks visible internally especially around doors and windows?</p> <p>Is the site clean and tidy?</p>	

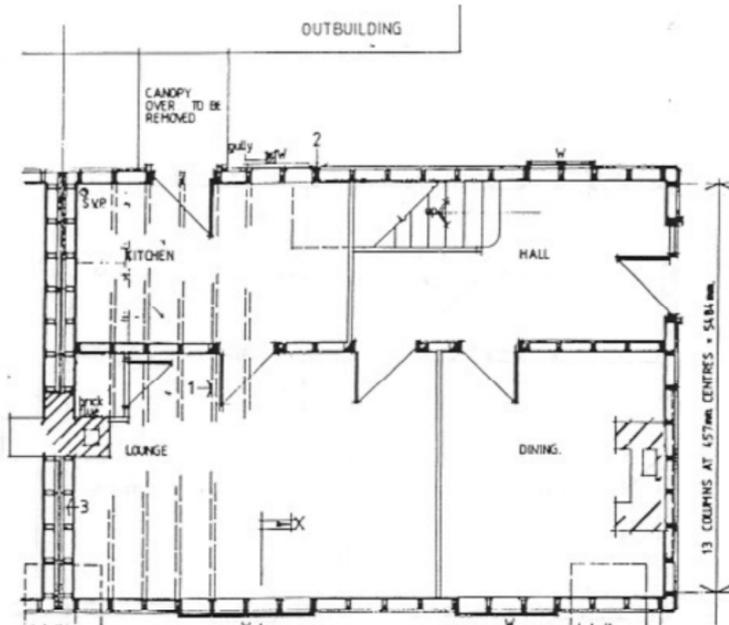
**SECTION 6 GENERAL ARRANGEMENT DRAWINGS**

**DRAWING 6.1**



NOTE: There are variations in these elevations notably where they have been designated North and South Facing but in essence the designs are similar but to some extent handed

**TYPICAL EXISTING ELEVATIONS**

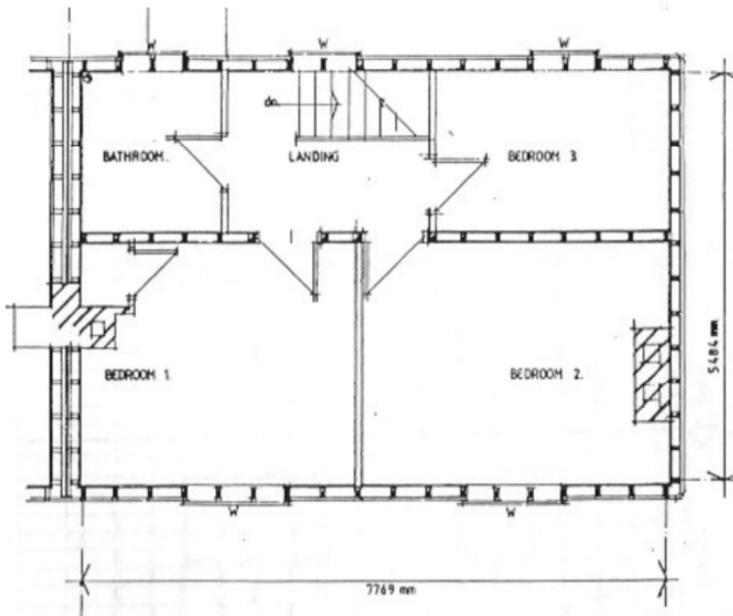


**DRAWING 6.2**

**TYPICAL EXISTING PLANS**

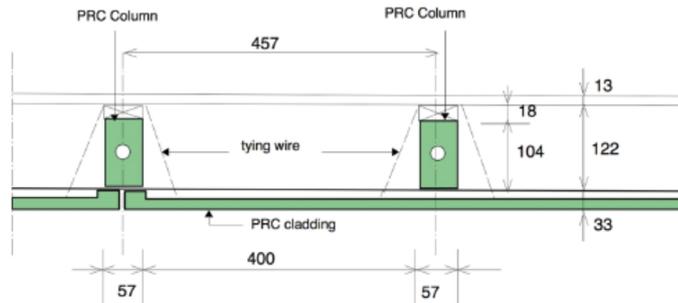
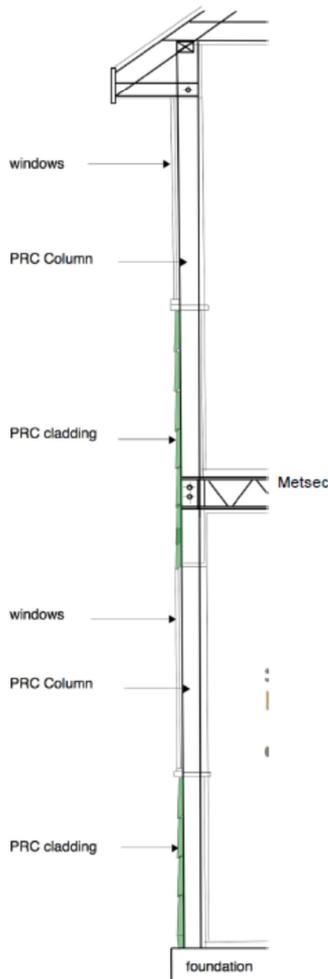
**GROUND FLOOR PLAN**

NOTE: There are variations in these Plans notably where they have been designated North and South Facing but in essence the designs are similar but to some extent handed



**FIRST FLOOR PLAN**

**SECTION 7 EXISTING STRUCTURE DRAWING 7.1**

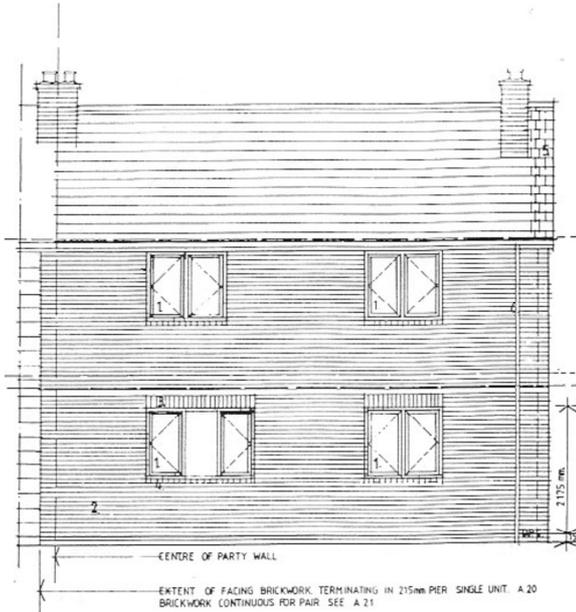


**SECTION THROUGH EXISTING EXTERNAL WALL CONSTRUCTION**

**SECTION THROUGH EXISTING EXTERNAL WALLS**

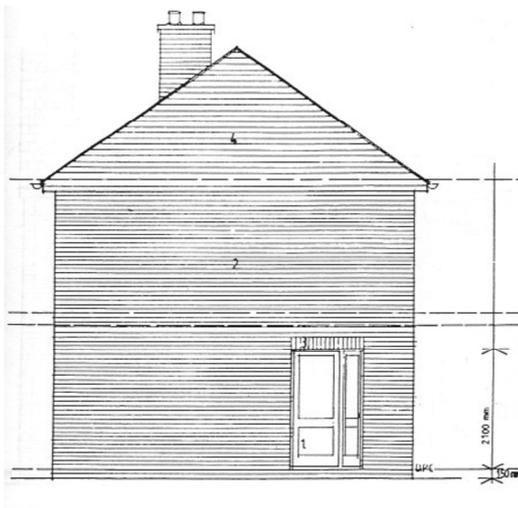
**GABLE WALL SIMILAR**

**SECTION 8 PROPOSED STRUCTURE**  
**DRAWING 8.1 Proposed Elevations Semi Detached House**



1. Replacement window
2. Facing brick clay stock to suit locality
3. Brick-on-end soldier course, contrasting brick
4. Plinth header, contrasting brick
5. Roof tiling extended to cover reconstructed gable
6. New RWP and guttering

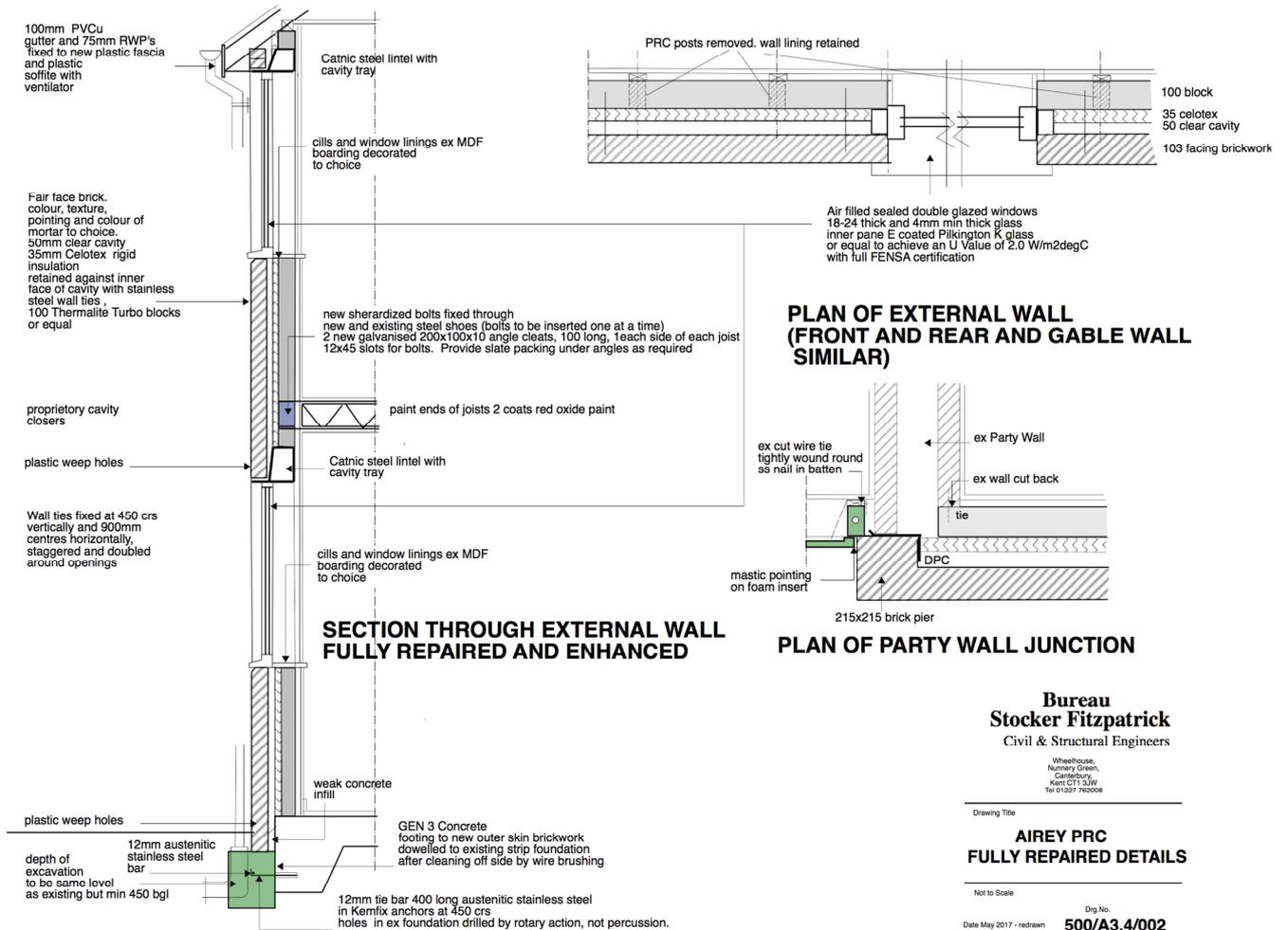
NOTE: There are variations in these elevations notably where they have been designated North and South Facing but in essence the designs are similar but to some extent handed



**TYPICAL PROPOSED ELEVATIONS**

1. Replacement door and sidelight
2. Facing brickwork
3. Soldier course
4. Tile hanging to gable construction

**DRAWING 8.2**  
**Proposed Reconstruction Details**



**Bureau Stocker Fitzpatrick**  
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Drawing Title  
**AIREY PRC FULLY REPAIRED DETAILS**  
 Not to Scale  
 Date May 2017 - redrawn  
 Dwg No. **500/A3.4/002**