

CALCULATION SHEET



|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |         |      |      |            |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|------|------|------------|
| Project Title                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Job No  |      | By   | Date       |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 2122-38 |      | MRL  | 30/08/2023 |
| Tangmere House Mural Removal                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Checked | Date | Page | of         |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | MRL     |      | dc01 | 1          |
| References                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Results |      |      |            |
| <div>Design Narrative</div> <p>It is intended to recover and reuse the mosaic to the north end lift/<del>staircase</del> of Tangmere House.</p> <p>It is not feasible to remove the mosaic from the reinforced concrete and hence the reinforced concrete structure to which the mosaic is applied is to be cut into sections and removed.</p> <p>The structure is to be removed in 1m height sections and the surrounding structure is to be dismantled at the same time as the height of the mosaic is reduced.</p> <p>These calculations are for the lifting frame and fixings required to remove the mosaic clad reinforced concrete sections.</p> |         |      |      |            |
| <div></div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |         |      |      |            |

CALCULATION SHEET

LOVELAND

Project Title

Muear - Transmute House  
Liftins Plan.

Job No

2022-38

By

MBL

Date

June 23

Checked

MBL

Date

June 23

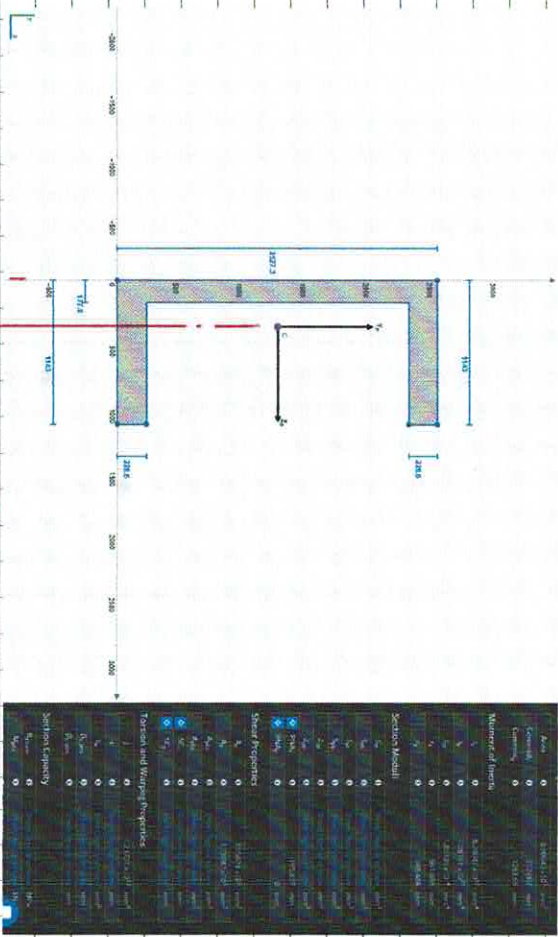
Page

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References

Results

CENTROID LOCATION.



Muear To Be Picked Up  
Concrete To Centroid Position  
To Prevent Tilting.

CALCULATION SHEET

LOVELAND

Project Title

MURAL - TRANSFORMER HOUSE.  
LIFTING PLAN.

Job No

2122-38

By

MD

Date

June 23

Checked

MD

Date

June 23

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References

Results

LOADING

CROSS SECTIONAL AREA =  $0.9m^2$

LIFT MURAL IN 1m HERTS

LOAD =  $0.9 \times 2500 \times 9.81 / 10^3 = 22kN$

Apply 1.5 Load Factor

Factored Load =  $22 \times 1.5 = 33kN$

Pick up in 2 locations

LOAD =  $33 / 2 = 17kN$

USE 2m BOLTS

Load per Bolt = 9kN

USE Hilti HSL4-S M12 ANCHORS

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Company: Michael Loveland Ltd  
Address: 4 Quarry Gate Cottages, Upper Chicks Grove  
Phone / Fax: 07976938662 /  
Design: Concrete - 28 Jun 2023  
Fastening Point: Mural Bracket

Page: 1  
Specifier: Michael Loveland  
E-Mail: Mike@Loveland.Ltd  
Date: 28/06/2023

## Specifier's comments:

## 1 Input data

## Anchor type and size:

HSL4-G M12\_hef3

## Return period (service life in years):

50

## Item number:

2237443 HSL4-G M12 d18x192 70/45/20

## Hilti Filling Set or any suitable annular gap filling solution

## Effective embedment depth:

 $h_{ef} = 130.0$  mm

## Material:

8.8

## Approval No.:

ETA-19/0556

## Issued / Valid:

02/11/2022 | -

## Proof:

SOFA design method + fib (07/2011) - after ETAG testing

## Stand-off installation:

 $e_b = 0.0$  mm (no stand-off);  $t = 10.0$  mmBaseplate <sup>R</sup>: $l_x \times l_y \times t = 150.0$  mm x  $400.0$  mm x  $10.0$  mm; (Recommended plate thickness: not calculated)

## Profile:

Square hollow,  $50 \times 50 \times 5.0$ ; ( $L \times W \times T$ ) =  $50.0$  mm x  $50.0$  mm x  $5.0$  mm

## Base material:

cracked concrete, C20/25,  $f_{ct,sp} = 20.00$  N/mm<sup>2</sup>,  $h = 10,000.0$  mm

## Installation:

hammer drilled hole, Installation condition: Dry

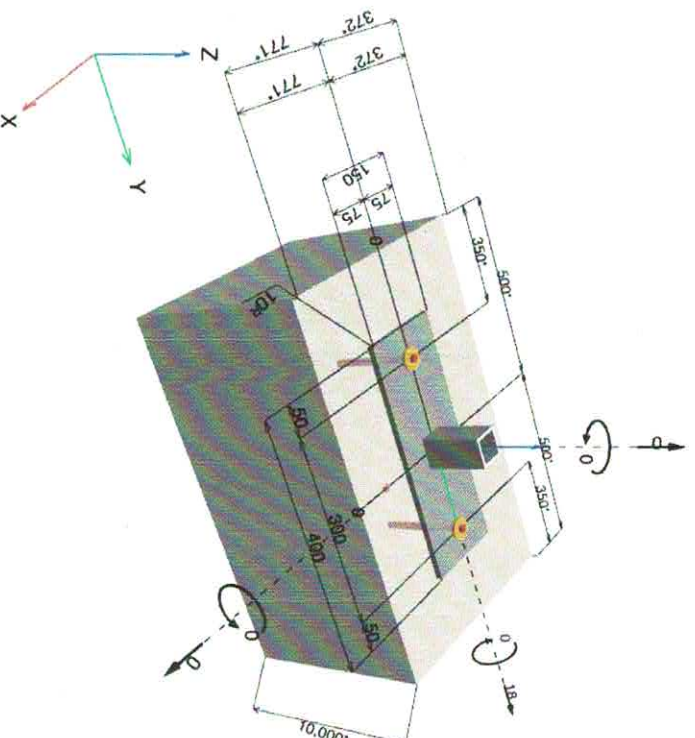
## Reinforcement:

No reinforcement or Reinforcement spacing  $\geq 150$  mm (any  $\emptyset$ ) or  $\geq 100$  mm ( $\emptyset \leq 10$  mm)

no longitudinal edge reinforcement

<sup>R</sup> - The anchor calculation is based on a rigid baseplate assumption.

## Geometry [mm] &amp; Loading [kN, kNm]



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|                  |                                           |            |                   |
|------------------|-------------------------------------------|------------|-------------------|
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| Address:         | 4 Quarry Gate Cottages, Upper Chicksgrove | Specifier: | Michael Loveland  |
| Phone   Fax:     | 07976938662                               | E-Mail:    | Mike@loveland Ltd |
| Design:          | Concrete - 28 Jun 2023                    | Date:      | 28/06/2023        |
| Fastening Point: | Mural Bracket                             |            |                   |

## 1.1 Load combination

| Case | Description   | Forces [kN] / Moments [kNm]                                                                                                            | Seismic | Fire | Max. Util. Anchor [%] |
|------|---------------|----------------------------------------------------------------------------------------------------------------------------------------|---------|------|-----------------------|
| 1    | Combination 1 | N = 0.000; V <sub>x</sub> = 0.000; V <sub>y</sub> = 18.000;<br>M <sub>x</sub> = 0.000; M <sub>y</sub> = 0.000; M <sub>z</sub> = 0.000; | no      | no   | 32                    |

## 2 Load case/Resulting anchor forces

Lifting of Cut Mural

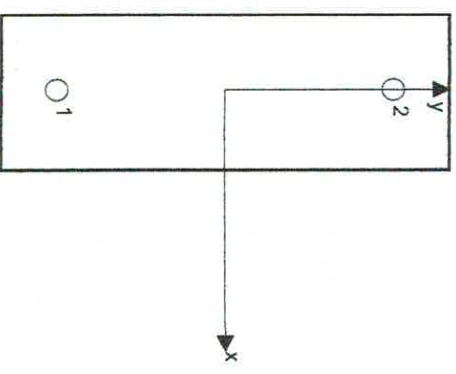
### Anchor reactions [kN]

Tension force: (+Tension, -Compression)

| Anchor | Tension force | Shear force | Shear force x | Shear force y |
|--------|---------------|-------------|---------------|---------------|
| 1      | 0.000         | 9.000       | 0.000         | 9.000         |
| 2      | 0.000         | 9.000       | 0.000         | 9.000         |

max. concrete compressive strain: - [‰]  
max. concrete compressive stress: - [N/mm<sup>2</sup>]  
resulting tension force in (x/y)=(0.0/0.0): 0.000 [kN]  
resulting compression force in (x/y)=(0.0/0.0): 0.000 [kN]

Anchor forces are calculated based on the assumption of a rigid baseplate.





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|                  |                                            |            |                  |
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| Phone   Fax:     | 07976938662                                | E-Mail:    | Mike@LovelandLtd |
| Design:          | Concrete - 28 Jun 2023                     | Date:      | 28/06/2023       |
| Fastening Point: | Mural Bracket                              |            |                  |

3 Tension load SOFA (fib (07/2011), section 10.1)

|                             | Load [kN] | Capacity [kN] | Utilization $P_n$ [%] | Status |
|-----------------------------|-----------|---------------|-----------------------|--------|
| Steel failure*              | N/A       | N/A           | N/A                   | N/A    |
| Concrete Breakout failure** | N/A       | N/A           | N/A                   | N/A    |
| Splitting failure**         | N/A       | N/A           | N/A                   | N/A    |

\* highest loaded anchor    \*\* anchor group (anchors in tension)

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E-Mail: Mike@Loveland.Ltd  
Date: 28/06/2023

#### 4 Shear load SOFA (fib (07/2011), section 10.2)

Dead Weight - Factored Loads (1.5) total load = 36 kN - Load per side = 18kN

|                                         | Load [kN] | Capacity [kN] | Utilization $\beta_v$ [%] | Status |
|-----------------------------------------|-----------|---------------|---------------------------|--------|
| Steel failure (without lever arm)*      | 9.000     | 47.440        | 19                        | OK     |
| Steel failure (with lever arm)*         | N/A       | N/A           | N/A                       | N/A    |
| Pryout failure**                        | 18.000    | 162.547       | 12                        | OK     |
| Concrete edge failure in direction y+** | 9.000     | 28.934        | 32                        | OK     |

\* Highest loaded anchor \*\* anchor group (relevant anchors)

#### 4.1 Steel failure (without lever arm)

| $V_{Rk,s}$ [kN] | $\gamma_{M,s}$ | $V_{Rd,s}$ [kN] | $V_{Sd}$ [kN] |
|-----------------|----------------|-----------------|---------------|
| 59.300          | 1.250          | 47.440          | 9.000         |

#### 4.2 Pryout failure

| $A_{c,N}$ [mm <sup>2</sup> ] | $A_{c,N}^0$ [mm <sup>2</sup> ] | $\psi_{A,N}$     | $C_{cr,N}$ [mm] | $S_{cr,N}$ [mm] | $k_1$         |
|------------------------------|--------------------------------|------------------|-----------------|-----------------|---------------|
| 269.100                      | 152.100                        | 1.769            | 195.0           | 390.0           | 2.700         |
| $e_{c1,v}$ [mm]              | $\psi_{ec1,N}$                 | $e_{c2,v}$ [mm]  | $\psi_{ec2,N}$  | $\psi_{s,N}$    | $\psi_{re,N}$ |
| 0.0                          | 1.000                          | 0.0              | 1.000           | 1.000           | 1.000         |
| $N_{Rk,c}^0$ [kN]            | $\gamma_{M,c,p}$               | $V_{Rd,cp}$ [kN] | $V_{Sd}$ [kN]   |                 |               |
| 51.041                       | 1.500                          | 162.547          | 18.000          |                 |               |

Group anchor ID

1, 2

#### 4.3 Concrete edge failure in direction y+

| $l_f$ [mm]        | $d_{nom}$ [mm]               | $k_v$                          | $\alpha$        | $\beta$       |               |                     |
|-------------------|------------------------------|--------------------------------|-----------------|---------------|---------------|---------------------|
| 130.0             | 18.00                        | 1.700                          | 0.045           | 0.049         |               |                     |
| $c_1$ [mm]        | $A_{c,v}$ [mm <sup>2</sup> ] | $A_{c,v}^0$ [mm <sup>2</sup> ] | $\psi_{A,v}$    |               |               |                     |
| 650.0             | 1,114,425                    | 1,901,250                      | 0.854           |               |               |                     |
| $\psi_{s,v}$      | $\psi_{h,v}$                 | $\psi_{u,v}$                   | $e_{c,v}$ [mm]  | $\psi_{ec,v}$ | $\psi_{re,v}$ | $\psi_{90^\circ,v}$ |
| 0.814             | 1.000                        | 1.000                          | 0.0             | 1.000         | 1.000         | 1.500               |
| $V_{Rk,c}^0$ [kN] | $\eta_1$                     | $\gamma_{Mc}$                  | $V_{Rd,c}$ [kN] | $V_{sd}$ [kN] |               |                     |
| 181.821           | 2                            | 1.500                          | 28.934          | 9.000         |               |                     |

Note: Resistance limit acc. to fib (07/2011) Eq. (10.2-6) is governing



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|                  |                                            |            |                   |
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| Address:         | 4 Quarry Gate Cottages, Upper Chicks Grove | Specifier: | Michael Loveland  |
| Phone / Fax:     | 07976938662 /                              | E-Mail:    | Mike@Loveland.Ltd |
| Design:          | Concrete - 28 Jun 2023                     | Date:      | 28/06/2023        |
| Fastening Point: | Mural Bracket                              |            |                   |

## 5 Displacements (highest loaded anchor)

Short term loading:

$$\begin{array}{lcl} N_{sk} & = & 0.000 \text{ [kN]} \\ & & \delta_N = 0.0000 \text{ [mm]} \\ V_{sk} & = & 6.667 \text{ [kN]} \\ & & \delta_V = 1.1799 \text{ [mm]} \\ & & \delta_{NV} = 1.1799 \text{ [mm]} \end{array}$$

Long term loading:

$$\begin{array}{lcl} N_{sk} & = & 0.000 \text{ [kN]} \\ & & \delta_N = 0.0000 \text{ [mm]} \\ V_{sk} & = & 6.667 \text{ [kN]} \\ & & \delta_V = 1.7699 \text{ [mm]} \\ & & \delta_{NV} = 1.7699 \text{ [mm]} \end{array}$$

Comments: Tension displacements are valid with half of the required installation torque moment for uncracked concrete! Shear displacements are valid without friction between the concrete and the baseplate! The gap due to the drilled hole and clearance hole tolerances are not included in this calculation!

The acceptable anchor displacements depend on the fastened construction and must be defined by the designer!

## 6 Warnings

- The anchor design methods in PROFIS Engineering require rigid baseplates per current regulations (AS 5216:2021, ETAG 001/Annex C, EOTA TR029 etc.). This means load re-distribution on the anchors due to elastic deformations of the baseplate are not considered - the baseplate is assumed to be sufficiently stiff. In order not to be deformed when subjected to the design loading, PROFIS Engineering calculates the minimum required baseplate thickness with CBFEM to limit the stress of the baseplate based on the assumptions explained above. The proof if the rigid baseplate assumption is valid is not carried out by PROFIS Engineering. Input data and results must be checked for agreement with the existing conditions and for plausibility!
- The accessory list in this report is for the information of the user only. In any case, the instructions for use provided with the product have to be followed to ensure a proper installation.
- The design method fib (07/2011) assumes that no hole clearance between the anchors and the fixture is present. This can be achieved by filling the gap with mortar of sufficient compressive strength (e.g. by using the Hilti Filling set) or by other suitable means
- The compliance with current standards (e.g. EN 1993, AS 4100:1998, etc.) is the responsibility of the user
- Checking the transfer of loads into the base material is required in accordance with fib (07/2011)!
- The characteristic bond resistances depend on the return period (service life in years): 50

## Fastening meets the design criteria!

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Design: Concrete - 28 Jun 2023  
Fastening Point: Mural Bracket

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Specifier: Michael Loveland  
E-Mail: Mike@Loveland.Ltd  
Date: 28/06/2023

## 7 Installation data

Baseplate, steel: S 235;  $E = 210.000,00 \text{ N/mm}^2$ ;  $f_{yk} = 235,00 \text{ N/mm}^2$   
Profile: Square hollow,  $50 \times 50 \times 5,0$ ;  $(L \times W \times T) = 50,0 \text{ mm} \times 50,0 \text{ mm} \times 5,0 \text{ mm}$

Anchor type and size: HSL4G M12\_hef3  
Item number: 2237443 HSL4G M12 d18x192 70/45/20

Hole diameter in the fixture:  $d_f = 20,0 \text{ mm}$

Maximum installation torque: 60 Nm

Plate thickness (input): 10,0 mm

Hole diameter in the base material: 18,0 mm

Recommended plate thickness: not calculated

Hole depth in the base material: 155,0 mm

Drilling method: Hammer drilled

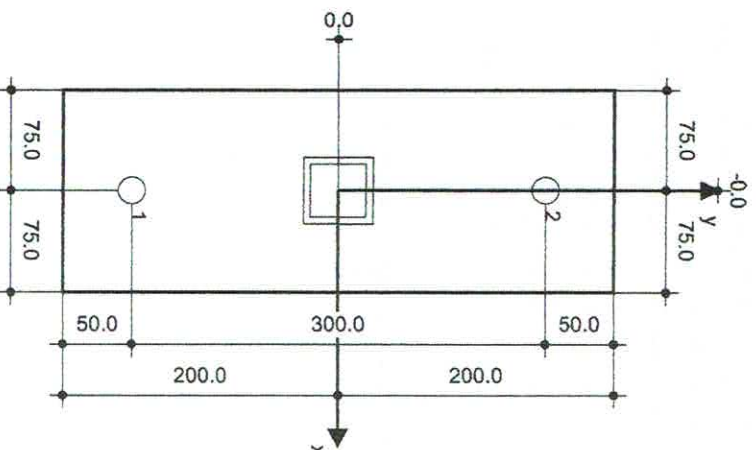
Minimum thickness of the base material: 250,0 mm

Cleaning: Manual cleaning of the drilled hole according to instructions for use is required.

Hilti HSL4-G expansion anchor with 130 mm embedment, M12\_hef3, Steel galvanized, installation per ETA-190556, with annular gaps filled with Hilti Filling Set or any suitable gap solutions

### 7.1 Recommended accessories

| Drilling                                                                                                   | Cleaning                                                               | Setting                                                                                                                                           |
|------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>Suitable Rotary Hammer</li> <li>Properly sized drill bit</li> </ul> | <ul style="list-style-type: none"> <li>Manual blow-out pump</li> </ul> | <ul style="list-style-type: none"> <li>Hilti SIW 6AT-A22 + SI AT-A22</li> <li>Hilti Filling Set</li> <li>Torque wrench</li> <li>Hammer</li> </ul> |



#### Coordinates Anchor [mm]

| Anchor | x   | y      | c <sub>x</sub> | c <sub>yx</sub> | c <sub>y</sub> | c <sub>xy</sub> |
|--------|-----|--------|----------------|-----------------|----------------|-----------------|
| 1      | 0,0 | -150,0 | 372,0          | 771,0           | 350,0          | 650,0           |
| 2      | 0,0 | 150,0  | 372,0          | 771,0           | 650,0          | 350,0           |

Input data and results must be checked for conformity with the existing conditions and for plausibility!  
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| Phone   Fax:     | 07976938662                                | E-Mail:    | Mike@Loveland.Ltd |
| Design:          | Concrete - 28 Jun 2023                     | Date:      | 28/06/2023        |
| Fastening Point: | Mural Bracket                              |            |                   |

### 8 Remarks: Your Cooperation Duties

- Any and all information and data contained in the Software concern solely the use of Hilti products and are based on the principles, formulas and security regulations in accordance with Hilti's technical directions and operating, mounting and assembly instructions, etc., that must be strictly complied with by the user. All figures contained therein are average figures, and therefore use-specific tests are to be conducted prior to using the relevant Hilti product. The results of the calculations carried out by means of the Software are based essentially on the data you put in. Therefore, you bear the sole responsibility for the absence of errors, the completeness and the relevance of the data to be put in by you. Moreover, you bear sole responsibility for having the results of the calculation checked and cleared by an expert, particularly with regard to compliance with applicable norms and permits, prior to using them for your specific facility. The Software serves only as an aid to interpret norms and permits without any guarantee as to the absence of errors, the correctness and the relevance of the results or suitability for a specific application.
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CALCULATION SHEET



Project Title

N10RA1  
LIFTING PLAN

Job No

2122.38

By

MDL

Date

June 23

Checked

MDL

Date

June 23

Page

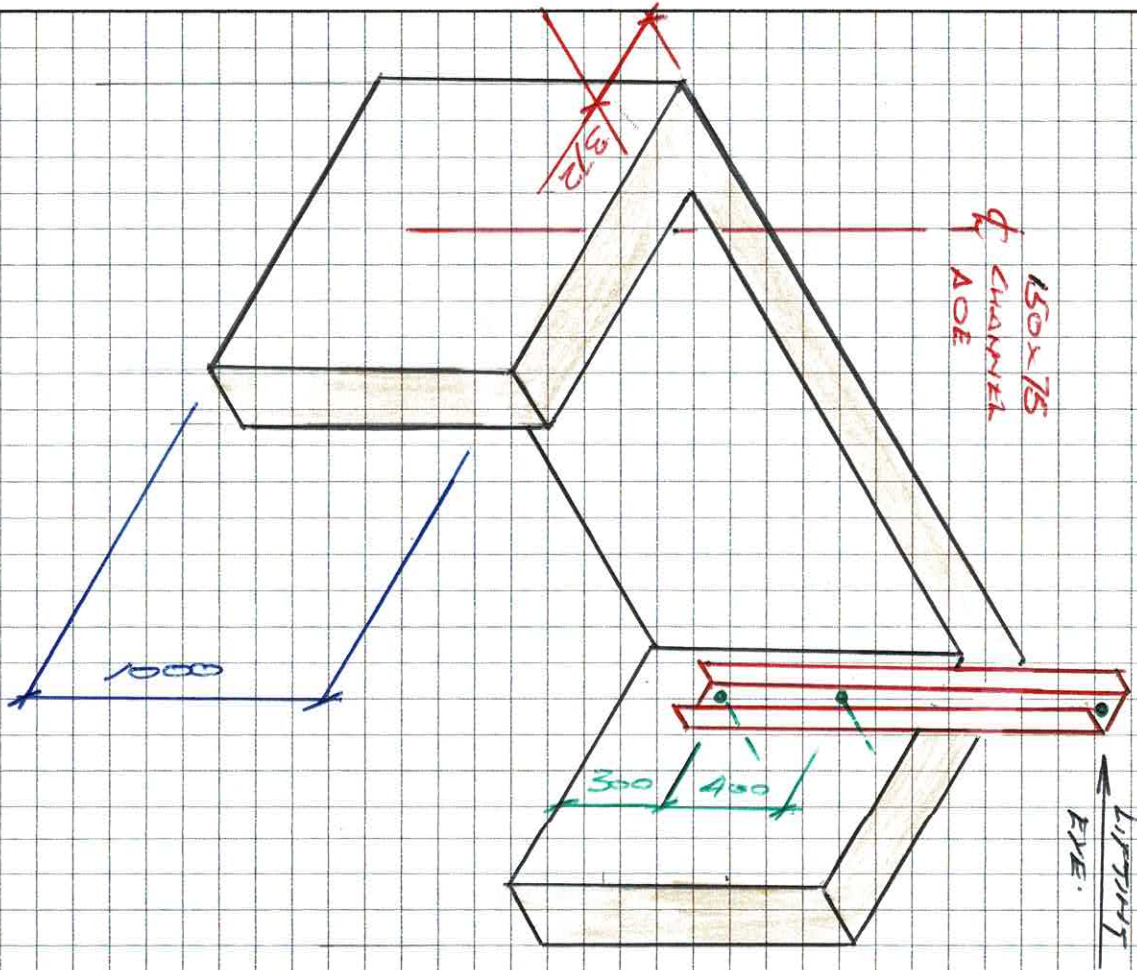
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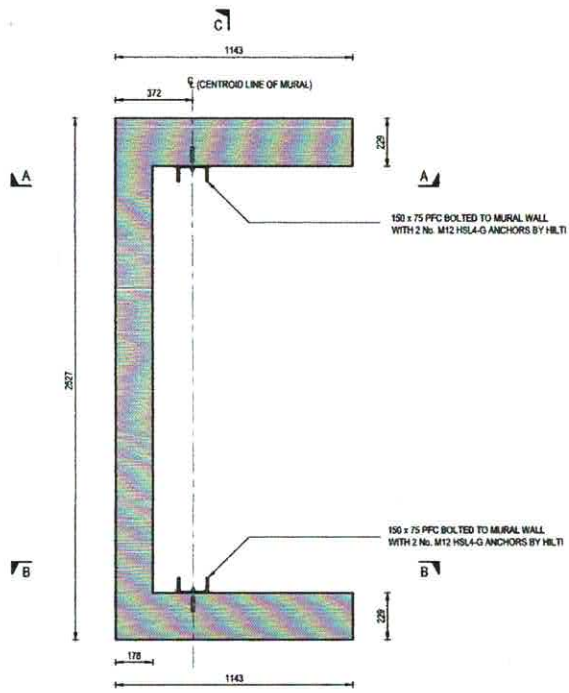
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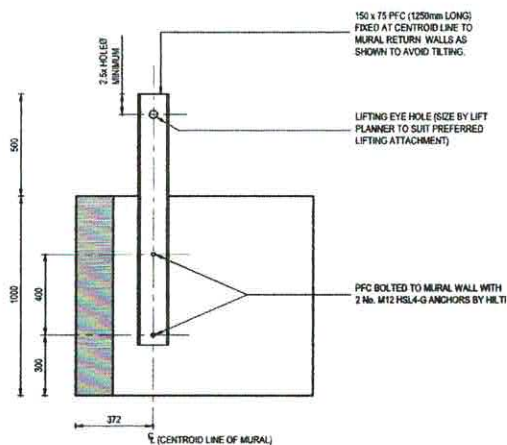
References

Results

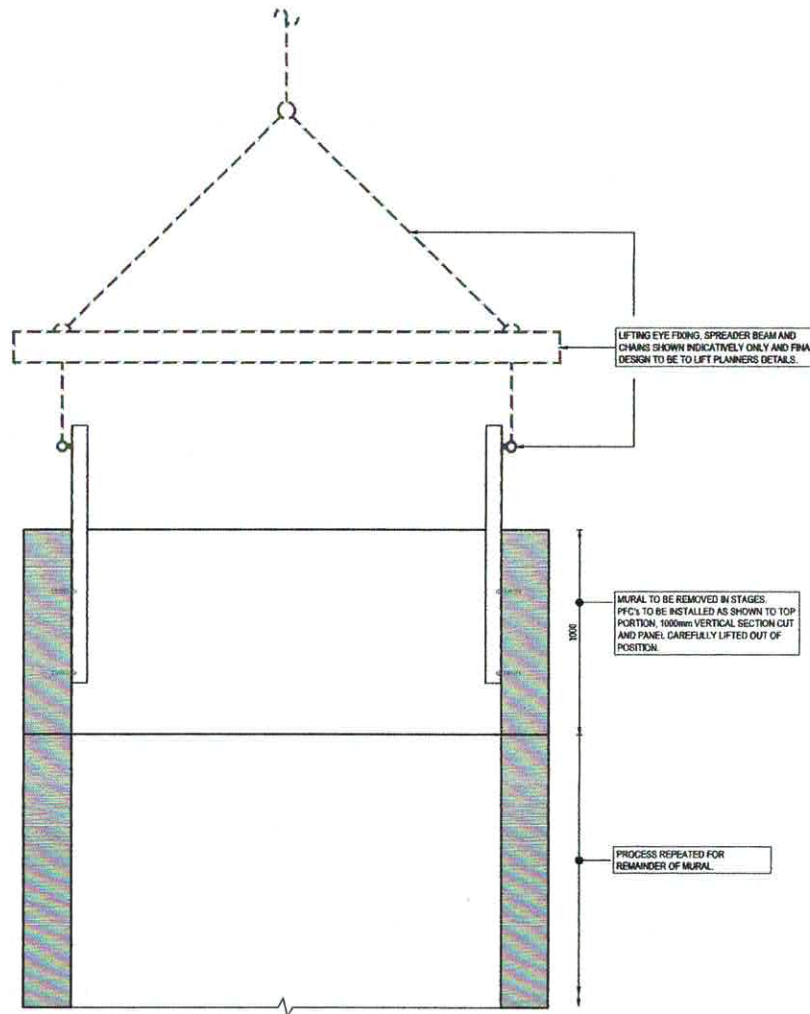




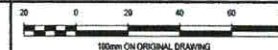
PLAN ON MURAL  
SCALE 1:25



SECTION A-A  
(SECTION B-B SIMILAR BUT HANDED)  
SCALE 1:25



SECTION C-C  
SCALE 1:25



#### GENERAL

1. THIS DRAWING HAS BEEN PRODUCED ON THE BASIS OF ARCHIVE DRAWING INFORMATION
2. ALL DIMENSIONS AND LEVELS ARE TO BE CHECKED ON SITE PRIOR TO ANY WORKS BEING PUT IN HAND.
3. IF DURING THE WORKS THE CONTRACTOR IS CONCERNED ABOUT THE STABILITY OF THE EXISTING STRUCTURE THEY SHOULD CEASE ACTIVITIES AND CONTACT THE ENGINEER.
4. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER CONTRACT DRAWINGS AND RELEVANT STRUCTURAL SPECIFICATIONS.
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6. ALL MATERIALS USED IN THE WORKS SHALL BE TO BRITISH STANDARDS OR OTHER APPLICABLE SPECIFICATIONS.
7. ALL WORK IS TO BE CARRIED OUT TO B.S. CODES OF PRACTICE AND IN ACCORDANCE WITH GOOD WORKMANSHIP PRACTICE.
8. ALL PROPRIETARY MATERIALS USED IN THE WORKS ARE TO BE USED IN COMPLETE ACCORDANCE WITH THE MANUFACTURERS RECOMMENDATIONS.

#### STEELWORK

1. THE WHOLE OF THE STRUCTURAL STEELWORK IS TO COMPLY WITH THE RELEVANT CLAUSES OF BS 5950-1 & 2 AND THE NATIONAL STRUCTURAL STEELWORK SPECIFICATION (7th EDITION)
2. ALL MATERIALS SHALL BE IN ACCORDANCE WITH SECTION 2 OF THE NISS (7th EDITION)
3. STEELWORK GRADES ARE TO BE AS FOLLOWS:
  - HOLLOW SECTIONS TO BE GRADE S355 IN ACCORDANCE WITH BS EN 10210 2006.
  - U.S. LC. PFC & ANGLE SECTIONS TO BE GRADE S355 TO BS EN 10025 2004.
  - PLATES TO BE GRADE S275 TO BS EN 10025 2004.
4. ALL WELDS TO BE 6mm F.W. TO BS EN ISO 15617:2003 & BS EN ISO 15609:2004 UNLESS NOTED OTHERWISE.
5. WORKMANSHIP SHALL BE IN ACCORDANCE WITH SECTIONS 4 TO 9 OF THE NISS (7th EDITION) UNLESS NOTED OTHERWISE.

#### STEEL FINISH

1. PROTECTIVE TREATMENT SHALL BE IN ACCORDANCE WITH SECTION 10 OF THE NISS (5th EDITION).
2. BLAST CLEAN TO SA 2 1/2.
3. SHOP APPLY 2 COATS OF RED OXIDE PRIMER.
4. STORAGE AND HANDLING PROCEDURES SHALL ENSURE THAT DAMAGE TO PROTECTIVE SYSTEMS IS MINIMISED. ANY DAMAGE IS TO BE MADE GOOD ON SITE (INACCESSIBLE AREAS PRIOR TO ERECTION).

## CONSTRUCTION

|     |                    |     |     |         |
|-----|--------------------|-----|-----|---------|
| C1  | CONSTRUCTION ISSUE | LHP | MRL | 2006/23 |
| P1  | ISSUED FOR COMMENT | LHP | MRL | 2006/23 |
| REV | AMENDMENT          | DRN | APP | DATE    |

## LOVELAND

MICHAEL LOVELAND LTD  
14 GARRY COTTAGES  
UPPER CROOKSTONE  
GLASGOW G11 5PP  
TEL: 01463 275188  
EMAIL: info@loveland.co.uk

#### CLIENT



#### PROJECT TITLE

BROADWATER FARM  
TANGMERE HOUSE DEMOLITION

#### DRAWING TITLE

LIFTING SUPPORT FOR MURAL  
REMOVAL

|            |                |         |          |                |
|------------|----------------|---------|----------|----------------|
| DRAWN      | CHK            | APP     | DATE     | SCALE          |
| LHP        | MRL            | MRL     | JUNE '23 | AS SHOWN AT A3 |
| JOB NUMBER | DRAWING NUMBER | REVISOR |          |                |
| 2122-38    | 100            | C1      |          |                |