ROBERTSON

Strathmore Primary School

Forfar/Carnoustie PPP Schools

Outcome of Structural Investigations

Summary Report

November 2016

[redacted]

Index

- Introduction
- Appendix 1a Goodson Associates visual inspection report
- Appendix 1b W.A. Fairhurst visual inspection report
- Appendix 2a RCT Intrusive Survey Report
- Appendix 2b Variations from Design
- Appendix 3 Rectification Works
- Appendix 4 W.A.Fairhurst Final Report

Parties involved throughout the investigations and their responsibilities are detailed below:

Elgin Education - Trusted Partner for Forfar/Carnoustie Schools

IML – Infrastructure Management for Forfar /Carnoustie Schools

Robertson Construction Eastern – Main Contractor for the construction of the Forfar/Carnoustie PPP schools.

Robertson Construction Tayside- Responsible for carrying out visual & Intrusive surveys and organising and management of remedial works

W.A Fairhurst – Project Engineers for the Construction of Forfar/Carnoustie PPP Schools

Responsible for carrying out visual inspections and identifying any remedial works to be carried out, and to ensure the works are carried out to their satisfaction and schools are safe for use thereafter.

Goodson Associates – Initial independent engineers for Robertson Construction to carry out visual inspection, and later appointed by IML to act as independent engineers during the investigations

Report on Visual and Structural Findings
Strathmore P.S. Forfar

1. Introduction

Following on from the structural faults found on the Edinburgh Schools Project earlier this year that identified various issues with Head Restraint Ties, Wall Ties and Bed Reinforcing, 7 schools within the Forfar/Carnoustie PFI contract were surveyed to establish that the construction met the design criteria
The schools investigated were of steel/concrete framed structures with an external envelope of "non-load bearing" walls.
In these schools, cavity masonry construction is primarily limited to games halls, with timber/metal stud framing used elsewhere such as the accommodation wings. In line with the initial information from the Edinburgh Schools investigation, investigations focused on these areas of cavity masonry wall construction and the interaction of wall panels with the principal structural frame.

The report detailed below is for Strathmore Primary School. (Opened 2008)

2. Visual Inspections

Robertson Construction (Tayside) appointed Goodson Associates to carry out visual inspections to identify any potential concerns regarding the stability of external walls. The inspection identified minor cracking to mortar beds on all elevations, with some evidence of cracking to render panels.

Following on from the initial visual inspection by Goodson Associates, arrangements were made to carry out a further visual inspection with the original contract engineer (W.A.Fairhurst & Partners), to further identify any potential signs of structural failures, and this report is included within this document.

Following these visual inspections, the decision was made to carry out an intrusive survey, and investigations were arranged to be carried out on 20/08/16 & 21/08/16. The investigation took place externally at random locations over various elevations.

Appendix 1a Goodson Associates visual report

- Report
- Marked up drawings
- Photographs

Appendix 1b W.A. Fairhurst & Partners visual report

- Report
- Design Drawings

3. Intrusive Survey & Findings

During the investigations it was evident that in certain areas, the structure was not built in line with the original design. Photos and marked up drawings of our findings, were issued to W.A.Fairhurst for review.

As Goodson Associates were originally appointed by RCTL on the initial inspections, IML then appointed them on behalf of themselves and Elgin Education to support the information being issued. This was practical, as they were already familiar with the schools to be inspected. Throughout the investigations [redacted] of Goodson Associates, was issued with the evidence from the investigation for comment and subsequent questions were answered by [redacted] of W.A.Fairhurst.

In addition, during these investigations [redacted] of Angus Council was in attendance on 20/08/16 and [redacted] of Angus Council was in attendance on 21/08/16

Our findings and variations from construction drawings are included in

Appendix 2a RCT intrusive survey report

- Report/Photographs
- Marked up drawings

Appendix 2b Variations from design

Head Restraints

The head restraint detail identified for both gable ends of the games hall on W.A.Fairhurst Drawing No 60299-S2-172 was not found at the time of the intrusive survey and deemed not to be installed, as there was no evidence of these being fitted.

Bed reinforcing

Internal walls are constructed with 2no skins of 100mm block tied together to achieve a 215mm thick wall, therefore bed reinforcing is not required.

Wall ties

Various areas were investigated and the findings were as follows:

Where the inner wall constructed of timber frame, wall ties were found to have an embedment of 60mm

Where the wall was constructed of block to the inner and outer walls, ties were exposed at the various locations, and embedment was confirmed to be an average of 50mm.

The wall tie detail identified on drawing 60299-S2-172 was found to be in place and ties were at regular intervals with an embedment of 70mm

4. Remedial actions

Reports were forwarded to W.A. Fairhursts and calculations were checked, along with a further visit to site, to carry out another survey to confirm remedial work details.

Following the recalculations, details were issued to all parties and confirmed as acceptable prior to works commencing.

The extent of works involved consisted of restraint straps installed at agreed locations within the plant room area

Details of rectification works are detailed within **Appendix 3** with W.A Fairhurst's final completion report included in **Appendix 4**

5. Conclusion

All remedial works have been carried out and signed off to the satisfaction of our structural engineer, which concludes the investigation at Strathmore Primary School, with no further action required.

Please see below sign off below from all relevant parties involved throughout the investigations, and confirmation that all information included within this document, is an accurate account of the findings during the visual inspections, and that all remedial works have been carried out in accordance with the engineers recommendations and details

Principal Contractor (Robertson Construction)

Project Engineer (W.A.Fairhurst & Partners)

On Behalf of Robertson Construction Tayside

Signed b[redacted] Aftercare Manager

Authorised by.....[redacted] Managing Director

On Behalf of W.A.Fairhurst & Partners

Approved by.....

[redacted] (Project Engineer)

APPENDIX 1a

Goodson Associates

Visual inspection report

- Report
- Marked up Drawings
- Photographs

[redacted] November 2016

Goodson Associates

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Consulting Civil, Structural and Transportation Engineers

Robertson Construction Tayside Ltd
1 George Buckman Drive
DUNDEE
Angus
DD2 3SP

LTR/P13256/MR

04 May 2016

[redacted]

Dea[redacted]

Masonry Review of Angus Schools

We refer to the above and following your instructions, confirm having visited the following schools in your presence over a period between Wednesday 13th and Friday 15th April 2016.

The purpose of our presence was to offer advice, when requested, during your walk around the schools with a view to identifying any areas of concern which would require further in depth investigation.

Burnside Primary School, Thomas Street, Carnoustie DD7 7JZ
Carlogie House, Carlogie Primary School, Caesar Avenue, Carnoustie DD7 6DS
Carlogie Primary, Caesar Avenue, Carnoustie DD7 6DS
Carnoustie High, Shanwell Road, Carnoustie DD7 7SS
Langlands Primary School, Glamis Road, Forfar DD8 1JY
Strathmore – Formerly Kirkriggs Primary, Strathmore Primary School, St James Road, Forfar DD8 1LE
Whitehills Primary School, Fyfe Street, Forfar DD8 3EQ
Woodlands Primary School, Queen Street, Carnoustie DD7 7SU

The outcome of your initial survey highlighted two schools which were identified for further investigation. Based on the selected drawings and photographs provided, we comment as follows:

Carnoustie High, Carnoustie

In view of the cracking indicated at the high level areas, intrusive investigations should take place to confirm the wall tie condition and level of embedment. This should extend to any lower levels following the outcome of the high level investigations.

constructionline

ace consultancy engineering business environment

Goodson Associates is the trading name of Goodson Associates Limited.
A Limited Company registered in Scotland No. 149661

[redacted]
Robertson Construction Tayside Ltd
4 May 2016

The remaining schools on the survey list also have cracking, the majority of which would appear to be due to shrinkage, insufficient expansion joints and possibly a lack of bed joint reinforcement.

However, it would be prudent to select areas in each of the remaining schools which have smaller cracks and carry out random intrusive works.

These works may result in confirming the level of any maintenance required over a prolonged period.

Please note that this approach only addresses the existing wall ties and embedment at high levels in an attempt to reduce or remove the possibility of uncontrolled collapse of any wall panels around each school building.

Yours sincerely

[redacted]

Regional Director

PERIMETER WALLS VISUALLY INSPECTED. HIGHUC IS CRACKING.

NOTES

Building Classification "Assembly Building"

WINDOWS / SCREENS / ROOFLIGHTS

Polyester powder coated aluminium windows, screens and rooflights to achieve 2.2W/m2K - All glazing below 800mm high above FFL to be in safety glass to BS 6262

All internal screens to be hardwood with MDF splayed facings for painting and where required with necessary fire test certification to satisfy local authority Building Control Fire resistant glass bedded in intumescent mastic. Glass to reflect fire resistance of area as required.

DOORS

All new doors to the building provides level access with barrier free thresholds to all doors 1200mm deep area immediately in front of all doors will be provided.

INTERNAL DOORS

All doorsets to be Ash/Beech faced 46mm solid core doors with matching HW lipping, MDF splayed facings for painting with the necessary fire test certification to satisfy the local authority Building Control. All glazed doors to have double rectangular apertures to meet requirements of Building Regulations. Fire resistant glass bedded in intumescet mastic.

EXTERNAL WALL CONSTRUCTION

100mm thick external leaf in either blockwork clad with K Rend render or facing blockwork. 50mm wide cavity, timber kit inner wall comprising: breather membrane, 9mm thick sheathing ply, 145 wide timber frame infilled with insulation to give min U value 0.30 and clad with 13mm thick Duraline wallboard, stainless steel wall ties fixed at centres to manufacturers recommendations.
Main Hall walls in 100 thick outer leaf in either blockwork clad with K Rend render or facing blockwork. 50mm wide cavity, 75mm thick Polyfoam insulation to achieve min U value 0.30 and 215 thick wall width in two 100mm thick leaves with inner leaf in fair faced paint quality blockwork, stainless steel wall ties fixed at centres to manufacturers recommendations.
Feature panels clad with Cedar wood linings

NATURAL VENTILATION

All windows to have opening area of at least 1/20th of the floor area of the room it serves. Permavents to all windows to provide a trickle ventilation of at least 400mm2 for each square metre of floor area.

TOILET PROVISION

Toilet/Shower provision meets the requirements of The Education (School Premises) Regulations 1999 and National Care Standards (for early education and childcare up to the age of 16). Staff Toilet provision reflects the requirements of the Building Standards (Scotland) Regulations

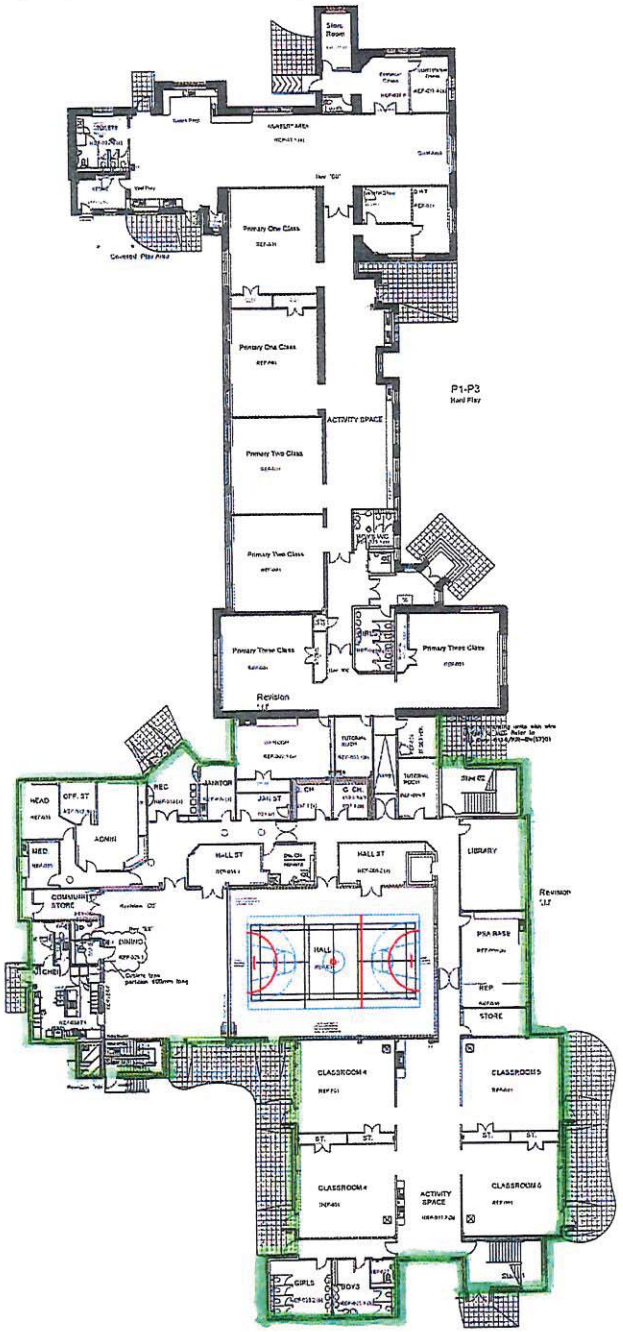
All dimensions to be verified on site prior to commencement of work and prior to manufacture of components and any discrepancy notified to the Architects immediately

All new sw etc to be treated by impregnation treatment at the timber yard or by a coloured preservative ie Cuprinol or e/a applied on site

FLOORS.- Ground floor in reinforced concrete to Engineers design and details finished ready to accept floor coverings - Main Hall to have Sports Floor 30mm thick Polyfoam under floor insulation

Intumescent paint applied on all primary steel work.

cavity barrier provided at both top and bottom of wall and at the the upper floor slab. refer to L(21)402



GROUND FLOOR PLAN

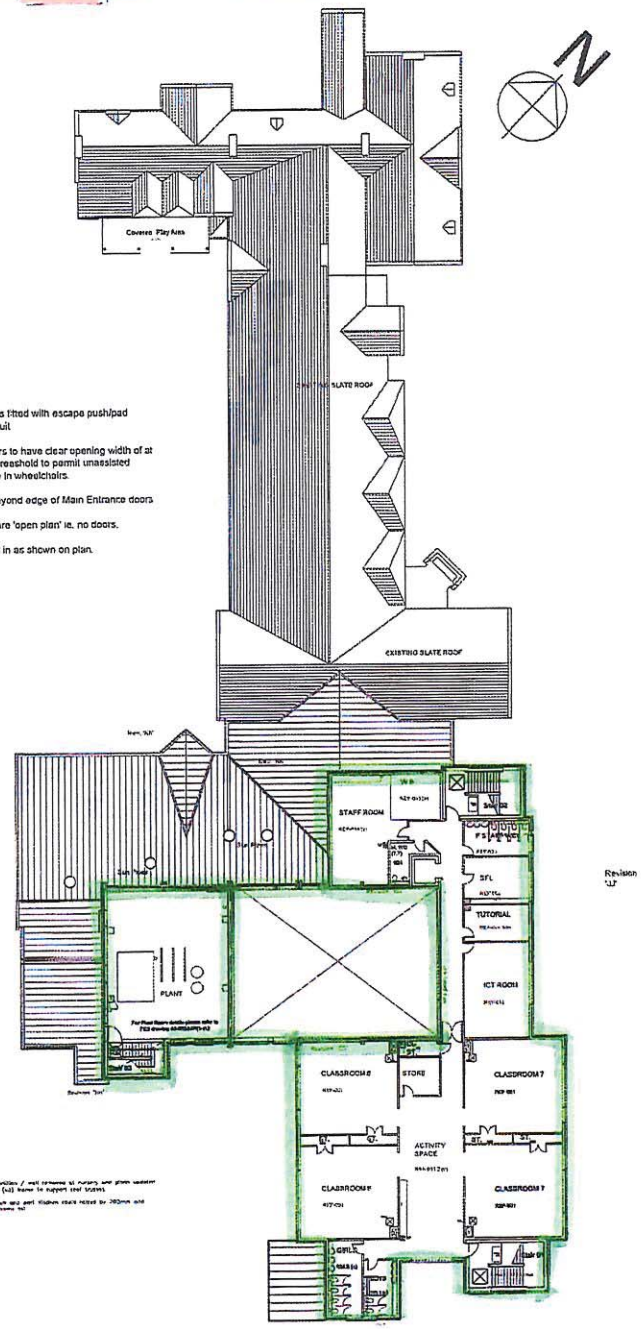
All final exit doors fitted with escape pushpad ironmongary to suit

All entrance doors to have clear opening width of at least 800mm. Threshold to permit unassisted access to people in wheelchairs.

Platt 1200mm beyond edge of Main Entrance doors

All Classrooms are 'open plan' ie. no doors.

All SWVP boxed in as shown on plan.



FIRST FLOOR PLAN

Notes

Angus Council

ROBERTSON

SS	Updated "AS BUILT" cubicle type partition added	Aug '08
RR	Hall Disabled toilet door indicated opening out	Jan '08
QQ	External Pat & ramped areas updated	14.12.07
PP	Disabled WC/shower/changing updated	10.11.07
OO	External plants added	12.11.07
NN	Hall Store doors to open out	25.10.07
MM	Admin/ Office Store partition amended	27.09.07
LL	Mullion added to window	11.06.07
KK	Door added and roof amendments	20.06.07
JJ	Partition removed from SFL (FP) + 2no sinks	
	updated as MICE Tutorial Room Refs updated	April 07
Revision		Date

Mackie Ramsay Taylor Chartered Architects

47 Victoria Street, Aberdeen, AB10 1QA

Telephone (01224) 639295 Fax (01224) 637956

e-mail : mail@mrtarchitects.com

Project

Forfar & Carnoustie Schools

STRATHMORE

Kirkriggs

Primary School

Drawing

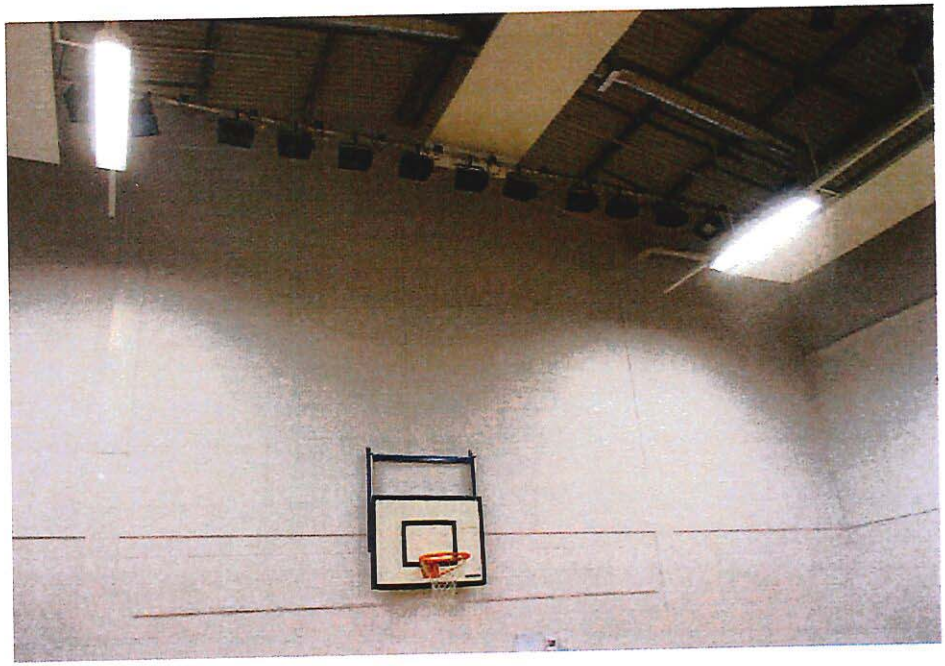
PROPOSED FLOOR PLANS

Scale: 1 : 200 @ A1

Date: NOV 2005 | Drawn By | Checked By

Project No: 1346 - 02 | Drawing No: L(20)01 | SS

Main Reception
Service Access



APPENDIX 1b

W.A Fairhurst & Partners

Visual inspection report

- Report
- Design Drawings

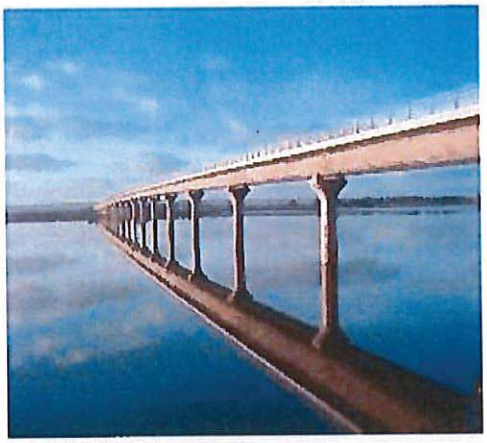
[redacted] November 2016

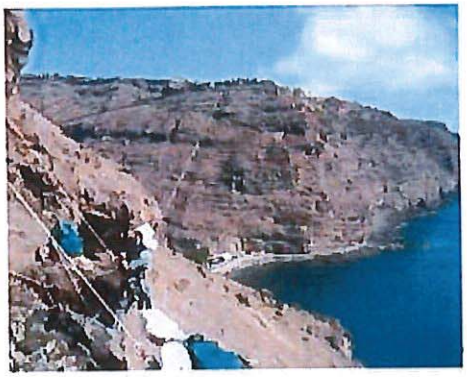
Robertson Construction Tayside

Investigation of Blockwork External Leaf, Forfar & Carnoustie Schools

Survey Report

June 2016





FAIRHURST

FAIRHURST

CONTROL SHEET

CLIENT: Robertson Construction Tayside

PROJECT TITLE: Investigation of Blockwork External Leaf, Forfar & Carnoustie Schools

REPORT TITLE: Survey Report

PROJECT REFERENCE: 115831

DOCUMENT NUMBER: 115831/dnd/01

Issue & Approval Schedule

ISSUE 1	Name	Signature	Date
Prepared by	[redacted]	[redacted]	30/06/16
Checked by	[redacted]	[redacted]	30/06/16
Approved by	[redacted]	[redacted]	30/06/16

Revision Record

Rev.	Date	Status	Description	Signature	
1				By	
				Checked	
				Approved	
2				By	
				Checked	
				Approved	

This document has been prepared in accordance with procedure OP/P02 of the *Fairhurst Quality and Environmental Management System*

FAIRHURST

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6.2. Inspection 11
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Appendix A – Inspection Report - Whitehills Primary School, Forfar
Appendix B – Inspection Report - Strathmore Primary School, Forfar
Appendix C – Inspection Report - Langlands Primary School, Forfar
Appendix D – Inspection Report - Carnoustie High School, Carnoustie
Appendix E – Inspection Report - Woodlands Primary School, Carnoustie
Appendix F – Inspection Report - Burnside Primary School, Carnoustie

1.0 Introduction

1.1 The purpose of this investigation is to check the external skin of blockwork at the Forfar and Carnoustie Schools listed below, with particular reference to possible defects arising from deficiencies in the wall ties.

Whitehills Primary School, Forfar
Strathmore (Kirkriggs) Primary School, Forfar
Langlands Primary School, Forfar
Carnoustie High School, Carnoustie
Woodlands Primary School, Carnoustie
Burnside (Thomas St) Primary School, Carnoustie
Carlogie Primary School, Carnoustie

1.2 The inspections were undertaken by our [redacted] on 22 June 2016 with [redacted] and [redacted] of Robertson Construction Tayside in attendance.

1.3 Please note that this report is based on an inspection made by Fairhurst during which we did not remove any finishes and is based on a visual check of the structural elements where readily accessible. Problems of timber infestation, fungal decay, damp and asbestos are outwith the scope of this report. This report has been prepared for the sole and exclusive use of Robertson Construction Tayside in response to their particular instructions. Any other party using the information contained within this report for any purpose whatsoever, do so at their own risk and any duty to care to that party is excluded.

1.4 We have been advised that Robertson Construction Tayside has undertaken inspections of the schools. A copy of the Inspection Reports for these investigations is included within the Appendices.

We have overmarked these drawings with notes from our survey on 22 June 2016.

3.0 Strathmore Primary School, Forfar

3.1. Introduction

This school is mainly two storey and is of steel frame construction. The external finishes are blockwork and render.

3.2. Inspection

The external walls were generally found to be in good order. The alignment of the walls was noted to be good.

The blockwork panels were generally found to be in good order. Hairline cracking was noted in the render panels at a few locations. The location of these defects has been annotated on the record plan at Appendix B.

Cracking in render panels

Vertical crack in render at door

Within the Games Hall the blockwork was generally in good order. Minor hairline cracking was noted at high level in the internal corners.

The location of the defects noted has been annotated in red on the record plan at Appendix B.

3.3. Robertson's Inspection Report

The inspection undertaken by Robertson did not identify any defects. No intrusive investigations were undertaken. A copy of the Inspection Record is included at Appendix B.

3.4. Conclusion

The blockwork was found to be in good order. No defects which are indicative of possible problems with either the wall ties or stability of the outer leaf were noted.

The cracking noted in the render is typical of shrinkage. Again there are no indications of problems with either the wall ties or the stability of the outer leaf.

Appendix B

Inspection Report
Strathmore Primary School, Forfar

PERIMETER WALLS VISUALLY INSPECTED.

HIGHLIGHTS CRACKING.

NOTES

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WINDOWS / SCREENS / ROOFLIGHTS

Polyester powder coated aluminium windows, screens and rooflights to achieve 2 2W/m2K - All glazing below 800mm high above FFL to be in safety glass to BS 6262

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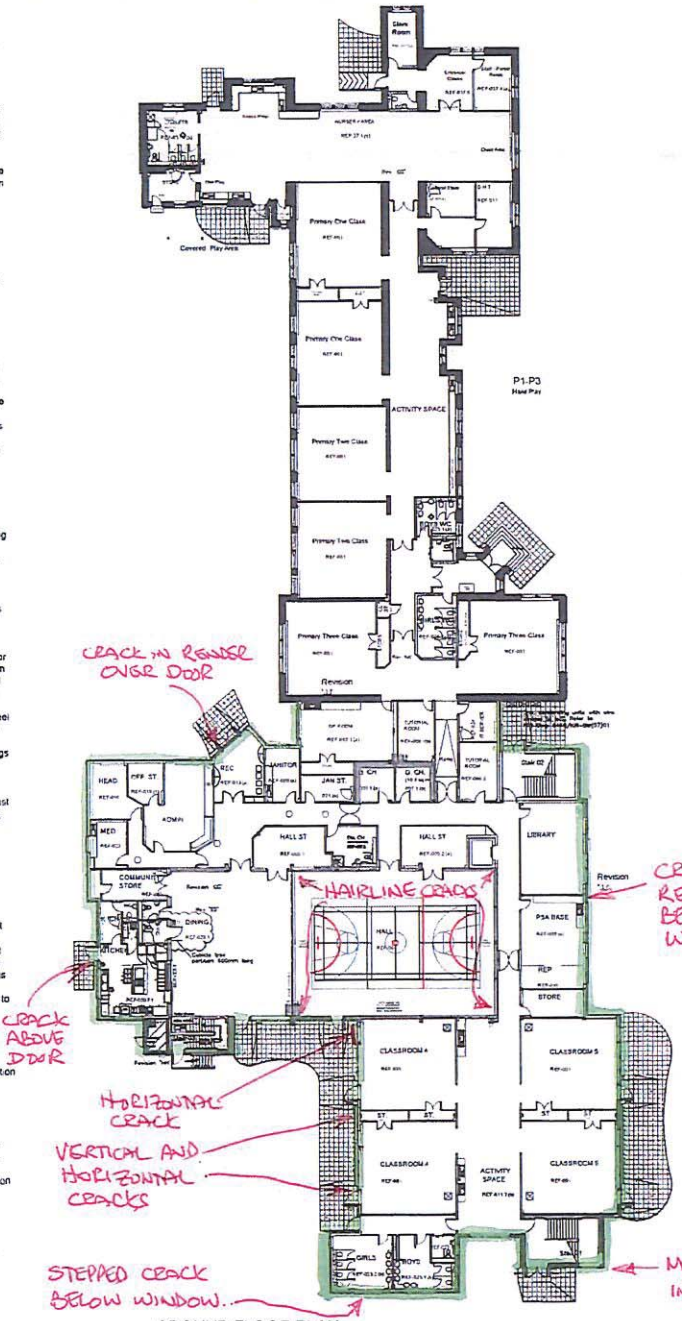
All dimensions to be verified on site prior to commencement of work and prior to manufacture of components and any discrepancy notified to the Architects immediately

All new sw etc to be treated by impregnation treatment at the timber yard or by a coloured preservative ie Cuprinol or e/a applied on site

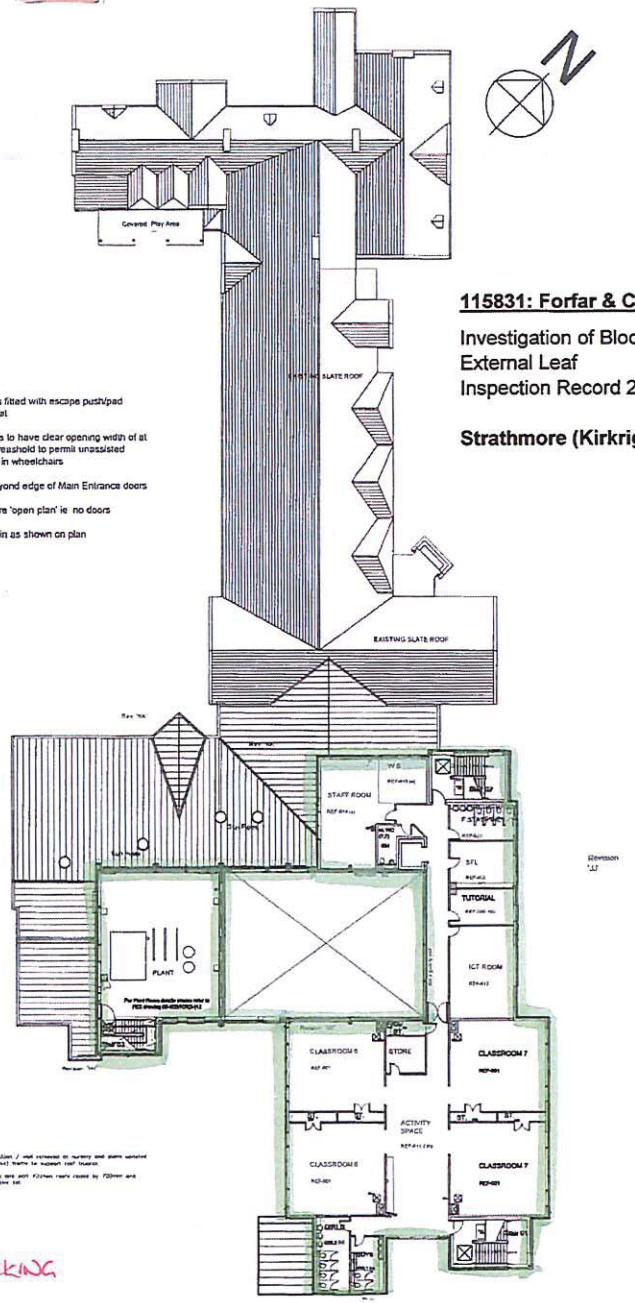
FLOORS - Ground floor in reinforced concrete to Engineers design and details finished ready to accept floor coverings - Main Hall to have Sports Floor 30mm thick Polyfoam under floor insulation

Intumescent paint applied on all primary steel work

cavity barrier provided at both top and bottom of wall and at the the upper floor slab refer to L(21)402



GROUND FLOOR PLAN



FIRST FLOOR PLAN

All final exit doors fitted with escape push/pad ironmongery to suit

All entrance doors to have clear opening width of at least 800mm Threashold to permit unassisted access to people in wheelchairs

Platt 1200mm beyond edge of Main Entrance doors

All Classrooms are 'open plan' ie no doors

All SWP boxed in as shown on plan

115831: Forfar & Carnoustie Schools

Investigation of Blockwork
External Leaf
Inspection Record 22 June 2016

Strathmore (Kirkriggs) Primary School, Forfar

Angus Council

ROBERTSON

GS	Updated "AS BUILT" cubicle type partition added	Aug '08
RR	Hall Disabled to let door indicated opening out	Jan '08
DO	External Platt & ramped areas updated	14 12 07
PP	Disabled WC/shower/changing updated	16 11 07
OO	External platts added	12 11 07
NN	Hall Store doors to open out	25 10 07
MM	Admin/ Office Store partition amended	27 09 07
LL	Mullion added to window	11 09 07
KK	Door added and roof amendments	20 08 07
JJ	Partition removed from SFL (FF) + 2no. sinks	
	updated as MICE Tutorial Room Refs updated	April 07
Revision		Date

Mackie Ramsay Taylor Chartered Architects

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e-mail : mail@mrtarchitects.com

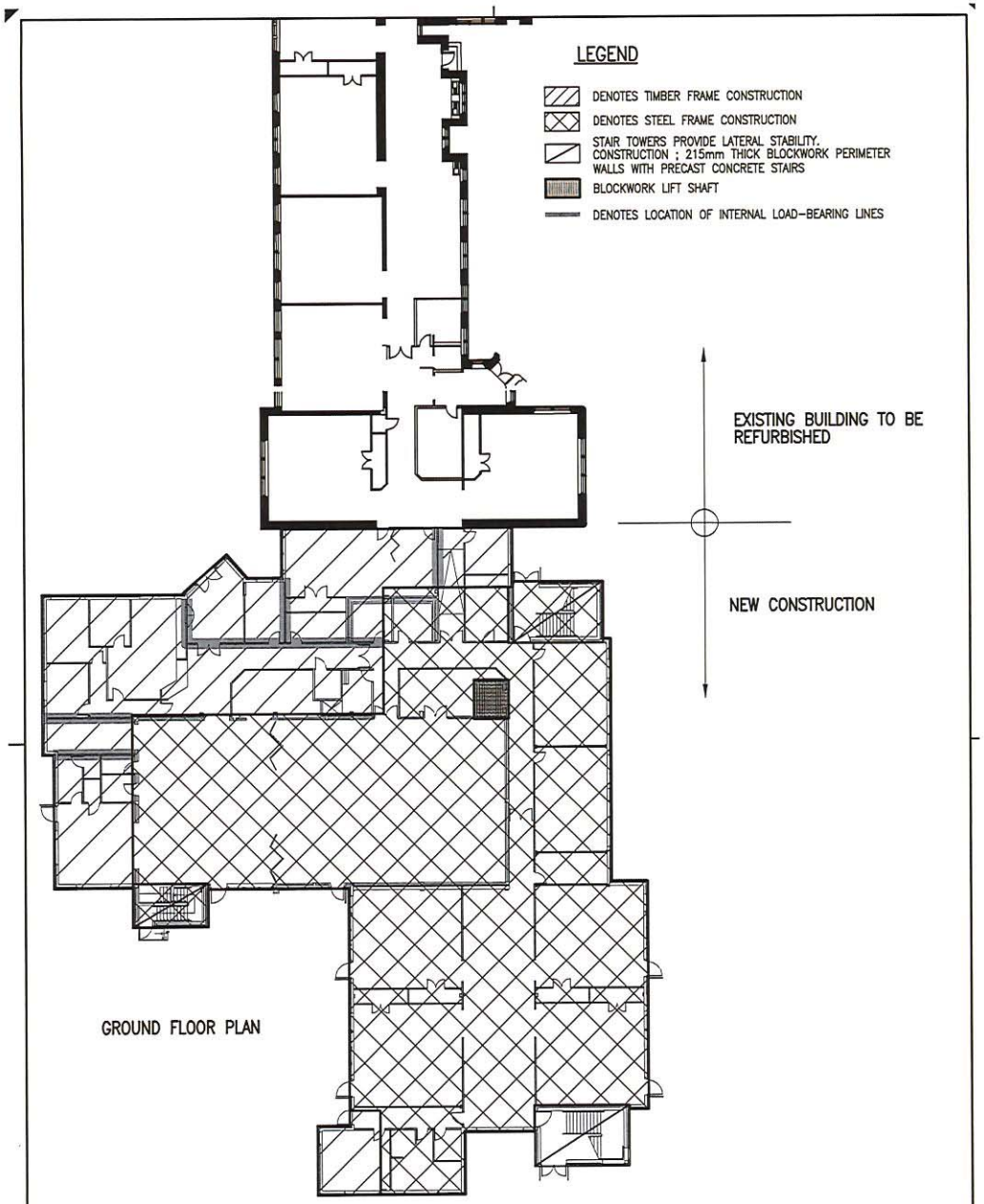
Project: Forfar & Carnoustie Schools
~~Kirkriggs~~ STRATHMORE
Primary School

Drawing: PROPOSED FLOOR PLANS

Scale: 1 : 200 @ A1

Date: NOV 2005 | Drawn By | Checked By

Project No.: 1346 - 02 | Drawing No.: L(20)01 SS



Rev.	Date	Description	Drawn	Checked	Approved
D	24.03.06	ISSUED FOR CONSTRUCTION.	SL		
C	24.03.06	ISSUED FOR BILLING ON BIW	PB		
B	09.03.06	DRAWING UPDATED TO SUIT ARCHITECTS REVISED LAYOUT	PB		
A	22.04.05	DRAWING UPDATED TO SUIT ARCHITECTS REVISED LAYOUT	PB		

Project Title:
FORFAR/CARNOUSTIE SCHOOLS PPP
KIRKRIGGS PRIMARY SCHOOL
FORFAR

Drawing Title:
S2 KIRKRIGGS PRIMARY SCHOOL
DESIGN PHILOSOPHY PLAN
GROUND FLOOR

FAIRHURST
CONSULTING STRUCTURAL AND CIVIL ENGINEERS
Western of Craigie
Southampton Road
Number
EH4 7PH
tel.: 01382 433200
fax.: 01382 436733

Scale at A3:	Status:	CAD File Name:
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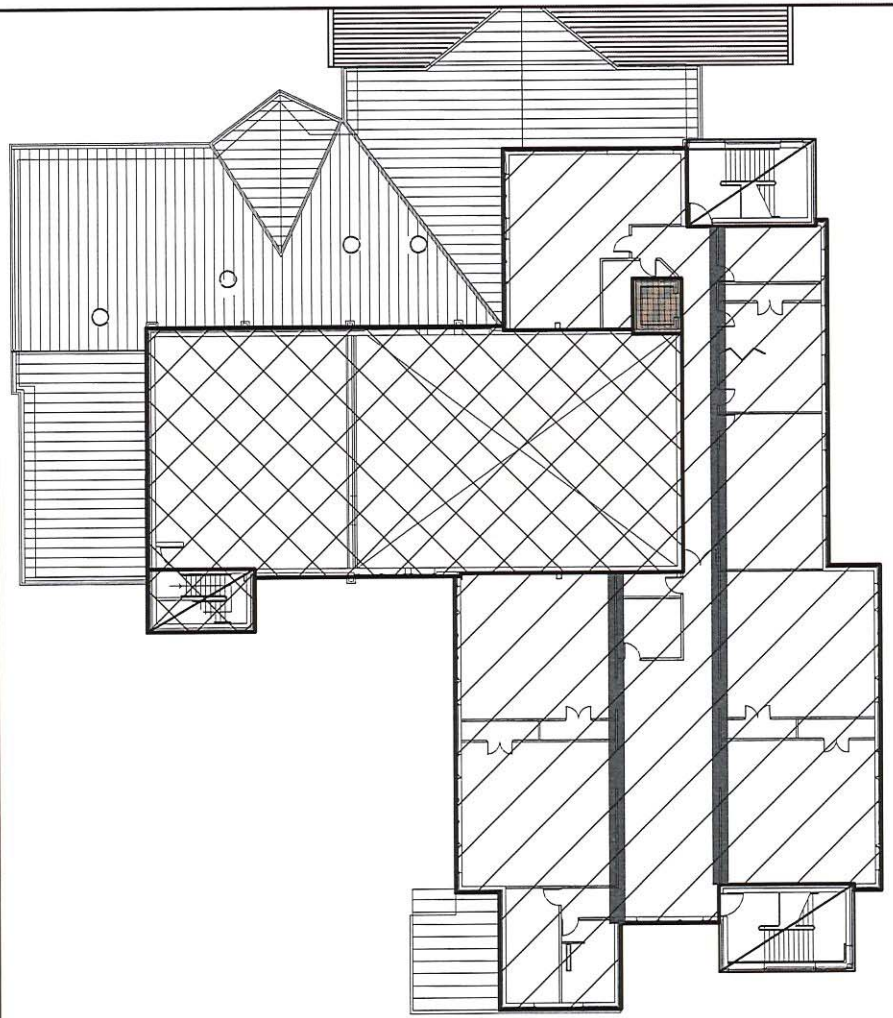
AM	SJC	GLB
Date: 18/03/05	Date: 06/11/06	Date: 06/11/06

Drawing No.: 60299-S2-152 Revision: D



LEGEND

- DENOTES TIMBER FRAME CONSTRUCTION
- DENOTES STEEL FRAME CONSTRUCTION
- STAIR TOWERS PROVIDE LATERAL STABILITY. CONSTRUCTION ; 215mm THICK BLOCKWORK PERIMETER WALLS WITH PRECAST CONCRETE STAIRS
- BLOCKWORK LIFT SHAFT
- DENOTES LOCATION OF INTERNAL LOAD-BEARING LINES

FIRST FLOOR PLAN

Rev.	Date	Description	Drawn	Checked	Approved
D	06.11.06	ISSUED FOR CONSTRUCTION	SL		
C	24.03.06	ISSUED FOR BILLING ON BIW	PB		
B	09.03.06	DRAWING UPDATED TO SUIT ARCHITECTS REVISED LAYOUT	PB		
A	22.04.05	DRAWING UPDATED TO SUIT ARCHITECTS REVISED LAYOUT	PB		

Client:

Project Title:
FORFAR/CARNOUSTIE SCHOOLS PPP
KIRKRIGGS PRIMARY SCHOOL
FORFAR

Drawing Title:
S2 KIRKRIGGS PRIMARY SCHOOL
DESIGN PHILOSOPHY PLAN
FIRST FLOOR

FAIRHURST
CONSULTING STRUCTURAL AND CIVIL ENGINEERS
Westerton of Craigie
Southampton Road
Dundee
DD4 7PN
tel.: 01382 453300
fax.: 01382 458755

Scale at A2:	Status:	CAD File Name:
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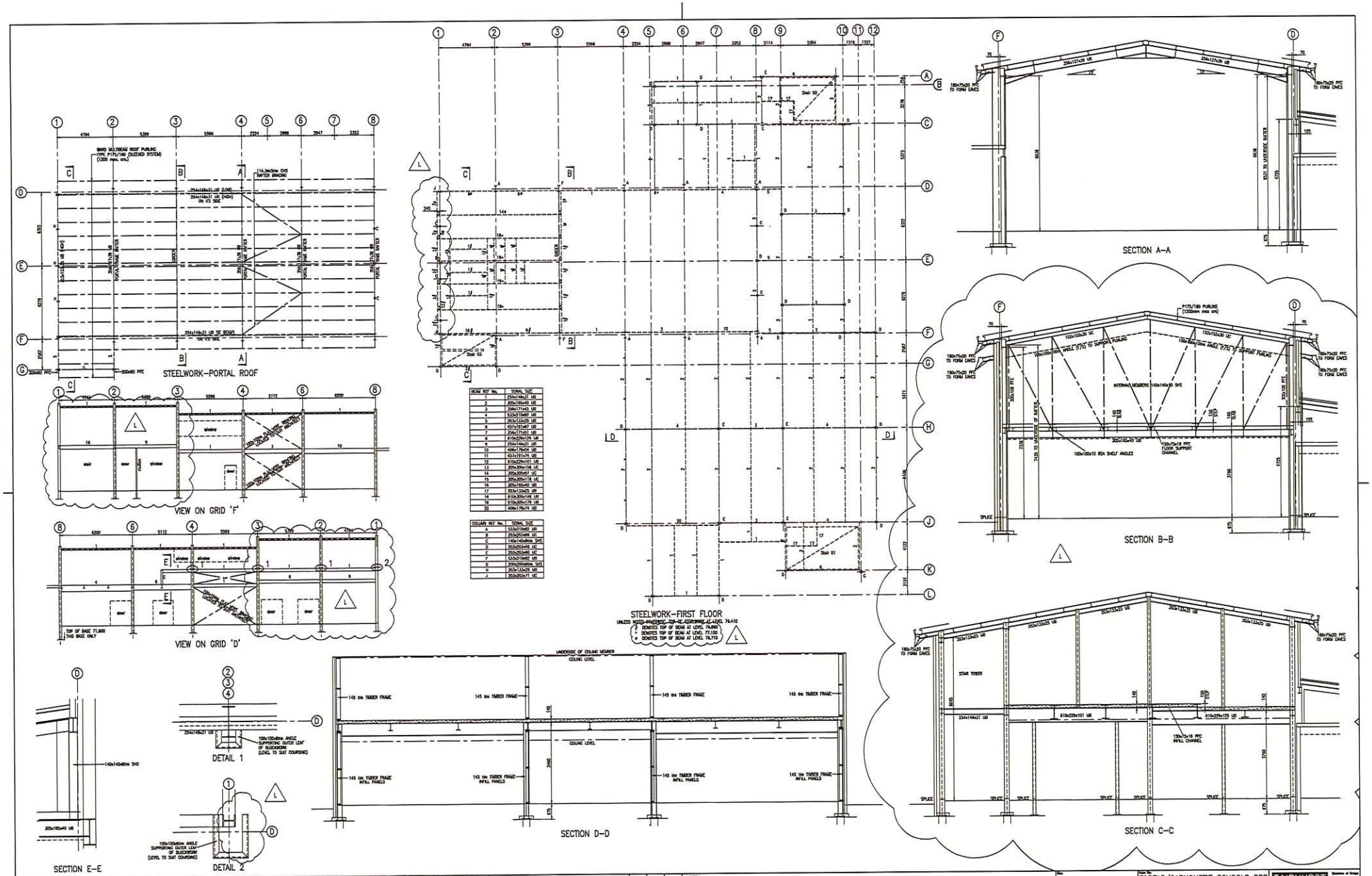
AM	SJC	CLB
Date: 18/03/05	Date: 06/11/06	Date: 06/11/06

Drawing No.: 60299-S2-154
Revision: D



BEAM REF No.	SERIAL SIZE
1	254x146x31 UB
2	305x165x40 UB
3	356x171x45 UB
4	533x210x82 UB
5	203x133x25 UB
6	457x191x67 UB
7	356x171x51 UB
8	610x229x125 UB
9	254x146x31 UB
10	406x178x54 UB
11	457x191x74 UB
12	610x229x101 UB
13	305x305x158 UC
14	305x305x97 UC
15	305x305x118 UC
16	305x165x40 UB
17	203x133x25 UB
18	610x305x149 UB
19	610x305x179 UB
20	406x178x74 UB

COLUMN REF No.	SERIAL SIZE
A	533x210x82 UB
B	203x203x86 UC
C	140x140x82m SHS
D	203x203x46 UC
E	203x203x60 UC
F	533x210x82 UB
G	200x200x82m SHS
H	203x133x25 UB
J	203x203x71 UC

Rev.	Date	Description	Drawn	Checked	Approved
E	31/08/06	STEELWORK ARRANGEMENT ALTERED TO SUIT UPDATED LAYOUT SECTION C-C UPDATED SECTIONS THROUGH FLOOR SLAB DELETED	PB		
D	11/08/06	FIRST FLOOR STEELWORK AMENDED RAFTER SIZES AMENDED	AM		
C	04/04/06	STEELWORK SIZES AND SECTIONS UPDATED	AM		
B	31/04/06	PORTAL ROOF SUPPORT ALTERED TO SHEETING RAILS	PB		
A	24/03/06	HOLDS REMOVED	PB		
J	04/12/06	BEAM SECTION SIZE ON GRID J ALTERED TO SUIT FES REQUIREMENTS	PB	SC	GLB
I	30/11/06	BEAMS ADDED AT STAIRS DIMENSIONS ADDED TO SECTIONS A-A, B-B & C-C	PB	SC	GLB
H	17/10/06	ISSUED FOR CONSTRUCTION	PB	JMD	GLB
G	11/08/06	PLANT ROOM FLOOR STEELWORK AMENDED	JMD		
F	26/01/06	COLUMNS MOVED TO REFLECT ARCHITECTS DETAILS SECTIONS GENERALLY UPDATED	AM		
L	02/03/07	LEVEL OF STEELWORK BETWEEN GRIDS 1&3 INCREASED BY 700mm DETAIL 2 ALTERED. STEEL ON GRID 1 ALTERED	PB	SC	GLB
K	06/12/06	COLUMN GRID D/B AMENDED TO SUIT LIFT PIT.	JMD		

NOTES
1. ALL HOLLOW SECTIONS TO BE GRADE S275 JZH TO BS EN 10 210.
2. ALL ANGLES TO BE GRADE S275 JZH TO BS EN 10 056
3. ALL OTHER STEELWORK TO BE GRADE S275 TO BS4:2005
4. ALL BOLTS TO BE GRADE 8.8.
5. ALL WELDS TO BE 6mm CONTINUOUS FILLET.
6. ALL DIMENSIONS TO BE CHECKED BY CONTRACTOR ON SITE PRIOR TO FABRICATING STEELWORK.
7. THIS DRAWING TO BE READ IN CONJUNCTION WITH ARCHITECTS DRAWINGS.
8. FOR PAINT TREATMENT REFER TO SPECIFICATION

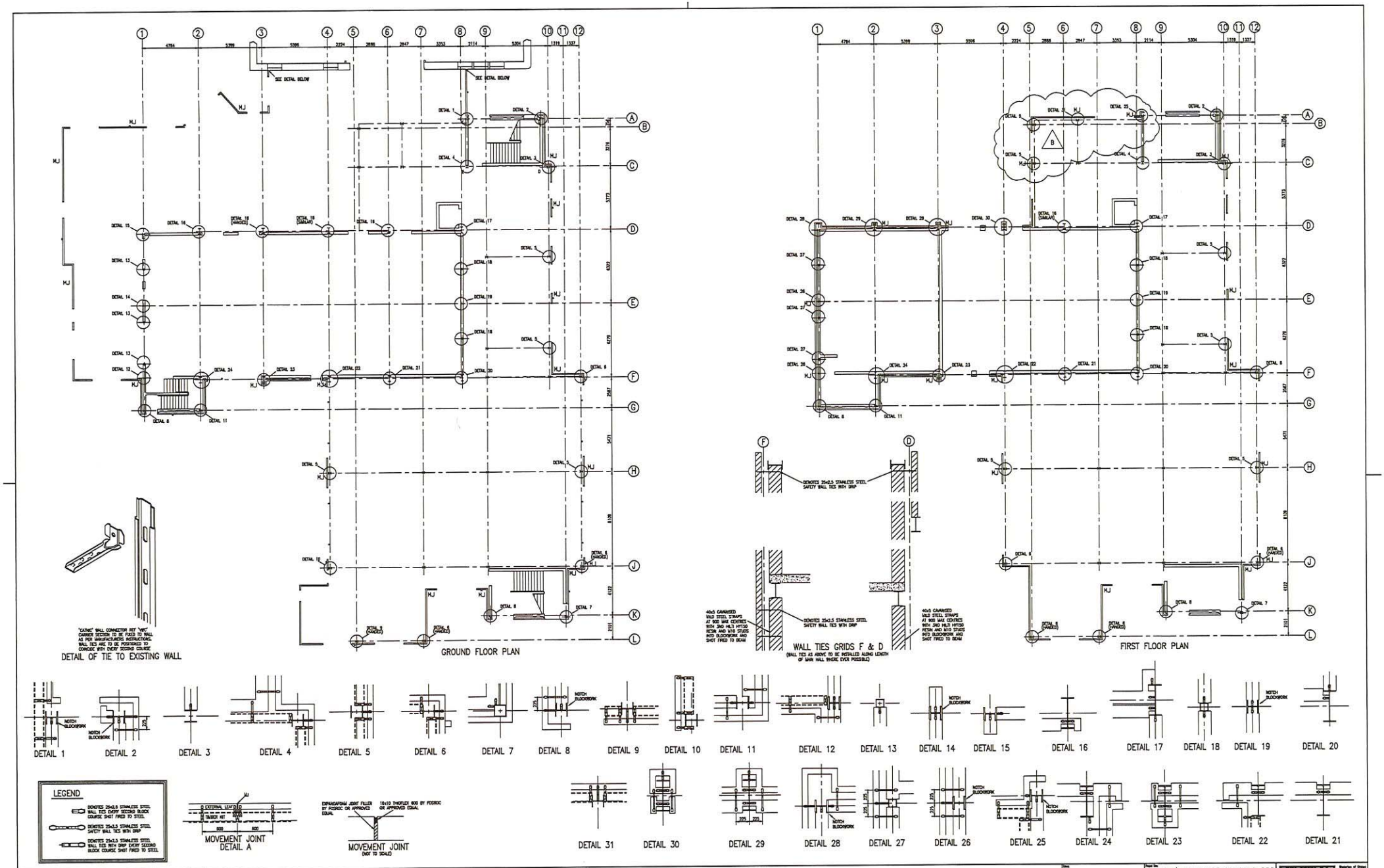
Project No.
FORFAR/CARNOUSTIE SCHOOLS PPP
KIRKRIGGS PRIMARY SCHOOL
FORFAR

Drawing No.
STEELWORK-FIRST FLOOR

FAIRHURST
CONSULTING STRUCTURAL AND CIVIL ENGINEERS

Scale at A1	Scale	Drawn	Checked
1:100	CONSTRUCTION	PB	JMD
Date	Date	Date	Date
15/03/05	17/10/06	17/10/06	

Drawing No. 60299-S2-151 Revision L



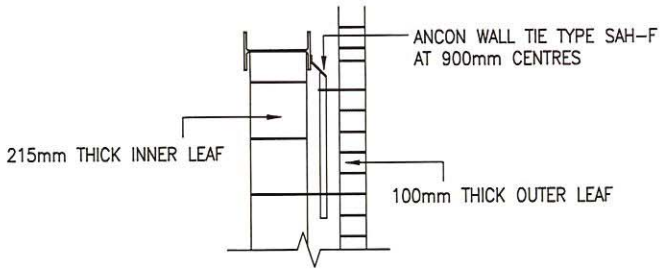
Rev.	Date	Description	Drawn	Checked	Approved
B	31/01/07	3No MOVEMENT JOINTS ADDED.	JMD		
A	08/01/07	ISSUED FOR INFORMATION	JMD		

FORFAR/CARNOUSTIE SCHOOLS PPP
KIRKRIGGS SCHOOL
FORFAR

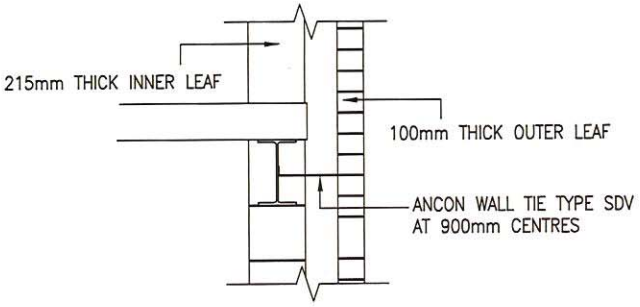
DETAILS OF WALL TIES
AND MOVEMENT JOINTS

FAIRHURST
CONSULTING STRUCTURAL AND CIVIL ENGINEERS

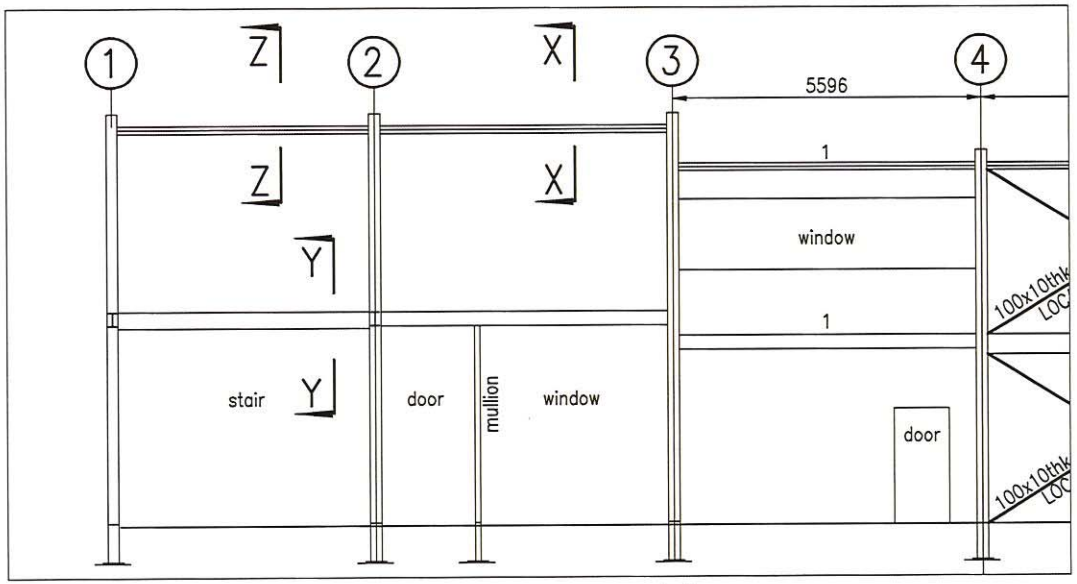
1:100 | PRELIMINARY | S2/P0168.dwg
JMD
12/12/06
60299-S2-168 | B



TYPICAL BLOCKWORK RESTRAINT X–X AT ROOF STEELWORK

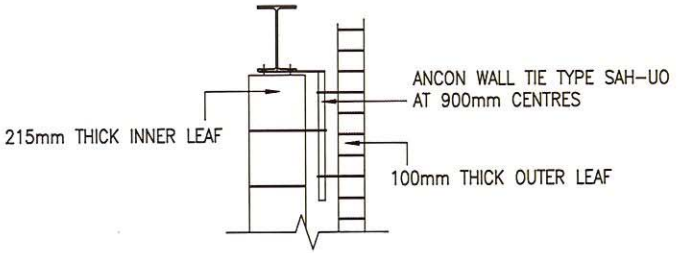


TYPICAL BEAM WALL TIE DETAIL Y–Y AT FIRST FLOOR STEELWORK



VIEW ON GRID LINE 'F'

SCALE 1:100



TYPICAL BLOCKWORK RESTRAINT Z–Z AT ROOF STEELWORK

Rev.	Date	Description	Drawn	Checked	Approved

Client:

Project Title:
FORFAR/CARNOUSTIE SCHOOLS PPP
KIRKRIGGS PRIMARY SCHOOL
FORFAR

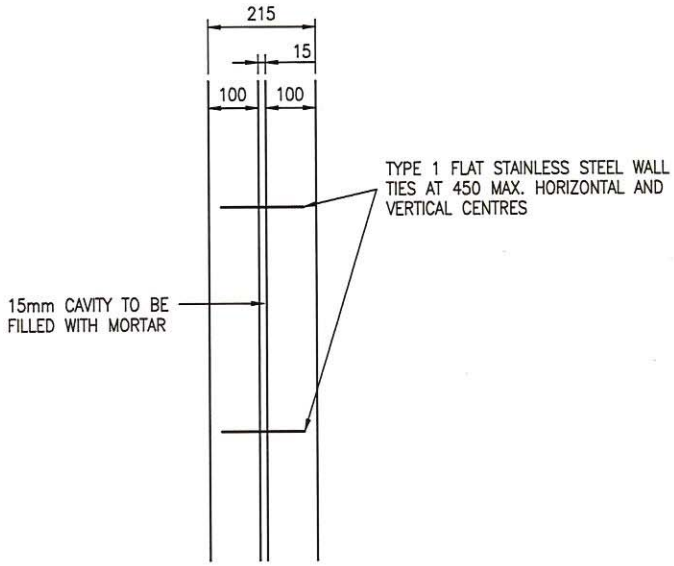
Drawing Title:
TYPICAL BLOCKWORK RESTRAINT AT ROOF AND FIRST FLOOR STEELWORK

FAIRHURST
CONSULTING STRUCTURAL AND CIVIL ENGINEERS
Westerton of Craigie
Southampton Road
Dundee
DD4 7PN
tel.: 01382 453300
fax.: 01382 456755

Scale at A3:	Status:	CAD File Name:
1:20	CONSTRUCTION	S2FPD172.dwg
Drawn: DJL	Checked: SC	Approved: GLB
Date: 23/04/07	Date: 26/04/07	Date: 26/04/07

Drawing No.: 60299–S2–172

Revision:



Rev.	Date	Description	Drawn	Chkd	App
A	03.10.06	ISSUED FOR CONSTRUCTION	AM	JMD	GS

Client:

Project Title:
FORFAR/CARNOUSTIE SCHOOLS PPP
KIRKRIGGS PRIMARY SCHOOL
FORFAR

Drawing Title:
DETAIL OF 215mm THICK WALL

FAIRHURST
CONSULTING STRUCTURAL AND CIVIL ENGINEERS
Westerton of Craigie
Southampton Road
Dundee
DD4 7PN
tel.: 01382 453300
fax.: 01382 456755

Scale at A4:	Status:	CAD File Name:
1:10	CONSTRUCTION	S2FPD158.dwg

Drawn:	Checked:	Approved:
AM	JMD	GS
Date: 17/03/06	Date: 03/10/06	Date: 20/10/06

Drawing No.: 60299–S2–158

Revision: A

APPENDIX 2a

RCT intrusive survey report

- Report/Photographs
- Marked up Drawings

ROBERTSON

Aftercare Progress Report

Progress Report August'16

Forfar/Carnoustie School inspections

Strathmore Primary School

Following the visual inspections and Fairhurst report it was requested that further investigations take place at all schools within the scope of works to satisfy Angus Council and Goodson Associates that the structure has been built as intended and concerns of structure failure were removed from the equation.

Arrangements were made to carry out the investigations on 20/08/16 and 21/08/16. The investigation took place at 7no locations on various elevations externally and 1no internally within the plant room to the rear of the building

Head Restraints
The engineers drawing identifies the requirement for head restraints at various locations and can confirm that during our investigation, no head restraints were identified as being installed

Bed reinforcing
This was not investigated as the games hall walls are 215mm thick made up of 2x 100mm concrete block tied together over the width of the wall which is then tied to the outer leaf of block over the width of the cavity, and there is no evidence of bed reinforcing being required here.

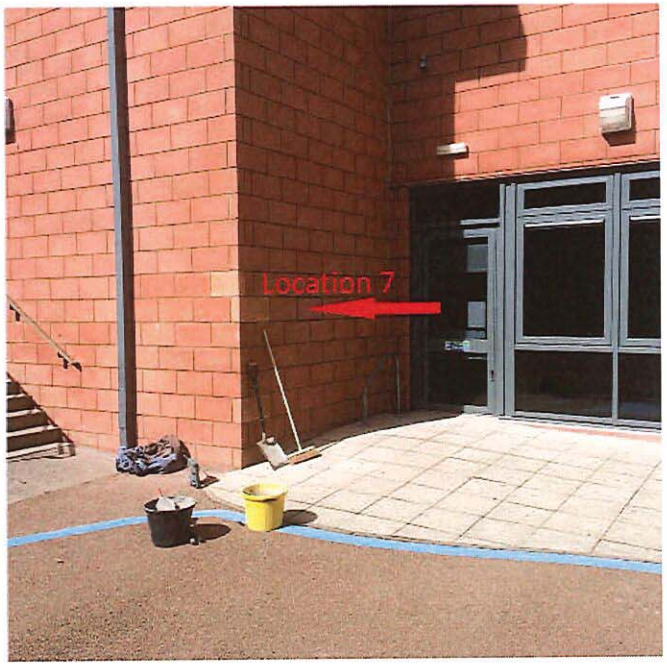
Wall ties
These were found to be at regular intervals wherever exposed during the investigations with an average embedment of 50mm. The tie at floor slab level between ground and first floor can be confirmed as being installed, and ties are at regular intervals with an embedment depth of 70mm.

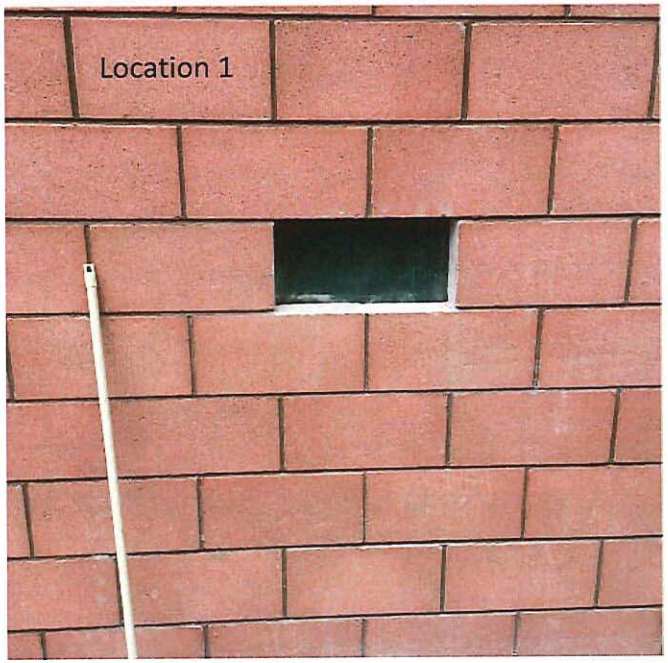
Angus Council were represented over the two days with [redacted] on 20/08/16 and [redacted] on 21/08/16 in attendance.

Photographs have been taken and marked up drawings have been sent to [redacted] of Fairhurst for comment and a meeting has been arranged for 24/08/16 at Fairhurst HQ to discuss our findings.

Strathmore
Primary School
Council
all visitors please report

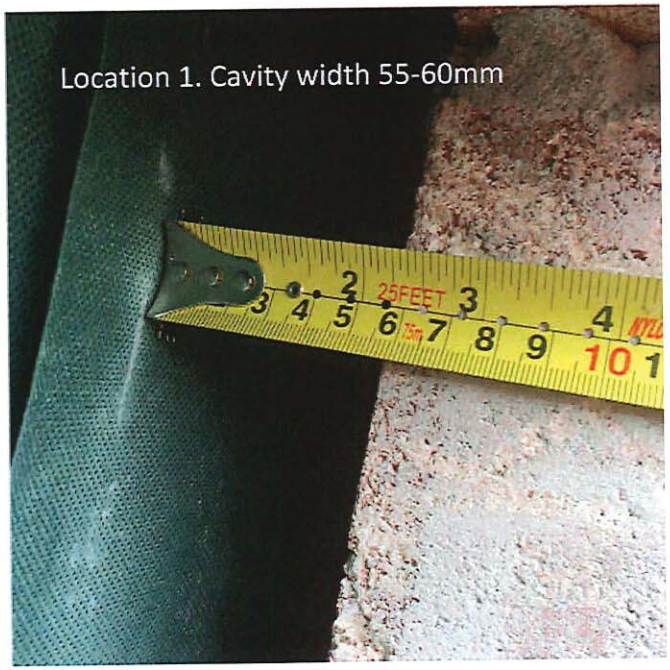
Location 1

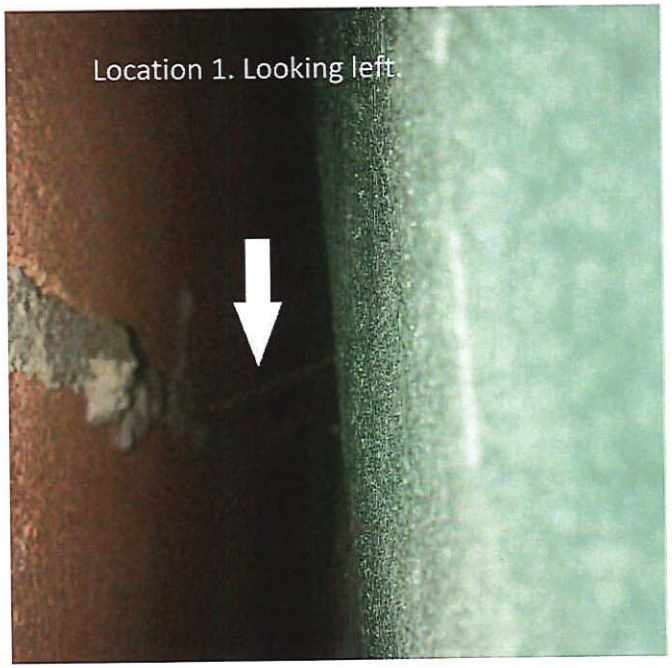

Location 7

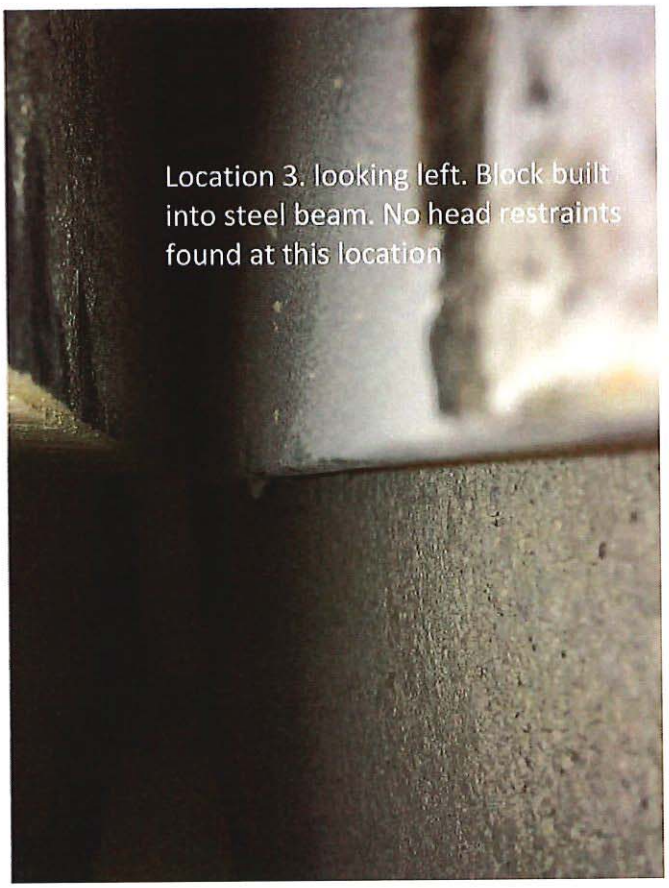

Location 1

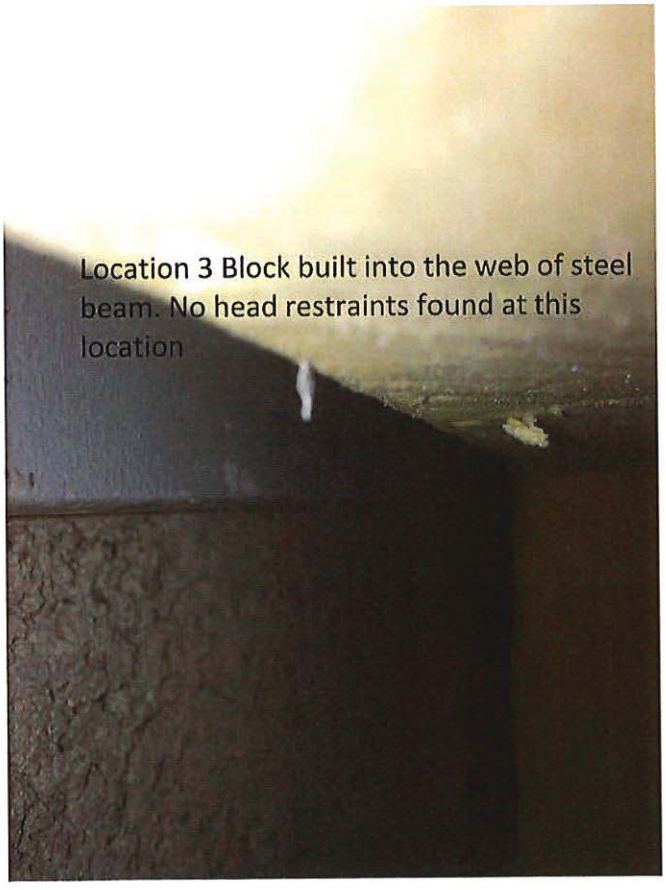
Location 1. Wall tie embedment
approx 60mm

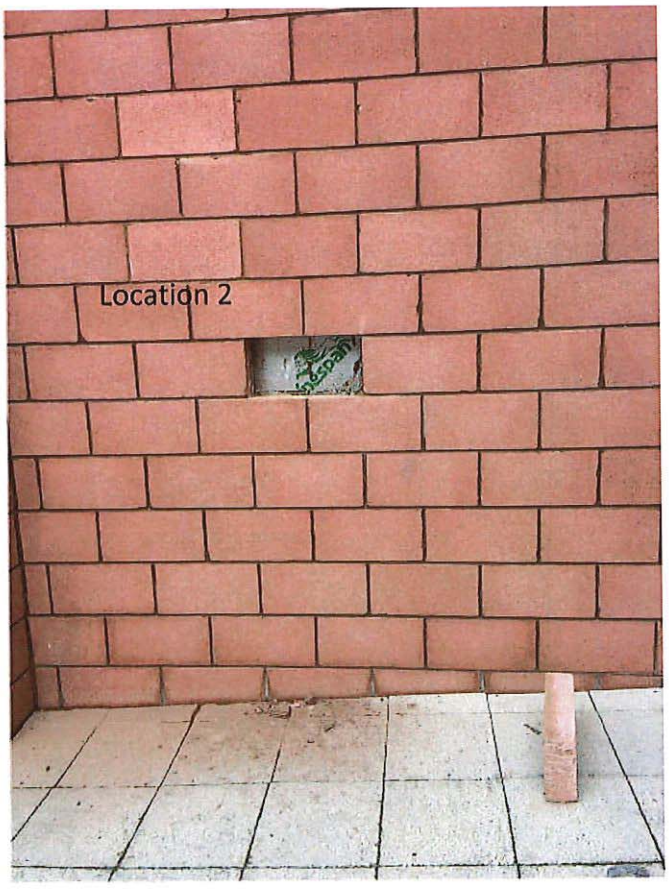
Location 1. Looking down

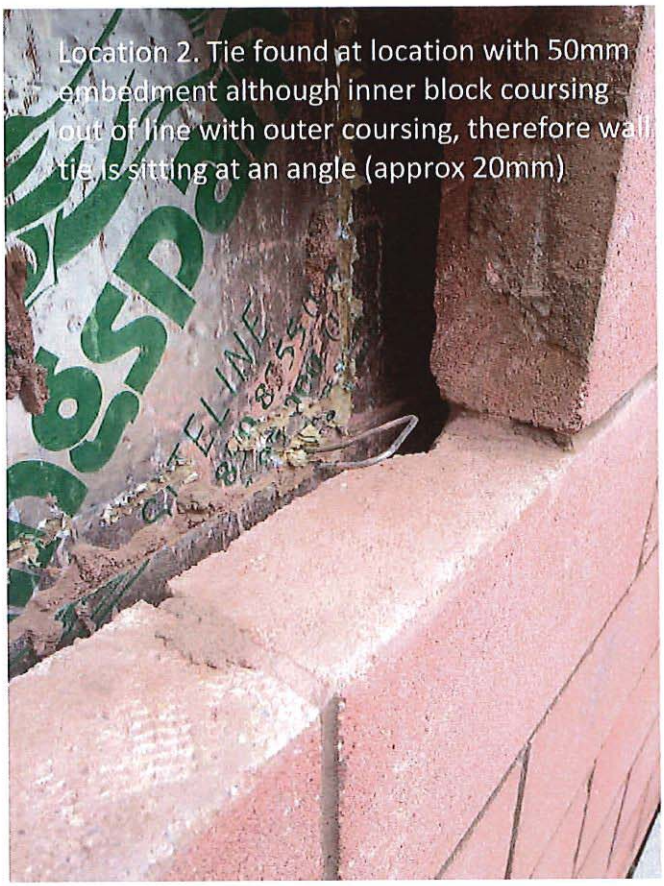

Location 1. Cavity width 55-60mm

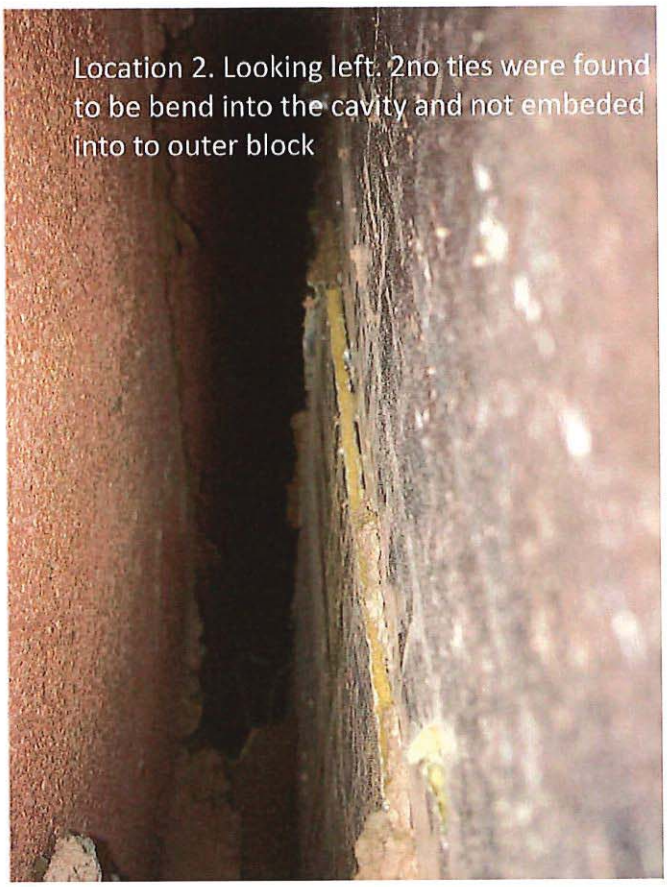

Location 1. Looking left

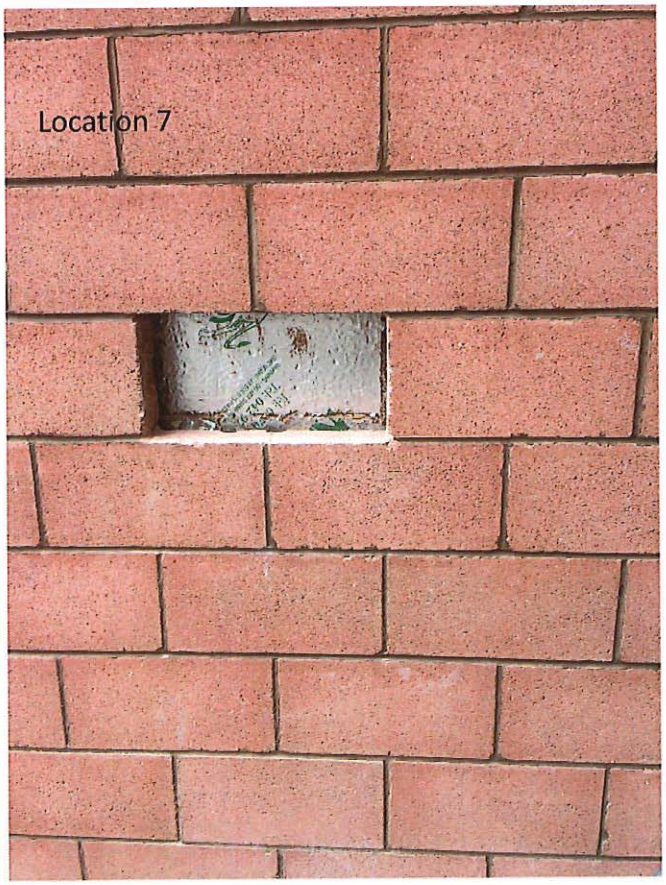

Location 3. looking left. Block built into steel beam. No head restraints found at this location

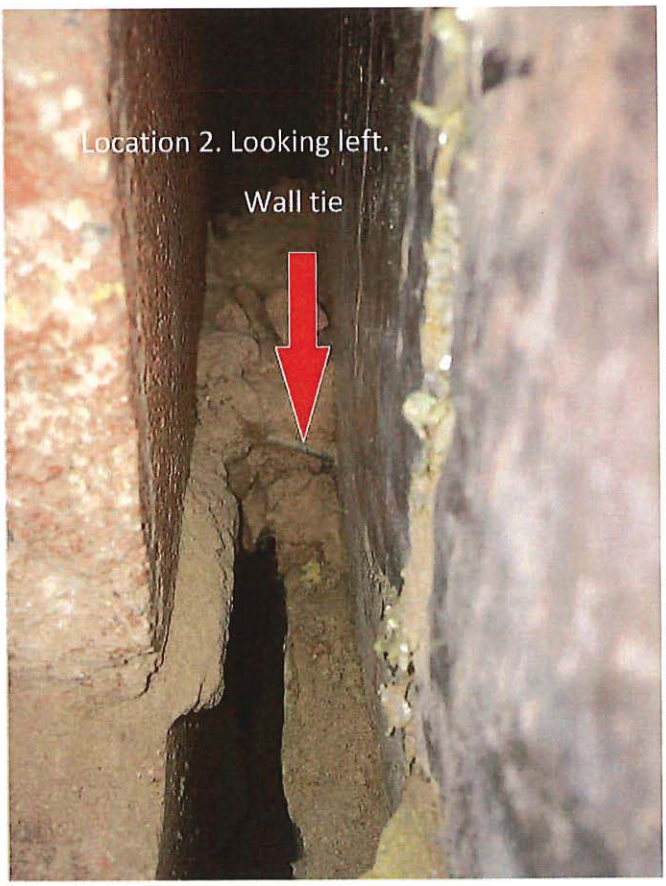

Location 3 Block built into the web of steel beam. No head restraints found at this location


Location 2

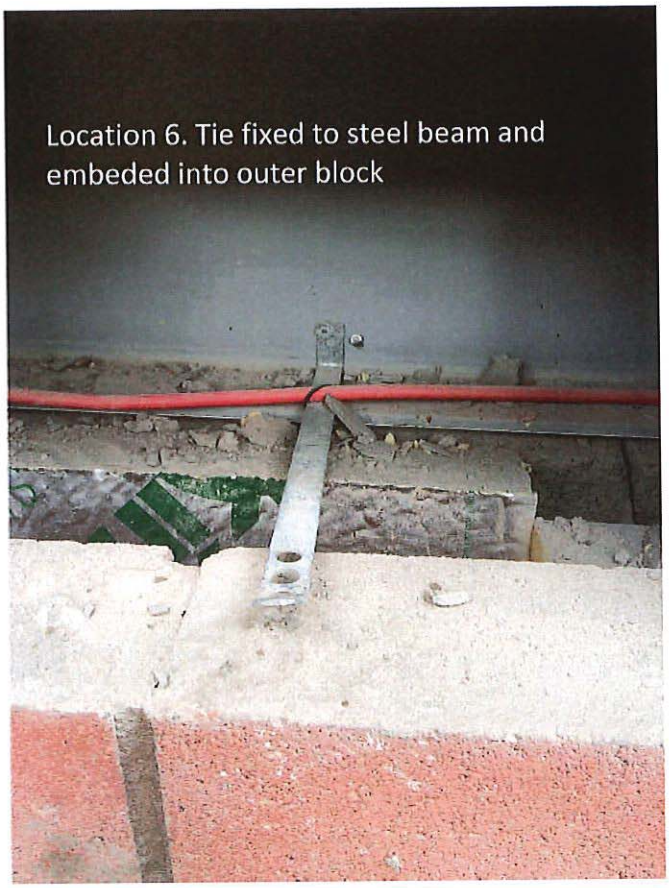

Location 2. Tie found at location with 50mm embedment although inner block coursing out of line with outer coursing, therefore wall tie is sitting at an angle (approx 20mm)

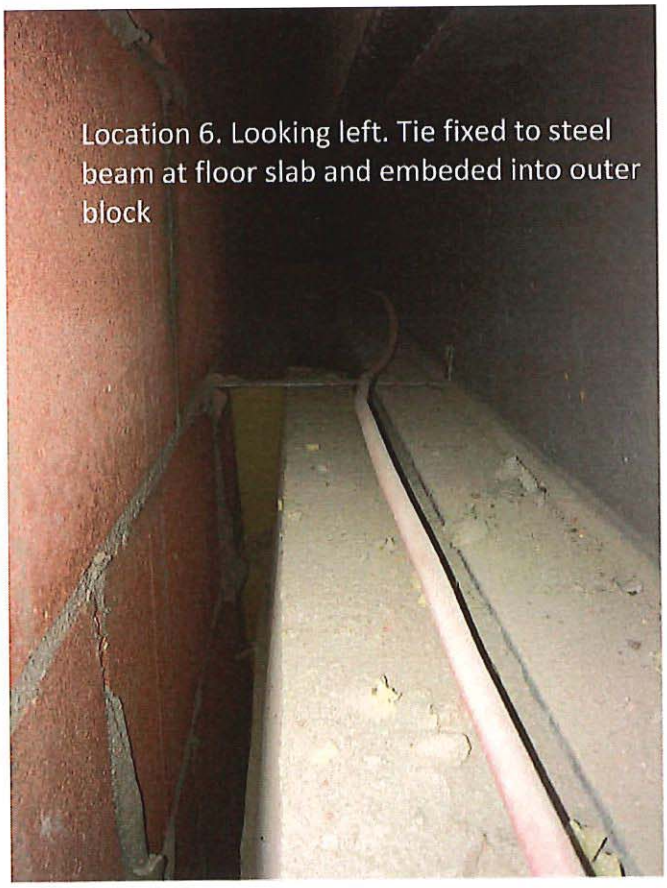

Location 2. Looking left. 2no ties were found to be bend into the cavity and not embeded into to outer block

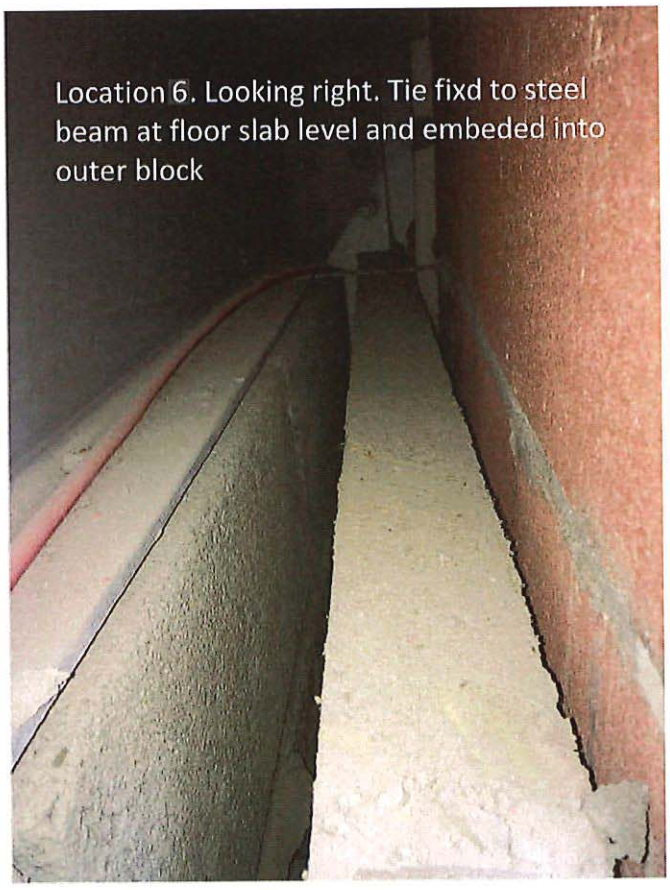

Location 7


Location 2. Looking left.
Wall tie

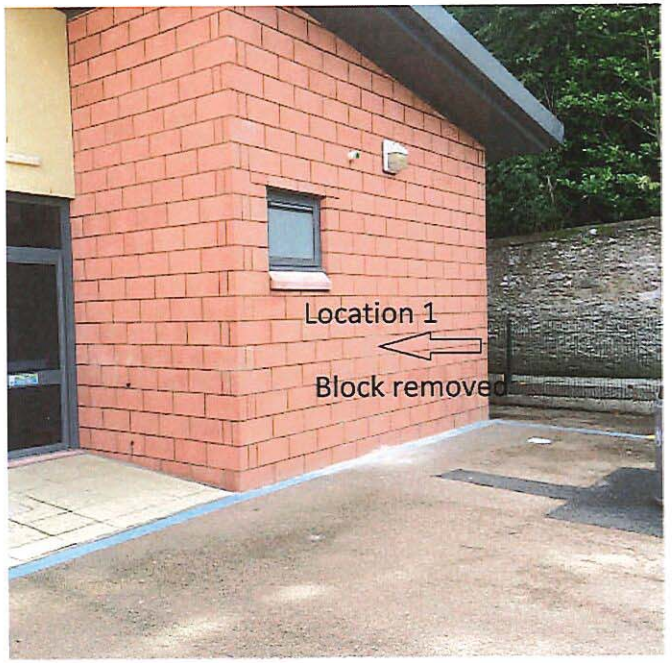
Location 6. Tie from steel beam at floor slab has 70mm embedment
Wickes


Location 6. Tie fixed to steel beam and embeded into outer block


Location 6. Looking left. Tie fixed to steel beam at floor slab and embeded into outer block


Location 6. Looking right. Tie fixd to steel beam at floor slab level and embeded into outer block

Wall tie
Looking up from location 4 to location 3


Location 1
Block removed

Wall tie
Looking right from location 4 up to location 3

Loc 4
Loc 5
Loc 6
Loc 7
Location 2
Block removed

WINDOWS / SCREENS / ROOFLIGHTS

'olyseter powder coated aluminium windows, screens and rooflights to achieve :.2W/m2K - All glazing below 800mm high ıbove FFL to be in safety glass to BS 6262

\ll internal screens to be hardwood with ИDF splayed facings for painting and where equired with necessary fire test certification ɔ satisfy local authority Building Control. 'ire resistant glass bedded in intumescent ıastic. Glass to reflect fire resistance of ırea as required.

)OORS

\ll new doors to the building provides level ıccess with barrier free thresholds to all loors. 1200mm deep area immediately in ront of all doors will be provided.

NTERNAL DOORS

\ll doorsets to be Ash/Beech faced 46mm olid core doors with matching HW lipping, ИDF splayed facings for painting with the ecessary fire test certification to satisfy the ocal authority Building Control. All glazed loors to have double rectangular apertures ɔ meet requirements of Building Regulations. Fire resistant glass bedded in ıtumescet mastic.

:XTERNAL WALL CONSTRUCTION

00mm thick external leaf in either lockwork clad with K Rend render or facing lockwork, 50mm wide cavity, timber kit ıner wall comprising: breather membrane, mm thick sheething ply, 145 wide timber rame infilled with insulation to give min U 'alue 0.30 and clad with 13mm thick)uraline wallboard, stainless steel wall ties ixed at centres to manufacturers ecommendations.
/ain Hall walls in 100 thick outer leaf in ither blockwork clad with K Rend render or acing blockwork, 50mm wide cavity, 75mm hick Polyfoam insulation to achieve min U 'alue 0.30 and 215 thick wall width in two 00mm thick leaves with inner leaf in fair aced paint quality blockwork, stainless steel vall ties fixed at centres to manufacturers ecommendations.
'eature panels clad with Cedar wood linings

IATURAL VENTILATION

\ll windows to have opening area of at least th of the floor area of the room it serves. 'ermavents to all windows to provide a rickle ventilation of at least 400mm2 for each square metre of floor area.

'OILET PROVISION

'oilet/Shower provision meets the equirements of The Education (School 'remises) Regulations 1999 and National Care Standards (for early education and hildcare up to the age of 16). Staff Toilet rovision reflects the requirements of the uilding Standards (Scotland) Regulations

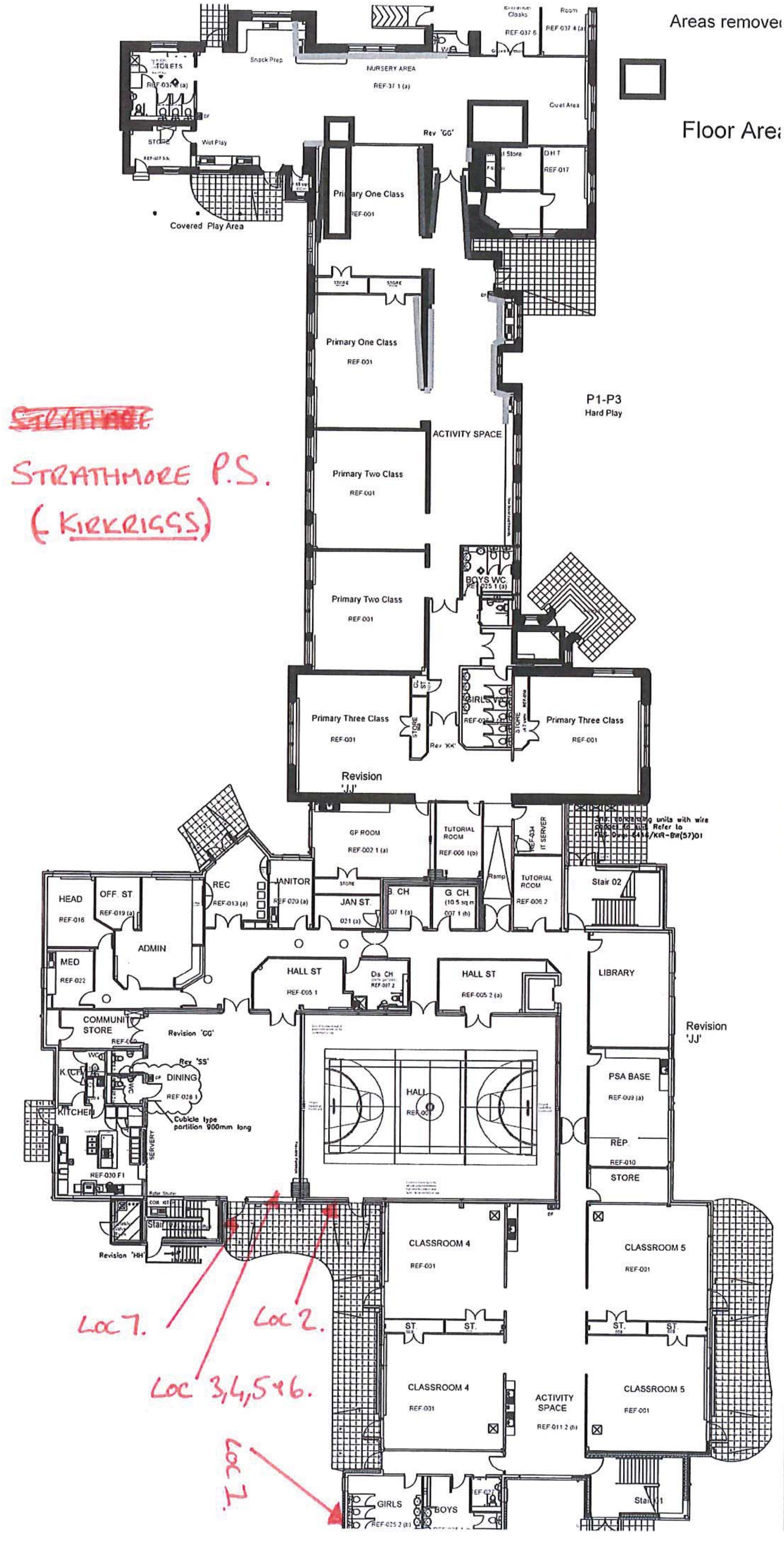
\ll dimensions to be verified on site prior to ommencement of work and prior to ıanufacture of components and any liscrepancy notified to the Architects mmediately

\ll new sw etc to be treated by impregnation reatment at the timber yard or by a oloured preservative ie Cuprinol or e/a pplied on site

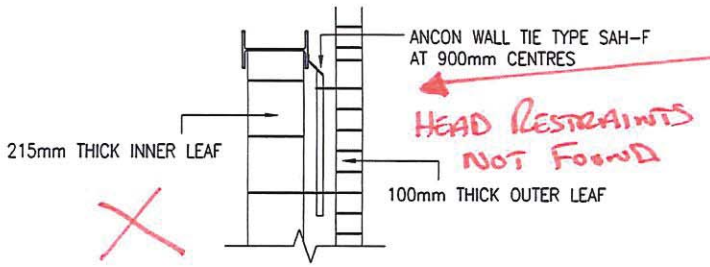
'LOORS:- Ground floor in reinforced oncrete to Engineers design and details inished ready to accept floor coverings - Лain Hall to have Sports Floor 0mm thick Polyfoam under floor insulation

ntumescent paint applied on all primary teel work.

avity barrier provided at both top and ottom of wall and at the the upper floor lab. refer to L(21)402

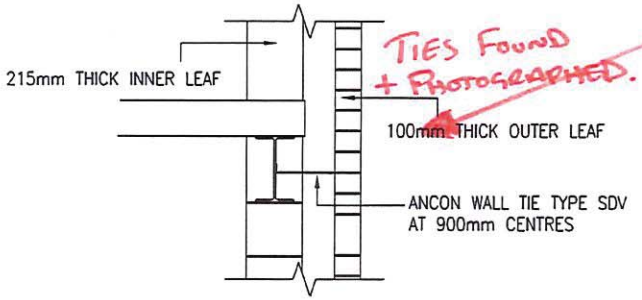


22-8-2016 12:22:49 Weir, David Project: Kirkriggs PS Drawing: S2FPD172 Rev: - Status: Construction (C) This drawing is not to scale



HEAD RESTRAINTS NOT FOUND

TYPICAL BLOCKWORK RESTRAINT X–X AT ROOF STEELWORK

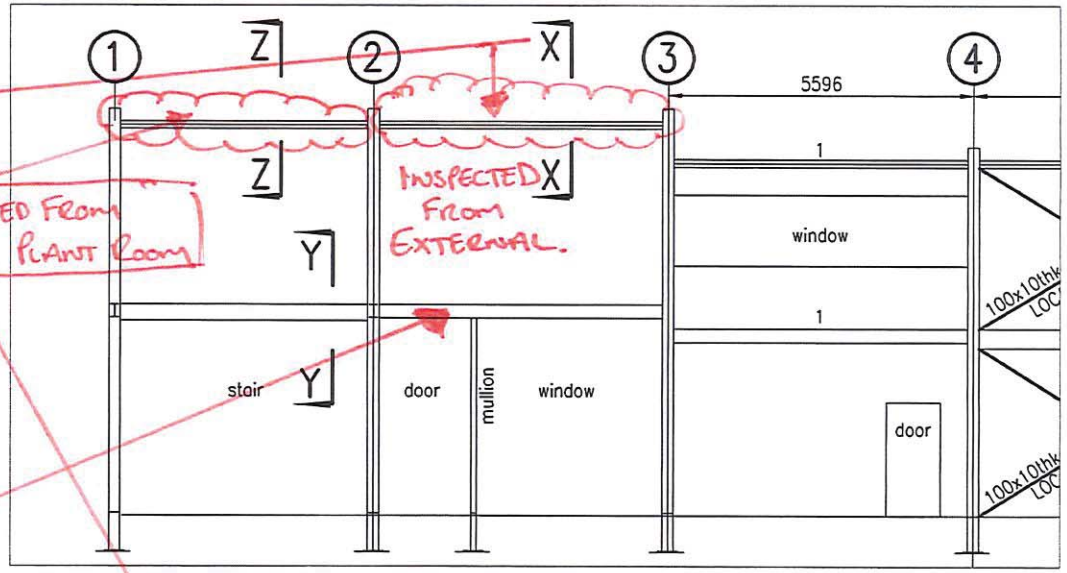


TIES FOUND + PHOTOGRAPHED.

TYPICAL BEAM WALL TIE DETAIL Y–Y AT FIRST FLOOR STEELWORK

INSPECTED FROM INSIDE PLANT ROOM

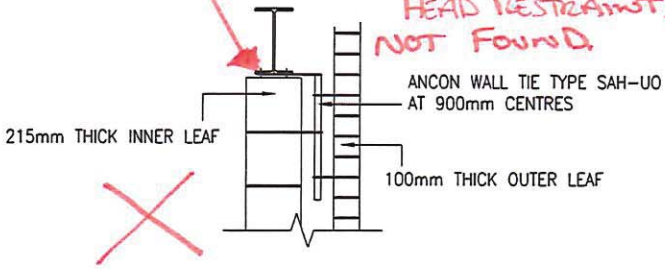
INSPECTED FROM EXTERNAL.



VIEW ON GRID LINE 'F'

SCALE 1:100

HEAD RESTRAINTS NOT FOUND.



TYPICAL BLOCKWORK RESTRAINT Z–Z AT ROOF STEELWORK

Rev.	Date	Description	Drawn	Checked	Approved

Client:

Project Title:
FORFAR/CARNOUSTIE SCHOOLS PPP
KIRKRIGGS PRIMARY SCHOOL
FORFAR

Drawing Title:
TYPICAL BLOCKWORK RESTRAINT AT ROOF AND FIRST FLOOR STEELWORK

FAIRHURST
CONSULTING STRUCTURAL AND CIVIL ENGINEERS
Westerton of Craigie
Southampton Road
Dundee
DD4 7PN
tel.: 01382 453300
fax.: 01382 456755

Scale at A3:	Status:	CAD File Name:
1:20	CONSTRUCTION	S2FPD172.dwg

Drawn:	Checked:	Approved:
DJL	SC	GLB
Date: 23/04/07	Date: 26/04/07	Date: 26/04/07

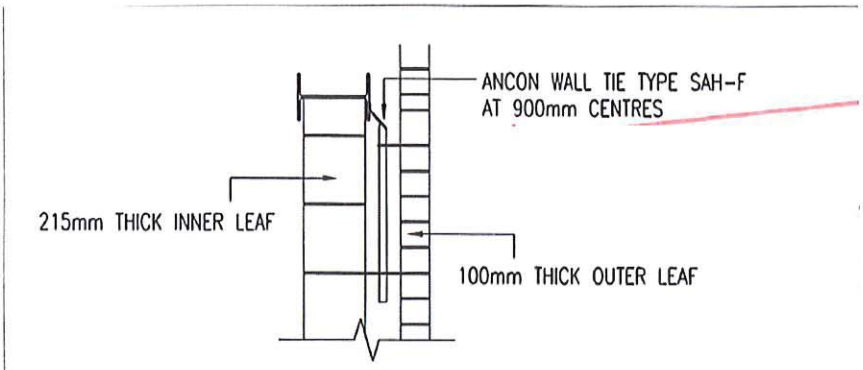
Drawing No.: 60299–S2–172

Revision:

APPENDIX 2b

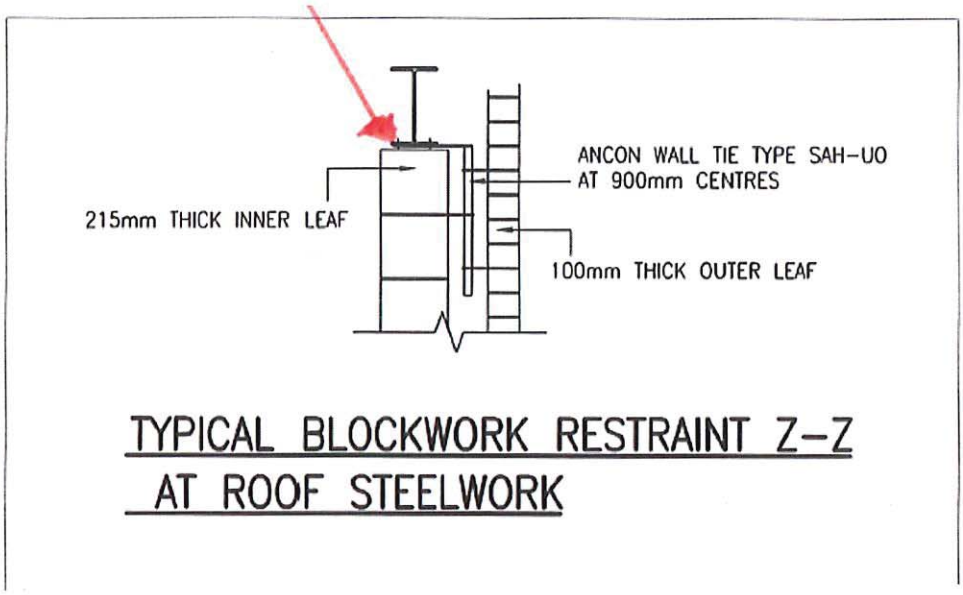
Variations from design

[redacted] November 2016



TYPICAL BLOCKWORK RESTRAINT X–X
AT ROOF STEELWORK

The above head restraint detail was not found at this location during the investigation



TYPICAL BLOCKWORK RESTRAINT Z–Z
AT ROOF STEELWORK

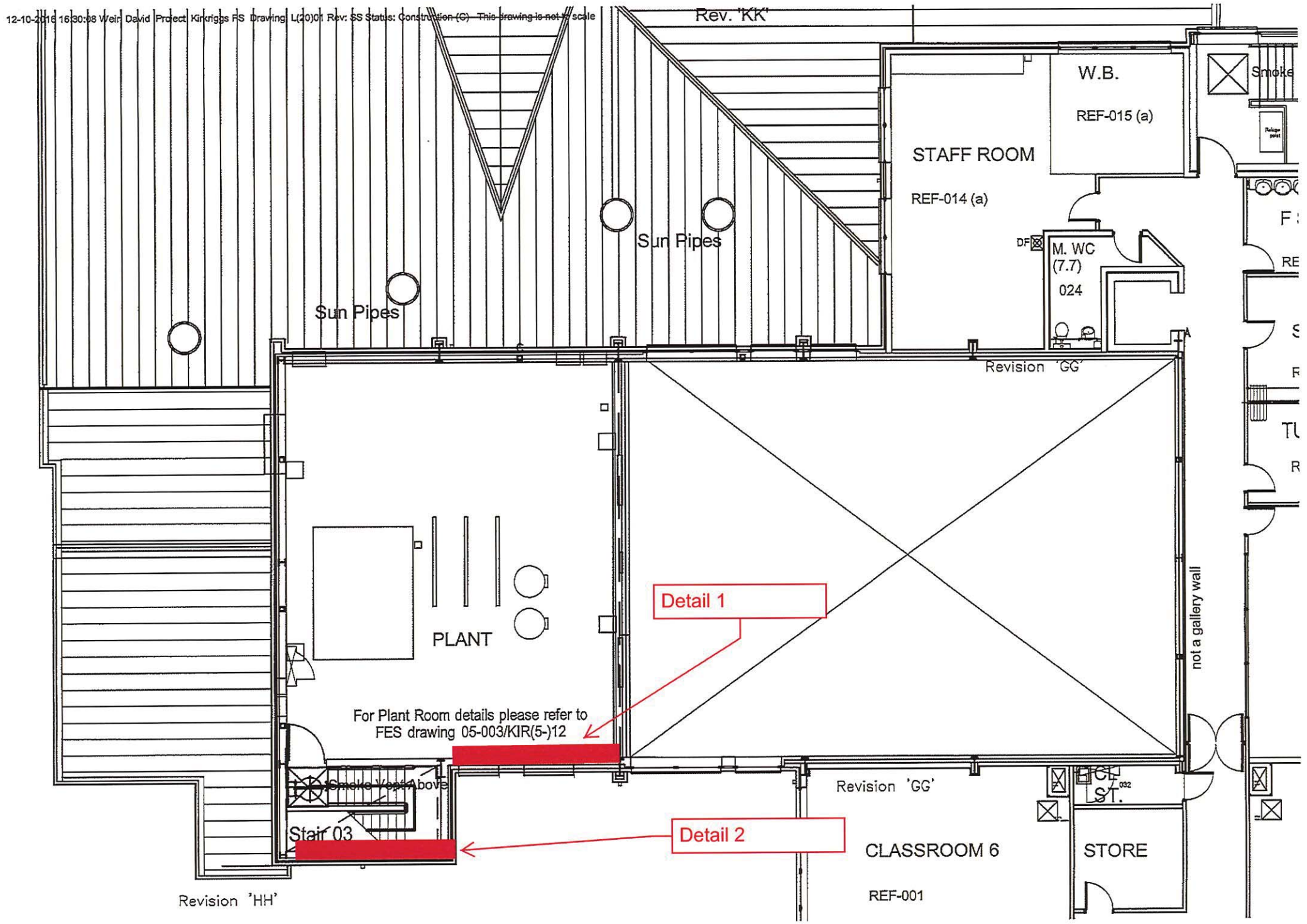
The above head restraint detail was not found at this location during the investigation

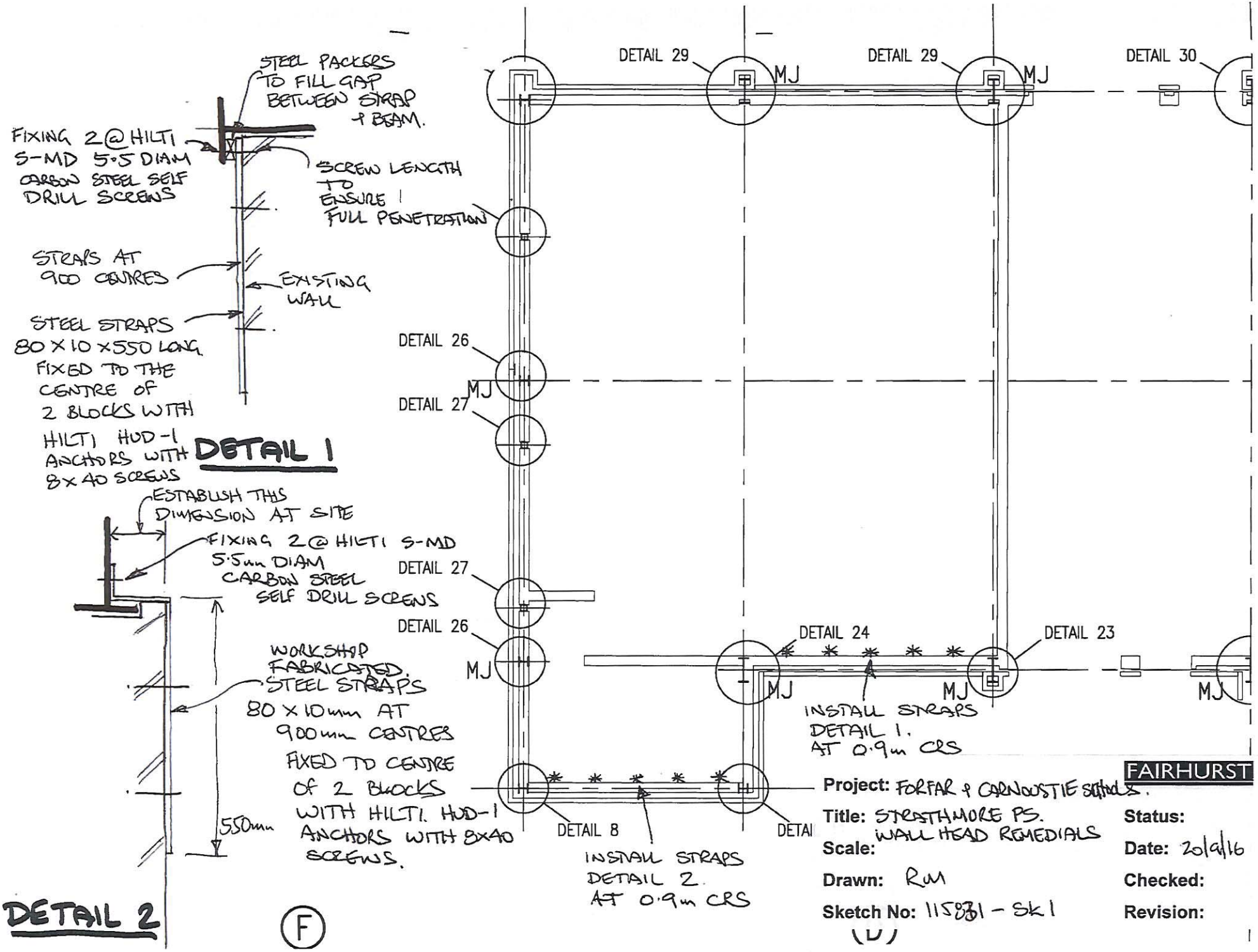
APPENDIX 3

Rectification works

[redacted]

November 2016


12-10-2016 16:30:08 Weir David Project Kirkriggs FS Drawing L(20)01 Rev: SS Status: Construction (C) This drawing is not to scale
Rev. 'KK'
W.B.
REF-015 (a)
Smoke
STAFF ROOM
REF-014 (a)
Sun Pipes
Sun Pipes
DF
M. WC
(7.7)
024
Revision 'GG'
PLANT
Detail 1
not a gallery wall
For Plant Room details please refer to
FES drawing 05-003/KIR(5-)12
Smoke Vent Above
Stair 03
Detail 2
Revision 'GG'
CLASSROOM 6
REF-001
STORE
Revision 'HH'



FAIRHURST

Project: FORFAR & CARNOUSTIE SCHOOLS.

Title: STRATHMORE PS. WALL HEAD REMEDIALS

Scale:

Drawn: RM

Sketch No: 115881 - Sk1

Status:

Date: 20/9/16

Checked:

Revision:

APPENDIX 4

W.A Fairhurst Close Out Report

[redacted] November 2016

engineering solutions, delivering results

115831/JRM/JB

16 November 2016

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THURSO
WATFORD
WESTHILL

Dear Sirs

115831: FORFAR AND CARNOUSTIE SCHOOLS – STRATHMORE PRIMARY SCHOOL

This letter should be read in conjunction with our Report 115831/dnd/01 dated 30/06/16. We confirm having reviewed the results of the various investigations and works undertaken and report as follows.

The design philosophy for the wall panels at the Games Hall is that they span horizontally with support provided to the ends of panel by columns and wind posts. The blockwork is exposed to the wind and extends to roof level, at one gable above the adjacent roof, and at parts of the elevations. In the other areas the lower part of the walls are sheltered by having single storey buildings and roofs abutting. At the elevations a wall head restraint is required at the top of the panels and a proprietary detail is specified. There is no design requirement for structural wall reinforcement in the beds.

The investigation of the wall ties in the area of double skin cavity masonry construction at the Games Hall revealed as follows:

Location 1 Tie Embedment 60mm
Location 2 Tie Embedment 50mm
Location 6 Tie Embedment 70mm (tie fixed to steel)

In one location wall ties were found to be folded up. Robertson has confirmed that other ties extended across the cavity at the correct centres in the area of the folded up ties. It appears that the purpose of the folded up ties is to hold the insulation in place. A step between the beds of the inner and outer leafs was also noted at Location 2. However, this appeared to be localised.

The investigations have revealed that the wall ties have adequate embedment in accordance with BS5628, Clause 25.2.6. The ties are generally property installed and in our opinion the structural integrity of the outer leaf is acceptable.

The investigations undertaken revealed that the Ancon wall head restraint at the elevation is missing. However, the inner leaf of 215mm block is built tight into the web of the beam at the Games Hall area and this will provide adequate horizontal support.

The blockwork panels at the gable walls span horizontally and we have undertaken a design check which confirms that these are acceptable without a specific head support. In the Plant room there are two locations where it appears that the Ancon head restraint detail has been omitted.

Chairman: R B McCracken Senior Partner: R Bryson
Partners: A J Connell M Peden P A Ridge P McMillan A R Milne G L Bruce D J Clayton I McKay J M Massage N M McSpadden A J Scott-Kiddie C A Clark S J Holmes J Lau

FAIRHURST

Restraint straps have been fitted to the inner face of the walls in accordance with the details on our sketch 115831-Sk1. We have enclosed record photographs showing the completed remedial works.

We therefore conclude that the remedial works which have been undertaken have addressed the issues identified in the investigations

Yours faithfully

[redacted]

Project Engineer

Enc./ Record Photographs
115831 – Sk1

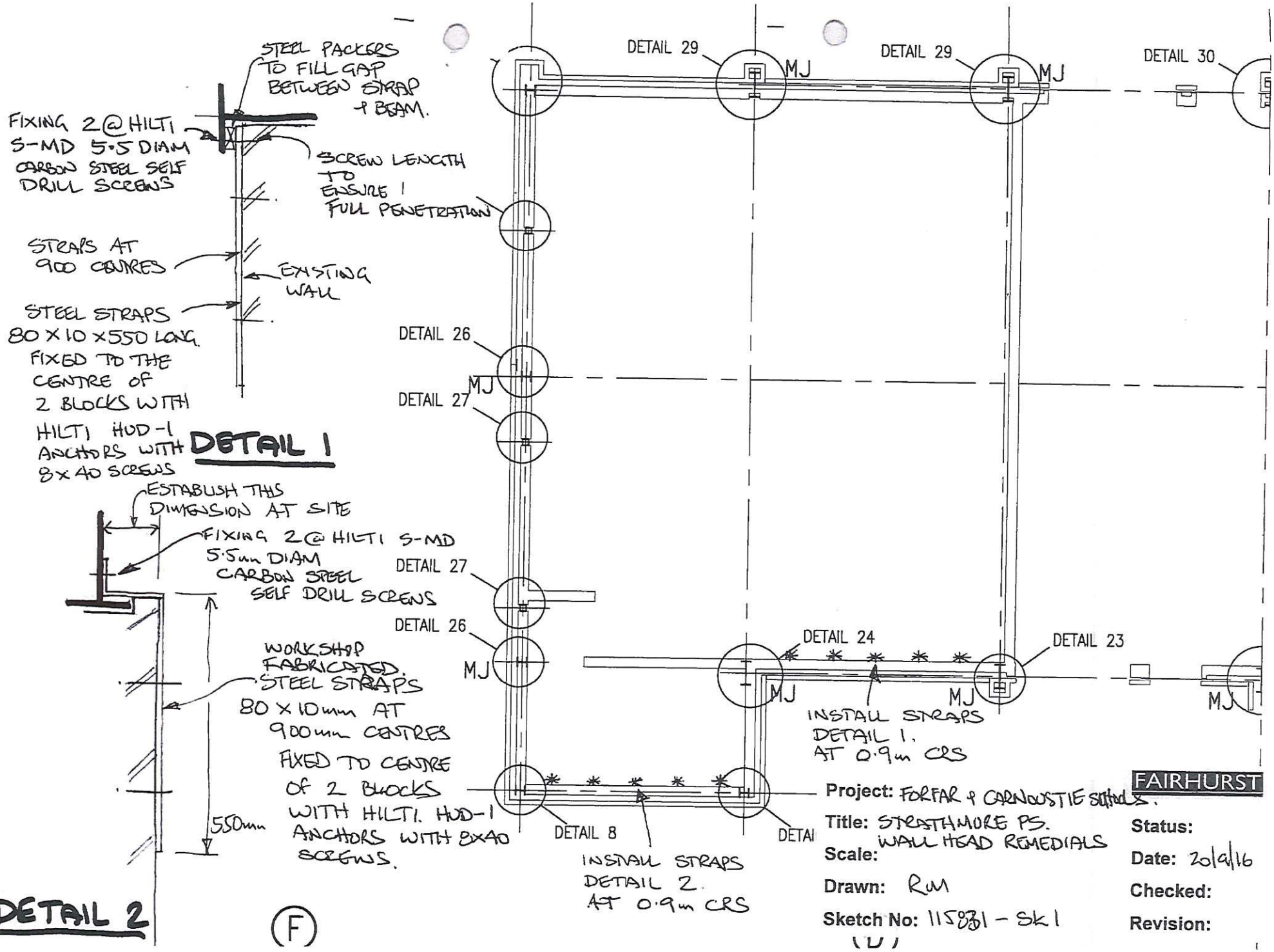
Reviewed by [redacted] - 15 November 2016

X:\111-115\115's\115831\Robertson Construction Tayside Ltd\jrmdwstrathmore151116.doc

Remedial Works – Record Photographs taken 12 October 2016

Remedial Straps in Stairwell

Remedial Straps in Plant Room


STEEL PACKERS TO FILL GAP BETWEEN STRAP & BEAM.
FIXING 2@HILTI S-MD 5.5 DIAM CARBON STEEL SELF DRILL SCREWS
SCREW LENGTH TO ENSURE 1 FULL PENETRATION
STRAPS AT 900 CENTRES
EXISTING WALL
STEEL STRAPS 80 X 10 X 550 LONG FIXED TO THE CENTRE OF 2 BLOCKS WITH HILTI HUD-1 ANCHORS WITH 8 X 40 SCREWS
DETAIL 1
ESTABLISH THIS DIMENSION AT SITE
FIXING 2@HILTI S-MD 5.5mm DIAM CARBON STEEL SELF DRILL SCREWS
WORKSHOP FABRICATED STEEL STRAPS 80 X 10mm AT 900mm CENTRES FIXED TO CENTRE OF 2 BLOCKS WITH HILTI. HUD-1 ANCHORS WITH 8X40 SCREWS.
550mm
DETAIL 2
DETAIL 29
DETAIL 29
DETAIL 30
MJ
MJ
DETAIL 26
MJ
DETAIL 27
DETAIL 27
DETAIL 26
MJ
DETAIL 24
DETAIL 23
MJ
MJ
MJ
INSTALL STRAPS DETAIL 1. AT 0.9m CRS
DETAIL 8
DETAI
INSTALL STRAPS DETAIL 2. AT 0.9m CRS
(F)
(D)
FAIRHURST
Project: FORFAR & CARNOUSTIE SCHOOLS.
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