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Structural Loading Review Report

for

The Installation of PV Panels to Existing Buildings

for:

Braunstone Town Council, Braunstone Civic Centre, Leicester, LE3 2PP

Date	Issued	Revision
06 May 2022		A

Reference: 82398 - 01

Prepared by:

Fiona Wing

Associate

1. INTRODUCTION

1.1. PRP UK Ltd. Have been instructed by Braunstone Town Council to review the structural impacts of installing PV panels to some of their buildings.

1.2 The four buildings they would like to install PV panels to are:

- Braunstone Civic Centre
- Braunstone Town Library
- Thorpe Astley Community Centre
- Mossdale Meadows Pavilion

1.3 The PV panels they intend to install are REC Solar 370 Watt 120 Cell TWIN-PEAK 4 Type Half Cut Mono 30mm Black Frame Solar Panel.

1.4 Based on the information provided by Braunstone Town Council an assessment will be made on the structural implications of adding the PV panels to their buildings.

1.5 Calculations have been carried out to review the loads applied to the existing structures. Where this is stated in the report as being the case these calculations have been carried out in accordance with current codes of practice using accepted methods of design to meet the requirements of the building regulations.

2. THE PV PANELS

2.1 The PV panels Braunstone Town Council would like to install onto their buildings are REC Solar 370 Watt 120 Cell TWIN-PEAK 4 Type Half Cut Mono 30mm Black Frame Solar Panel.

2.2 From the manufacturer's product brochure, the panel dimensions are 1755x1040x30mm and weigh 20kg each.

2.3 The panels are fitted to rails which are then attached to the roof.

3. BUILDING 1 – BRAUNSTONE CIVIC CENTRE

3.1 Braunstone Civic Centre is located at 209 Kingsway, Braunstone Town Leicester, LE3 2PP.

3.2 It is a single storey building with cavity external walls. The building was constructed in 1977 and has been subject to extensions and alterations in 1983 and 1996.

3.3 The complete roof construction is unknown and assumptions will have to be made. The roof is made out of Ruberoid glasphalt roofing with a rubervent glass fibre board under-layer.

3.4 See appendix I for images of the building.

3.5 See appendix II for historical drawings.

4. BUILDING 2 – BRAUNSTONE TOWN LIBRARY

4.1 Braunstone Town Library is located at 209 Kingsway, Braunstone Town, Leicester, LE3 2PP.

4.2 Braunstone Town Library was constructed in 2007 as a separate annex adjacent to the civic centre. It was originally designed by Pick Everards Architects. It is a compact building of 185m² floor area comprising a mono pitch roof and a cavity wall construction.

4.3 Structural drawings for the roof make up were not available. However, given the age and nature of the building, it appears to be constructed of a lightweight cladding system and insulation, supported on steel or timber beams at roof level.

4.4 See appendix I for images of the building.

5. BUILDING 3 – THORPE ASTLEY COMMUNITY CENTRE

5.1 Thorpe Astley Community Centre is located at Lakin Drive, Leicester, LE3 2RU.

5.2 Thorpe Astley Community Centre is a multipurpose building constructed in 2009 out of rendered block, facing brick and masonry cedar clad construction.

5.3 From the drawings the roof construction is a lightweight cladding system supported by a steel frame roof structure.

5.4 See appendix I for images of the building.

5.5 See appendix II for historical drawings.

6. BUILDING 4 – MOSSDALE MEADOWS PAVILION

6.1 Mossdale Meadows Pavilion is located at Kingsway, Braunstone Town, Leicester, LE3 2TW.

6.2 This building houses the parks development vehicles and a small office. It has a corrugated cement board roof, but in some areas, it is likely to be a corrugated asbestos roof material.

6.3 The pavilion was constructed around 1981.

6.4 The roof is a timber truss roof.

6.5 See appendix I for images of the building

6.6 See appendix II for historical drawings

7. DISCUSSION

7.1 The PV panels weigh 20kg per panel taken from the manufacturer's product brochure.

7.2 Based on their figures it can be expected that the additional load added to the roof from the solar panel would be 0.1kN/m². This is the load of the PV panels only.

7.3 The PV panels will be fixed to the roof using rails and fixing and therefore it would conservative to say that the additional total load added would be approximately 0.12kN/m².

7.4 The Building Regulations 2010 approved document A states that an additional load of up to 15% can be added to the roof without there needing to be a significant change.

7.5 For roofs constructed prior to the early 1990s, roofs were designed for an imposed snow load of 0.75 kN/m^2. Due to updates to the British Standards, roofs designed after this date were designed for lower imposed loads.

7.6 Braunstone Civic Centre was constructed prior to the change in standards. A comparison of the anticipated dead loads and design snow load for the roof indicates that the increase in loading is less than 15%. Therefore, the increase in loading on the roof structure based on the PV panel information provided is acceptable. However, the roof cladding consists of Ruberoid glasphalt roofing with a rubervent glass fibre board. These panels are unlikely to support any additional vertical loading. Therefore, the PV panels loads should be transferred to the roof structure elements by a framing system which does not surcharge the panels. In addition, the integrity of the panels could be compromised by penetrations due to PV panel fixings. Therefore, the construction details must be carefully considered in order to determine an appropriate load path to the existing structure.

7.7 Braunstone Town Library was constructed to the more recent loading standards. A comparison of the anticipated dead loads and design snow load for the roof indicates that the increase in loading is less than 15%. Therefore, the increase in loading on the roof structure based on the PV panel information provided is acceptable. However, the roofing cladding is likely to consist of lightweight insulated roof panels. These panels are unlikely to support any additional vertical loading. Therefore, the PV panels loads should be transferred to the roof structure elements by a framing system which does not surcharge the panels. In addition, the integrity of the panels could be compromised by penetrations due to PV panel fixings. Therefore, the construction

details must be carefully considered in order to determine an appropriate load path to the existing structure.

7.8 Thorpe Astley Community Centre was constructed to the more recent loading standards. A comparison of the anticipated dead loads and design snow load for the roof indicates that the increase in loading is less than 15%. Therefore, the increase in loading on the roof structure based on the PV panel information provided is acceptable. However, the roofing cladding is likely to consist of lightweight insulated roof panels. These panels are unlikely to support any additional vertical loading. Therefore, the PV panels loads should be transferred to the roof structure elements by a framing system which does not surcharge the panels. In addition, the integrity of the panels could be compromised by penetrations due to PV panel fixings. Therefore, the construction details must be carefully considered in order to determine an appropriate load path to the existing structure.

7.9 Mossdale Meadows Pavilion was constructed prior to the change in standards. A comparison of the anticipated dead loads and design snow load for the roof indicates that the increase in loading is less than 15%. Therefore, the increase in loading on the roof structure based on the PV panel information provided should be acceptable. However, the roof cladding consists of corrugated asbestos cement panels. These panels are unlikely to support any additional vertical loading. In addition, these panels are susceptible to damage, causing release of asbestos fibres. It is unlikely that PV panels can be fixed to this roof structure safely. The existing roof cladding should be removed and replaced. Therefore, the increase in loading cannot be determined until the new roof cladding proposals are available. It is likely that the load increase will exceed 15%, and that this roof structure would require strengthening to support PV panels.

7.10 The installation of PV panels requires transfer of load to the primary structural elements. This inevitably involves penetrating the roof cladding and waterproofing systems. A specialist should be consulted to ensure appropriate waterproofing details are provided to ensure all penetrations are appropriately watertight following the works.

8. CONCLUSION

8.1 Based on the information provided, it is likely that PV panels can be installed on Braunstone Civic Centre, Braunstone Town Library, and Thorpe Astley Community Centre. This is subject to confirmation of the PV panel proposals, fixings, load spreading systems, and existing structural make up.

8.2 Based on the information provided, it is unlikely that the Mossdale Meadows Pavilion can support the loading of PV panels.

9. RECOMMENDATION

9.1 Detailed proposals for PV panel installations should be provided for review prior to construction.

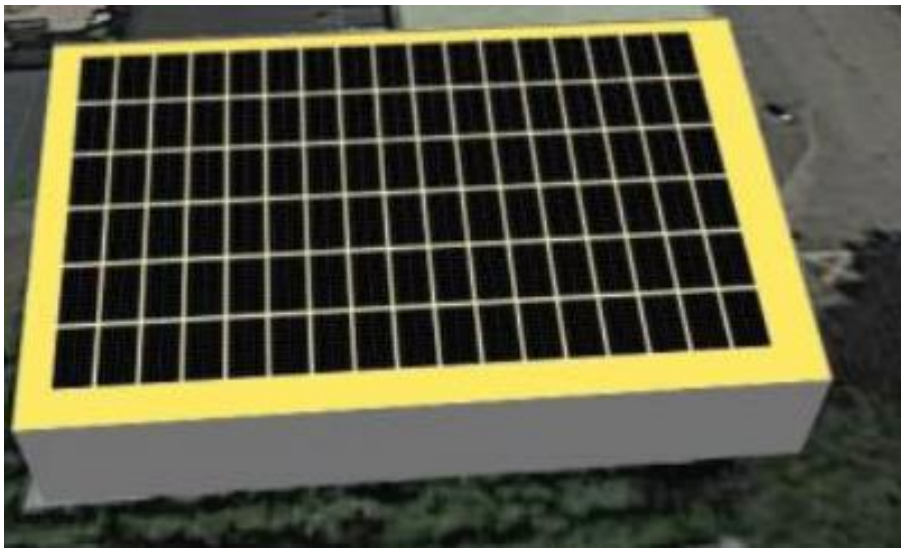
9.2 Structural inspections of the existing structures should be carried out prior to construction works to confirm the existing structures are as anticipated, and that the existing structures are in an acceptable condition.

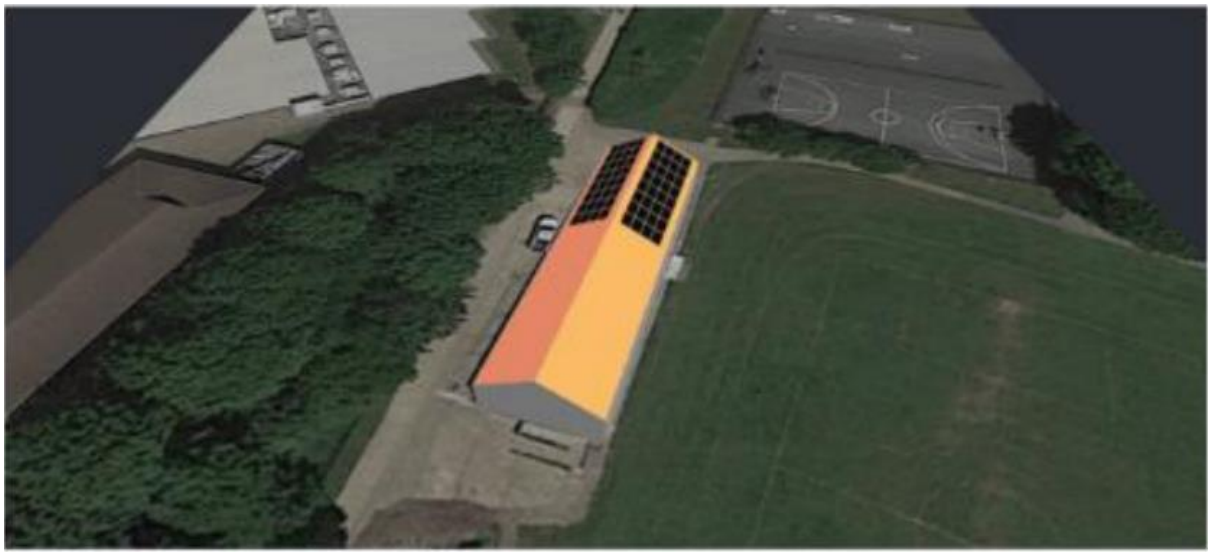
9.3 Alternative proposals should be sought for Mossdale Meadows due to the dangers inherent in fixing to asbestos cement roof cladding.

9.4 A waterproofing specialist should be consulted to ensure appropriate details are provided to penetrations in existing roof cladding systems.

APPENDIX I

IMAGES OF THE BUILDINGS



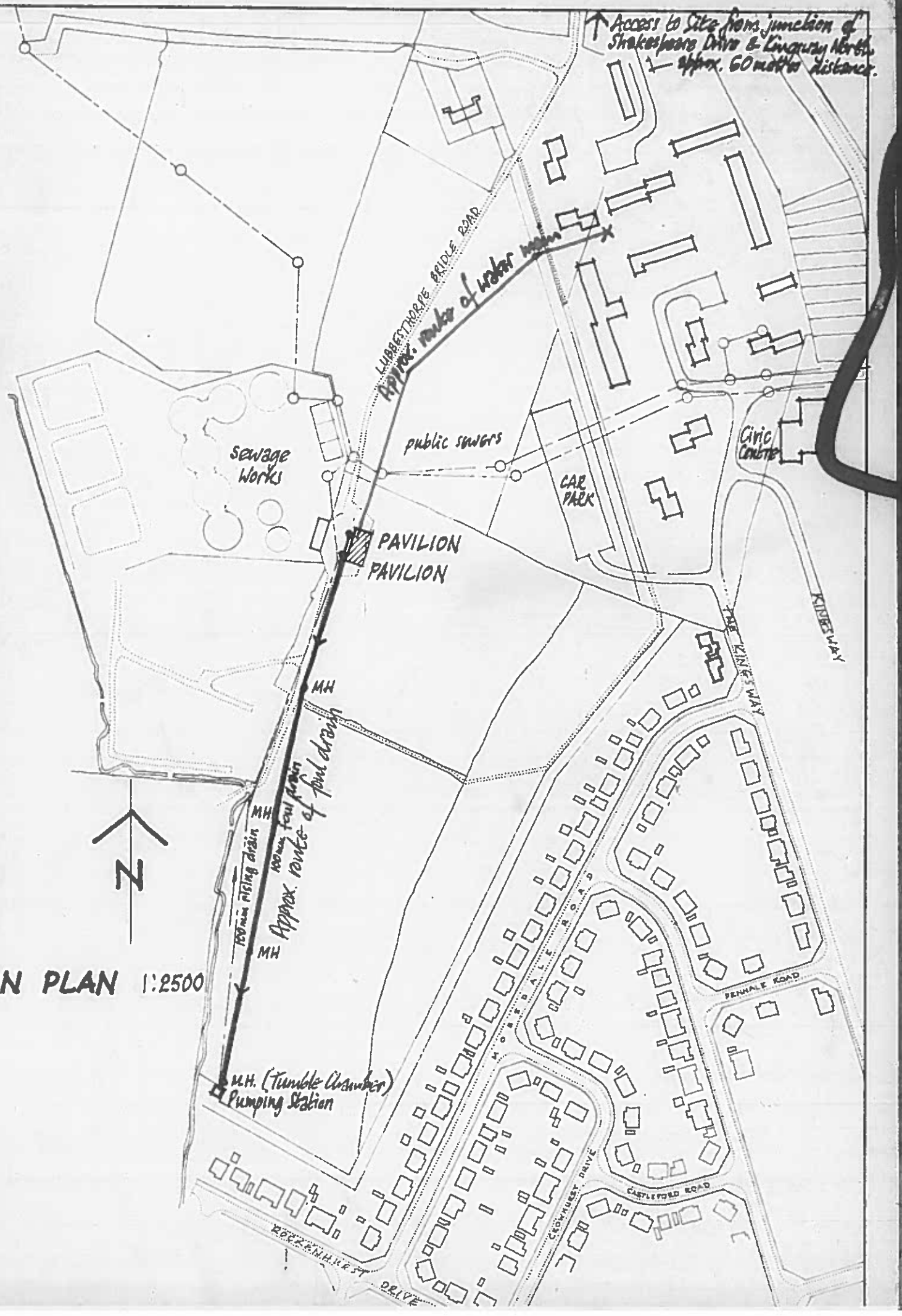


APPENDIX II

HISTORICAL DRAWINGS

NOTES:

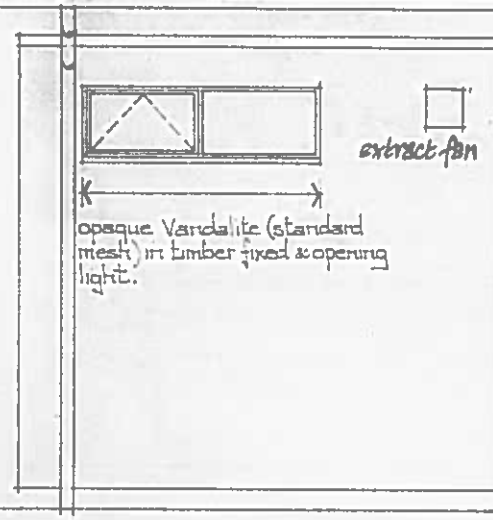
1. New manholes to be built in 112mm class B B.S. 3921 brickwork on 150mm conc. bases with concrete benching
2. All new drains to be flexible jointed vitrified clay pipework with push fit polypropylene flexible couplings, and to be laid on and surrounded with 150mm granular material and protected as necessary to accord with Reg. N14.
3. Drains passing through walls to be isolated from structure.
4. All wastes from sanitary fittings to have deep seal traps with suitable access for cleaning.
5. All materials and workmanship to be carried out in accordance with any manufacturers recommendations and to the relevant B.S. specifications and Codes of Practice.
6. Extract fans in W.C.'s to provide min. 3 air changes per hour and to be linked to light switch.
7. Existing walls shown shaded

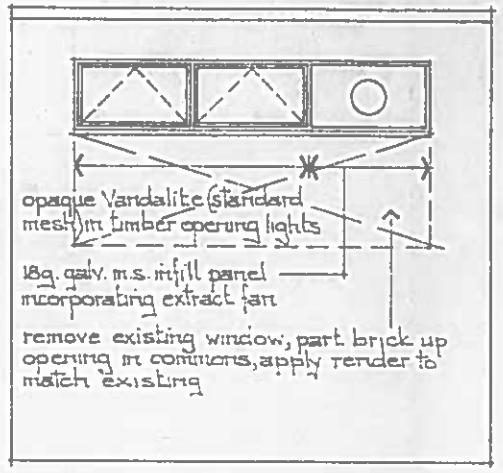


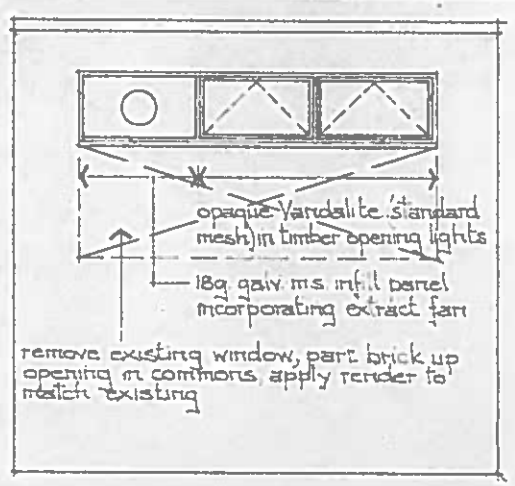
LOCATION PLAN 1:2500

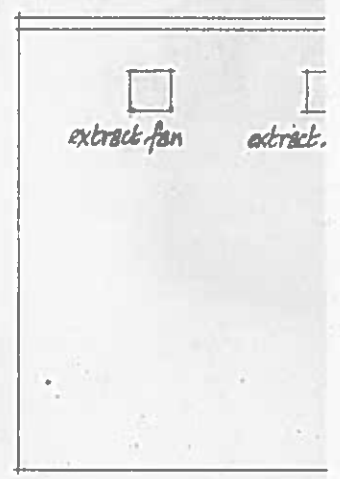
existing corrugated asbestos cement roof

new svp with wire bird guard



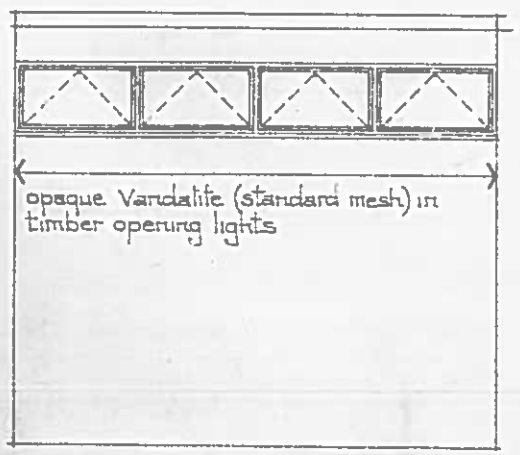


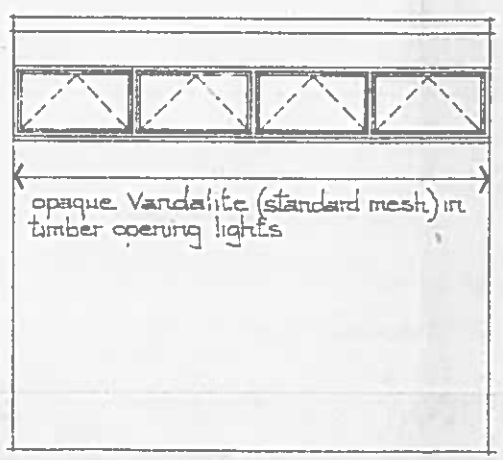


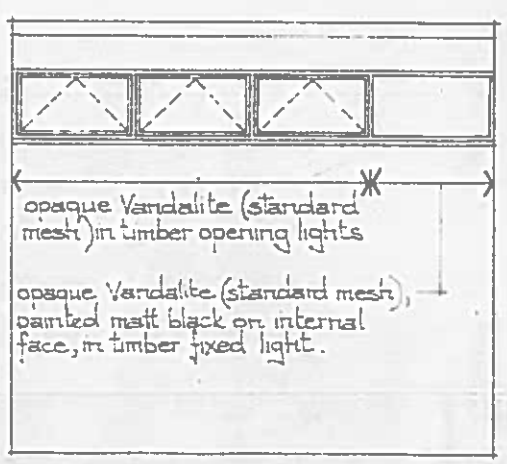


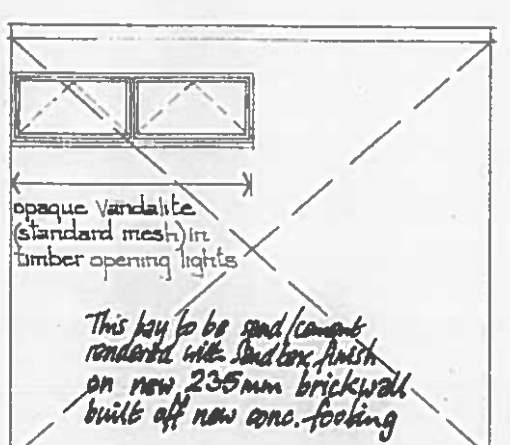
WEST ELEVATION

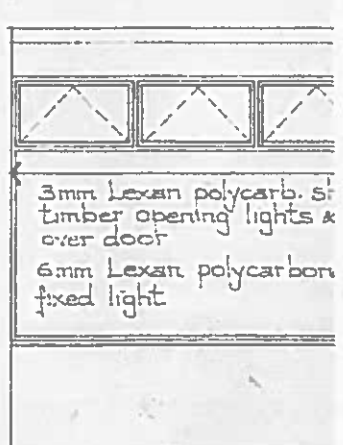
existing corrugated asbestos cement roof

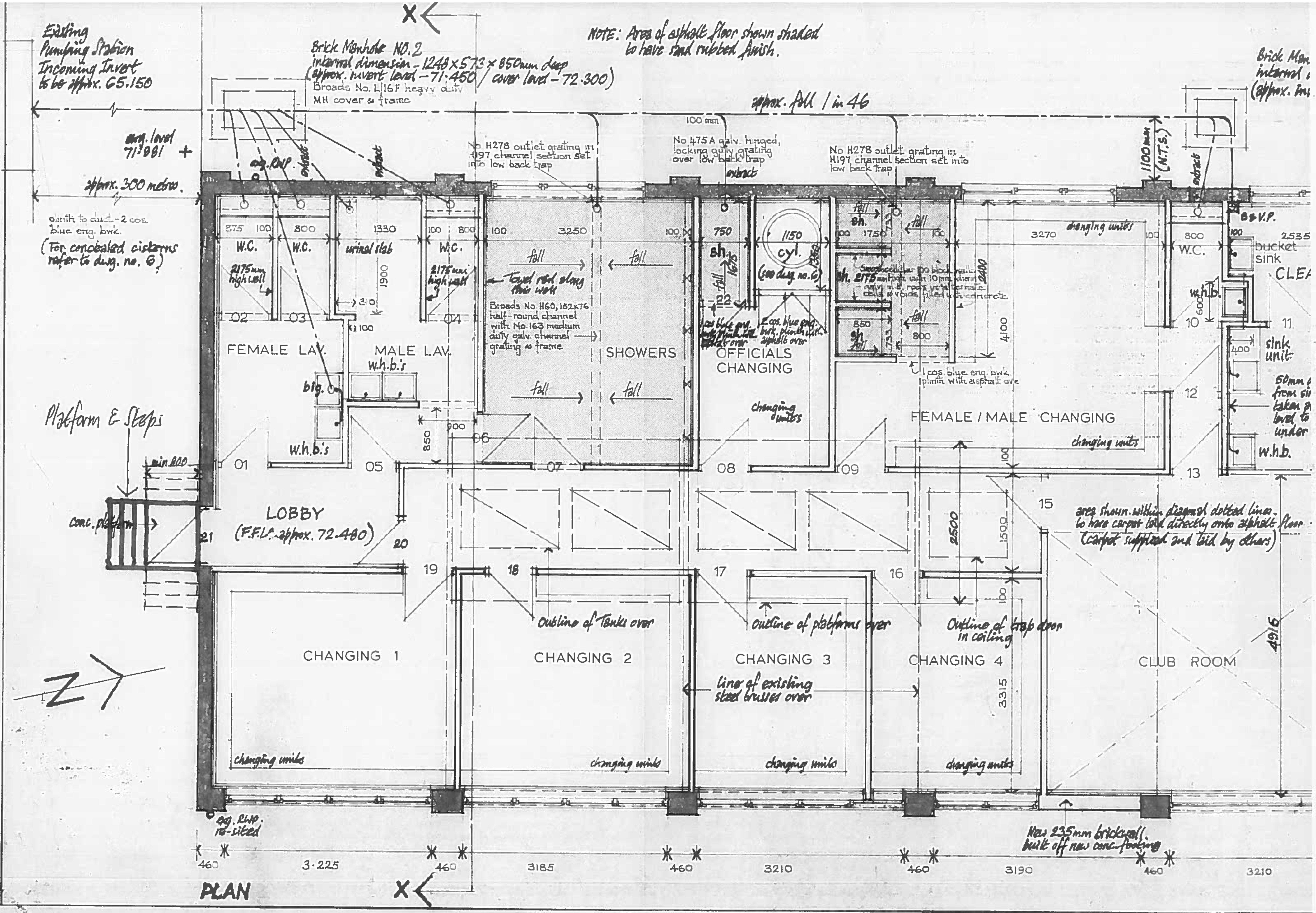


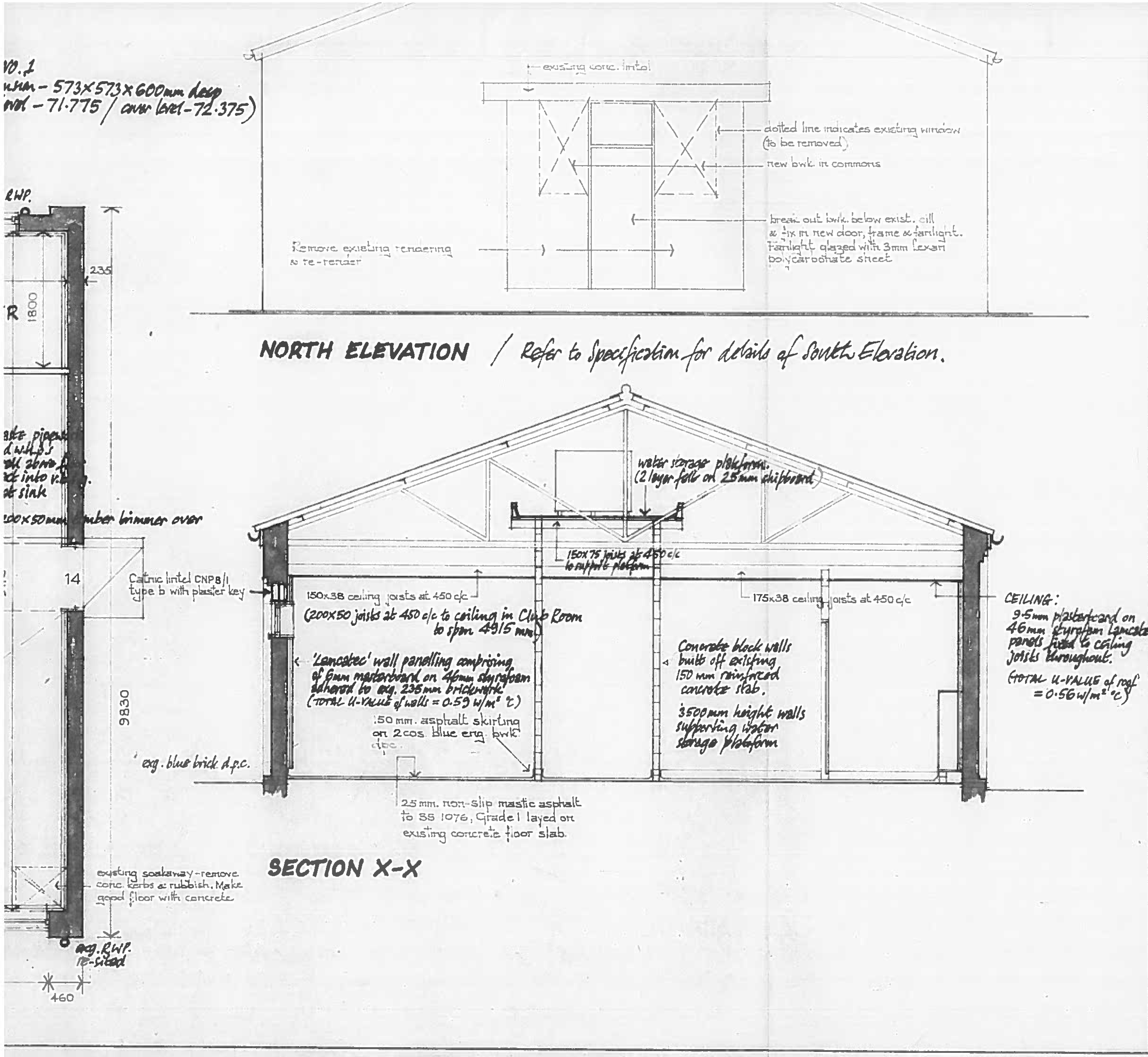









Existing Pumping Station Incoming Invert to be approx. 65.150
Brick Manhole NO. 2 internal dimension - 1248 x 573 x 850mm deep (approx. invert level - 71.450 / cover level - 72.300)
Broads No. L16F heavy duty MH cover & frame
NOTE: Area of asphalt floor shown shaded to have sand rubbed finish.
approx. fall 1 in 46
exg. level 71.881
approx. 300 metres
plinth to duct - 2 cos. blue eng. bwk.
(For concealed cisterns refer to dwg. no. 6)
No. H278 outlet grating in H197 channel section set into low back trap
No 475 A galv. hinged, locking duty grating over low back trap
No H278 outlet grating in H197 channel section set into low back trap
Broads No H60, 152x76 half-round channel with No. 163 medium duty galv. channel grating & frame
Towel rail along this wall
FEMALE LAV.
MALE LAV.
w.h.b.'s
SHOWERS
OFFICIALS CHANGING
FEMALE / MALE CHANGING
changing units
LOBBY
(F.F.L. approx. 72.480)
Platform & Steps
conc. platform
CHANGING 1
CHANGING 2
CHANGING 3
CHANGING 4
CLUB ROOM
Outline of Tanks over
Outline of platforms over
Outline of trap door in ceiling
line of existing steel trusses over
area shown within diagonal dotted lines to have carpet laid directly onto asphalt floor (Carpet supplied and laid by others)
New 235mm brickwall built off new conc. footing
exg. RWP re-sited
Brick Manhole internal (approx.
bucket sink
sink unit
w.h.b.
S.V.P.
PLAN



REVISIONS

No.	DATE	
A	7 Nov. 1980.	Additional notes added in respect of sanitary fittings/drainage.
B	18 Nov. 1980.	Changing units amended in Female & Male Changing Room. Further general notes added.
C	27 Nov. 1980	Shower cubicle and cylinder cupd. interchanged in Officials Changing.
D	Feb. 1981	Drainage revised plus minor amendments to door positions, and additional notes.
E	May 1981	Drainage revised in Toilets and Cleaners Room.

LEICESTERSHIRE COUNTY COUNCIL
ARCHITECT'S DEPARTMENT
COUNTY HALL
GLENFIELD, LEICESTER, LE3 8RE
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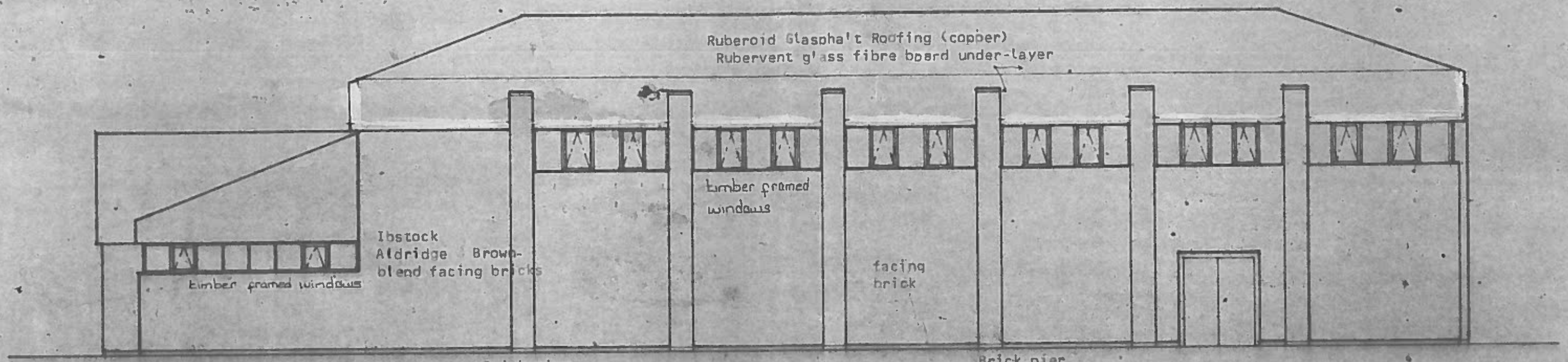
THOMAS LOCKE, D.A.(GLAS), A.R.I.B.A.
COUNTY ARCHITECT

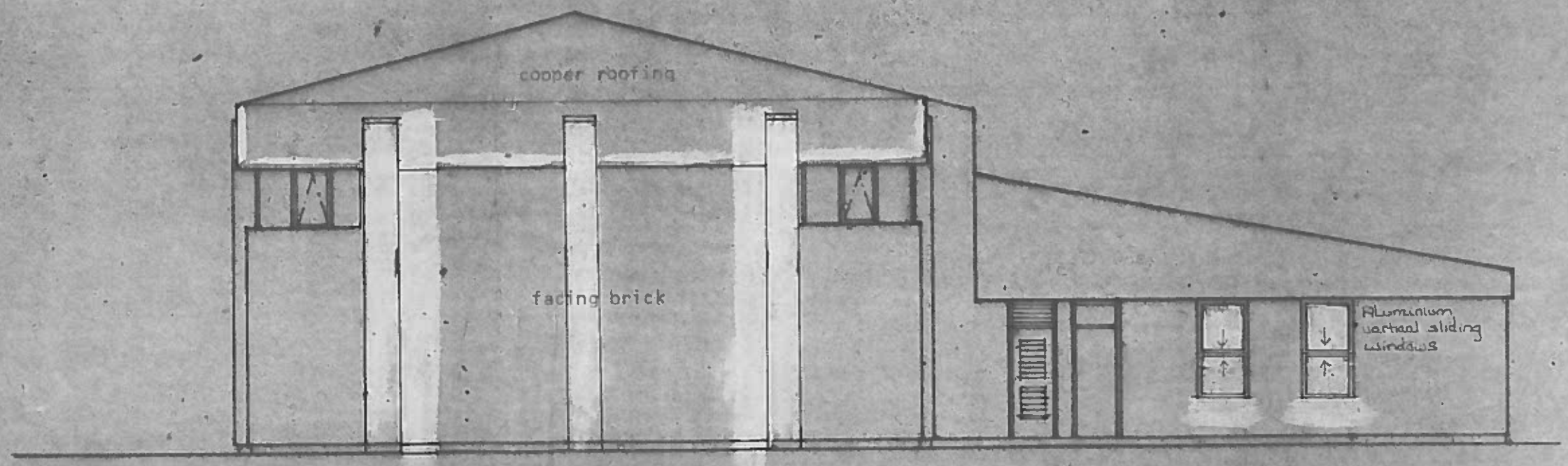
PAVILION / CHANGING ROOMS
MOSSDALE MEADOWS
BRAUNSTONE

LAYOUT PLAN

job no.		drawing no. 5414	1 E
scale 1·50	date Feb.'80	drawn	



EAST ELEVATION



NORTH ELEVATION

RKP architects

REVISIONS
A 18.10 window door to boiler

DISTRIBUTION
client
BS
planning
bldg regs JKP
fire officer
p.contractr

A B C D E F G H

JOB
BRAUNSTONE PARISH HALL

CONTENT
ELEVATIONS - NORTH AND EAST

SCALE	DRN BY	CHECKED	DATE
1 : 100	TJH		May 73

JOB Nº	SIB		DRAWING/SCHEDULE Nº	
155			03	BR

REVISIONS A

The Forest Keene Partnership, 150 Upper New Walk, Leicester LE1 7QA Telephone Leicester 27059 or 58405

Thorpe Astley Community Centre plan