

**Exchequer Court
25-51 St.Mary Axe and
9 St.Helen's Place
London EC3**

**Appraisal and Testing
of Retained Elements**

**Library of Documents
Volume 11**

**Waterman Partnership
Phase 6 Report**

EXCHEQUER COURT
25-51 ST. MARY AXE
AND
9 ST. HELEN'S PLACE
LONDON E.C.3.

ASSESSMENT AND TESTING
RETAINED STRUCTURES

PHASE 6 REPORT

GARDEN AREA STRUCTURES

DECEMBER 1993 (8859/A)

PHASE 6 REPORT

GARDEN AREA STRUCTURES

CONTENTS

- 1.0 INTRODUCTION.
- 2.0 AIMS.
- 3.0 INVESTIGATIONS, TESTING & ANALYSIS.
- 4.0 RESULTS & ASSESSMENTS.
- 5.0 SUMMARY.

APPENDIX A. - TAYWOOD ENGINEERING LTD
PHASE 6 REPORT No. 1303/93/6784 : JULY 1993

APPENDIX B. - SUPPORTING DOCUMENTATION

- 1.0 WATERMAN PARTNERSHIP DRAWING No. L/8859/A1
KEY PLAN.
- 2.0 WATERMAN PARTNERSHIP DRG No. SKETCH 8859/AT/09/(A3)
GARDEN AREA GROUND FLOOR PLAN.
- 3.0 WATERMAN PARTNERSHIP DRG No. SKETCH 8859/AT/10/(A3)
GARDEN AREA PLAN LEVEL -1.
- 4.0 WATERMAN PARTNERSHIP DRG No. SKETCH 8859/AT/11/(A3)
GARDEN AREA SECTION A-A.
- 5.0 WATERMAN PARTNERSHIP DRG No. SKETCH 8859/AT/12/(A3)
GARDEN AREA SECTION B-B.
- 6.0 WATERMAN PARTNERSHIP DRG No. SKETCH 8859/AT/13/(A3)
GARDEN AREA SECTION C-C.
- 7.0 WATERMAN PARTNERSHIP DRG No. SKETCH 8859/AT/14/(A3)
GARDEN AREA SECTION D-D.

8.0 WATERMAN PARTNERSHIP PROJECT RECORD SHEET, SITE VISIT 27.7.93.

APPENDIX C. SUPPORTING DOCUMENTATION - PHOTOGRAPHS

PLATE 1.0 GARDEN AREA, PLANTER 'A', POST EXPLOSION APRIL 1992.

PLATE 2.0 GARDEN AREA, VIEW WEST, POST EXPLOSION APRIL 1992.

1.0 INTRODUCTION

- 1.1 On 10th April 1992 a terrorist bomb, estimated by Royal Ordnance as equivalent in size to 450kg of high explosive, exploded in the back of a van parked in St. Mary Axe, London E.C.3.

The approximate location of the bomb is shown on the accompanying Waterman Partnership drawing No. L/8859/A1 in Appendix 'B'.

- 1.2 In accordance with the general investigation procedures outlined in the Waterman Partnership "Strategy Document : December 1992" this report has been prepared following the completion of the associated assessment and testing operations undertaken during Phase 6.

This Phase is not specifically identified within the Strategy Document as the Garden Area was originally intended to be inspected and included within either the Phase 1 or Phase 2 investigations. However due to site access problems and the demolition operations it was found more appropriate to cover this area separately as Phase 6.

- 1.3 The structural elements investigated and assessed in Phase 6 comprised the visual inspection of the R.C. slabs and walls forming the planters in the south west corner of the site.

The garden area construction comprises four main planters at various levels about the general Level -1 structural slab level which is at 11.110M. The 200mm thick R.C. slab of Planter 'A' is at 14.545M, Planter 'B' has a 125mm thick slab at 14.140M, Planter 'C' has a 150mm thick slab at 12.360M and Planter 'D' has a 300mm thick slab at 10.810M. The R.C. upstand walls to the planters are generally 130mm thick and 1000mm high.

The inside surfaces of the planters have been lined with a waterproof protection system using a Hydrotech Monolithic Membrane 6125. The external surfaces of the R.C. upstand walls have been treated with a bitumastic waterproofer and were at the time of the explosion clad with granite facings.

The constructional arrangement in this area is complicated and for a better understanding of the layout it is recommended that reference is made to the copy of the Waterman Partnership general arrangement drawing for this area, No. L/8244/P20, contained in the Taywood Engineering Phase 6 Report in Appendix 'A' of this report.

2.0 AIMS

- 2.1 The purpose of Phase 6 was to determine the remedial works required to the concrete beams, slabs, walls and columns in this area and also to determine the structural adequacy of the retained members.
- 2.2 This report records the various operations undertaken during Phase 6 of the assessment and testing of the retained structures, assesses the results of the investigations and advises on the structural significance.

3.0 INVESTIGATIONS, TESTING & ANALYSIS

The investigations undertaken during Phase 6 covered the items as noted below.

1. The visual inspection of all accessible concrete surfaces.
2. The visual inspection of approximately 1.0m² of the concrete slab surface within Planter 'A' exposed following the removal of the Hydrotech waterproofing membrane.

The principal document covering these inspections is the Taywood Engineering Phase 6 Report No. 1303/93/6784 dated July 1993 which forms Appendix 'A' of this report.

The Waterman Partnership "Schedule of Remedial Works" referred to in various items in this report is included as a separate item in the Document Library. As it generally applies to most of the Phases it has not been included as an Appendix in the individual reports to avoid unnecessary repetition and to restrict report sizes.

- 3.2 With regard to the retained sub-structure in this area the groundshock calculation assessments undertaken and included in the Waterman Partnership Phase 2 Report are also relevant to this area.

4.0 RESULTS AND ASSESSMENTS

- 4.1 From the summary noted on Page 4 of the Taywood Engineering Phase 6 Report it will be seen, that although there were some minor blemishes and fine cracking in the concrete construction, these are insignificant and the retained structures are considered structurally sound. This opinion is in accordance with the Waterman Partnership assessments and has also been agreed by the Independent Structural Engineers.

- 4.2 With respect to the statements contained in the Taywood Engineering Phase 6 Report our observations on these are as follows using the TEL Page and Item numbering for reference as applicable.

Unless otherwise qualified by observations in this report the contents of the Taywood Engineering Phase 6 Report have been noted and considered reasonable.

4.3 **TEL Page 4. Summary.**

Item 2. Noted and agreed. With regard to observations on factors which could have influenced the cracking and in one case possibly shear stresses, this is in Planter 'D' and Item 4.3 on Page 7 of the Taywood Engineering Report refers. Our assessment of this is covered in Item 4.7 of this report. The cracks are not considered structurally significant, although of interest and do not warrant special remedial attention being so fine.

Item 3. Noted and agreed. with regard to the planters being lined with a Hydrotech waterproofing membrane it should be noted that during the period of the site investigations and the over-lapping reconstruction phase, these areas were flooded by rain water. As no leakage was experienced it is not unreasonable to assume that the membrane had not been significantly damaged by the explosion and that the supporting structure was also generally sound. In this respect it is considered that significant structural cracking or spalling of the R.C. elements would almost certainly have been reflected by some damage to the Hydrotech membrane which would have resulted in some water leakage, even though the membrane is considered as being more able to accommodate deformation than the supporting concrete.

4.4 **TEL Page 5. The Survey.**

Item 3.1 Visual Inspection.

Noted and agreed. With regard to the restrictions imposed on the visual inspections by the rough surfaces of the concrete and dust in some areas, it should be noted that these factors would not have masked evidence of significant structural distress.

Item 3.3 Inaccessible Areas. (Page 6)

Noted and agreed. With regard to the restrictions imposed on the visual inspections by the black bitumastic type paint, it should be noted that due to its limited thickness and weathering following the removal of the stone facings evidence of any significant structural distress would have been revealed, none were found.

4.5 **TEL Page 7. Item 4.1. General Cracking.**

Noted and agreed. The nature of the general cracking revealed is considered as indicative of early age restrained movements. No doubt enhanced due to the complicated constructional profiles in this area with level variations, different slab thicknesses and the comparatively thin upstand walls at 130mm thick.

4.6 TEL Page 7. Item 4.2. Crazed Surfaces.

Noted and agreed. Our comments in Item 4.5 above are also considered of relevance with regard to the crazing revealed by the inspections in some areas.

4.7 TEL Page 7. Item 4.3. Planter D, Walls.

Noted and agreed. With regard to the cracks in this area generally it is considered that early age restrained movement is partially the cause and also the added complications of the demolition works. However the complications of the constructional layout, previously commented on, was also no doubt a factor and in this area particularly the isolation of the planter slab due to the duct openings which occur on all four sides would also have been an influence.

Coupled with these factors is the possibility, which is difficult to prove, that some local high stresses, including shears, developed in this constructionally complicated area due to the groundshock pressures induced by the explosion. In support of this hypothesis are, the changes in levels and the isolated Planter 'D' slab which would have made the distribution of horizontal forces across these areas generally difficult.

Against this hypothesis is the fact that Planter 'D' is some 25-30m away from the site of the explosion so that the explosion effects would have been greatly reduced by both distance and time. Also it is considered from the investigations undertaken during Phase 2 that the mass concrete filled brick vaults along part of the St. Mary Axe frontage shielded the sub-structure from a lot of the groundshock explosion effects. In any event the cracks as revealed are not considered of structural significance and the retained structural elements are considered sound.

4.8 TEL Page 8. Item 4.4 Pipe Penetrations through Slabs.

Noted and agreed. The leakage referred to around the pipe near grid X6/Y15 is not significant and is not strictly within the garden area as such.

4.9 TEL Page 9. Item 4.5. Planter 'A', Top Surface.

Noted and agreed. Although the area inspected was limited the results were very relevant and indicate the general soundness of the R.C. construction.

Due to the generator room being located under this area and as the Hydrotech membranes had performed satisfactorily it was agreed that only a limited area of a planter slab would be exposed initially for inspection. Depending on the success of the initial test a decision would be made on the need for further detailed checks. In the event,

due to prevailing weather conditions, a water test was applied to the slab. As no leaks through the slab construction were observed similar formal tests were not considered necessary.

Following the investigations and informal water test the exposed slab area was made good with Hydrotech by specialist contractors. It is intended as part of the general reconstruction works for all the Planters to be re-lined with an additional Hydrotech membrane to ensure the long term integrity of the protection, as noted in the Waterman Partnership "Schedule of Remedial Works" Phase 6 Item 1.0 therein refers.

The inspection of this area was monitored by Waterman Partnership and the Independent Structural Engineers as noted on the Site Visit Project Record Sheet dated 27.7.93 a copy of which is in Appendix 'B' of this report.

- 4.10 As a result of the investigations and the minor nature of the cracks revealed it is intended that the exposed soffits of the planter slabs be treated with two coats of Sikatop Seal 107 as noted in the Waterman Partnership "Schedule of Remedial Works" Phase 6 Item 1.1 therein refers.

4.11 **PHOTOGRAPHS.**

Due to the sound condition of the R.C. construction revealed by the inspections and the complicated layout and associated access problems few photographs were taken in this area other than those which form part of the Taywood Engineering Phase 6 Report in Appendix 'A' of the report, and Plates 1.0 and 2.0 in Appendix 'C' of this report.

Plate 1.0 is a high level view of the south west corner of the Garden Area taken within 48 hours of the explosion on 10.4.92. This shows most of Planter 'A' at the 14.545 level and part of Planter 'B' at 14.140 level. Most of the damage to the stonework would appear to have been caused by flying debris as distinct from direct airshock pressures.

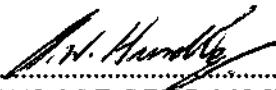
Plate 2.0, taken on the same day as Plate 1.0 shows the east elevation of Planters 'C' and 'D'. Note the lack of gross damage to much of the stonework although there were numerous surface defects found as a result of flying debris, e.g. metal window frames.

5.0 **SUMMARY.**

- 5.1 The investigations undertaken during Phase 6 included:

- a) The visual inspection of all accessible concrete surfaces associated with Planters 'A', 'B', 'C' and 'D' and the adjoining access ways in the Garden Area.

- b) The visual inspection of approximately 1.0m² of the concrete slab surface within Planter 'A' exposed following the removal of the Hydrotech waterproofing membrane.
- 5.2 The various inspections of the reinforced concrete construction undertaken under Items a) and b) above did not reveal any significant defects which could be directly attributed to the effects of the explosion. Although some minor blemishes and fine cracking were identified the concrete was found structurally adequate.
- 5.3 The various investigations undertaken during Phase 6 were reviewed by the Independent Structural Engineers. This report has also been reviewed with them and they have confirmed their opinion on the validity of the conclusions reached as noted in their letter to Waterman Partnership dated 5.1.94 which accompanies this section.



.....
A W HURDLE C ENG. M I STRUCT E.



.....
C A DICKS C ENG. F I STRUCT E. FFB. M CONS B.

Ove Arup & Partners
Consulting Engineers

13 Fitzroy Street
London W1P 6BQ
Telephone 071 636 1531

45668/MG/DH
5 January 1994

Direct Dialling:
Fax: 071-465 3679
Tel: 071-465 3648

Mr A.W. Hurdle
Waterman Partnership
46-47 Blackfriars Road
London SE1 8PN

ARUP

Dear Mr Hurdle

EXCHEQUER COURT, 25-51 ST MARY AXE, LONDON EC3
INDEPENDENT STRUCTURAL ENGINEER

Within the scope of our appointment as Independent Structural Engineers we have commented on draft copies of Waterman Partnership's Phase 6 Report and discussed our observations with them.

Following the completion of this review process we confirm our opinion that valid conclusions have been drawn from the tests, inspections and analyses carried out by Waterman Partnership.

Yours sincerely

Mike Glover,

Mike Glover

cc: Mr Peter Heritage - Buro 4

APPENDIX A

TAYWOOD ENGINEERING LIMITED
PHASE 6 REPORT No. 1303/93/6784 : JULY 1993

EXCHEQUER COURT ASSESSMENT & TESTING RETAINED STRUCTURES
PHASE 6 REPORT

Technical Report

Report No 1303/93/6784

Page 1 of 8

Title

EXCHEQUER COURT
25-51 ST MARY AXE, EC3

PHASE 6 REPORT

**ASSESSMENT OF RETAINED
STRUCTURE IN GARDEN AREA**

**Report Number
& Date of Issue**

1303/93/6784
OCTOBER 1993

Author(s) T A LORD

TE Job No. 8364

Technical Approval:

(Validators signatures where relevant)

Technical Approval (Authorising Signatory):

K McLernon

External Distribution (Authorising Signatory):

R Blundell

Distribution - 1 copy to Information Centre for archival purposes

1 copy to TEL

12 copies to Waterman Partnership

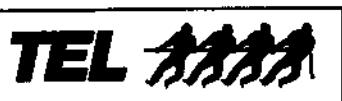
Abstract

A visual inspection of all accessible concrete surfaces in the Garden Area was carried out. A 1m² area of tanking within Planter A was removed and the concrete surface below was inspected in detail. No significant damage is reported.

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**Taywood Engineering Ltd
R & D Division**

Taywood House • 345 Ruislip Road • Southall • Middlesex • UB1 2QX



Issue 3 / 4482 / March 1992

CONTENTS

1. INTRODUCTION	3
2. SUMMARY	4
3. THE SURVEY	5
3.1 Visual Inspection	5
3.2 Element Identification	5
3.3 Inaccessible Areas	6
4. RESULTS	7
4.1 General	7
4.2 Crazed Surfaces	7
4.3 Planter D, Walls	7
4.4 Pipe Penetrations Through Slabs	8
4.5 Planter A, Top Surface	8

APPENDIX 1

Drawing L/8244/P20 - St. Mary Axe Garden Area Plans & Details

Figures 1 - 14

Table 1

Plates 1 - 14

1. INTRODUCTION

This document reports on Phase 6 of a six phase programme of inspection and testing carried out at Exchequer Court, 25-51 St Mary Axe, London EC3.

Following discussions with the Waterman Partnership the following items of work were carried out over the period between 22 June and 27 July 1993 and were designed to investigate the integrity of the retained structure in the garden area of the building which had been subjected to the effects of a terrorist bomb.

- Visual inspection of all accessible concrete surfaces.
- Visual inspection of a 1m² area of concrete within Planter A, following the removal of the "Hydrotech" waterproofing membrane.

2. SUMMARY

1. There were no visible defects in the garden area which could be specifically attributed to bomb damage.
2. The exposed concrete surfaces revealed minor construction blemishes and some very fine cracking which is likely to be the result of a combination of factors such as early age restrained movement, possibly the bomb blast, demolition effects and in one case possibly shear stresses. These cracks are not regarded as structurally significant.
3. Large areas of the planter slabs and walls were covered with a "Hydrotech" waterproofing membrane and therefore could not be inspected. In one area where this membrane was locally removed, no visible defects were identified.

3. THE SURVEY

The structure under investigation is located in the South West corner of the site; see Figure 1 and Plates 1 & 2.

3.1 Visual Inspection

All accessible concrete surfaces were subject to a visual inspection using portable access and lighting. Where not tanked, the slab top surface was swept clear for inspection but the surface was generally rough and still partly covered with dust, such that some minor defects and cracks up to 1mm wide may not have been visible. All visible cracks were highlighted with spray paint in order to assist in their identification at a later date. Crack width measurements were taken in selected locations using a proprietary optical device.

3.2 Element Identification

The garden area extends from the slab at Level -1 up to Level 0. It contains four r.c. planters labelled A to D, plus associated walls and staircases - see Plate 2. Appendix 1 contains a copy of the Waterman Partnership drawing: L/8244/P20 - St. Mary Axe Garden Area Plans and Details.

For ease of identification, due to the intricate nature of the garden area, the walls have been labelled with the letters A to U inclusive which are shown as follows:-

- | | |
|----------|-----------------------|
| Figure 2 | - GA Plan at Level -1 |
| Figure 3 | - GA Plan at Level 0 |

All visible areas of the slabs in this area are reported in Figures 4 to 6.

Only elevations of walls and staircases exhibiting cracking or other defects are reported. These are contained within Figures 7 to 14 inclusive.

3.3 Inaccessible Areas

The top surface of all planters and the Level -1 slab around the garden area were covered by a waterproofing membrane and so were generally not inspected. In Planter A at approximate grid reference X2/Y21, about 1m² of the membrane was removed to allow a local inspection of the concrete slab surface underneath. See Figure 3 and Plate 13.

The waterproofing membrane was also dressed up the surfaces of all walls forming the four planters, prohibiting inspection of these surfaces. In addition all other external elevations of walls were covered by a black bitumastic type paint, which could have concealed minor defects and cracks (see Plates 2 and 7).

The soffits of the staircase and planter slabs were inspected, except that the soffit of the slab at Level -1 was covered by insulation and ducting. However an area of about 10m² was exposed for inspection by removal of the insulation (see Figure 5). In addition a small area of the Level -1 slab soffit was accessible at the north end via the ventilation room at Level -2.

4. RESULTS

All accessible surfaces of the concrete structure were subject to a visual inspection and the results are presented in Figures 4 to 14. Plates 3 to 14 show photographs of selected areas. Section 3.3 of this report describes areas which were inaccessible for inspection.

4.1 General Cracking

On most concrete surfaces, fine to hairline random cracks, of 0.3mm maximum width, were observed. Many of these cracks were very fine or barely visible. It is likely that early age restrained movement is the main cause of this cracking, although the bomb blast may have caused some further propagation. Similarly, vibrations due to the demolition works may have also induced some aggravation of the cracking. Figures 7 to 14 depict elevations of walls containing the most visible cracking or defects.

Certain walls exhibit little or no defects and therefore these have not been drawn up but are listed in table 1. None of the fine visible cracking is regarded as structurally significant.

4.2 Crazed Surfaces

On some concrete surfaces there were small areas of crazing with very fine cracks of width less than 0.1mm at average centres of 150mm. The largest such area was the Level 0 slab soffit to Planter B and locally wall L, at grid X4 to X5/Y20½. (see Figures 6 and 13 and Plate 8). Further small areas are evident on wall G, south elevation (Figure 11, Plate 9) and in the Level 0 soffit to Planter A at grid X1 to X2/Y18 to Y19 (Figure 6, Plate 11). This crazing is likely to be the result of some early age construction phenomenon, eg formwork preparation, and is considered to be insignificant.

4.3 Planter D, Walls

Figure 7 and Plates 3 to 6 indicate a pattern of generally vertical cracks in walls A, B and C around Planter D. It is thought that early age restrained movement is at least partly the cause of this cracking, possibly exacerbated by the bomb blast and demolition works. However, it should be noted that the cracks incline inwards at both ends of each wall and if the factors above were the only causes, one would have expected the opposite with the cracks fanning outwards. It is therefore possible that there are further reasons for the cracking in this instance. These walls appear to be acting as beams, and the action of shear may have also influenced the cracking in these elements. The structural design would need checking to confirm this but nevertheless, the cracking would appear not to be significant.

4.4 Pipe Penetrations Through Slabs

Various cast-iron drainage pipes pass through the slabs to each planter and also through the Level -1 slab around the garden area. With the exception of one pipe, all penetrations were dry with no evidence of leakage. However near grid X6/Y15, one pipe had significant rust runs suggesting that some leakage has occurred in the past (see Figure 2).

In the vicinity of the pipe penetrations any minor cracking reported in 4.1 or 4.2 radiated locally from the pipe. This would be expected as the pipe would tend to at least influence and possibly initiate any cracking which may be liable to occur.

4.5 Planter A, Top Surface

At grid X2/Y21 for an area of about 1m², the "Hydrotech" waterproofing membrane was removed to allow visual inspection of the concrete surface underneath. One reason for selecting this particular area was that the soffit inspection revealed two cracks which, at 0.2 and 0.3mm wide, were relatively wider than all other cracks in the slab soffits. See Figures 3 & 6, and Plates 13 & 14.

Following removal of the membrane the surface was swept clear and although damp, no visible defects were evident in the top surface.

The concrete surface was exposed for a period of about 2 hours throughout which it was raining continually. Consequently the surface was always damp and for about ¾ hour, water ponded upto 10mm deep on the exposed slab. The slab soffit was inspected at various times during and after this period, and no traces of dampness or leakage were observed.

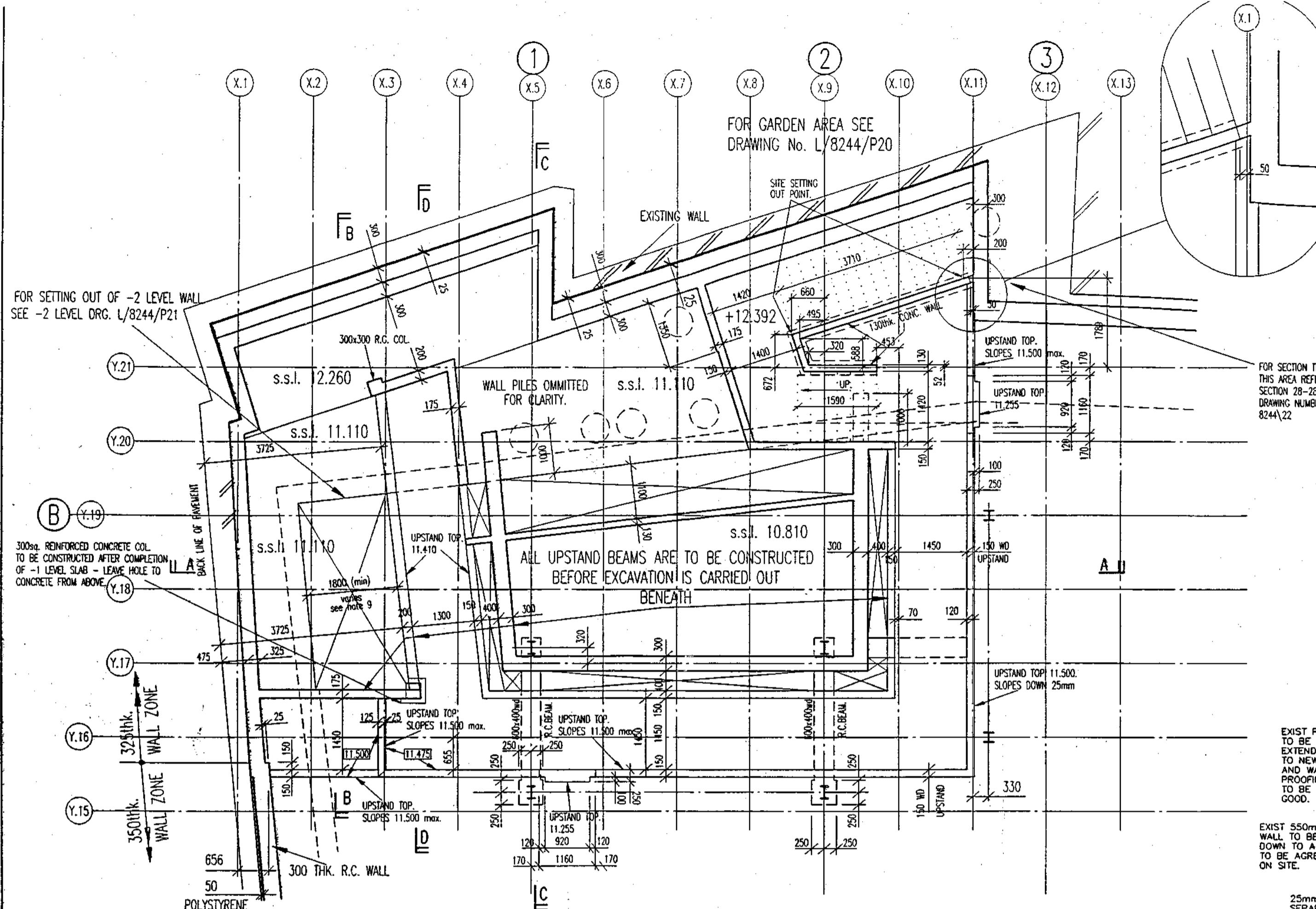
APPENDIX

GENERAL NOTES

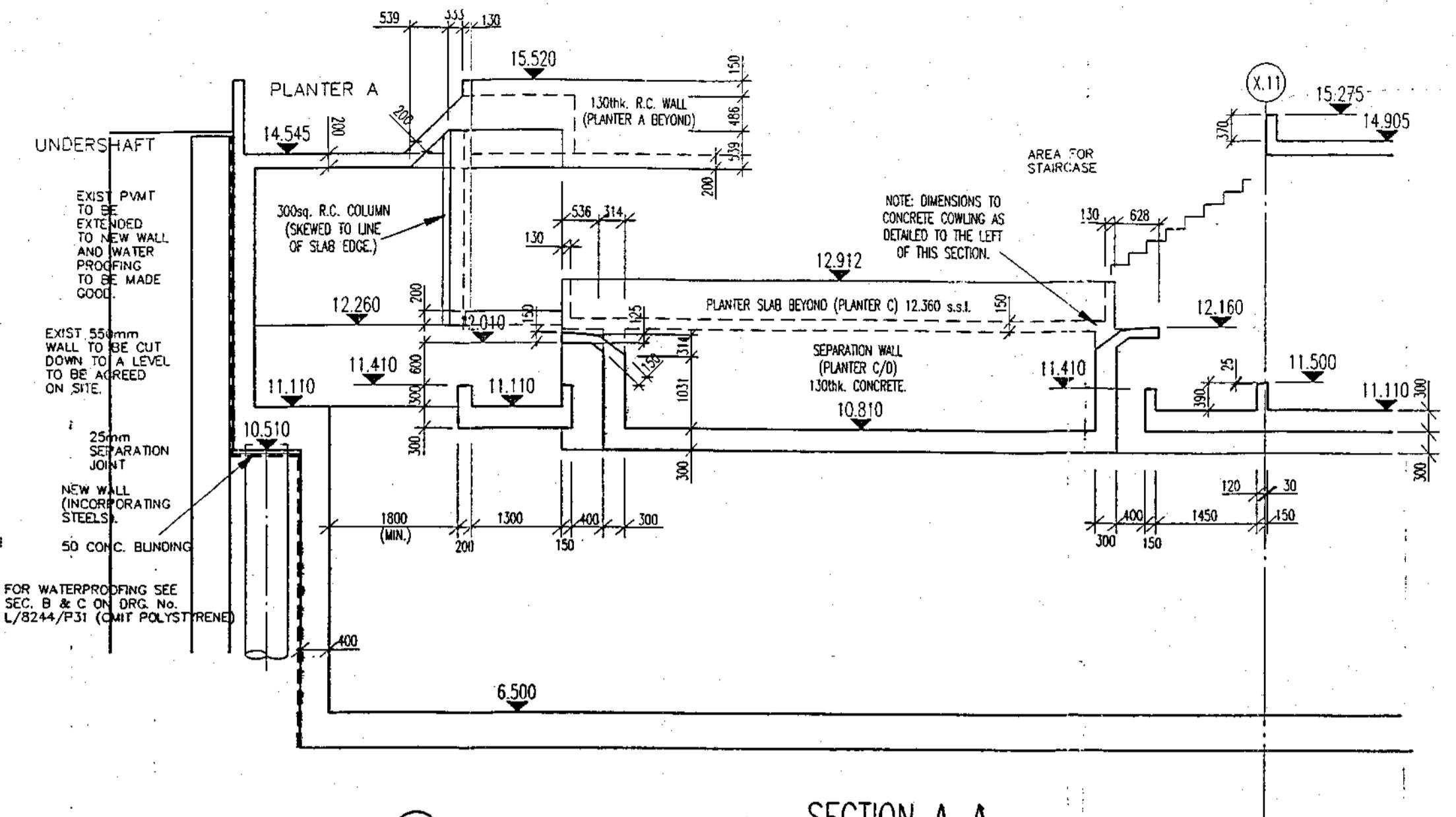
- For General Notes and Reference Drawings See
 1. All materials and workmanship shall be in accordance with the Consulting Engineer's specification.
 2. For sections 1-1 to 13-13 see drawing No. L/8244/P31.
 3. For details of column heads see drawing No. L/8244/TD1.
 4. The concrete mixes are to be:

LOCATION	Min. req'd cube strength @ 28 days	Max. aggregate size
All concrete in contact with the ground. Note: Water-tight construction.	35 N/mm ² S.R.C.	20mm
C20	20mm	20mm
Other in Basement.	35 N/mm ² O.P.C.	Mix Reference C

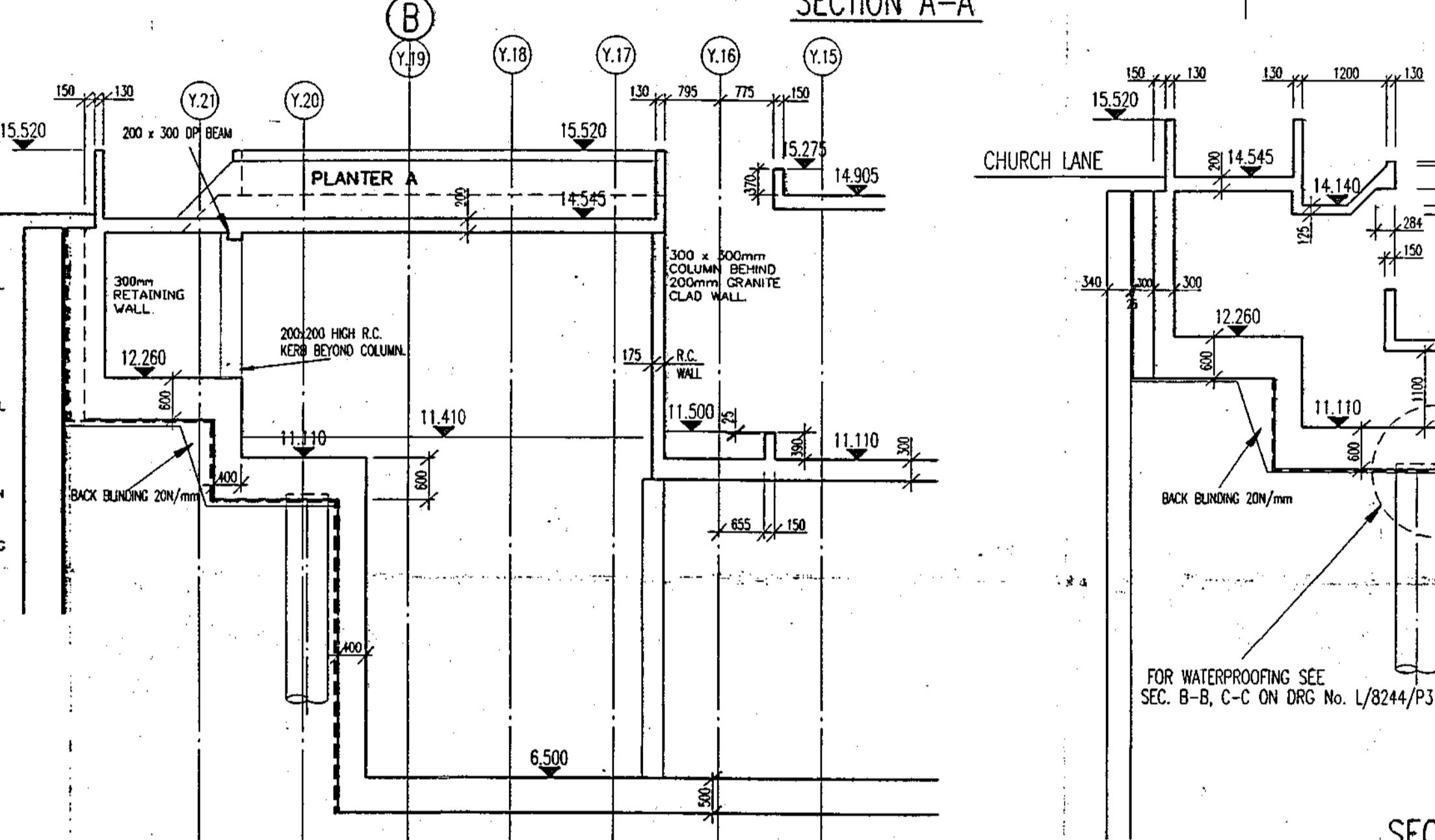
 5. On no account should holes or other openings be cut or displaced in any part of the structure without prior approval of the Consulting Engineer.
 6. Fixings and fixings areas.
 7. For pipe arrangement see drawing No. L/8244/PL04.
 8. For positions of manholes and ducts refer to Mechanical Consultants Eng.
 9. The thickness of the concrete walls may be reduced back to octagonal thickness, but a minimum of 225mm concrete wall must be maintained. The 50mm insulation layer may be omitted along this length to achieve wall thickness.



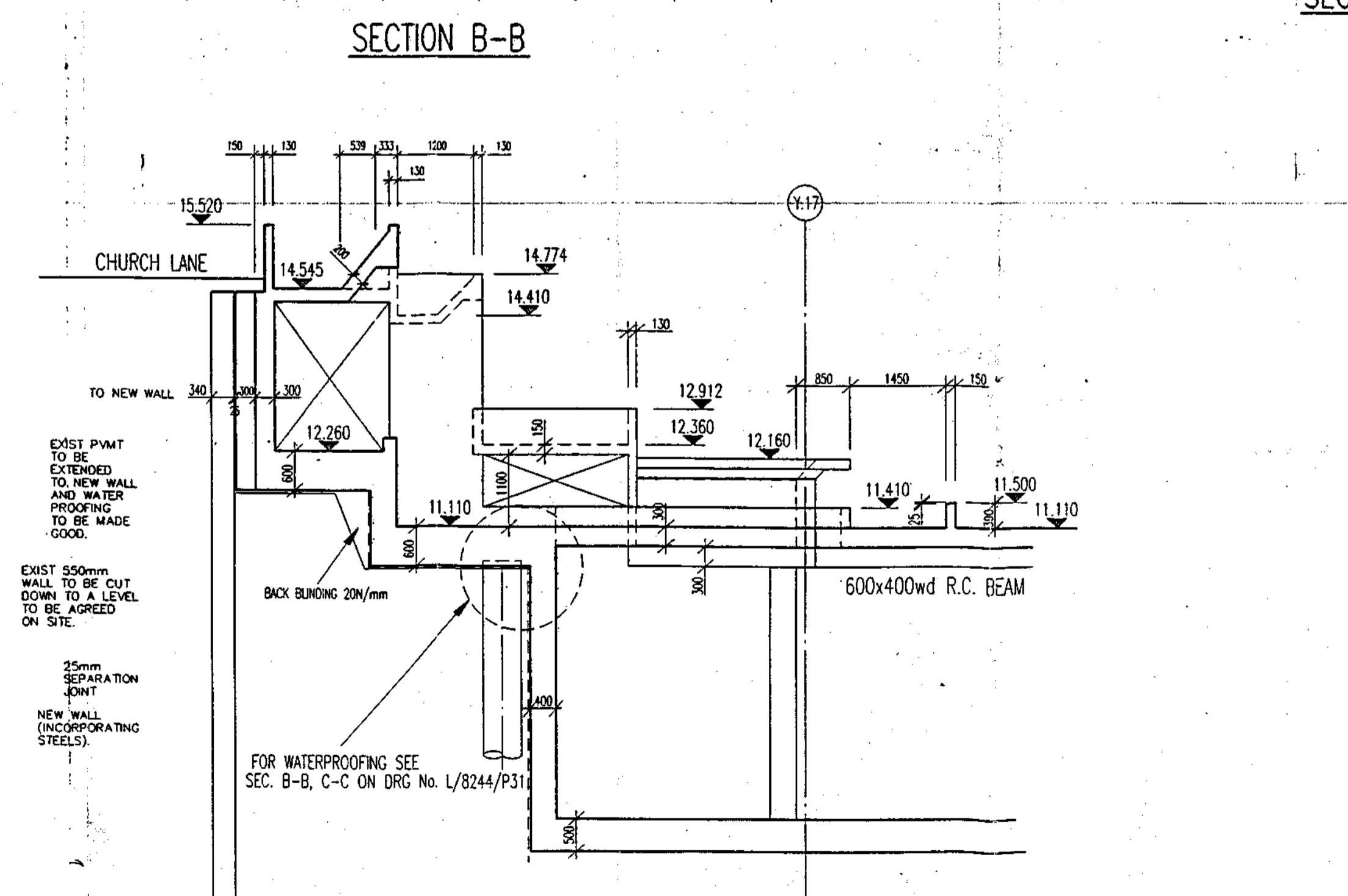
PLAN AT LEVEL -1 (LEVEL 11.500)

(STEPPED UP TO 12.260
AGAINST ST HELENS CHURCH)

SECTION A-A



SECTION C-C



SECTION D-D

C	OCT.92	NOTE ADDED TO LEVEL 1 PLAN.	M.A.H.
B	4.7.90	GENERAL REVISIONS MADE TO SUIT ARCHITECT'S COMMENTS.	M.H.
A	29.8.90	DIMENSIONS ADDED ON PLAN AT -1 FOR CLARITY.	M.H.
REF. DATE		DRAWING REVISED TO SUIT ARCHITECT'S COMMENTS.	M.H.
BY		DESCRIPTION	
AMENDMENTS			
FILE NO.		ST MARY AXE	
GARDEN AREA PLANS AND DETAILS			
CLIENT:	SPEYHAWK MOUNT ROW		
ARCHITECT:	FITZROY ROBINSON PARTNERSHIP		
Waterman Partnership Consulting Civil & Structural Engineers			
46-47 BLACKFRIARS ROAD LONDON SE1 8PN Telephone 01-928 7868 Fax 01-928 3033			
SUITE 5 BEATTY HOUSE ADMIRALS WAY LONDON E14 9UF Telephone 01-857 4333 Fax 01-858 3428			
CENTRE CITY PODIUM 5 MILL STREET BIRMINGHAM B5 4JJ Telephone 021 616 1066 Fax 021 616 1246			
Designed by:	M.H.	Scale:	1:70
Drawn by:	M.H.	Date:	MAY '90
Checked by:		Drawing No.	L/8244/P20
Date:		Signature:	C

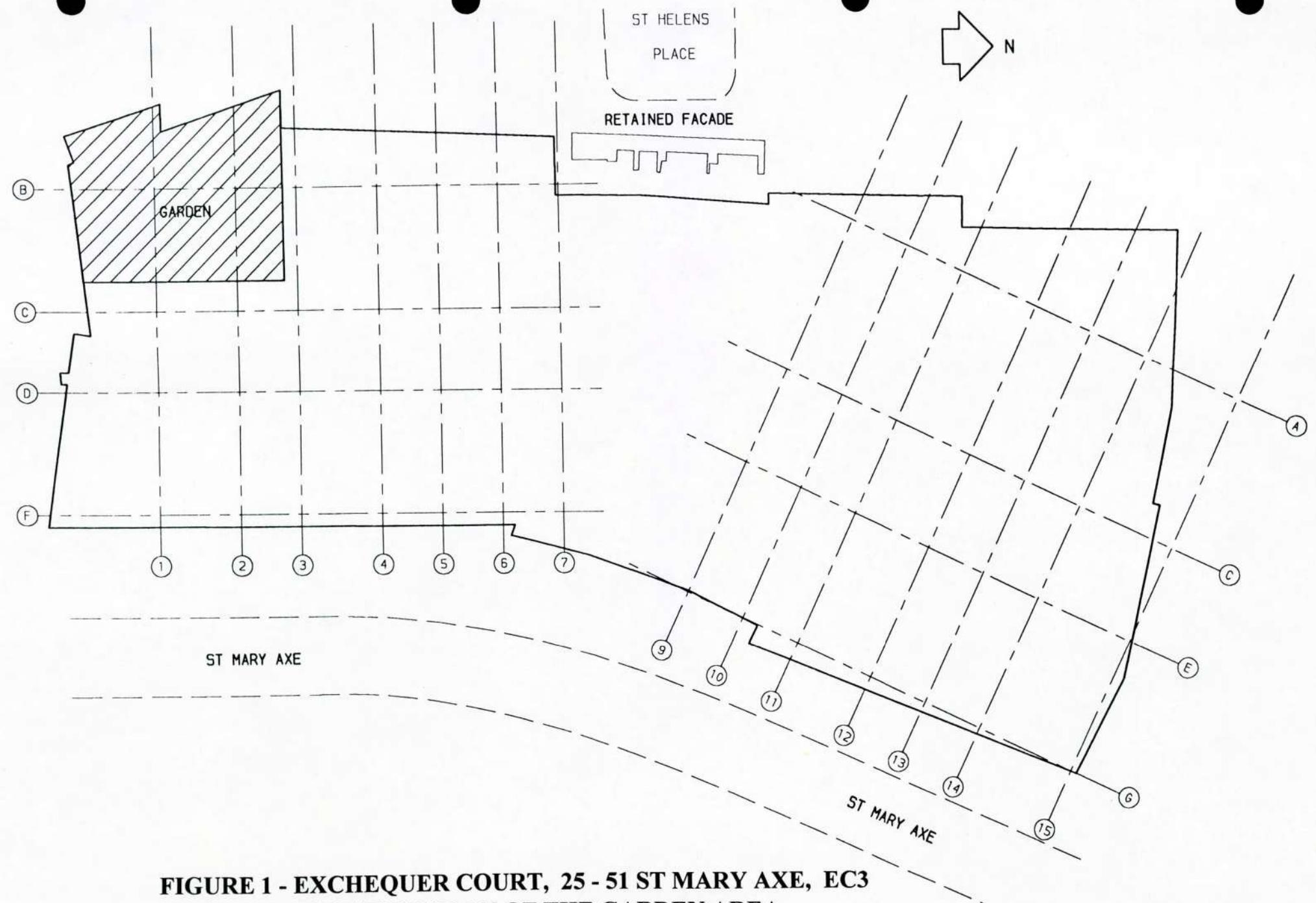


FIGURE 1 - EXCHEQUER COURT, 25 - 51 ST MARY AXE, EC3
LOCATION PLAN OF THE GARDEN AREA

KEY
ssl: structural slab level

(Y.23)

(X.1)
(X.2)

(X.3)
(X.4)

(X.5)
(X.6)

(X.7)
(X.8)

(X.9)
(X.10)

(X.11)
(X.12)

(3)

(Y.22)

(Y.21)

(Y.20)

B (Y.19)

(Y.18)

(Y.17)

(Y.16)

(Y.15)

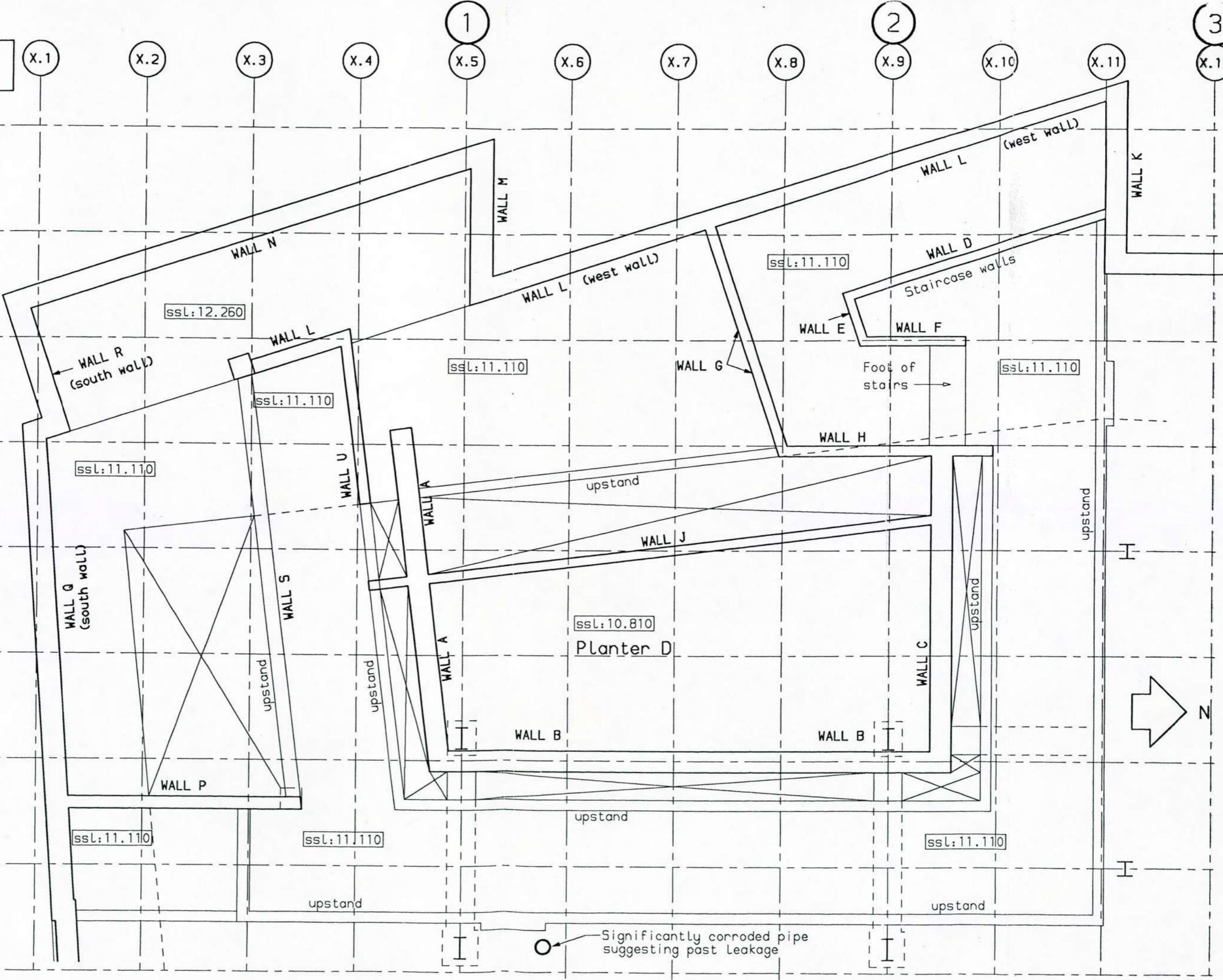


FIGURE 2 - G.A. PLAN at LEVEL -1

FIGURE 2

KEY
 ssl: structural slab level
 tow: top of wall

Y.23

Area of "Hydrotech" waterproofing membrane removed to allow visual inspection of concrete surface underneath.

Y.22

Y.21

Y.20

B Y.19

Y.18

Y.17

Y.16

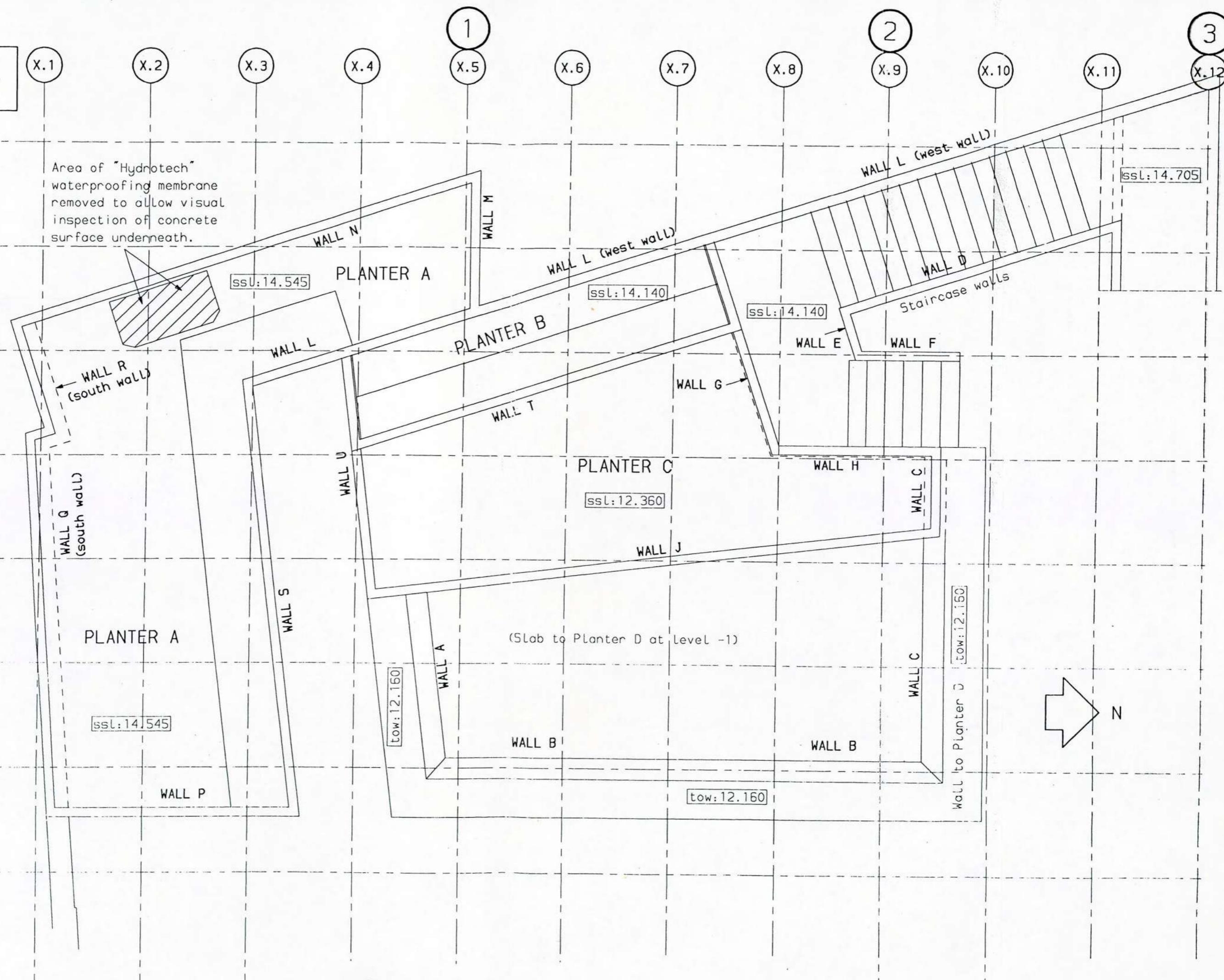


FIGURE 3 - G.A. PLAN at LEVEL 0

FIGURE 3

KEY
 structural slab level
 = cracks (width in mm)
 = No visible defects

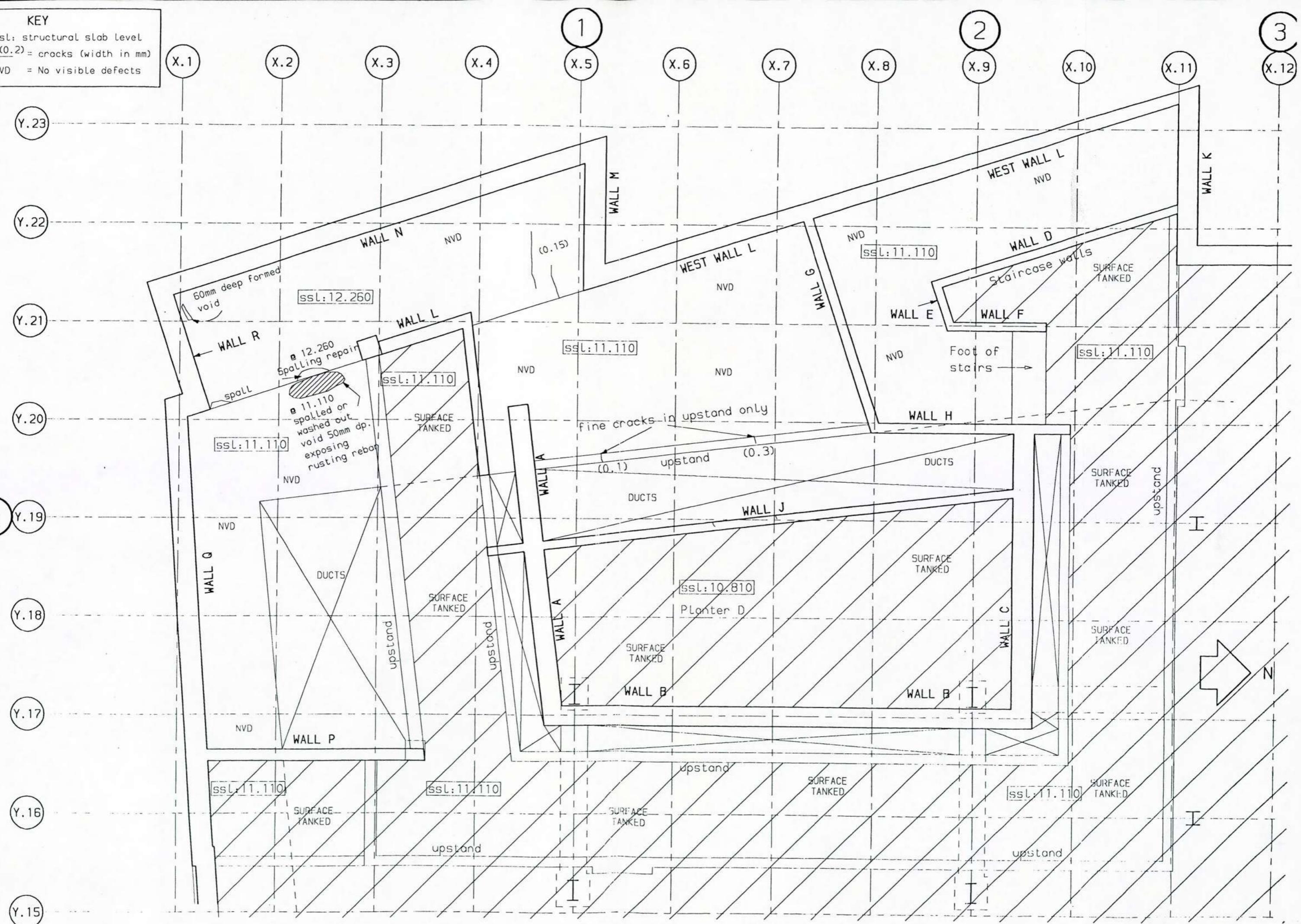


FIGURE 4 - LEVEL -1 SLAB, TOP SURFACE INSPECTION

FIGURE 4

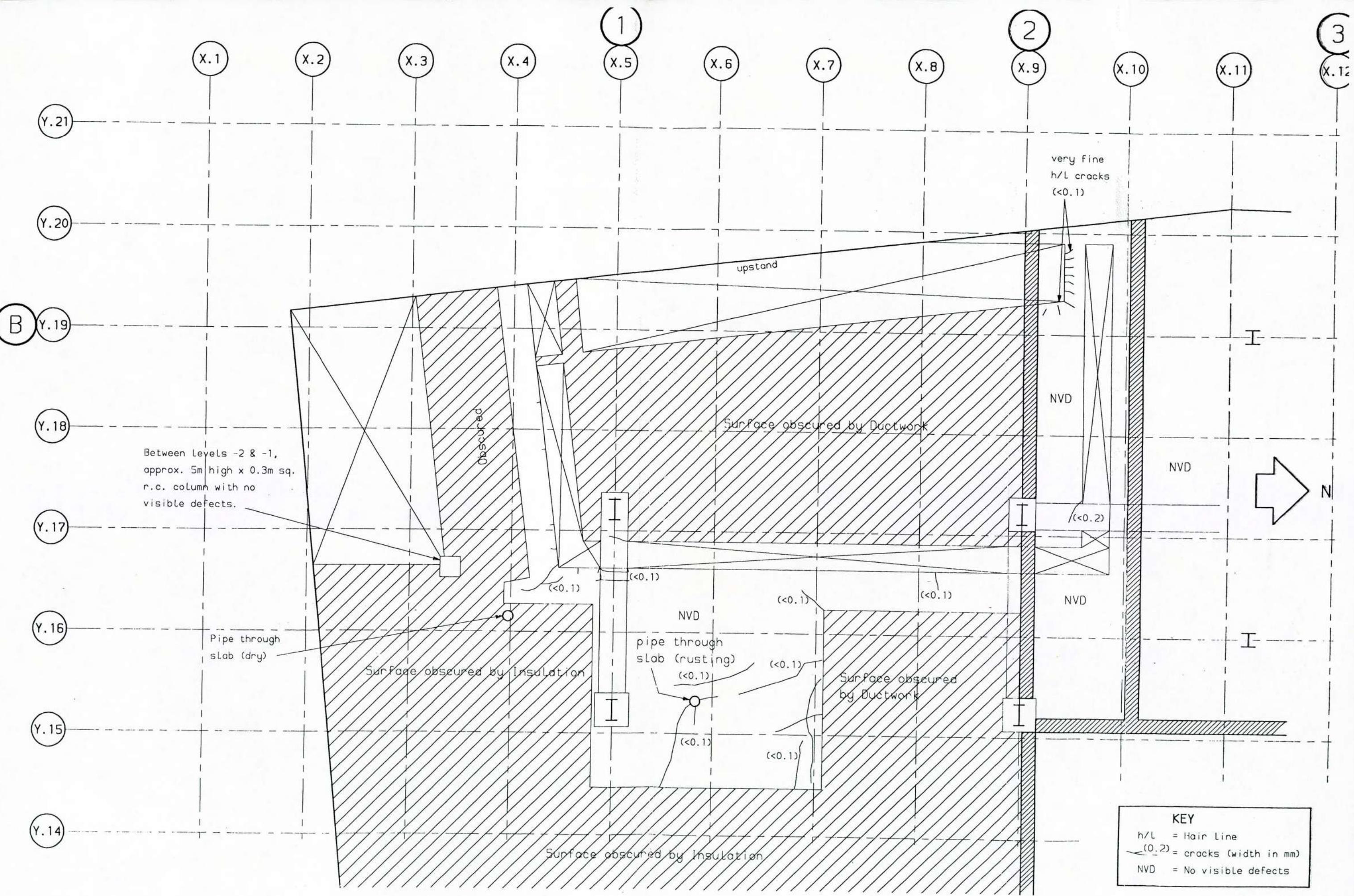


FIGURE 5 - LEVEL -1 SLAB, SOFFIT INSPECTION

FIGURE 5

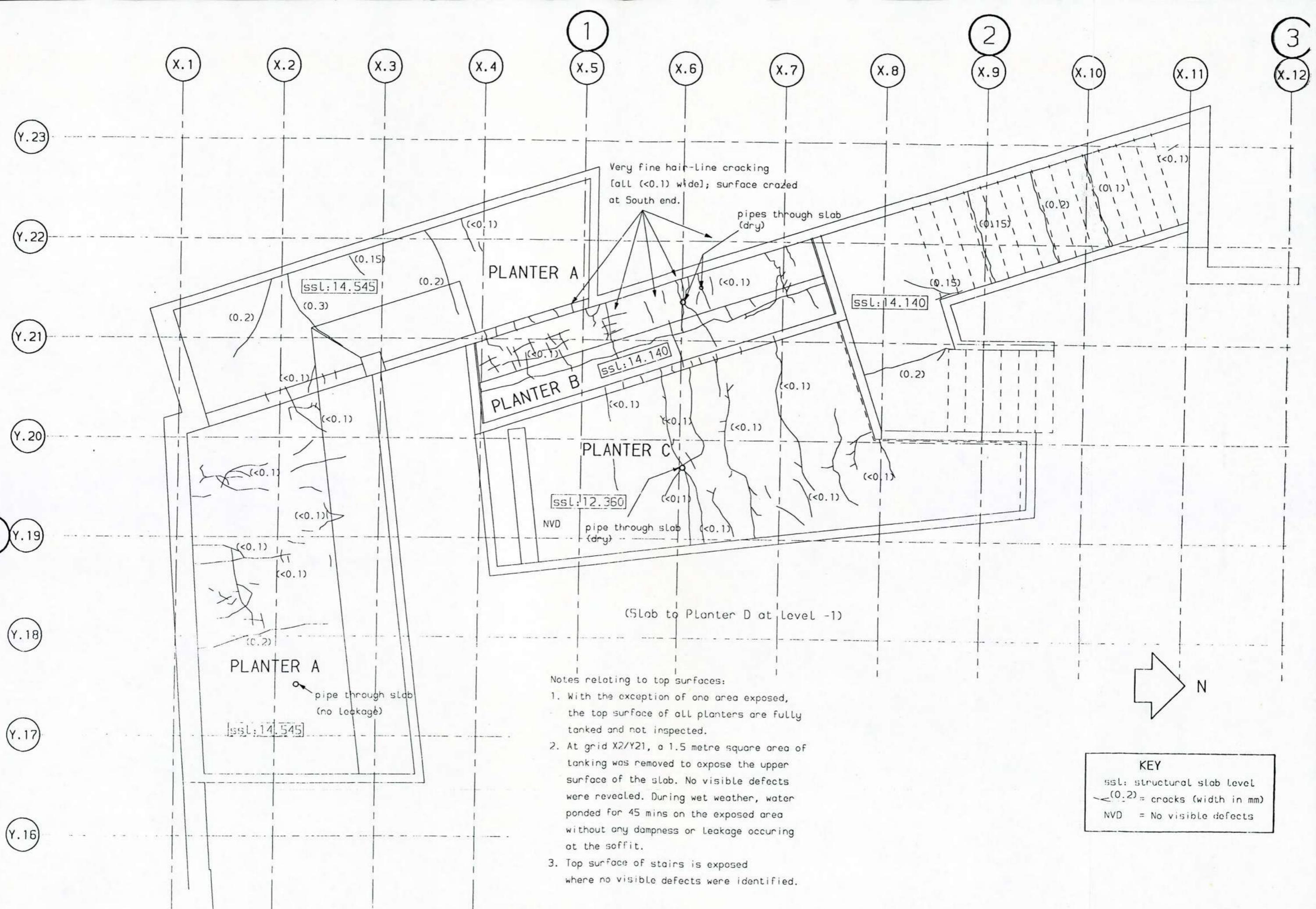
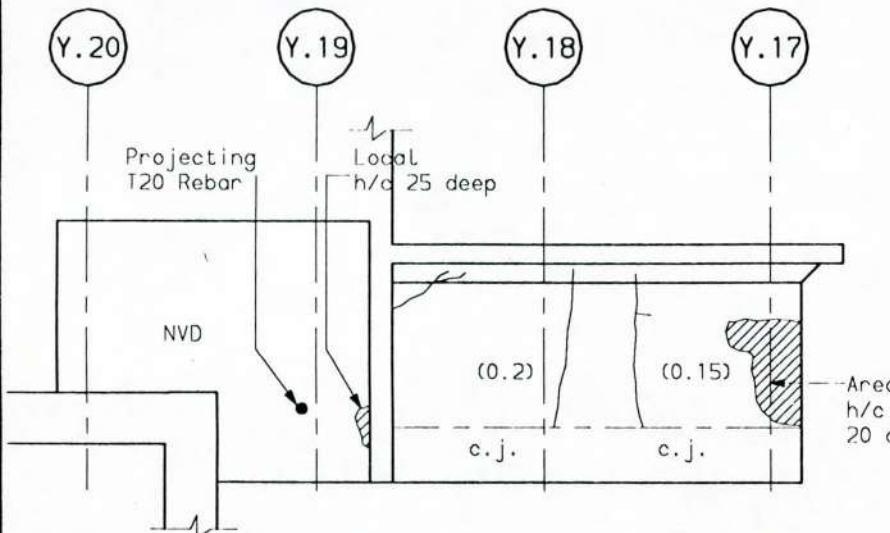
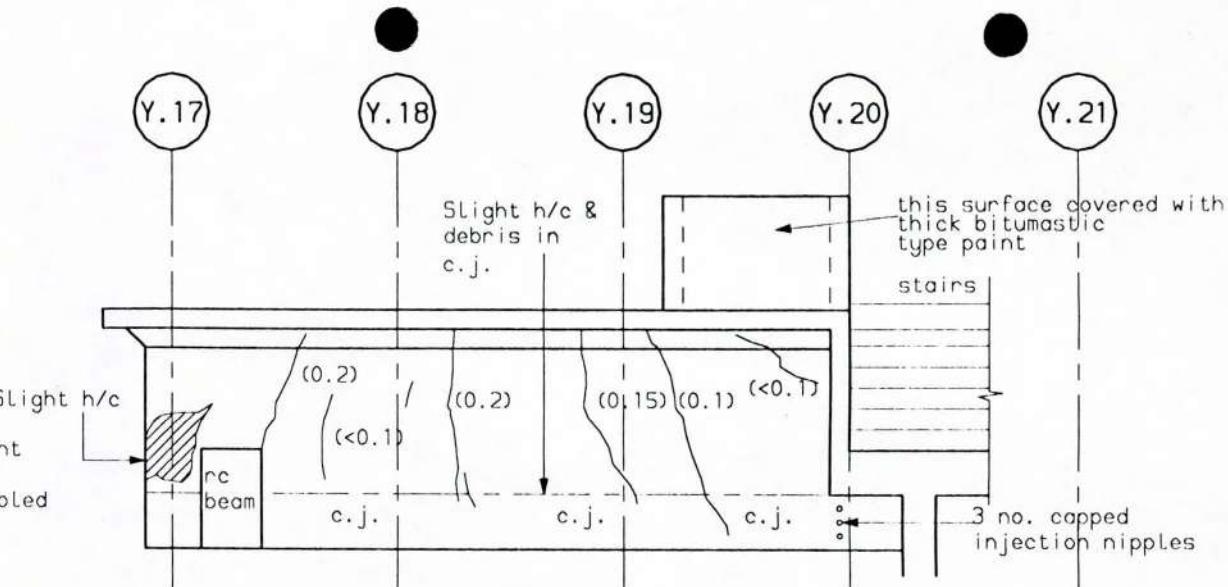


FIGURE 6 - LEVEL 0 SLAB, SOFFIT INSPECTION

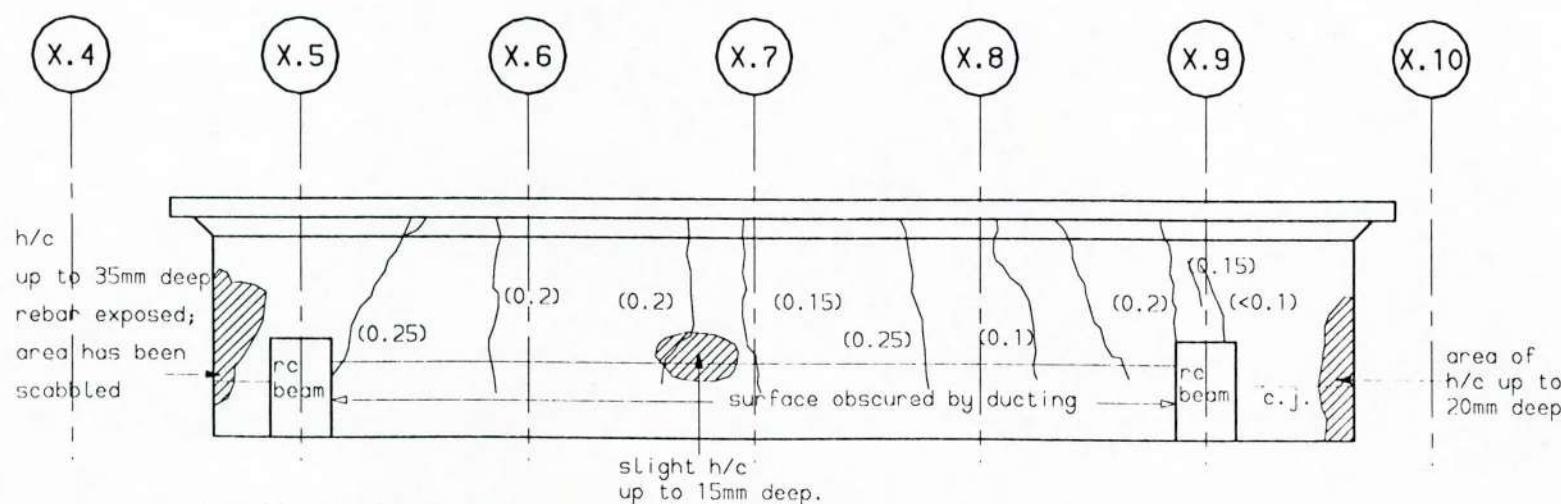
FIGURE 6



SOUTH ELEVATION OF WALL A at X4.5/Y17-Y20



NORTH ELEVATION OF WALL C at X9.5/Y17-Y20



EAST ELEVATION OF WALL B at Y17/X4.5-X9.5

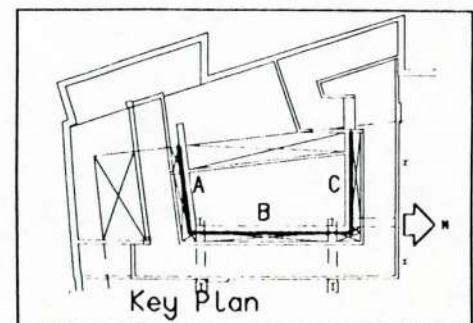
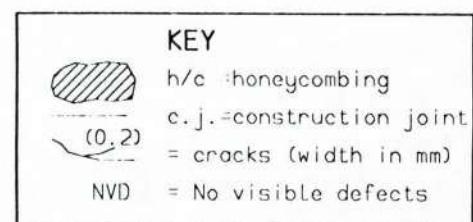
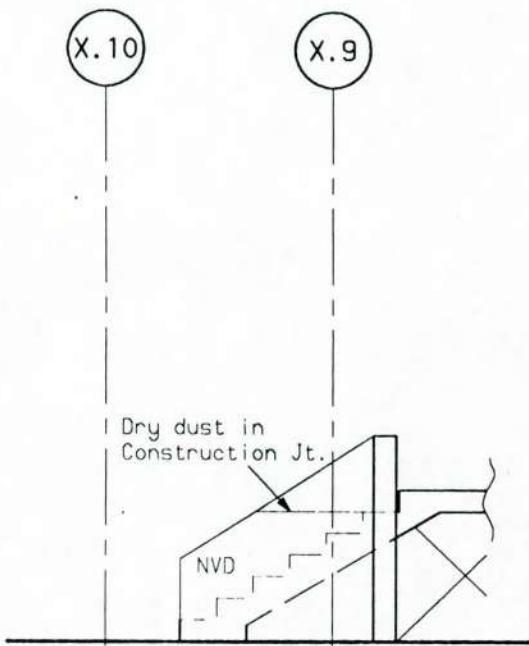
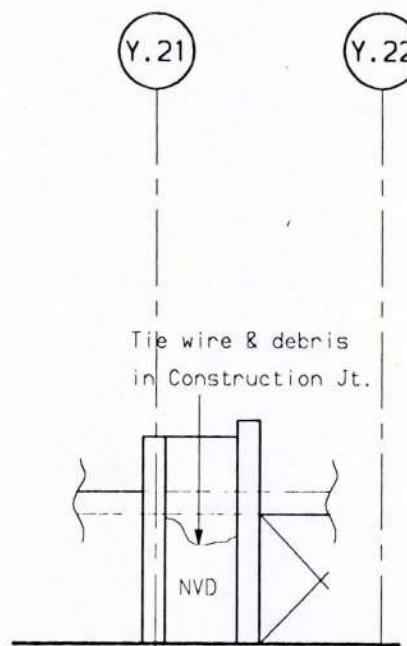


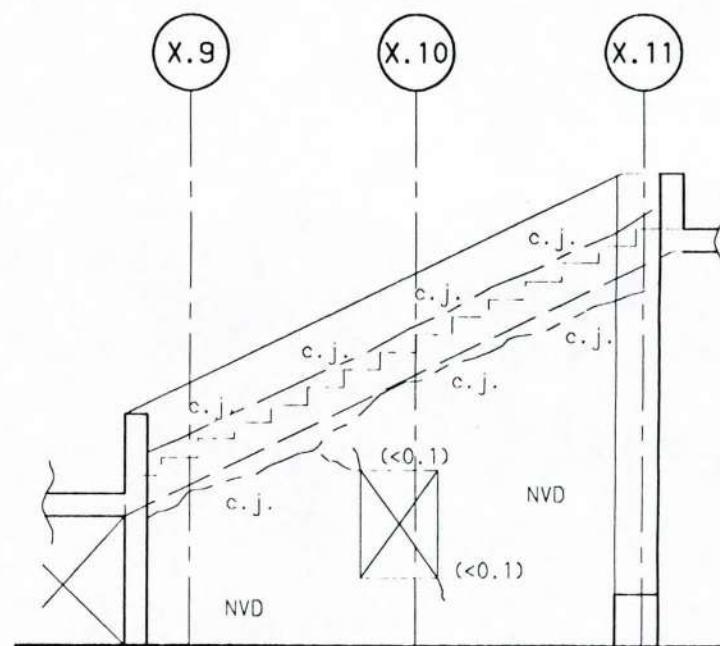
FIGURE 7 - PERIMETER WALLS A, B & C TO PLANTER D



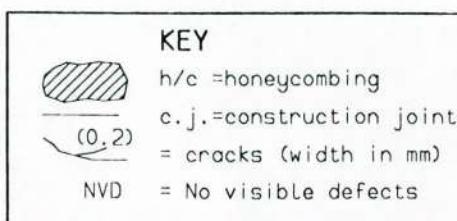
EAST ELEVATION
OF WALL F



NORTH ELEVATION
OF WALL E



EAST ELEVATION OF STAIR WALL D



ALL surfaces coated in black
bitumastic type paint.
No significant visible defects.

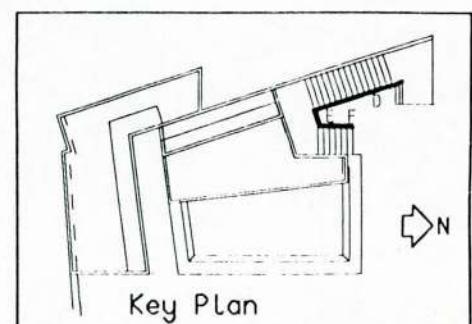
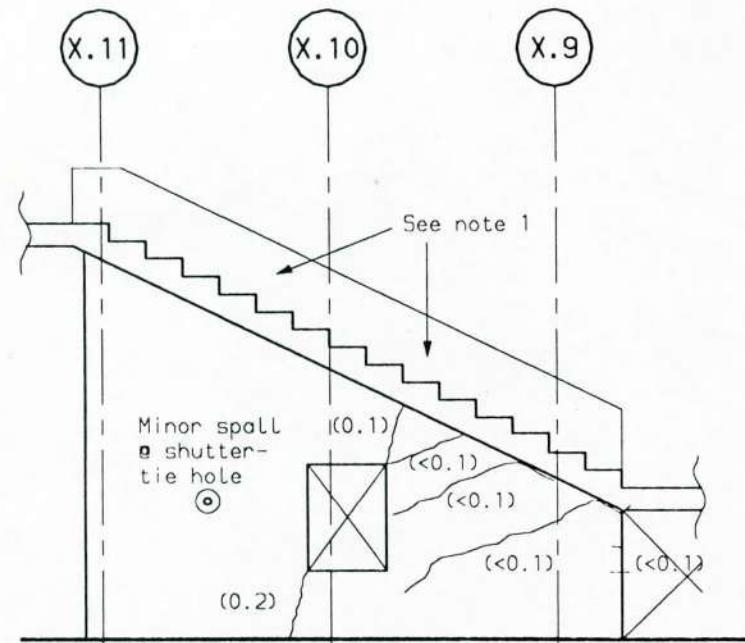
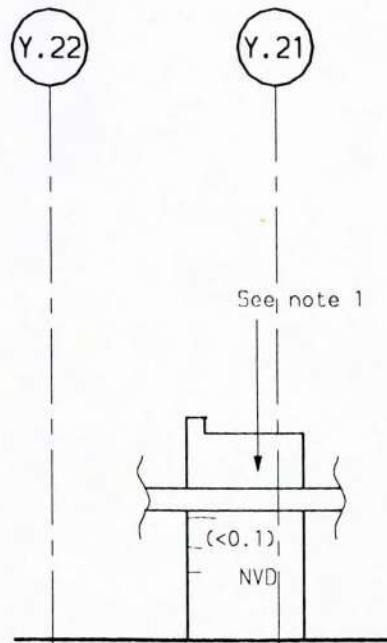


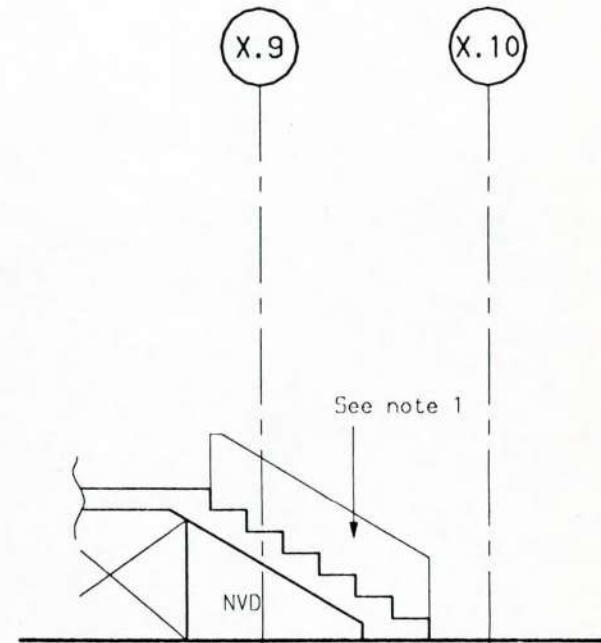
FIGURE 8 - STAIRCASE WALLS D, E & F, EXTERNAL ELEVATIONS



WEST ELEVATION
OF WALL D



SOUTH ELEVATION
OF WALL E



EAST ELEVATION
OF WALL F

KEY	
	h/c = honeycombing
	c.j. = construction joint = cracks (width in mm)
NVD	= No visible defects

Note 1 - Surface above stairs coated with black bitumastic type paint.

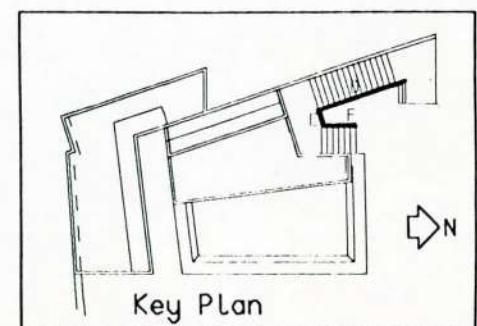
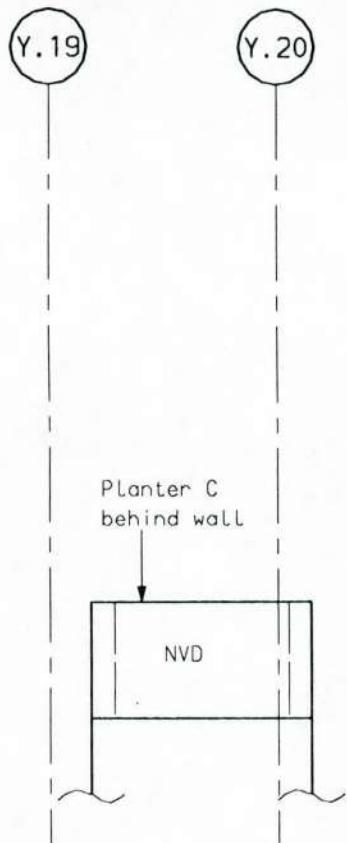
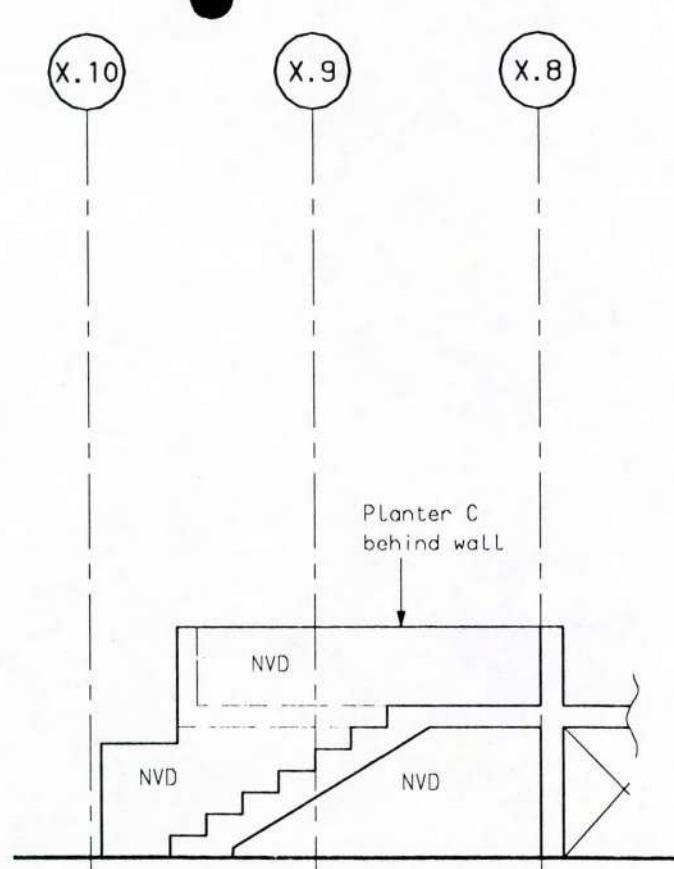


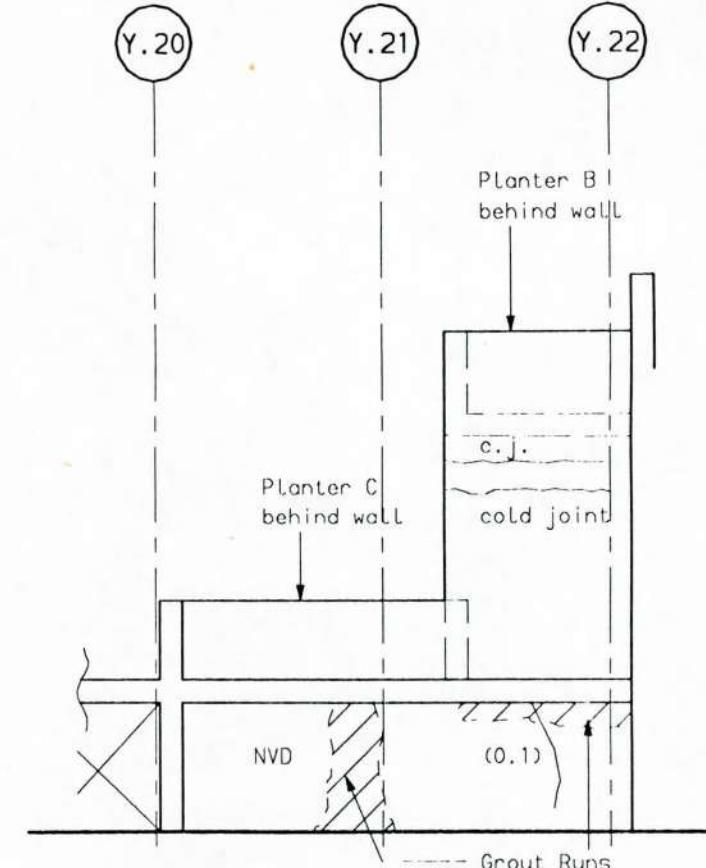
FIGURE 9 - STAIRCASE WALLS D, E & F, INTERNAL ELEVATIONS



NORTH ELEVATION OF
WALL C at X9.5/Y19-Y20



EAST ELEVATION OF WALL H
ON GRID Y20/X8-X10



NORTH ELEVATION OF WALL G
FROM GRID X8/Y20 TO X7/Y22

Surfaces above stairs coated in Black Bituminous type paint.
No visible significant defects. Numerous fine blowholes/minor h.c.
Also various drilled holes and cast in studs (some removed).

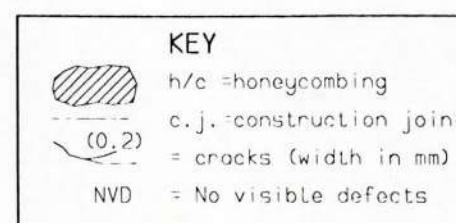
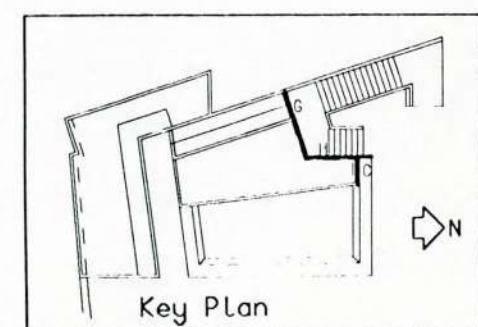
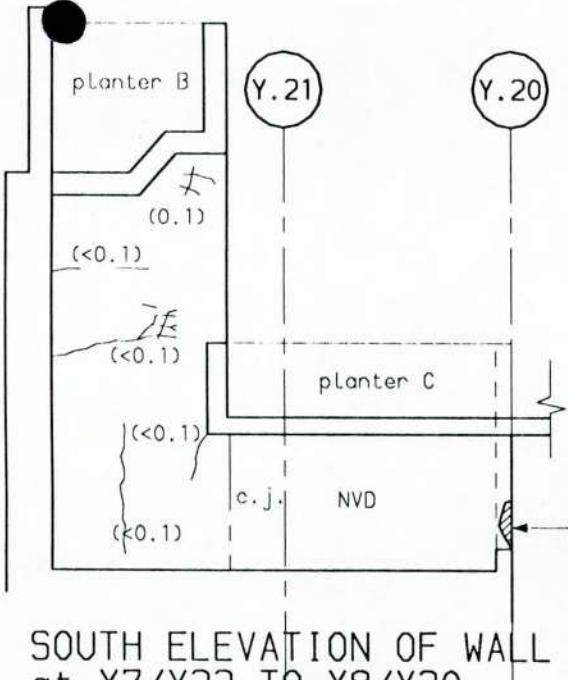
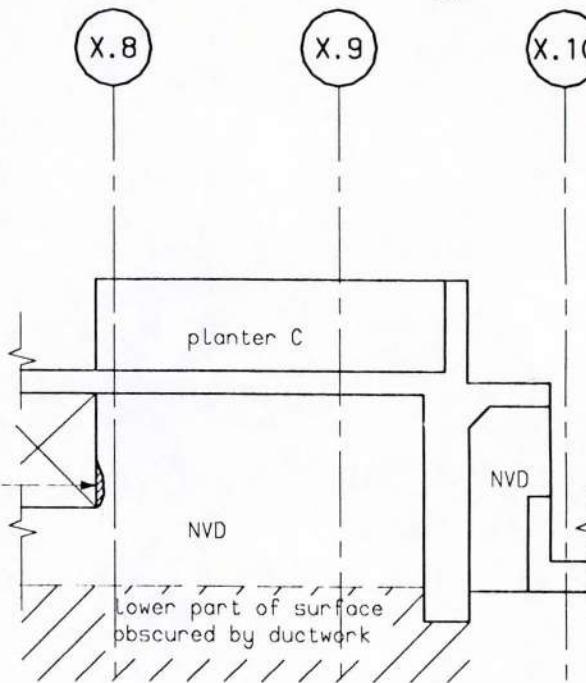


FIGURE 10 - WALLS C, G & H
BETWEEN STAIRCASE AND PLANTERS B & C

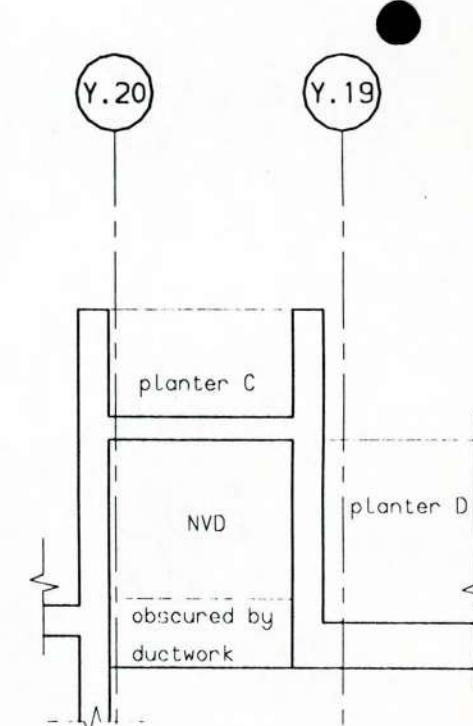




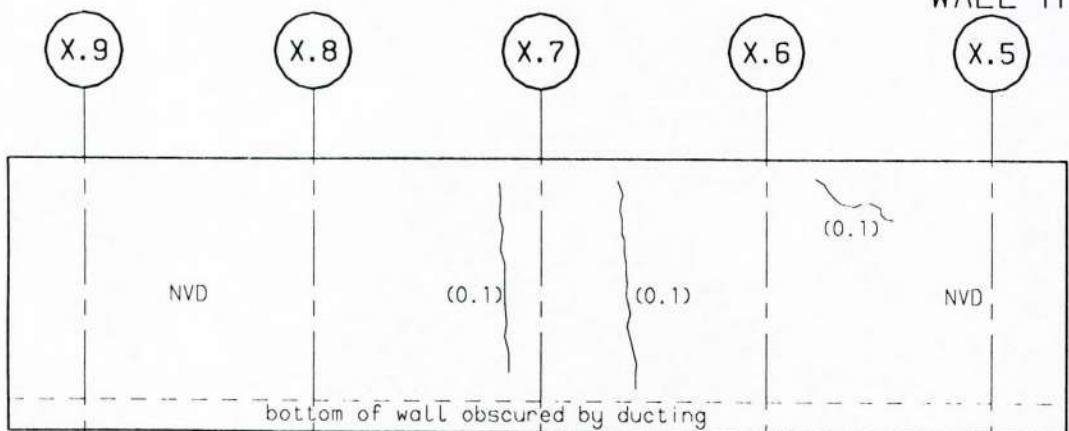
SOUTH ELEVATION OF WALL G
at X7/Y22 TO X8/Y20



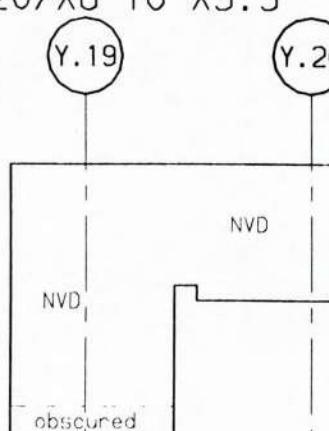
WALL H at Y20/X8 TO X9.5



WALL C at X9.5/Y19 TO Y20



WEST ELEVATION OF WALL J at Y19/X4.5 TO X9.5



WALL A - NORTH ELEV
at X4.5/Y18.5 TO Y20

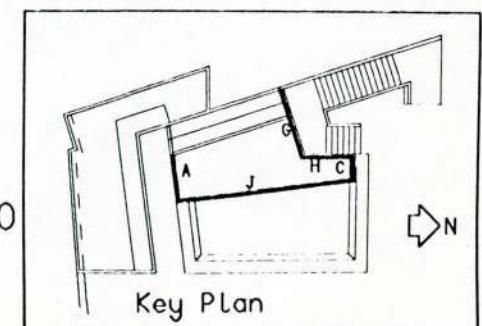
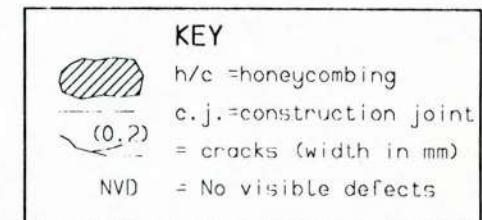
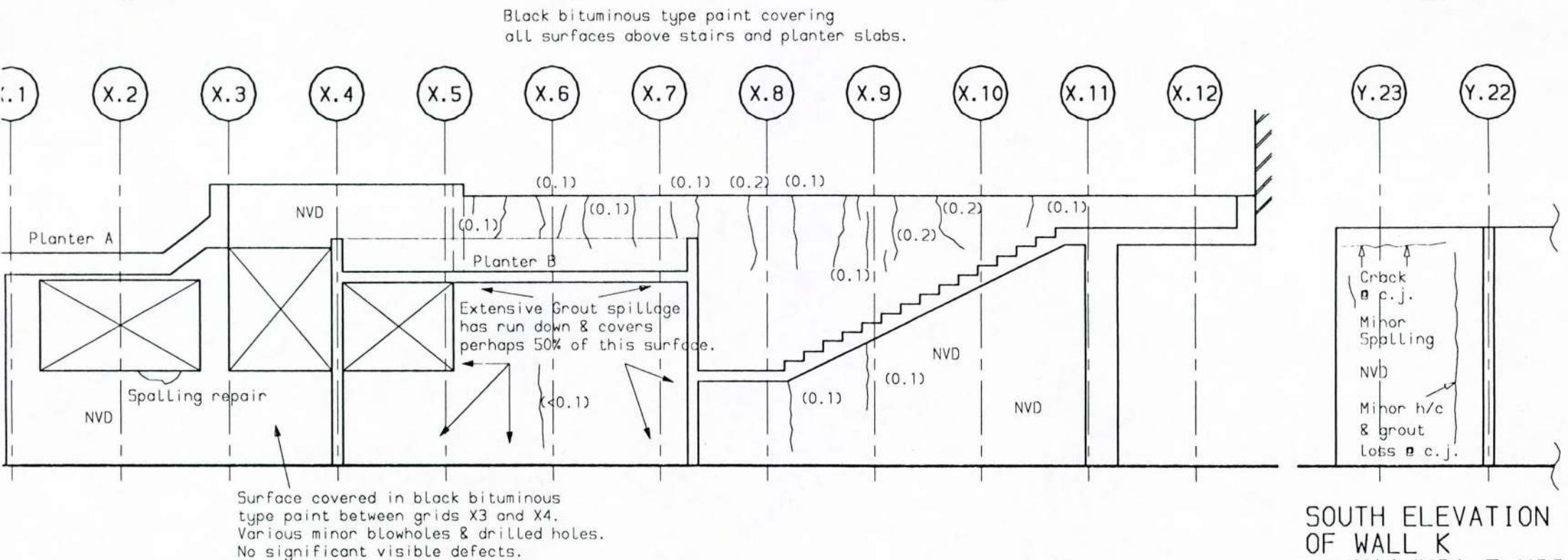


FIGURE 11 - WALLS A, C, G, H & J AROUND AND BELOW PLANTER C



EAST ELEVATION OF WALL L FROM GRID X3/Y21 TO X12/Y24

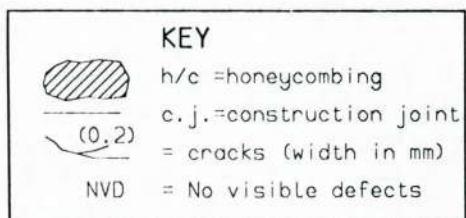
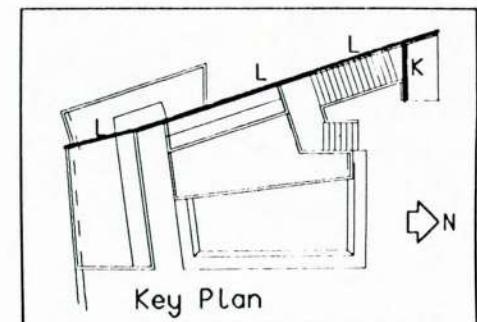


FIGURE 12 - WEST WALL L, EAST ELEVATION



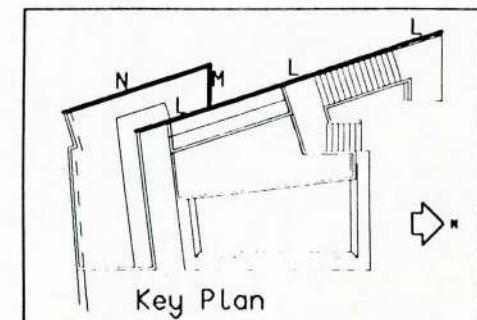
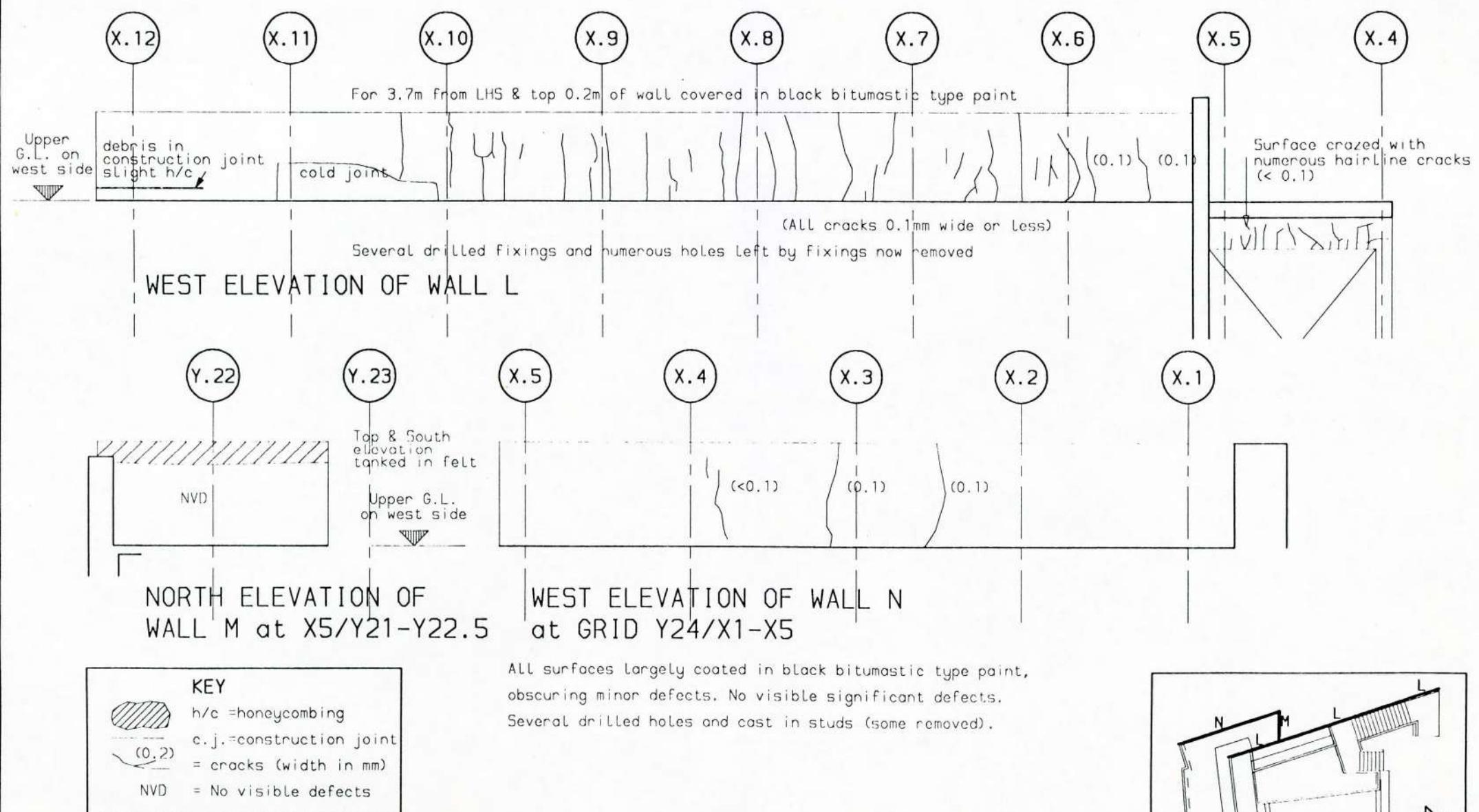
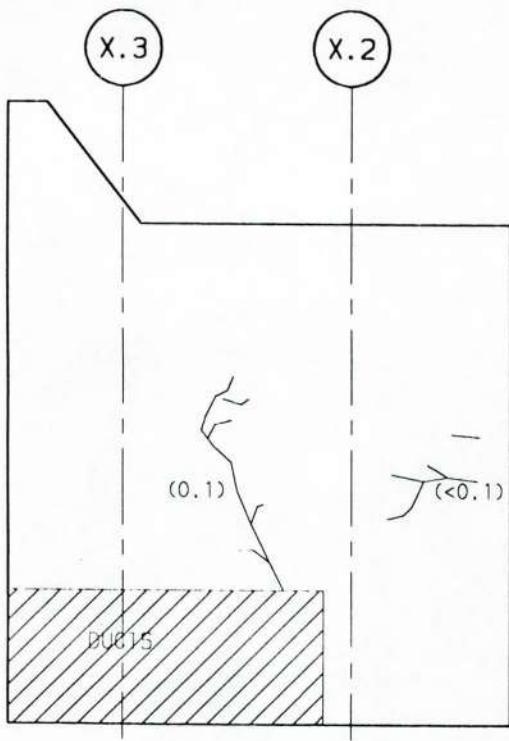
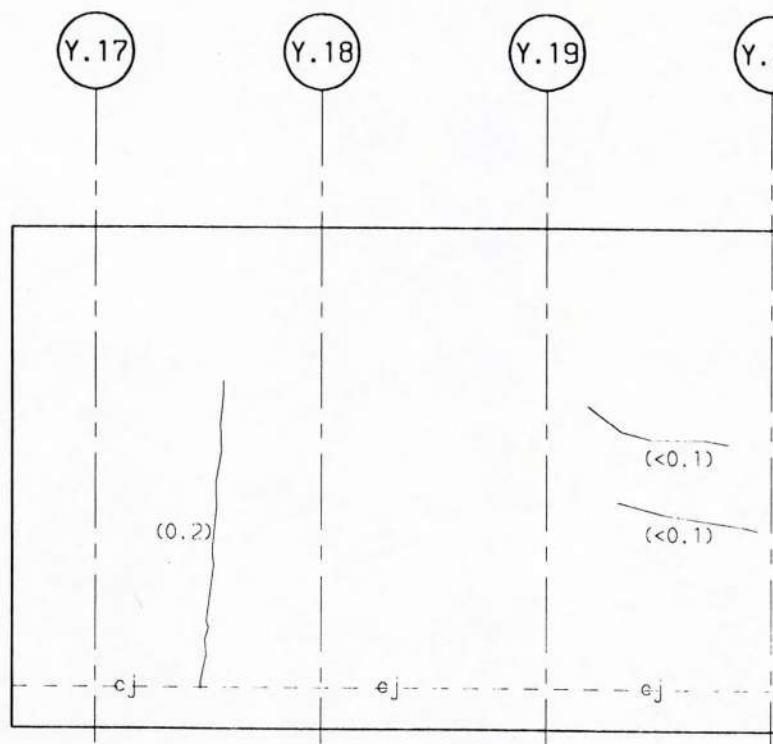


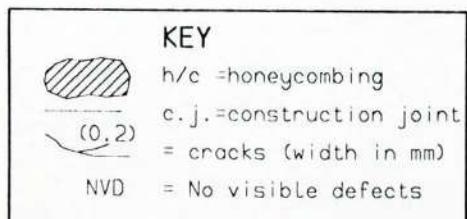
FIGURE 13 - WEST WALL L, WEST ELEVATION



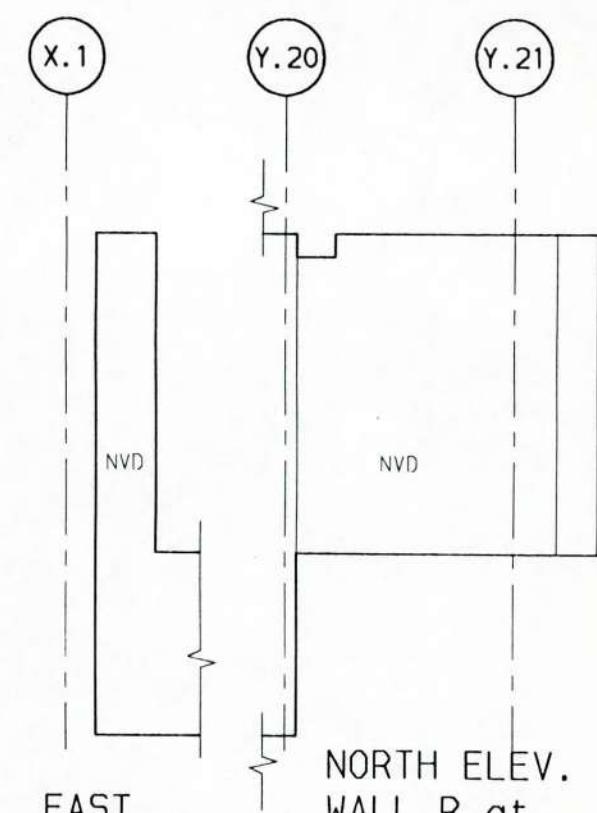
WEST ELEVATION of
WALL P at Y17/X1-X3



NORTH ELEVATION of
WALL Q at X1/Y17-Y20



Concrete generally appears in good condition
with no visible significant defects.



NORTH ELEV.
WALL R at
X1/Y20-Y21.5

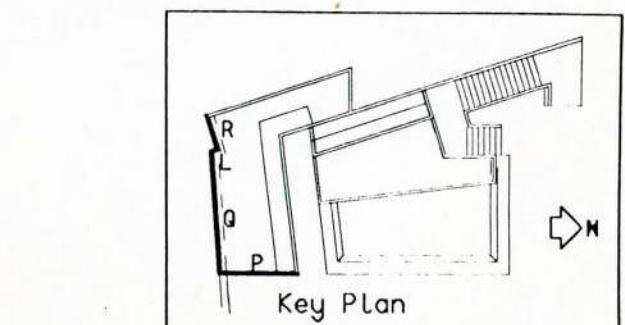


FIGURE 14 - SOUTH WALLS L, P, Q & R, ELEVATIONS

TAYWOOD ENGINEERING

WATERMAN PARTNERSHIP

EXCHEQUER COURT
25-51 ST MARY AXE, EC3

THE GARDEN AREA - CONCRETE INSPECTION

MEMBER	ELEVATION	INSPECTION RESULTS
Wall J	East	Lower half of wall tanked with "Hydrotech" membrane. Upper half covered with black bitumastic type paint. No significant visible defects.
Wall M	South, but only below planter A	Occasional short fine to hairline cracks. No significant visible defects.
Wall N	East, but only below planter A	Occasional short fine to hairline cracks. No visible significant defects.
Wall P	East	Surface covered by black bitumastic type paint. No visible cracks. Occasional fine blowholes & slight honeycombing. Various drilled holes & cast-in fixings, some removed. Void in concrete formed by cast-in polythene bag on grid X3 near top of wall.
Wall S	North	Surface covered by black bitumastic type paint. No visible cracks. Occasional fine blowholes & slight honeycombing. Various drilled holes & cast-in fixings, some removed. Void in concrete formed by cast-in polythene bag on grid X3 near top of wall.
Wall S	South	No significant visible defects
Wall T	East	Lower half tanked with "Hydrotech" membrane. Upper half covered with black bitumastic type paint. No significant visible defects
Wall T	West	Occasional very fine short cracks at bottom of wall.

INSPECTION RESULTS OF WALL ELEVATIONS
WHICH ARE NOT SHOWN IN FIGURES

TABLE 1

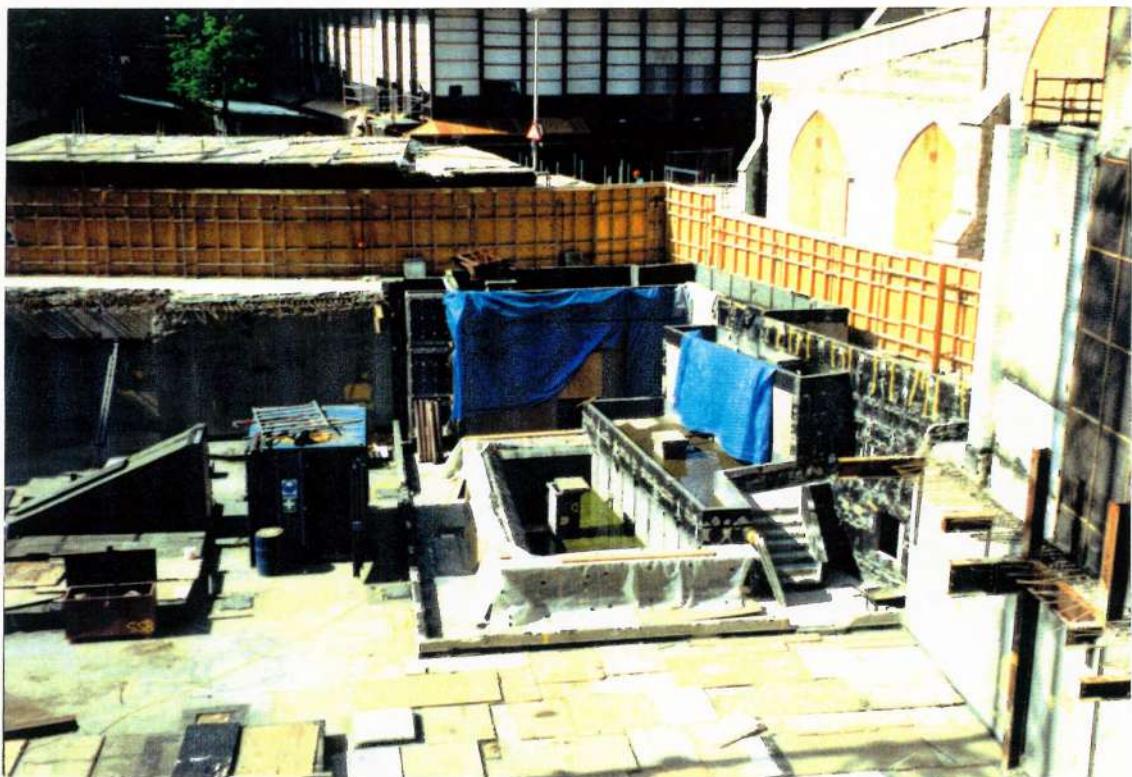


Plate 1 - General view of the garden from the north (EC/TL1/1)



Plate 2 - General view of the garden from the north (EC/TL1/2)



Plate 3 - Wall A, south elevation (EC/TL1/5)



Plate 4 - Wall C, north elevation (EC/TL1/3)



Plate 5 - Wall B, east elevation, south end (EC/TL1/7)



Plate 6 - Wall B, east elevation, north end (EC/TL1/6)

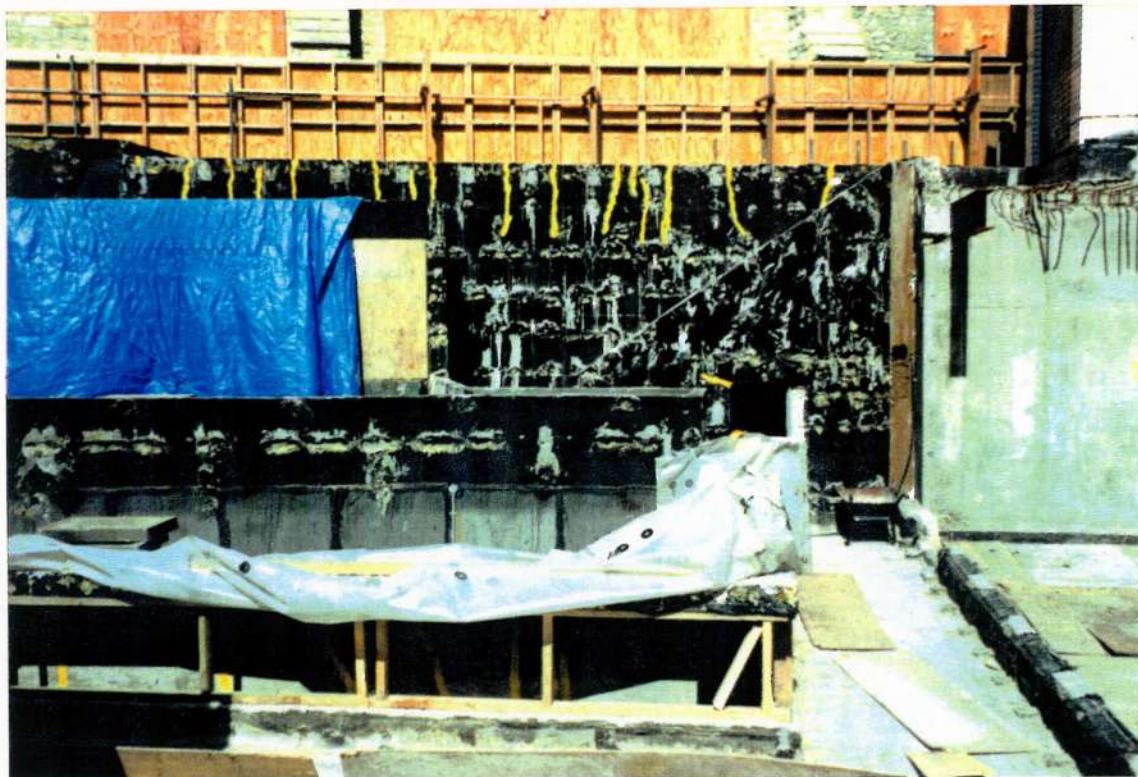


Plate 7 - Part east elevations of walls B,D,J & L at north end of garden (EC/TL1/4)



Plate 8 - View from under planter A, showing parts of Planter B soffit,
Walls L, M & T, and top of level -1 slab (EC/TL1/9)



Plate 9 - Wall G south elevation, Wall T west elevation at north end, and part level -1 slab
(EC/TL1/10)



Plate 10 - Wall T west elevation at south end, and part of level -1 slab (EC/TL1/8)

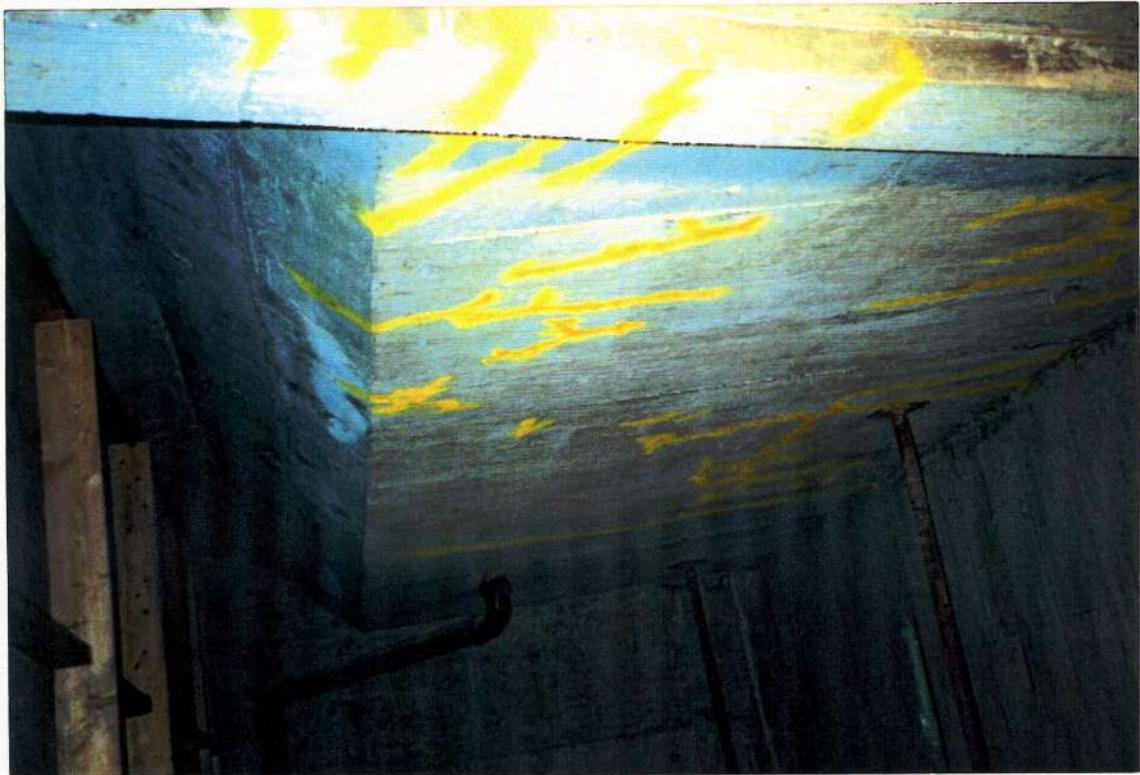


Plate 11 - Planter A, soffit at south east end (EC/TL1/11)



Plate 12 - Wall P, west elevation (EC/TL1/12)



Plate 13 - Area of 'Hydrotech' membrane removed in Planter A at grid X2/Y21 (EC/PP6/6)

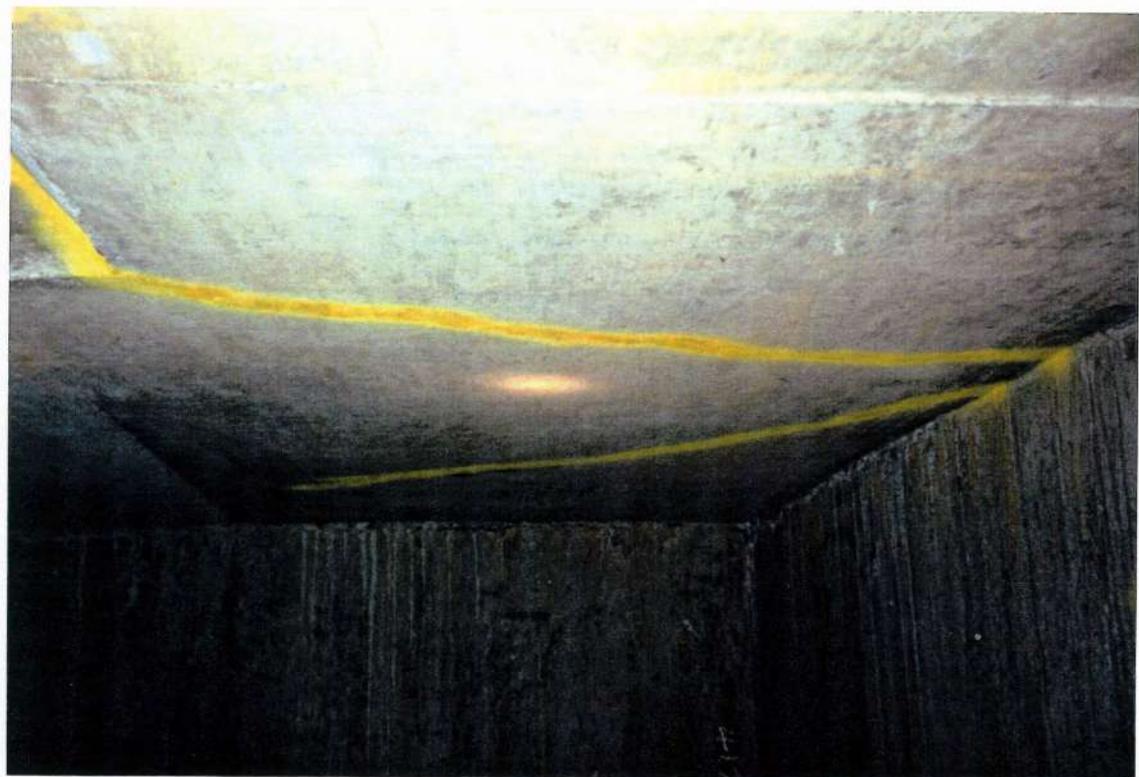
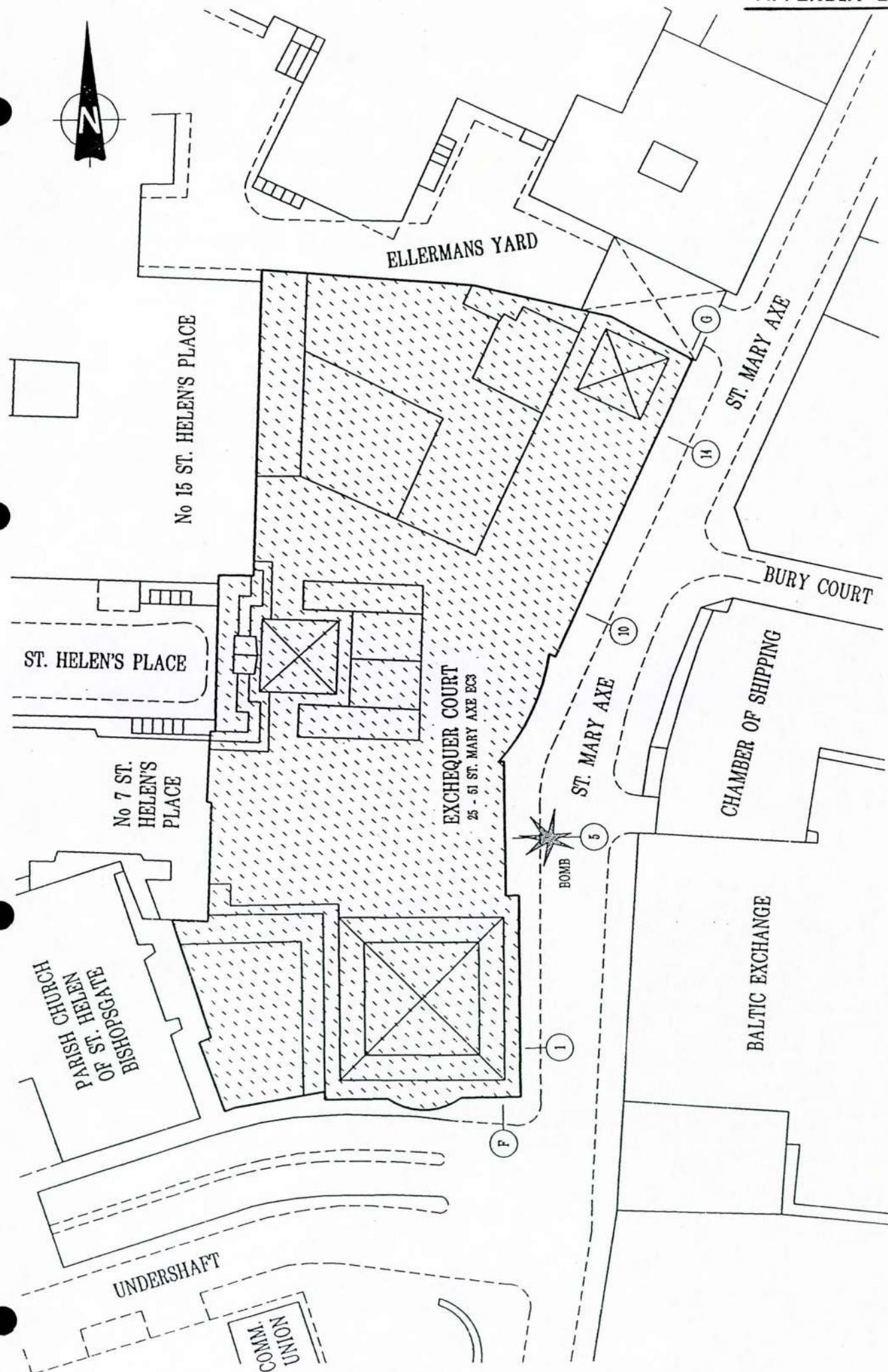


Plate 14 - 2no. cracks in soffit of Planter A at grid X2/Y21 (EC/PP6/4)

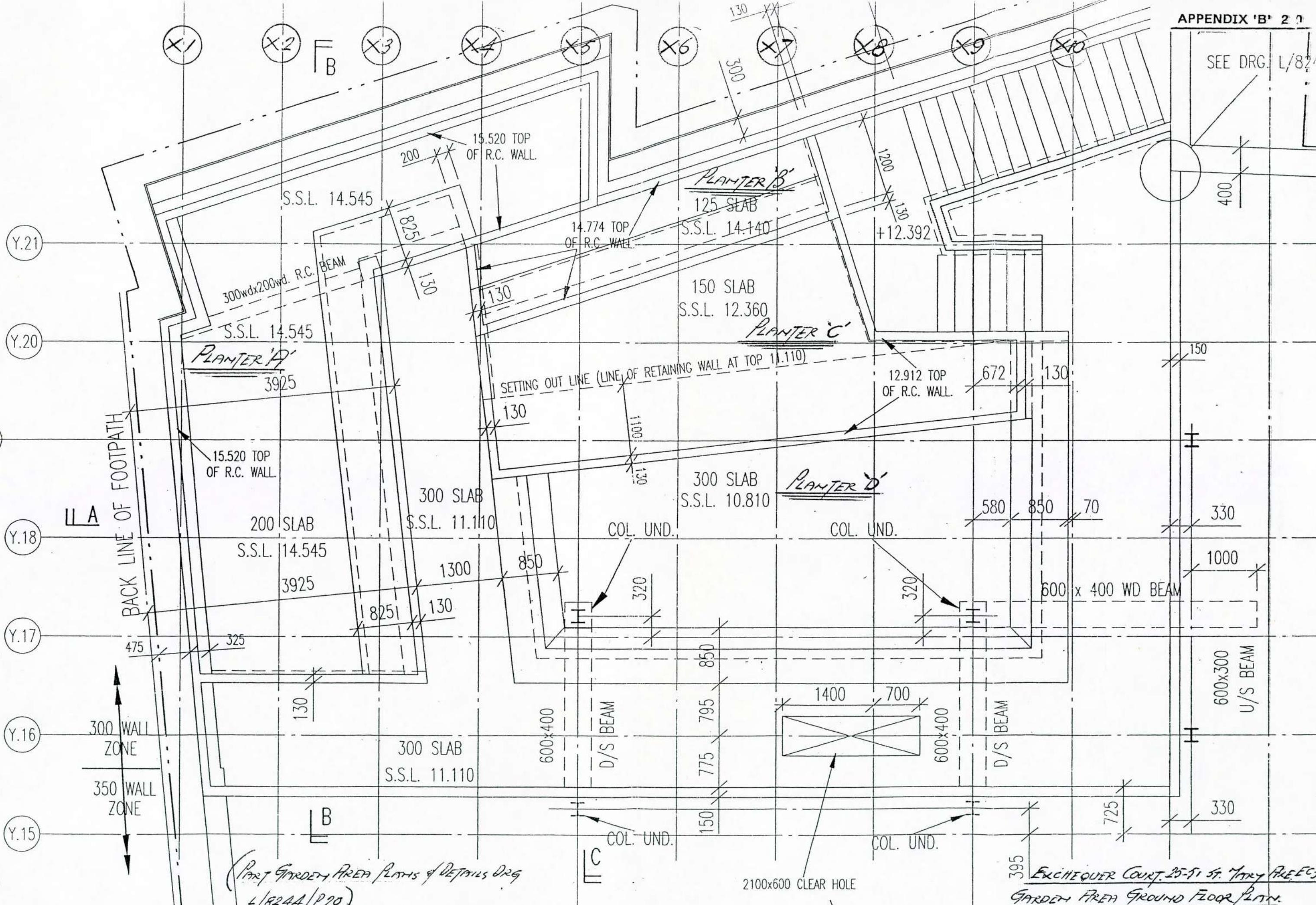
APPENDIX B

- 1.0 WATerman PARTNERSHIP DRAWING No. L/8859/A1
KEY PLAN.
- 2.0 WATerman PARTNERSHIP DRG No. SKETCH 8859/AT/09/(A3)
GARDEN AREA GROUND FLOOR PLAN.
- 3.0 WATerman PARTNERSHIP DRG No. SKETCH 8859/AT/10/(A3)
GARDEN AREA PLAN LEVEL -1.
- 4.0 WATerman PARTNERSHIP DRG No. SKETCH 8859/AT/11/(A3)
GARDEN AREA SECTION A-A.
- 5.0 WATerman PARTNERSHIP DRG No. SKETCH 8859/AT/12/(A3)
GARDEN AREA SECTION B-B.
- 6.0 WATerman PARTNERSHIP DRG No. SKETCH 8859/AT/13/(A3)
GARDEN AREA SECTION C-C.
- 7.0 WATerman PARTNERSHIP DRG No. SKETCH 8859/AT/14/(A3)
GARDEN AREA SECTION D-D.
- 8.0 WATerman PARTNERSHIP PROJECT RECORD SHEET, SITE VISIT 27.7.93.

EXCHEQUER COURT ASSESSMENT & TESTING RETAINED STRUCTURES



SEE DRG. L/824



(Part Garden Area Plans & Details DRG
L/8244/P20)

(Phase 6 Of Strategy
Document)

PLAN FROM GROUND LEVEL.

EXCHEQUER COURT, 25-51 ST. MARY AVE, EC3
GARDEN AREA GROUND FLOOR PLAN
STRETCH 8859/AT/09/(A3)

WATERMINT PARTNERSHIP

APPENDIX 'B' 3.0

FOR GARDEN AREA SEE
DRAWING No. L/8244/P20

ITTING OUT OF -2 LEVEL WALL
LEVEL DRG. L/8244/P21

Y.19
EINFORCED CONCRETE COL
STRUCTURED AFTER COMPLETION
LEVEL SLAB - LEAVE HOLE TO
E FROM ABOVE.

BACK LINE OF PAVEMENT

S.S.I. 12.260
S.S.I. 11.110
3725
varies
see note 9

300x300 R.C. COL.

200
175

WALL PILES OMITTED
FOR CLARITY.

ALL UPSTAND BEAMS ARE TO BE CONSTRUCTED
BEFORE EXCAVATION IS CARRIED OUT

BENEATH

WALL ZONE
LINE

325thk.

UPSTAND TOP
SLOPES 11.500 max.

25
150
1450
11.500
11.475
655

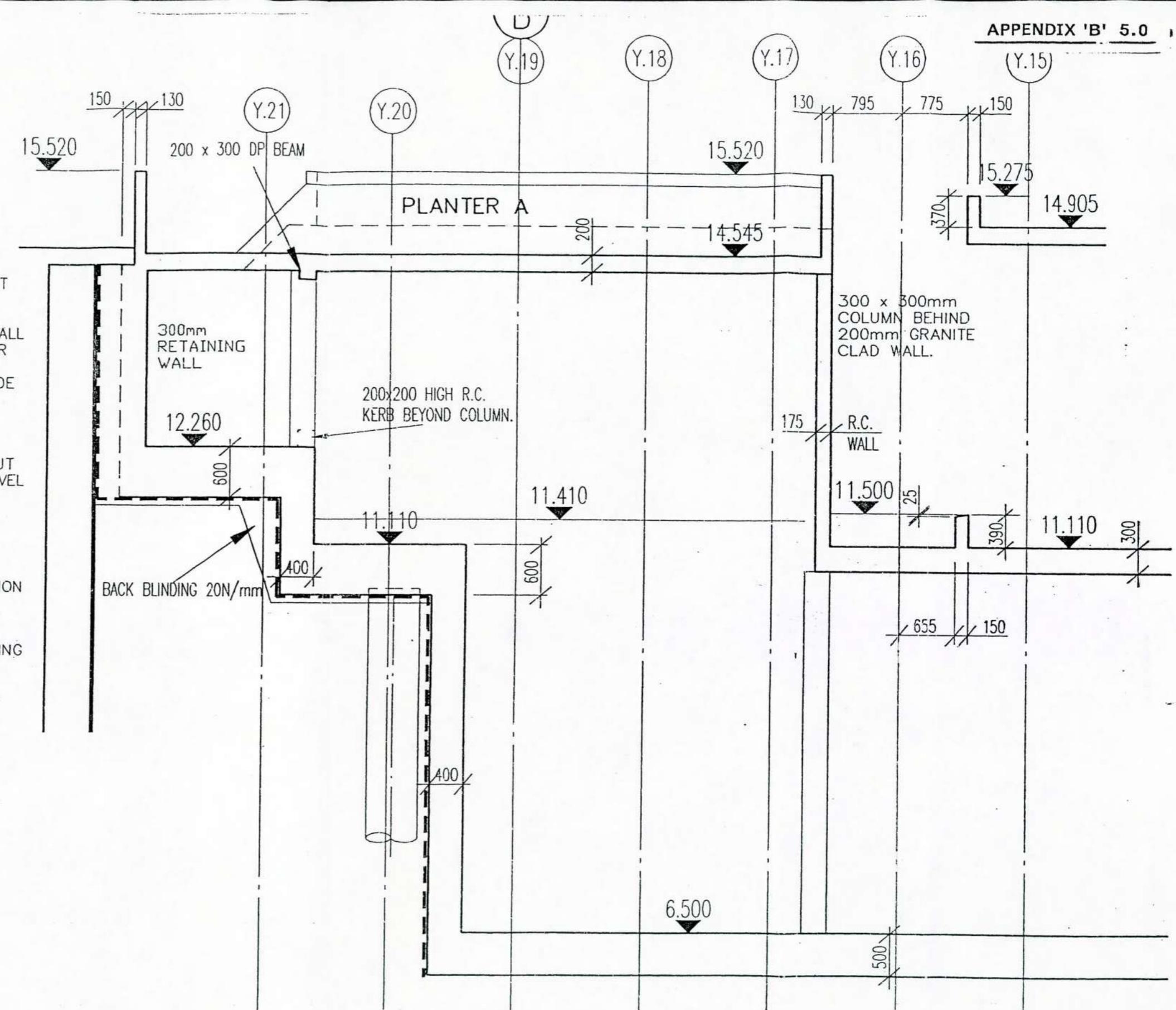
R.C.BEAM.
UPSTAND TOP.
SLOPES 11.500 max.

250
250
600x400wd
R.C.BEAM.
(Part Garden Area Details
DRG. L/8244/P20)

EXCHEQUER COURT 25-51 St. THOMAS PLACE
GARDEN PAV. PLAN - LEVEL - 1
SKETCH 8859/AT/10/(P3)
(LVL 11.50,
25)

PHASE 6 OF STRATEGY DOCUMENT

WATERMAN PARTNERSHIP



SECTION B-B

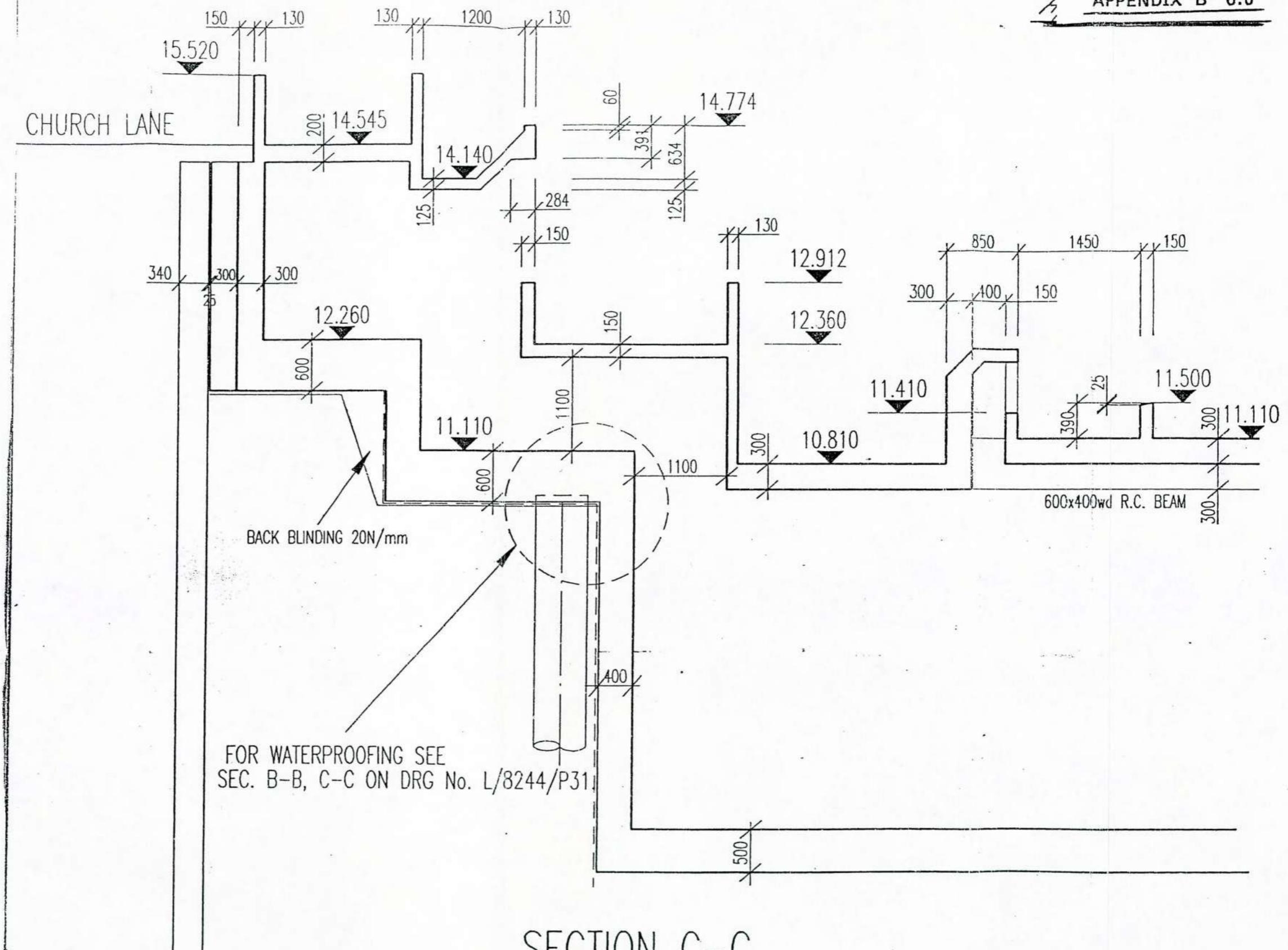
(PART GARDEN AREA PLANS & DETAILS.
DRG L/8244/P20).
(PHASE 6 OF STRATEGY DOCUMENT).

150 130 539 333 1200 130

EXCHEQUER COURT, 25-51 ST. JAMES'S EC3
GARDEN AREA SECTION B-B.

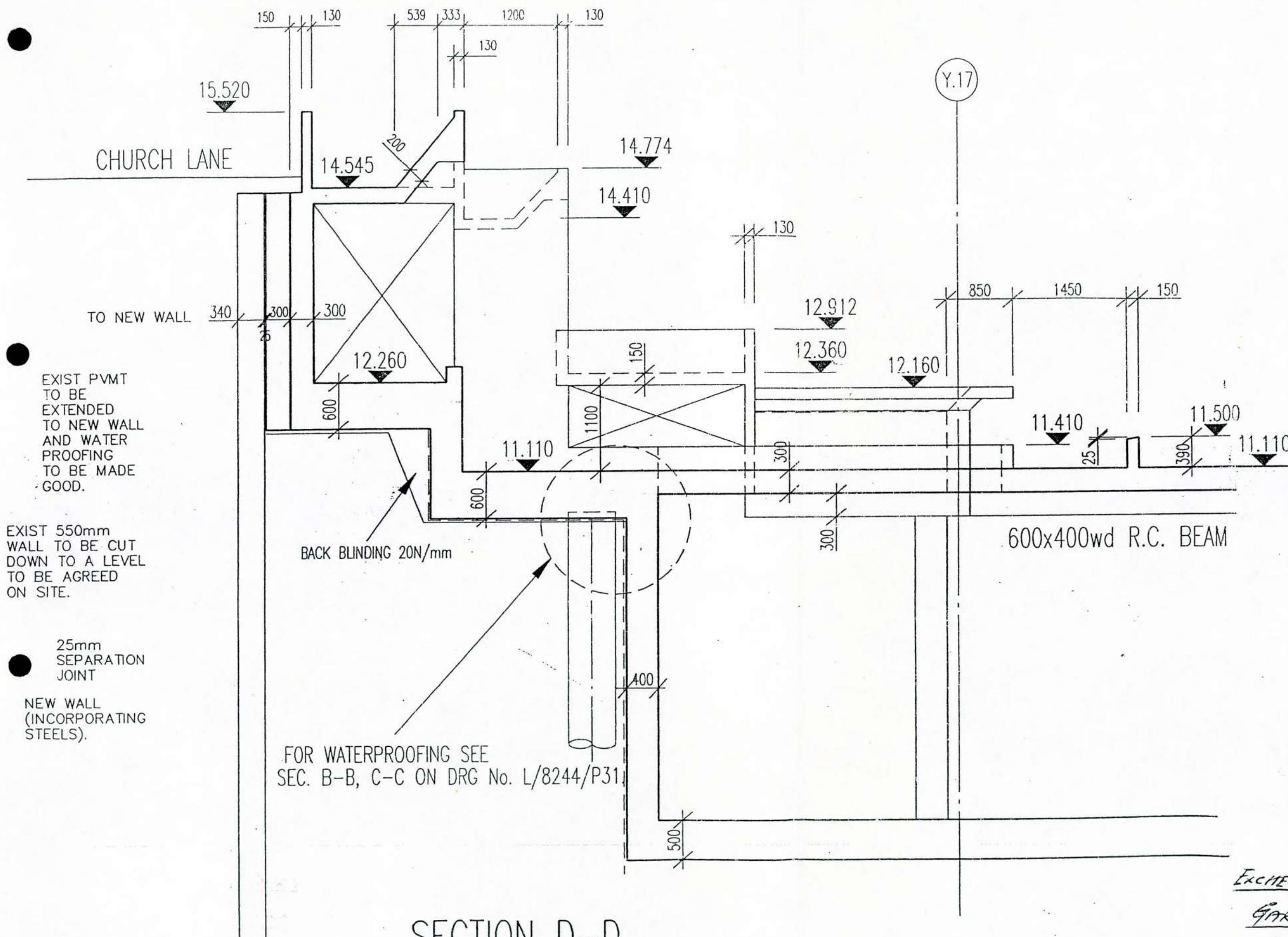
SKETCH 8859/AT/12/(A3).

WATERMAN PARTNERSHIP.



(Part Garden Area Plans & DETAILS
DRG. L/8244/P20).
(PAGE 6 OF STRATEGY DOCUMENT).

EXCHEQUER COURT, 25-27 ST. MARY AXE E.C.3.
GARDEN AREA SECTION C-C.
SKETCH 8859/AT/13/(A3).
WATERLOO PARTNERSHIP.



(Part GARDEN AREA PLANS & DETAILS DRG. L/8244/P20).
(PHASE 6 OF STRATEGY DOCUMENT).

EXCHEQUER COURT, 25-51 ST. MARY Axe, E.C.3.
GARDEN AREA SECTION D-D.
SKETCH 8859/AT/14/(A3).
WATERMAN PARTNERSHIP.

File - Tick as appropriate

MINUTES	
CORRESPONDENCE <i>(TEL)</i>	✓

~~MEETING RECORD~~
~~TEL. DISCUSSION~~
~~FILE NOTE~~
~~SITE VISIT~~

* Delete as applicable

PROJECT *Fochabers Court 25-51 St. Tay Rd E.C.3.*NO *8889/9.* DATE *27.7.93.*Assessment / Testing Retained Structures.

ACTION

File Note On Site Visit To Inspect R.C. Slab In Planter "A" 14.545 Level.
Garden Area.

Proj. M.W.Hawke (wp), P.Penison (Tec), B.Bcock (Arch), D.Thorne (Sap).

- 1). Purpose of visit was to inspect the R.C. slab in Planter "A" in S.W corner of the Garden area where the Hydratex membrane had been locally removed in a suspected crack area.
- 2). An area of Hydratex about 1m x 2m had been carefully removed and no evidence of cracks in the surface was found.
- 3). Although it rained quite heavily an inspection of cracks in the slab itself did not reveal any water penetration.
- 4). The causes of the cracks found in the Garden area generally and recorded by Tec are considered to be due to mechanical movement ie shrinkage.
- 5). It was generally agreed that the cracks as noted previously in this area were unlikely to have been caused by the occupation.

BY *M.W.Hawke*

APPENDIX C

SUPPORTING DOCUMENTATION

PHOTOGRAPHS.

- PLATE 1.0 GARDEN AREA, PLANTER 'A', POST EXPLOSION APRIL 1992.
PLATE 2.0 GARDEN AREA, VIEW WEST, POST EXPLOSION APRIL 1992.

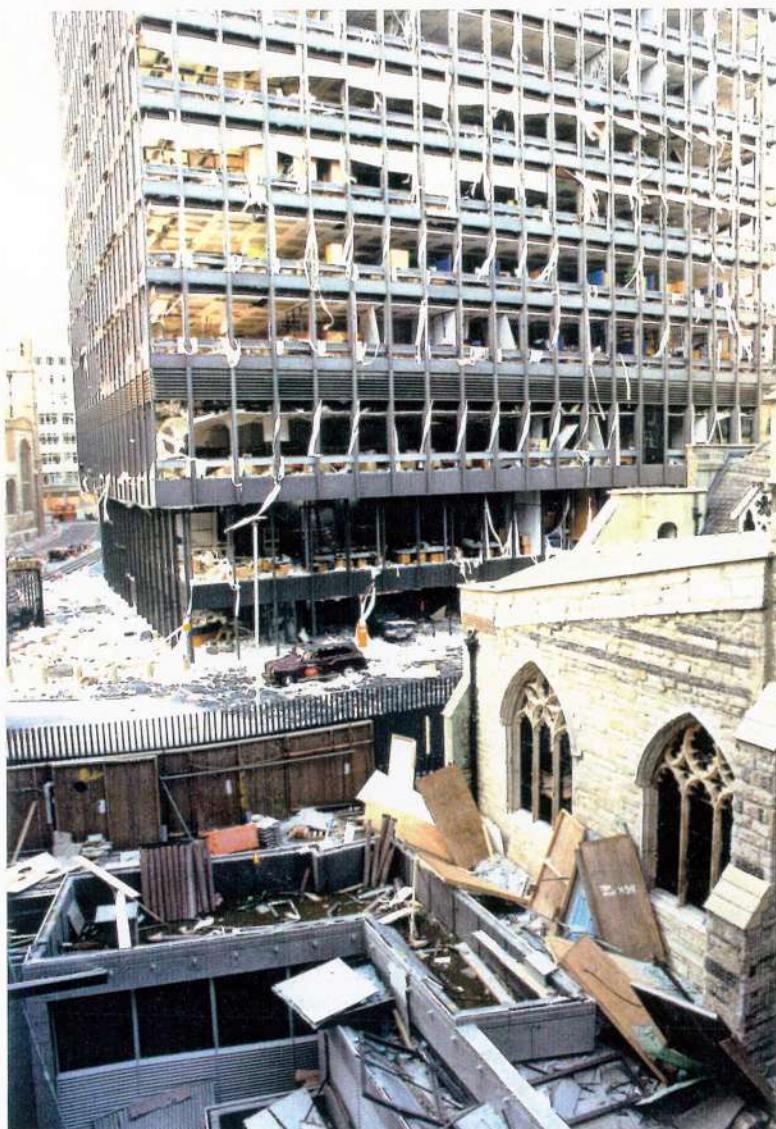


PLATE 1.0 GARDEN AREA, PLANTER 'A', POST EXPLOSION, APRIL 1992

EXCHEQUER COURT ASSESSMENT & TESTING RETAINED STRUCTURES

PHASE 6 REPORT : APPENDIX C



PLATE 2.0 GARDEN AREA, VIEW WEST, POST EXPLOSION, APRIL 1992

EXCHEQUER COURT ASSESSMENT & TESTING RETAINED STRUCTURES
PHASE 6 REPORT : APPENDIX C