BYE LAW APPLICATION FEES

REF. NO.: 91A/1113 CERTIFICATE NO.: 1563B

PROPOSAL: Warehouse Building + Car Park

LOCATION: 75A Cookstown Industrial Estate

APPLICANT: Petersons Haulage Ltd

	1	2	3	4	5	6	7
CLASS	DWELLINGS/AREA LENGTH/STRUCTURE	RATE	AMT. OF FEE REQUIRED	AMT. LODGED	BALANCE DUE	RED. FEE APPL.	AMT. OF RED. FEE
A	Dwelling (Houses/Flats)	@ £55					
B	Domestic Ext. (Improvement/ Alts.)	@ £30					
C 540M²	Building for office or other comm. purpose	@ £3.50 per M² or £70	£1890	£1890			
D	Building or other structure for purposes of agriculture	@ £1.00 per M² in excess of 300 M² Min. £70					
E	Petrol Filling Station	@ £200					
F	Dev. of prop. not coming within any of the forgoing classes	£70 or £9 per .1 hect. whichever is the greater					

Column 1 Certified: Signed: [signature] Grade: SPTO Date: 8-7-91

Column 1 Endorsed: Signed: [signature] Grade: _____ Date: _____

Columns 2,3,4,5,6 & 7 Certified: Signed: [signature] Grade: S.O Date: 8/7/91

Columns 2,3,4,5,6 & 7 Endorsed: Signed: _____ Grade: _____ Date: _____

PLANNING APPLICATION FEES

Reg. Ref. 91A/1113 Cert. No. 25932

PROPOSAL Warehouse Building + Car Parking

LOCATION 75A Coolcotton Industrial Estate

APPLICANT Peterson Hardings Ltd

CLASS	DWELLINGS/AREA LENGTH/STRUCT.	RATE	AMT. OF FEE REC.	AMOUNT LODGED	BALANCE DUE	BALANCE PAID
1	Dwellings	@£32				
2	Domestic,	@£16				
3	Agriculture	@50p per m2 in excess of 300m2. Min. £40				
4	Metres 5400 m	@£1.75 per m2 or £40	£945	£945		
5	x .1 hect.	@£25 per .1 hect. or £250				
6	x .1 hect.	@£25 per .1 hect. or £40				
7	x .1 hect.	@£25 per .1 hect. or £100				
8		@£100				
9	x metres	@£10 per m2 or £40				
10	x 1,000m	@£25 per £1000m or £40				
11	x .1 hect.	@£5 per .1 hect. or £40				

Column 1 Certified: Signed: ..... Grade SEO Date 8-7-91

Column 1 Endorsed: Signed: ..... Grade ..... Date .....

Columns 2,3,4,5,6 & 7 Certified: Signed: ..... Grade ..... Date 8/7/91

Columns 2,3,4,5,6 & 7 Endorsed: Signed: ..... Grade ..... Date .....

A1-7

LOCATION GOVERNMENT (PLANNING AND DEVELOPMENT) ACTS, 1963 TO 1982

ASSESSMENT OF FINANCIAL CONTRIBUTION

EG. REF.: 91A/ 1113

CNT. REG.:

ERVICES INVOLVED: WATER/FOUL SEWER/SURFACE WATER

REA OF SITE:

LOOR AREA OF PRESENT PROPOSAL: 5,812 Sq ft

EASURED BY: [signature] 8-2-91

HECKED BY:

ETHOD OF ASSESSMENT:

OTAL ASSESSMENT

ANAGER'S ORDERED NO: P/ / 1453
DATED

NTERED IN CONTRIBUTIONS REGISTER: 14359

EVELOPMENT CONTROL ASSISTANT GRADE

29th August 1991

Proposed Extension to Unit 75A
Cookstown Industrial Est for
Bee Marketing

91A/1113

Total Area of Existing & Proposed 3615 m2
Total Area of Buildings 1766 m2

Site Coverage $\frac{1766}{3615} = 48.8\%$

Total Area of Proposed Site = 552
" " " Proposed Buildings 1238

= 44.5%

Drawing A1 – 1
Scale 1:500

Brian [illegible]
Room 114

Dublin County Council Comhairle Chontae Atha Cliath **Planning Department**

Bloc 2, Ionad Bheatha na hEireann,
Block 2, Irish Life Centre,
Sraid na Mainistreach Iacht,
Lower Abbey Street,
Baile Atha Cliath 1.
Dublin 1.
Telephone. (01)724755
Fax. (01)724896

Mr. J. Carson,
Liffey House,
Dublin 2.

Our Ref.
Your Ref.
Date 31.10.91

Re: Development at 75A Cookstown Ind. Est.

Reg. Ref. No. : 91A/1113

I refer to the submission for Building Bye-Law Approval received in this Department on 30.10.91.

The submission is in compliance with conditions of Building Bye-Law Approval issued. Please confirm that the submission is strictly compliance as requested and not a new application and accordingly that a Bye-Law fee is not required. Documents enclosed.

for Noeleen Deane
STAFF OFFICER,
REGISTRY SECTION

Order No. P/4176/91

L4359.

COMHAIRLE CHONTAE ÁTHA CLIATH

Record of Executive Business and Manager's Orders

Permission for the erection of a single storey warehouse building and car parking at 75A Cookstown Industrial Estate, Tallaght for Petersons Holdings Ltd.

Hamilton Young & Associates,
12 Terenure Road East,
Rathgar,
Dublin 6.

Reg. Ref.	91A/1113
App. Recd:	03.07.1991
Floor Area:	540 sq. m.
Site Area:	1243 sq. m.
Zoning:	

Report of the Dublin Planning Officer, dated 29 August 1991

This is an application for PERMISSION for erection of a single storey warehouse building and car parking at 75A Cookstown Industrial Tallaght for Petersons Holdings Ltd.

The area in which the site is located is zoned with the objective "to provide for industrial and related uses".

The proposal represents a sub-division of an existing site. A register search to 1980 indicates no planning history in that period. The two companies will share access. It is proposed to paint and upgrade the existing (adjoining) section of P. E. O'Briens building.

A report on file from Sanitary Services indicates that all services are available.

An unsigned report from Roads Department dated 12th August, 1991, indicates that the permission should be refused because of the density involved which would lead to on street parking and therefore endanger public safety.

During my own site inspection there were actually very few cars on site. Most spaces were unused.

Roads Department quote Development Plan Standards for manufacturing/warehousing which requires 3.00 spaces per 100 sq. metres. This would result in a total of 58 spaces being required, 42 for the existing building and 16 for the proposed.

In fact the existing use on the site is warehousing (storage and wholesale of hardware). The proposed use is also warehousing.

In the circumstances, the requirement that "manufacturing" standards be met would seem excessive in this case.

However, any future change of use to manufacture or other intensive use should be the subject of planning permission.

I recommend that a decision to GRANT PERMISSION be made under the Local Government (Planning and Development) Acts, 1963-1990 subject to the following (12) conditions:-

Order No. P/4176/91

COMHAIRLE CHONTAE ÁTHA CLIATH

Record of Executive Business and Manager's Orders

Permission for the erection of a single storey warehouse building and car parking at 75A Cookstown Industrial Estate, Tallaght for Petersons Holdings Ltd.

CONDITIONS	REASONS FOR CONDITIONS
1. The development to be carried out in its entirety in accordance with the plans, particulars and specifications lodged with the application, save as may be required by the other conditions attached hereto.	1. To ensure that the development shall be in accordance with the permission and that effective control be maintained.
2. That before development commences, approval under the Building Bye-Laws be obtained, and all conditions of that approval be observed in the development.	2. In order to comply with the Sanitary Services Acts, 1878-1964.
3. That the requirements of the Chief Fire Officer be ascertained and strictly adhered to in the development.	3. In the interest of safety and the avoidance of fire hazard.
4. That the requirements of the Supervising Environmental Health Officer be ascertained and strictly adhered to in the development.	4. In the interest of health.
5. That the water supply and drainage arrangements, including the disposal of surface water, be in accordance with the requirements of the County Council.	5. In order to comply with the Sanitary Services Acts 1878-1964.
6. That no industrial effluent be permitted without prior approval from Planning Authority.	6. In the interest of health.
7. That the area between building and roads must not be used for truck parking or other storage or display purposes, but must be reserved for car parking and landscaping as shown on lodged plans.	7. In the interest of amenity.
8. That the existing boundary wall to be repaired and improved where necessary.	8. In the interest of the proper planning and development of the area.
9. That the existing planting to be protected during development.	9. In the interest of the proper planning and development of the area.

Contd.../

Order No. P/4176/91

COMHAIRLE CHONTAE ÁTHA CLIATH

Record of Executive Business and Manager's Orders

Permission for the erection of a single storey warehouse building and car parking at 75A Cookstown Industrial Estate, Tallaght for Petersons Holdings Ltd.

CONDITIONS	REASONS FOR CONDITIONS
10. That no additional advertising sign or structure be erected, except those which are exempted development, without prior approval of the Planning Authority.	10. In the interest of the proper planning and development of the area.
11. That a financial contribution in the sum of £ 4359 be paid by the proposer to the Dublin County Council towards the cost of provision of public services in the area of the proposed development and which facilitate this development; this contribution to be paid before the commencement of development on the site.	11. The provision of such services in the area by the Council will facilitate the proposed development. It is considered reasonable that the developer should contribute towards the cost of providing the services.
12. That the proposed building shall be used for warehousing only and ancillary offices as shown on the lodged plans and any future change of use ~~which would entail more intensive traffic shall~~ be the subject of an application for planning permission.	12. In the interest of the proper planning and development of the area.

NB: Compliance with one or more of the conditions of this permission may result in material alterations to the development as initially proposed and accordingly may require the submission of a further planning application.

(GB/BB)

Endorsed:- for Principal Officer

Richard Cremins S.E.P.
For Dublin Planning Officer
30.8.91

Order:- A decision pursuant to Section 26(1) of the Local Government (Planning and Development) Acts, 1963-1990, to GRANT PERMISSION for the above proposal subject to the (12) conditions set out above is hereby made.

Dated: 30 August, 1991.

K. O'Sullivan
ASSISTANT CITY & COUNTY MANAGER

to whom the appropriate powers have been delegated by Order of the Dublin City and County Manager, dated 26th August, 1991.

G.B.

DUBLIN COUNTY COUNCIL

REG. REF: 91A-1113

DEVELOPMENT: Erection of a single storey warehouse building and car parking.

LOCATION: 75A Cookstown Industrial Estate, Tallaght.

APPLICANT: Petersons Holdings Ltd.

DATE LODGED: 3rd July, 1991.

The proposal is for a new warehouse adjacent to an existing warehouse development (P. E. O'Brien Ltd.) with access via the existing entrance to the P. E. O'Brien development. Fourteen off-street parking spaces are proposed, most of which are located on a hard standing area presently used by the adjacent site for heavy vehicles. It would also be available at present for car parking.

To comply with Development Plan standards the two developments together would require 58 off-street car parking spaces. In total (refer site plan) 35 off-street spaces are proposed of which 21 will serve P. E. O'Brien Ltd and 14 will serve the proposed development. Development Plan standards are 42 and 16 respectively.

While the applicant shows that the car parking would satisfy the short term requirements of staff in both developments, the Roads Department would be concerned about shortfalls in parking which could result from future occupants of these sites. The proposal is undesirable due to its intensity.

Permission should be refused as-

The development as proposed would , because of its density, lead to on-street car parking and heavy vehicle parking near a junction and would, thereby, endanger public safety by reason of a traffic hazard.

(Note: Alternatively, additional information could be requested as a proposal for a less dense development.)

PLANNING DEPT.
DEVELOPMENT CONTROL SECT
Date 20.08.91
Time 9.00

GC/MM
12.8.91

SIGNED:_____ **ENDORSED:**_____

DATE:_____ **DATE:**_____

SS only.

Geraldine Boothman.

Register Reference : 91A/1113 Date : 12th July 1991

Development : Erection of a single storey warehouse building and car parking

LOCATION : 75A Cookstown Industrial Estate, Tallaght

Applicant : Petersons Holdings Ltd

App. Type : PERMISSION/BUILDING BYE-LAW APPROVAL

Planning Officer : G.BOOTHMAN

Date Recd. : 3rd July 1991

Attached is a copy of the application for the above development .Your report would be appreciated within the next 28 days.

PLANNING DEPT.
DEVELOPMENT CONTROL SECT
Date 22:08:91
Time 10:00

Yours faithfully,

.....

for PRINCIPAL OFFICER

DUBLIN Co. COUNCIL
- 7 AUG 1991
SAN SERVICES

Date received in Sanitary Service .....

FOUL SEWER

Available.
Any effluent other than domestic effluent to be subject to the previsions of the Water Pollution Act.

SURFACE WATER

DUBLIN COUNCIL
ARTS SERVICES
20 AUG 1991
Returned

Available.
Surface water run-off to be subject to the previsions of the Water Pollution Act.

SENIOR ENGINEER,
SANITARY SERVICES DEPARTMENT,
46/49 UPPER O'CONNELL STREET,
DUBLIN 1

Dublin 15/8/91.

J.R.
16/8/91

EHCP 25/7

PLANNING DEPT.
DEVELOPMENT CONTROL SECT
Date 22.08.91
Time 10.00

Register Reference : 91A/1113 Date : 12th July 1991

ENDORSED ______ DATE ______

WATER SUPPLY Refer to CPD. Available. A separate connection from the Ø 150 mm watermain fronting the site will be necessary.

V O'Sullivan
9/8/91.

ENDORSED [signature] DATE 16/8/91

DUBLIN CO. COUNCIL
SANITARY SERVICES
20 AUG 1991
Returned [signature]

55 July

Geraldine Boothman.

Register Reference : 91A/1113 Date : 12th July 1991

Development : Erection of a single storey warehouse building and car parking

LOCATION : 75A Cookstown Industrial Estate, Tallaght

Applicant : Petersons Holdings Ltd

App. Type : PERMISSION/BUILDING BYE-LAW APPROVAL

Planning Officer : G.BOOTHMAN

Date Recd. : 3rd July 1991

Attached is a copy of the application for the above development .Your report would be appreciated within the next 28 days.

PLANNING DEPT.
DEVELOPMENT CONTROL SECT
Date 22:08:91
Time 10:00

Yours faithfully,

.....
for PRINCIPAL OFFICER

DUBLIN CO. COUNCIL
- 7 AUG 1991
SAN SERVICES

Date received in Sanitary Service

FOUL SEWER

Available.
Any effluent other than domestic effluent to be subject to the provisions of the Water Pollution Act.

SURFACE WATER

Available.
Surface water run-off subject to the provisions of the Water Pollution Act.

NIL
SANITARY SERVICES
20 AUG 1991
Returned

SENIOR ENGINEER,
SANITARY SERVICES DEPARTMENT,
46/49 UPPER O'CONNELL STREET,
DUBLIN 1

for Dublin 15/8/91.

16/8/91

EHCD 25/9

PLANNING DEPT.
DEVELOPMENT CONTROL SECT
Date 22.08.91
Time 10.00

Register Reference : 91A/1113 Date : 12th July 1991

ENDORSED DATE

WATER SUPPLY Refer to C.E.E.
available. A separate connection
from the Ø 150 mm watermain fronting the
site will be necessary.
M O'Sullivan
7/8/91.

ENDORSED [signature] DATE 16/8/91

[illegible] COUNCIL
SANITARY SERVICES
20 AUG 1991
Received

Hamilton
Young
Associates
Architects

12 Terenure Road East,
Rathgar, Dublin 6.
Tel 907577 / 906637
Fax 906604
V.A.T. No. 6575105 C

Our Ref

Your Ref

Mr. J. Kearney,
Dublin County Council,
Building Control Section,
Irish Life Centre,
Lr. Abbey Street,
Dublin 1.

29th October, 1991.

91A/1113
2.40
BBL Comp/V

RE/ 75A Cookstown Ind. Estate.
Plan No. 91A/1113, BBL 2597/91.

Dear Mr. Kearney,

Further to the receipt of Bye-Law Approval for the above with reference to condition no. 6, we enclose the following drawings:-

(21) 4 showing proposed lintol arrangement over windows and doors and ceiling details in office area.

A1-4 showing section through office area.

A0-1 showing drain sizes.

(66) 2 showing ventilation to toilets.

We also enclose an Engineers certificate from Hanley Pepper & Associates who are the structural consultants involved on this job.

Should you have any queries in connection with the enclosed drawing, please contact us as soon as possible as a contractor has been appointed and work is due to start on site within the next few days.

Yours sincerely,

pp. Marguerite Stokes.

Gillian Fletcher.

For Hamilton Young & Associates.

HANLEY PEPPER

Consulting Engineers
Civil and Structural

Owenstown House, Foster's Ave.,
Blackrock, County Dublin.
Telephone 2832967/8
Fax No. 2832466

L10600/KP

Hamilton Young & Associates
Architects
12 Terenure Road East
Dublin 6

25 October 1991

ATT : Ms Gillian Fletcher

RE : Extension to - 75A Cookstown Industrial Estate
Tallaght, Co. Dublin

Dear Gillian,

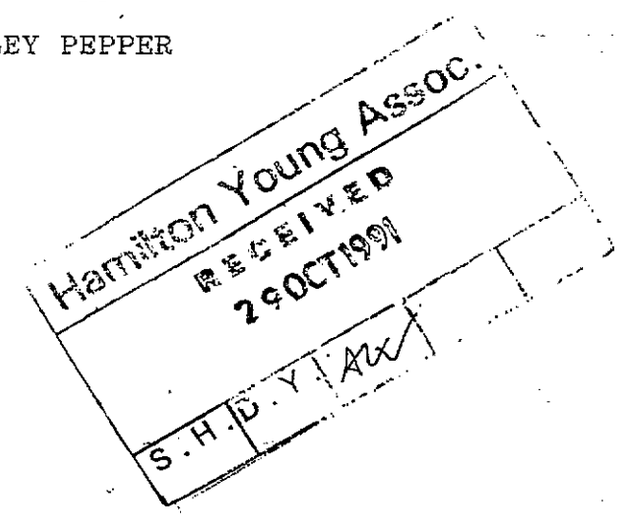
This is to certify that Structural aspects to the above extension are designed in accordance with current relevant British and Irish Codes of Practice and Standards.

Yours sincerely

K. Pepper

Kevin Pepper

HANLEY PEPPER



Kevin Pepper CEng Eur.Ing. MIStructE, MIEI, MConsEI.
Denis Hanley BSc MASc. CEng. MIEI. MICE. MConsEI.

Registered No. 119556
Registered Office: Kildress House, Pembroke Row, Dublin

DUBLIN COUNTY COUNCIL

Tel. 724755 (ext. 262/264)

PLANNING DEPARTMENT,
BLOCK 2,
IRISH LIFE CENTRE,
LR. ABBEY STREET,
DUBLIN 1.

Notification of Decision to Grant Permission/[redacted]

Local Government (Planning and Development) Acts, 1963-1983

To: Hamilton Young & Associates,
12 Terenure Road East,
Rathgar,
Dublin 6.

Decision Order Number and Date: P/4176/91 - 30.08.1991

Register Reference No.: 91A/1113

Planning Control No.:

Application Received on: 03.07.1991

Applicant: Petersons Holdings Ltd. Floor Area: 540 sq. m.

In pursuance of its functions under the above-mentioned Acts, the Dublin County Council, being the Planning Authority for the County Health District of Dublin, did by Order dated as above make a decision to grant Permission/[redacted] for:-

erection of a single storey warehouse building and car parking at 75A Cookstown Industrial Estate, Tallaght.

SUBJECT TO THE FOLLOWING CONDITIONS

CONDITIONS	REASONS FOR CONDITIONS
1. The development to be carried out in its entirety in accordance with the plans, particulars and specifications lodged with the application, save as may be required by the other conditions attached hereto.	1. To ensure that the development shall be in accordance with the permission and that effective control be maintained.
2. That before development commences, approval under the Building Bye-Laws be obtained, and all conditions of that approval be observed in the development.	2. In order to comply with the Sanitary Services Acts, 1878-1964.
3. That the requirements of the Chief Fire Officer be ascertained and strictly adhered to in the development.	3. In the interest of safety and the avoidance of fire hazard.
4. That the requirements of the Supervising Environmental Health Officer be ascertained and strictly adhered to in the development.	4. In the interest of health.
5. That the water supply and drainage arrangements, including the disposal of surface water, be in accordance with the requirements of the County Council.	5. In order to comply with the Sanitary Services Acts 1878-1964.

Contd..../

Signed on behalf of the Dublin County Council .....
For Principal Officer

Date: 30th August, 1991.

IMPORTANT: Turn overleaf for further information

CONDITIONS	REASONS FOR CONDITIONS
6. That no industrial effluent be permitted without prior approval from Planning Authority.	6. In the interest of health.
7. That the area between building and roads must not be used for truck parking or other storage or display purposes, but must be reserved for car parking and landscaping as shown on lodged plans.	7. In the interest of amenity.
8. That the existing boundary wall to be repaired and improved where necessary.	8. In the interest of the proper planning and development of the area.
9. That the existing planting to be protected during development.	9. In the interest of the proper planning and development of the area.
10. That no additional advertising sign or structure be erected, except those which are exempted development, without prior approval of the Planning Authority.	10. In the interest of the proper planning and development of the area.
11. That a financial contribution in the sum of £4359. be paid by the proposer to the Dublin County Council towards the cost of provision of public services in the area of the proposed development and which facilitate this development; this contribution to be paid before the commencement of development on the site.	11. The provision of such services in the area by the Council will facilitate the proposed development. It is considered reasonable that the developer should contribute towards the cost of providing the services.
12. That the proposed building shall be used only for warehousing and ancillary offices as shown on the lodged plans, and any future change of use to be the subject of an application for planning permission.	12. In the interest of the proper planning and development of the area.
NOTE: Compliance with one or more of the conditions of this permission may result in material alterations to the development as initially proposed and, accordingly, may require the submission of a further planning application.	

NOTE:

If there is no appeal to An Bord Pleanala against this decision PERMISSION/APPROVAL will be granted by the Council as soon as may be after the expiration of the period for the taking of such appeal. If every appeal made in accordance with the Acts has been withdrawn, the Council will grant the PERMISSION/APPROVAL after the withdrawal.

An appeal against the decision may be made to An Bord Pleanala. The applicant may appeal within one month from the date of receipt by him of this notification. ANY OTHER PERSON may appeal within twenty-one days beginning on the date of the decision.

An appeal shall be in writing and shall state the subject matter and grounds of the appeal. It should be addressed to:—

An Bord Pleanala, Blocks 6 and 7, Irish Life Centre, Lower Abbey Street, Dublin 1.

(1) An appeal lodged by an applicant or his agent with An Bord Pleanala will be invalid unless accompanied by a fee of £36 (Thirty-six Pounds). (2) A party to an appeal making a request to An Bord Pleanala for an Oral Hearing of an appeal must, *in addition* to (1) above, pay to An Bord Pleanala a fee of £36 (Thirty-six Pounds). (3) A person who is not a party to an appeal must pay a fee of £10 (Ten Pounds) to An Bord Pleanala when making submissions or observations to An Bord Pleanala in relation to an appeal.

Approval of the Council under Building Bye-Laws must be obtained and the terms of the approval must be complied with in the carrying out of the work before any development which may be permitted is commenced.

FUTURE PRINT LTD.

Hamilton
Young
Associates
Architects

Stuart F. Hamilton, Dip. Arch., Arch. Tech., M.R.I.A.I.
David T. Young, Dip.Arch., M.R.I.A.I.
David Lawlor, Dip.Arch., B.Arch.Sc., M.R.I.A.I.

12 Terenure Road East,
Rathgar, Dublin 6.
Tel: 907577/906637
Fax: 906604
V.A.T. No. 4746674D
Our Ref
Your Ref

RECEIVED
02 AUG 1991
91A/1113
Reg. Sec.

The Planning Department,
Dublin Co. Council,
Irish Life Centre,
Lr. Abbey St.,
Dublin 1.

2nd August, 1991

RE/ Proposed New Warehouse at 75a Cookstown Ind. Est.
Planning Reg. Ref. 91a/1113.

Dear Sirs,

Further to our letter dated 3rd July, 1991 submitting the Planning and Bye Law application for this project we now enclose 2 copies of the following documents indicating the structural calculations for this building as noted in our letter:-

a) Hanley Pepper Consulting Engs. Drawing No. S10600/01a.

b) Grangeford Precast Ltd.'s drawing no. G91/7/1.

c) Hanley Pepper Consulting Engs. bound set of calculations.

Could you please ensure that these documents are transferred promptly to the Bye Law Officer who is dealing with this application as on 2 previous occasions similar submissions were never received by the relevant Bye Law officers.

Yours sincerely,

Stuart Hamilton, Dip.Arch., Arch.Tech., MRIAI.
For Hamilton Young & Associates.

1.4.2 Unsolved AI for BBL
91A/1113

HANLEY PEPPER

Consulting Engineers
Civil and Structural

Owenstown House, Foster's Ave.,
Blackrock, County Dublin.
Telephone 2832967/8
Fax No. 2832466

BYE LAW CALCULATIONS

FOR

ALTERATIONS TO

UNIT 75
COOKSTOWN INDUSTRIAL ESTATE
DUBLIN

ARCHITECT : Hamilton Young & Associates
12 Terenure Road East
Rathgar
Dublin 6

JULY 1991

Kevin Pepper CEng Eur.Ing. MIStructE, MIEI, MConsEI.
Denis Hanley BSc MASc. CEng. MIEI. MICE. MConsEI.

Registered No. 119556
Registered Office: Kildress House, Pembroke Row, Dublin 2.

INTRODUCTION

This submission covers the proposed extension to Unit 75, Cookstown Industrial Estate.

The existing building is a two bay precast concrete frame designed by Sitecast Ltd. It is proposed to connect a Concast rafter to the existing external column.

Concast calculation for the three bays are included. Concast are also responsible for the stability and the roof purlins.

The design complies with BS 8110 and BS 5628 and all relevant current Codes of Practice.

HANLEY PEPPER
Consulting Engineers
Civil and [redacted]ctural

Telephone 832967/8.

Contract: #75 Cookstown Industrial Estate | Job ref.:
Part of structure: Beg - Low Calculations | Calc. Sheet No.: 1.
Drawing ref. | Calculations by: PR | Checked by | Date: July '91

Members ref.	CALCULATIONS	OUTPUT

LOADINGS

1. ROOF

Dead Load: Sheeting = 0.3 kN/m²
Rafter = 0.25 kN/m²
Purlins = 0.27 kN/m²
TOTAL = 0.82 kN/m²

Live Load: Snow = 0.75 kN/m².

2. WALLS

External Walls = 6.0 kN/m².
215 Solid = 5.0 kN/m².

3. WIND.

$V = 46$ m/s.

$S_1 = 1.0 = S_3$

S_2: Ground Roughness 2: Class A.

@ 6.0 m $S_2 = 0.8$

$\Rightarrow V_s = 46 \times 0.8 = 36.8$ m/s.

$\therefore q = 0.83$ kN/m².

HANLEY PEPPER
Consulting Engineers
Civil and [redacted]ctural

Telephone 832967/8.

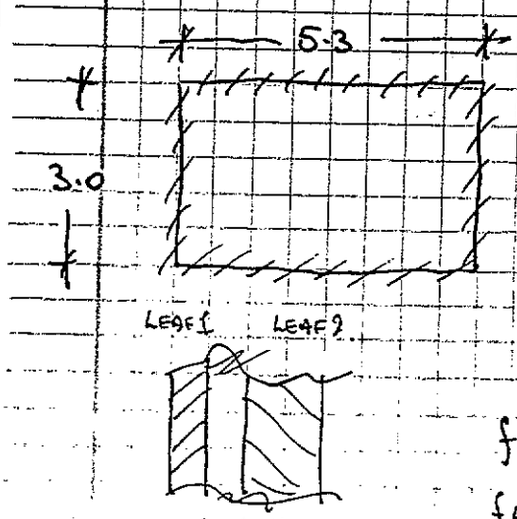
Contract: #75 Cookstown Industrial Estate
Job ref.:
Part of structure: Bye-Law Calculations
Calc. Sheet No.: 2
Drawing ref.:
Calculations by: PR
Checked by:
Date: July '91.

Members ref. | CALCULATIONS | OUTPUT

External Wall Design

Worst CASE – Gable.

Gable restrained by 2 No Gable Posts
Concrete Band beam divides the panels horizontally.



100 SOLID OUTER LEAF
215 HOLLOW INNER LEAF.

Mortar Grade (iii)

$f_{kx\parallel} = 0.15$ $\gamma_m = 3.5$
$f_{kx\perp} = 0.25$.

See Computer Design.

Design Wind Load = 1.16 kn/m²
Capacity = 1.28 kn/m² ∴ Panel O.K.

Design of laterally loaded panels to BS5628 : Part 1 : 1978 (amended 1985)
Program version 3.08 licence CESG 612 BS5628 G T S Limited

Ref.	Calculations	Leaf 1	Leaf 2

Legend: ..... free ///// simple XXXXX continuous edge

INPUT DATA

CONSTRUCTION

Figure 2	Cavity wall		
	Panel height	3000 mm	
	Panel length	5300 mm	
Figure 2	Leaf thickness	102.0 mm	215.0 mm

MATERIALS

Table 1	Mortar designation	(iii)	(iii)
Table 3	Masonry	Concrete blocks 5.00N/mm2	Concrete blocks 3.5N/mm2
	Basic fkxpar	0.25 N/mm2	0.17 N/mm2
	Basic fkxper	0.51 N/mm2	0.30 N/mm2

PARTIAL SAFETY FACTORS

Table 4	Materials	3.50	
Cl 22(b)	Wind load	1.40	
	Dead load	0.90	

CHARACTERISTIC LOADINGS

CP3 V pt2	Design wind speed	36.80 m/s	
	Pressure coeff.	1.00 Cpe	0.00 Cpi
	Wind load	0.83 kN/m2	
	Material density	1800 kg/m3	1500 kg/m3

Design of laterally loaded panels to BS5628 : Part 1 : 1978 (amended 1985)
Program version 3.08 licence CESG 612 BS5628 G T S Limited

Ref.	Calculations	Leaf 1	Leaf 2
	D E S I G N R E S U L T S		
	D E S I G N L O A D I N G S		
	Wind load	1.16 kN/m2	
	Self weight	1.62 kN/m ht	2.85 kN/m ht
	D I M E N S I O N C H E C K S		
fig. 2.	Effective thickness	215 mm	
36.3	Limits	limits b)2 O.K.	limits b)2 O.K.
	B E N D I N G M O M E N T C O E F F I C I E N T S		
36.4.2/T9	Edge conditions	E	E
	Aspect ratio	0.57	
3.16	Basic ortho ratio U	0.49	0.58
36.4.2	Mod U for dead loads/piers	0.65	0.82
36.4.2/T9	BM coeff par span	0.018	0.020
	BM coeff par edge	0.000	0.000
	BM coeff per span	0.028	0.024
	BM coeff per edge	0.000	0.000
	S E C T I O N M O D U L U S		
	Parallel span	1734 cm3	7704 cm3
	Parallel edge	1734 cm3	7704 cm3
	Perpendicular span	1734 cm3	7704 cm3
	Perpendicular edge	1734 cm3	7704 cm3
36.4.2	**M O D I F I E D P A R A L L E L F L E X U R A L S T R E N G T H S**		
	From self wt span	0.08 N/mm2	0.07 N/mm2
	From self wt edge	0.08 N/mm2	0.07 N/mm2
	fkxpar span (basic+above)	0.33 N/mm2	0.24 N/mm2
	fkxpar edge (basic+above)	0.33 N/mm2	0.24 N/mm2
36.4.3	**M O M E N T S O F R E S I S T A N C E**		
	Parallel span	0.165 kNm	0.535 kNm
	Parallel edge	0.165 kNm	0.535 kNm
	Perpendicular span	0.253 kNm	0.653 kNm
	Perpendicular edge	0.253 kNm	0.653 kNm

Design of laterally loaded panels to BS5628 : Part 1 : 1978 (amended 1985)
Program version 3.08 licence CESG 612 BS5628 G T S Limited

Ref.	Calculations	Leaf 1		Leaf 2
36.4.2	D E S I G N W I N D L O A D C A P A C I T Y			
	Parallel span	0.32 kN/m2		0.96 kN/m2
	Parallel edge Perpendicular span	0.32 kN/m2		0.96 kN/m2
	Perpendicular edge			
	Design capacity	0.32 kN/m2	plus	0.96 kN/m2
	Design wind load 1.16 kN/m2 less than capacity 1.28 kN/m2			
	PANEL OK			

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Consulting Engineers
Civil and Structural

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Contract	Job ref.
#75 Cookstown Industrial Estate	
Part of structure: Bye-Law Calculations	Calc. Sheet No. 6.
Drawing ref. / Calculations by: R / Checked by	Date: July '91

Members ref.	CALCULATIONS	OUTPUT

FOUNDATION DESIGN

1. EXISTING BASE 1·8 x 1·05 m x 0·975 dp.

Loads from Concast Calculations

Max Load = 181 kN.

$\Rightarrow BP = \frac{181 \cdot 0}{1 \cdot 8 \times 1 \cdot 05}$

$= 95 \text{ kN/m}^2$.

Assumed Allowable Bearing Pressure = 150 kN/m²

∴ O.K.

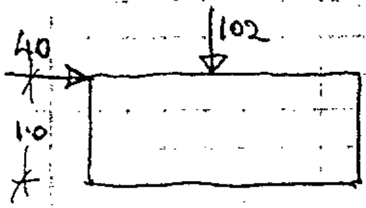
OUTPUT: Ex BASES O.K. FOR NEW LOAD

2. NEW BASES 1·2 x 1·8 x 1·0 m dp.

Loads from Concast Calculations

V = 102 kN

H = 40 kN.



$\therefore e = \frac{40 \times 1 \cdot 0}{102} = 0 \cdot 39$

$\therefore BP = \frac{102}{1 \cdot 8 \times 1 \cdot 2}\left(1 \pm \frac{6 \times 0 \cdot 39}{1 \cdot 8}\right)$

$= 108 \text{ kN/m}^2$ ∴ O.K.

OUTPUT: NEW BASES 1·8 x 1·2 x 1·0 m dp.

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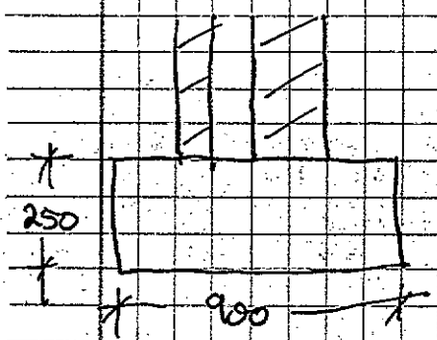
Contract: #75 Coketown Industrial Estate
Job ref.:
Part of structure: Bye-Law Calculations
Calc. Sheet No.: 7
Drawing ref.:
Calculations by: PR
Checked by:
Date: July '91.

Members ref.	CALCULATIONS	OUTPUT

3. External Wall strip footings.



Load = 8m wall + SW

= 8 × 6.0 kN/m² + 6

= 54 kN.

∴ BP = $\frac{54.0}{0.9}$ = 60 kN/m²

< 150 kN/m²

∴ O.K.

External Strips

900W × 250 Dp.

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Contract: #75 Cookstown Industrial Estate
Job ref.:
Part of structure: Beam - Laser Calculations
Calc. Sheet No.:
Drawing ref.:
Calculations by: PR.
Checked by:
Date: July '91

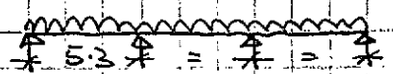
Members ref.	CALCULATIONS	OUTPUT

Inside Band Beam 215 sq.

Worst Case - Gable

Span = 5.3 m

Supports 3.0 m Wind.



$\therefore$ UDL = $0.83 \times 1.4 \times 3.0$

$= 3.5$ kN/m

$BM = \frac{3.5 \times 5.3^2}{9}$

$= 11$ kN.m

$d_{eff} = 215 - 30 - 8 = 177$ mm

$\frac{M}{bd^2} = \frac{11 \times 10^6}{215 \times 177^2}$

$= 1.63 \Rightarrow \%\ A_{s\ req} = 0.43 \equiv 163\ mm^2$

$\therefore$ Use 2Y16 T+B $A_{s\ prov} = 402\ mm^2$

$\Rightarrow f_s = 116$ N/mm²

$\therefore$ Mod factor = 1.74

$\therefore$ Max Span = $1.74 \times 5.3 \times 20$

$= 6.2\ m > 5.3\ m$

$\therefore$ O.K.

WIND BAND BEAM

215 Sq.

2Y16 E.F.

'A' FRAME DESIGN TO BS8110 ----- :1985 NUMBER A0164

DESIGN LOAD CASES

CASE	DESCRIPTION
1	1.4 DEAD + 1.6 IMPOSED
2	1.2 DEAD + 1.2 IMPOSED + 1.2 WIND, Cpi=+0.2 WIND L. to R.
3	1.2 DEAD + 1.2 IMPOSED + 1.2 WIND, Cpi=+0.2 WIND R. to L.
4	1.2 DEAD + 1.2 IMPOSED + 1.2 WIND, Cpi=-0.3 WIND L. to R.
5	1.2 DEAD + 1.2 IMPOSED + 1.2 WIND, Cpi=-0.3 WIND R. to L.
6	1.2 DEAD + 1.2 IMPOSED + 1.2 WIND ON GABLE END (X-X BENDING)
7	1.2 DEAD + 1.2 IMPOSED + 1.2 WIND ON GABLE END (Y-Y BENDING)
8	0.9 DEAD + 1.4 WIND, Cpi=+0.2, WIND L. to R
9	0.9 DEAD + 1.4 WIND, Cpi=+0.2, WIND R. to L
10	0.9 DEAD + 1.4 WIND, Cpi=-0.3, WIND L. to R
11	0.9 DEAD + 1.4 WIND, Cpi=-0.3, WIND R. to L
12	0.9 DEAD + 1.4 WIND ON GABLE END (X - X BENDING)
13	0.9 DEAD + 1.4 WIND ON GABLE END (Y - Y BENDING)

CHARACTERISTIC VALUES OF MATERIALS

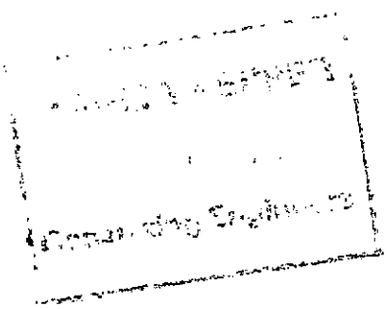
CONCRETE GRADE 50 USED TO SATISFY ALL
DURABILITY REQUIREMENTS.

CONCRETE STRENGTH fcu=40 N/mm2

STEEL STRESS fy=425 N/mm2 (NOT 460 N/mm2 AS NOW PERMITTED)

PARTIAL SAFETY FACTORS USED:

CONCRETE=1.5 TENSION STEEL=1.15 COMPRESSION STEEL=1.38



'A' FRAME DESIGN TO BS8110 ----- :1985 NUMBER A0164

Shape code = 4 [Triple Span] Max.Span = 15.240m Max.Eaves Ht.= 6.000m Level Site Bays = 4.572m

DIMENSIONS	DEAD LOAD	IMPOSED LOAD
SPAN = 15.240m	SHEETING = 0.301KN/sq.m	SL = 0.434
BAY CENTRES = 4.572m	RAFTERS = 0.252KN/sq.m	SA = 0.078
LENGTH = 36.178m	PURLINS = 0.269KN/sq.m	ALTITUDE = 90m
EAVES HEIGHT = 6.000m		SNOW LOAD = 0.752KN/sq.m
	GK = 0.822KN/sq.m	SERVICE LOAD = 0.000KN/sq.m
COMPONENTS? = Manual		
	G1 = 16.0KN G2 = 16.0KN	QK = 0.752KN/sq.m
	G3 = 16.0KN G4 = 16.0KN	

WIND LOAD

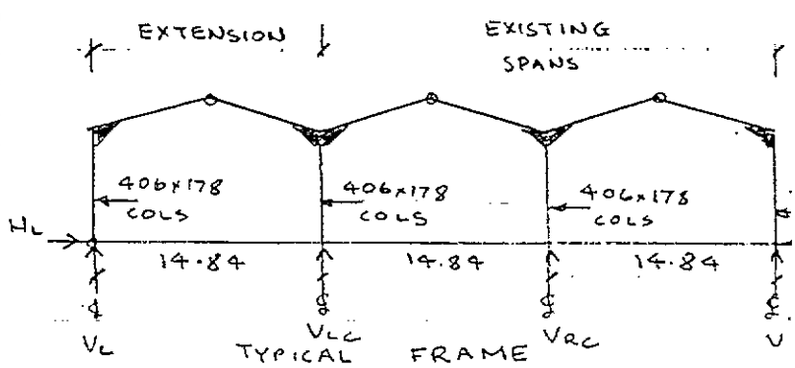
DOMINANT OPENINGS? No

WIND SPEED = 46m/s
TOPOG.(S1) = A [Normal]
ROUGHNESS(S2) = 2 [Open]
WK = 0.856KN/sq.m

COMPONENT DATA

LEFT COLUMN	CENTRE L. COLUMN	CENTRE R. COLUMN	RIGHT COLUMN
WIDTH = 406mm	WIDTH = 406mm	WIDTH = 406mm	WIDTH = 406mm
BREADTH = 178mm	BREADTH = 178mm	BREADTH = 178mm	BREADTH = 178mm
BOLT CCS. = 762mm	BOLT CCS. = 762mm	BOLT CCS. = 762mm	BOLT CCS. = 762mm
TOP BOLT = 225mm	TOP BOLT = 225mm	TOP BOLT = 225mm	TOP BOLT = 225mm

LEFT RAFTERS	CENTRE RAFTERS	RIGHT RAFTERS
BREADTH = 170mm	BREADTH = 170mm	BREADTH = 170mm
TIP DEPTH = 200mm	TIP DEPTH = 200mm	TIP DEPTH = 200mm
DP1 = 406mm	DP1 = 406mm	DP1 = 406mm
DP2 = 406mm	DP2 = 406mm	DP2 = 406mm
XD1 = 1800mm	XD1 = 1800mm	XD1 = 1800mm
XD2 = 1800mm	XD2 = 1800mm	XD2 = 1800mm
SLOPE = .208	SLOPE = .208	SLOPE = .208



MATERIAL DATA

GRADE 40 CONCRETE - CHARACTERISTIC STRENGTH (fcu) = 40N/mm**2
REBAR STEEL GRADE 425 - CHARACTERISTIC STRENGTH (fy) = 425N/mm**2

'A' FRAME DESIGN TO BS8110 ----- :1985 NUMBER A0164

DESIGN RESULTS - COLUMNS

USE C18/60 SP REIN AS BELOW FOR LEFT COL

MARK	DIA	No
A	T25	
B	T25	
C	T25	
D	T20	
E1	T20	
E2	T20	
M	NOT USED	

REIN EXCEEDS DESIGN REQ.

C18/60SP. LEFT COLUMN				EXISTING L.CENTRE COLUMN				EXISTING R.CENTRE COLUMN				EXISTING RIGHT COLUMN			
MARK	DIA.	No.	LENGTH	MARK	DIA.	No.	LENGTH	MARK	DIA.	No.	LENGTH	MARK	DIA.	No.	LENGTH
A	T25	2	7029.	A	T12	2	7029.	A	T12	2	7029.	A	T25	2	7029.
B	T25	1	3239.	B	NOT USED			B	NOT USED			B	T25	1	3239.
C	T25	1	2404.	C	NOT USED			C	NOT USED			C	T25	1	2404.
D	T12	2	6712.	D	T12	2	6712.	D	T12	2	6712.	D	T12	2	6712.
E	T16	1	3159.	E	NOT USED			E	NOT USED			E	T16	1	3159.
F	T16	1	1321.	F	NOT USED			F	NOT USED			F	T16	1	1321.
M	NOT USED			M	T32	2	3628.	M	T32	2	3628.	M	NOT USED		
MAIN STEEL WT.= 94.91kg				MAIN STEEL WT.= 70.17kg				MAIN STEEL WT.= 70.17kg				MAIN STEEL WT.= 94.91kg			
14No T8 'J' LINKS @ 59ccs 38No R5 'L' LINKS @ 150ccs				4No T6 'J' LINKS @ 150ccs 38No R5 'L' LINKS @ 150ccs				4No T6 'J' LINKS @ 150ccs 38No R5 'L' LINKS @ 150ccs				14No T8 'J' LINKS @ 59ccs 38No R5 'L' LINKS @ 150ccs			
TOTAL STEEL WT.= 109.76kg CONCRETE WT.=1091.80kg SHIPPING WT.=1201.56kg				TOTAL STEEL WT.= 79.97kg CONCRETE WT.=1100.52kg SHIPPING WT.=1180.50kg				TOTAL STEEL WT.= 79.97kg CONCRETE WT.=1100.52kg SHIPPING WT.=1180.50kg				TOTAL STEEL WT.= 109.76kg CONCRETE WT.=1091.80kg SHIPPING WT.=1201.56kg			
TRANSFER PRICE = 149.76				TRANSFER PRICE = 135.05				TRANSFER PRICE = 135.05				TRANSFER PRICE = 149.76			

DESIGN RESULTS - RAFTERS

RAFTER USE CUT DOWN HALF PITCH 60'-0" A RAFTER. REIN. TO DRG ARR/HP/60 SP. CAGE MK 1.

MARK	DIA	NO.
A	T20	2
B	T20	1
C	T20	1
D	T20	2
E	NOT USED	

REIN EXCEEDS DESIGN REQUIREMENTS.

LEFT RAFTERS				CENTRE RAFTERS				RIGHT RAFTERS			
MARK	DIA.	No.	LENGTH	MARK	DIA.	No.	LENGTH	MARK	DIA.	No.	LENGTH
A	T16	2	7344.	A	T16	2	7344.	A	T16	2	7344.
B	T20	1	4004.	B	T20	1	4004.	B	T20	1	4004.
C	T20	1	5003.	C	T20	1	4803.	C	T20	1	5003.
D	T12	2	8150.	D	T12	2	8150.	D	T12	2	8150.
E	NOT USED			E	NOT USED			E	NOT USED		
MAIN STEEL WT.= 59.84kg				MAIN STEEL WT.= 59.34kg				MAIN STEEL WT.= 59.84kg			
TOTAL STEEL WT.= 77.76kg CONCRETE WT.= 954.25kg SHIPPING WT.=1032.00kg				TOTAL STEEL WT.= 77.26kg CONCRETE WT.= 954.39kg SHIPPING WT.=1031.66kg				TOTAL STEEL WT.= 77.76kg CONCRETE WT.= 954.25kg SHIPPING WT.=1032.00kg			
TRANSFER PRICE = 121.46				TRANSFER PRICE = 121.22				TRANSFER PRICE = 121.46			
MAIN TIE BOLT = 0.000"[EN8] = 36mm[EN16T]				MAIN TIE BOLT = 0.000"[EN8] = 36mm[EN16T]				MAIN TIE BOLT = 0.000"[EN8] = 36mm[EN16T]			

NOTE. L.CENTRE COL WILL HAVE BEEN REIN. AS EXT. COL IE. C18/60 SP. BARS A & D BEING T20 ADEQUATE AS INTERNAL COL.

'A' FRAME DESIGN TO BS8110 ----- :1985 NUMBER A0164

LEFT COLUMN DATA

LEFT-HAND COLUMN MOMENTS

HT.	CASE 1	CASE 2	CASE 3	CASE 4	CASE 5	CASE 6	CASE 7	CASE 8	CASE 9	CASE 10	CASE 11	CASE 12	CASE 13
0.00	7.64	4.04	4.65	5.35	5.95	4.14	20.81	-0.41	1.11	-1.93	2.64	-0.52	20.83
0.50	27.78	8.86	20.52	10.49	22.15	17.48	18.58	-7.32	7.11	-8.46	9.01	2.53	18.23
1.00	47.91	14.26	35.80	16.81	38.35	30.24	16.45	-13.53	12.41	-13.61	15.39	4.89	15.75
1.50	68.05	20.25	50.49	24.31	54.55	42.41	14.43	-19.06	17.03	-17.38	21.77	6.57	13.39
2.01	88.19	26.83	64.59	32.99	70.75	53.98	12.52	-23.91	20.96	-19.77	28.14	7.55	11.16
2.51	108.33	34.01	78.10	42.85	86.94	64.97	10.72	-28.06	24.20	-20.79	34.52	7.85	9.06
3.01	128.47	41.77	91.02	53.89	103.14	75.37	9.02	-31.52	26.75	-20.43	40.89	7.46	7.08
3.51	148.61	50.12	103.35	66.11	119.34	85.17	7.43	-34.30	28.62	-18.69	47.27	6.37	5.22
4.01	168.75	59.07	115.09	79.52	135.54	94.39	5.95	-36.39	29.79	-15.58	53.65	4.61	3.49
4.51	188.88	68.60	126.24	94.10	151.74	103.02	4.58	-37.79	30.28	-11.09	60.02	2.15	1.89
5.01	209.02	78.73	136.80	109.86	167.94	111.05	3.31	-38.50	30.08	-5.22	66.40	-1.00	0.41

REACTIONS

VERTICAL	102.619	54.320	62.444	71.862	79.986	55.562	55.562	5.494	14.971	25.960	35.437	6.943	6.943
HORIZON.	40.173	9.012	32.249	9.076	32.313	27.214	27.214	-14.465	12.644	-14.390	12.719	6.771	6.771

COLUMN DESIGN STEEL AREAS

HT. ABOVE FTL	T D'	T BARS SELECTED	T ACTUAL AREA	C D'	C BARS SELECTED	C ACTUAL AREA	MA+	MRC+	MA-	MRC-	MAyy	MRCyy	MOMENT RATIO
0.00	38.	2-T25	982.	31.	2-T12	226.	7.64	145.71	-1.93	-38.92	20.83	28.08	0.75
0.50	38.	2-T25	982.	31.	2-T12	226.	27.78	145.71	-8.46	-38.92	18.58	32.92	0.68
1.00	38.	2-T25	982.	31.	2-T12	226.	47.91	145.71	-13.61	-38.92	16.45	32.92	0.71
1.50	38.	2-T25	982.	31.	2-T12	226.	68.05	145.71	-19.06	-31.96	14.43	32.92	0.73
2.01	38.	2-T25	982.	31.	2-T12	226.	88.19	145.71	-23.91	-31.96	12.52	32.92	0.75
2.51	38.	2-T25	982.	31.	2-T12	226.	108.33	145.71	-28.06	-31.96	10.72	32.92	0.77
3.01	38.	2-T25	982.	31.	2-T12	226.	128.47	145.71	-31.52	-31.96	9.02	32.92	0.79
3.51	60.	2-T25,1-T25	1473.	53.	2-T12,1-T16	427.	148.61	177.55	-34.30	-52.80	7.43	45.40	0.64
4.01	60.	2-T25,1-T25	1473.	53.	2-T12,1-T16	427.	168.75	177.55	-36.39	-52.80	5.95	45.40	0.66
4.51	60.	2-T25,2-T25	1964.	53.	2-T12,1-T16	427.	188.88	204.07	-37.79	-52.57	4.58	54.15	0.59
5.01	60.	2-T25,2-T25	1964.	53.	2-T12,2-T16	628.	209.02	217.76	-38.50	-74.44	3.31	57.72	0.57

CUT-OFFS: 3.04m ,3.88m 2.82m ,4.65m
[ABOVE BASE TOP]

NO Y-Y BENDING STEEL REQUIRED

MAIN BOLT = 1.750" [EN8]/36mm [EN15T]

T8 SHEAR LINK SPACING = 59mm

'A' FRAME DESIGN TO BS8110 ----- :1985 NUMBER A0164

LEFT CENTRE COLUMN DATA

LEFT CENTRE COLUMN MOMENTS

HT.	CASE 1	CASE 2	CASE 3	CASE 4	CASE 5	CASE 6	CASE 7	CASE 8	CASE 9	CASE 10	CASE 11	CASE 12	CASE 13
0.00	-13.52	7.34	-8.28	-9.92	-10.86	-6.80	40.45	0.60	-1.69	3.61	-4.71	0.03	40.81
0.50	-13.72	7.38	-10.73	-9.94	-13.37	-6.89	35.98	0.78	-4.43	3.72	-7.51	0.05	35.60
1.00	-13.92	7.43	-13.18	-9.96	-15.89	-6.99	31.72	0.96	-7.16	3.83	-10.32	0.06	30.64
1.50	-14.13	7.48	-15.63	-9.97	-18.40	-7.08	27.69	1.14	-9.89	3.93	-13.12	0.08	25.93
2.01	-14.33	7.52	-18.08	-9.99	-20.91	-7.18	23.86	1.32	-12.63	4.04	-15.93	0.10	21.47
2.51	-14.53	7.57	-20.53	-10.00	-23.43	-7.27	20.25	1.50	-15.36	4.15	-18.74	0.11	17.26
3.01	-14.73	7.61	-22.98	-10.02	-25.94	-7.37	16.86	1.68	-18.09	4.25	-21.54	0.13	13.30
3.51	-14.94	7.66	-25.43	-10.04	-28.45	-7.46	13.68	1.86	-20.83	4.36	-24.35	0.14	9.59
4.01	-15.14	7.71	-27.89	-10.05	-30.97	-7.55	10.72	2.04	-23.56	4.47	-27.16	0.16	6.14
4.51	-15.34	7.75	-30.34	-10.07	-33.48	-7.65	7.97	2.22	-26.29	4.58	-29.96	0.18	2.93
5.01	-15.55	7.80	-32.79	-10.09	-35.99	-7.74	5.44	2.40	-29.03	4.68	-32.77	0.19	-0.02

REACTIONS

VERTICAL	181.619	98.612	111.206	133.322	145.916	91.357	91.357	8.046	22.739	48.541	63.233	-0.418	-0.418
HORIZON.	-0.405	0.092	-4.890	-0.033	-5.014	-0.188	-0.188	0.359	-5.453	0.213	-5.598	0.032	0.032

COLUMN DESIGN STEEL AREAS

HT. ABOVE FTL	T D'	T BARS SELECTED	T ACTUAL AREA	C D'	C BARS SELECTED	C ACTUAL AREA	MA+	MRC+	MA-	MRC-	MAyy	MRCyy	MOMENT RATIO
0.00	31.	2-T12	226.	31.	2-T12	226.	13.52	91.56	-7.34	-63.98	40.81	42.79	0.95
0.50	31.	2-T12	226.	31.	2-T12	226.	13.72	91.56	-7.38	-63.98	35.98	51.70	0.77
1.00	31.	2-T12	226.	31.	2-T12	226.	15.89	79.86	-7.43	-63.98	31.72	51.70	0.70
1.50	31.	2-T12	226.	31.	2-T12	226.	18.40	79.86	-7.48	-63.98	27.69	51.70	0.62
2.01	31.	2-T12	226.	31.	2-T12	226.	20.91	79.86	-7.52	-63.98	23.86	51.70	0.55
2.51	31.	2-T12	226.	31.	2-T12	226.	23.43	79.86	-7.57	-63.98	20.25	22.46	0.99
3.01	31.	2-T12	226.	31.	2-T12	226.	25.94	79.86	-7.61	-63.98	16.86	22.46	0.84
3.51	31.	2-T12	226.	31.	2-T12	226.	28.45	79.86	-7.66	-63.98	13.68	22.46	0.70
4.01	31.	2-T12	226.	31.	2-T12	226.	30.97	79.86	-7.71	-63.98	10.72	22.46	0.57
4.51	31.	2-T12	226.	31.	2-T12	226.	33.48	79.86	-7.75	-63.98	7.97	22.46	0.45
5.01	31.	2-T12	226.	31.	2-T12	226.	35.99	79.86	-7.80	-63.98	5.44	22.46	0.34

CUT-OFFS: NONE NONE
[ABOVE BASE TOP]

2NO. T32 BARS UP 2.89m FROM FTL FOR Y-Y BENDING

MAIN BOLT = 0.875" [EN8]/16mm [EN16T]

*** NO SHEAR LINKS REQUIRED ***

'A' FRAME DESIGN TO BS8110 ----- :1985 NUMBER A0164

LEFT SPAN RAFTER DATA

LEFT SPAN LEFT RAFTER MOMENTS

DIST.	CASE 1	CASE 2	CASE 3	CASE 4	CASE 5	CASE 6	CASE 7	CASE 8	CASE 9	CASE 10	CASE 11	CASE 12	CASE 13
0.00	232.00	91.20	147.08	130.73	186.61	118.00	118.00	-37.85	27.34	8.27	73.45	-6.58	-6.58
1.80	113.19	41.53	80.53	57.42	96.43	61.77	61.77	-21.93	23.57	-3.38	42.12	1.69	1.69
1.80	113.19	41.53	80.53	57.42	96.43	61.77	61.77	-21.93	23.57	-3.38	42.12	1.69	1.69
2.00	103.62	37.59	75.00	51.65	89.06	57.16	57.16	-20.58	23.06	-4.17	39.47	2.26	2.26
2.60	77.39	26.87	59.58	35.99	68.71	44.40	44.40	-16.78	21.39	-6.13	32.04	3.68	3.68
3.20	54.84	17.78	45.93	22.81	50.96	33.24	33.24	-13.36	19.49	-7.48	25.36	4.68	4.68
3.80	35.96	10.33	34.05	12.11	35.84	23.68	23.68	-10.31	17.37	-8.23	19.45	5.27	5.27
4.40	20.77	4.52	23.95	3.89	23.33	15.73	15.73	-7.65	15.03	-8.37	14.30	5.44	5.44
5.00	9.26	0.34	15.62	-1.84	13.43	9.38	9.38	-5.36	12.46	-7.91	9.91	5.19	5.19
5.60	1.42	-2.20	9.06	-5.10	6.15	4.63	4.63	-3.45	9.68	-6.84	6.29	4.52	4.52
6.20	-2.73	-3.10	4.26	-5.88	1.49	1.48	1.48	-1.92	6.67	-5.17	3.43	3.43	3.43
6.79	-3.21	-2.37	1.25	-4.18	-0.57	-0.06	-0.06	-0.77	3.45	-2.89	1.33	1.92	1.92
7.39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

LEFT SPAN RIGHT RAFTER MOMENTS

DIST.	CASE 1	CASE 2	CASE 3	CASE 4	CASE 5	CASE 6	CASE 7	CASE 8	CASE 9	CASE 10	CASE 11	CASE 12	CASE 13
0.00	225.97	114.44	123.72	152.12	161.40	115.20	115.20	-7.00	3.83	36.96	47.79	-6.11	-6.11
1.80	108.75	59.15	57.54	73.69	72.08	59.71	59.71	1.39	-0.49	18.35	16.47	2.04	2.04
1.80	108.75	59.15	57.54	73.69	72.08	59.71	59.71	1.39	-0.49	18.35	16.47	2.04	2.04
2.00	99.35	54.64	52.27	67.39	65.02	55.18	55.18	1.97	-0.79	16.84	14.08	2.60	2.60
2.60	73.59	42.15	37.89	50.11	45.85	42.63	42.63	3.42	-1.55	12.71	7.73	3.98	3.98
3.20	51.51	31.28	25.66	35.29	29.67	31.69	31.69	4.46	-2.10	9.14	2.58	4.95	4.95
3.80	33.11	22.00	15.56	22.91	16.47	22.36	22.36	5.07	-2.43	6.13	-1.37	5.49	5.49
4.40	18.40	14.33	7.61	12.97	6.26	14.63	14.63	5.27	-2.56	3.70	-4.14	5.62	5.62
5.00	7.36	8.25	1.80	5.49	-0.96	8.49	8.49	5.06	-2.47	1.92	-5.70	5.34	5.34
5.60	0.00	3.79	-1.86	0.44	-5.20	3.97	3.97	4.42	-2.17	0.52	-6.07	4.63	4.63
6.20	-3.68	0.92	-3.38	-2.15	-6.46	1.04	1.04	3.36	-1.66	-0.22	-5.24	3.50	3.50
6.79	-3.68	-0.34	-2.76	-2.30	-4.72	-0.28	-0.28	1.89	-0.94	-0.39	-3.22	1.96	1.96
7.39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

'A' FRAME DESIGN TO BS8110 ----- :1985 NUMBER A0164

LEFT SPAN RAFTER DATA

RAFTER DESIGN STEEL AREAS

DIST. FROM SOP	H	T D'	T BARS SELECTED	T ACTUAL AREA	C D'	C BARS SELECTED	C ACTUAL AREA	MA+	MRC+	MA-	MRC-
1.80	406.	56.	2-T16,2-T20	1030.	31.	2-T12	226.	113.19	116.38	-21.93	-29.25
1.80	406.	56.	2-T16,2-T20	1030.	31.	2-T12	226.	113.19	116.38	-21.93	-29.25
2.00	391.	56.	2-T16,2-T20	1030.	31.	2-T12	226.	103.62	110.78	-20.58	-28.02
2.60	369.	56.	2-T16,2-T20	1030.	31.	2-T12	226.	77.39	102.34	-16.78	-26.18
3.20	347.	56.	2-T16,1-T20	716.	31.	2-T12	226.	54.84	69.18	-13.36	-24.33
3.80	325.	33.	2-T16	402.	31.	2-T12	226.	35.96	40.28	-10.31	-23.39
4.40	303.	33.	2-T16	402.	31.	2-T12	226.	23.95	36.99	-8.37	-21.54
5.00	281.	33.	2-T16	402.	31.	2-T12	226.	15.62	33.71	-7.91	-19.70
5.60	259.	33.	2-T16	402.	31.	2-T12	226.	9.68	30.43	-6.84	-17.85
6.20	237.	33.	2-T16	402.	31.	2-T12	226.	6.67	27.15	-6.46	-16.00
6.79	215.	33.	2-T16	402.	31.	2-T12	226.	3.45	23.86	-4.72	-14.16
7.39	193.	33.	2-T16	402.	31.	2-T12	226.	0.00	20.58	0.00	-12.31

CUT-OFFS: [FROM SOP] 3.04m ,4.04m NONE

'A' FRAME DESIGN TO BS8110 ----- :1985 NUMBER A0164

CENTRE SPAN RAFTER DATA

CENTRE SPAN LEFT RAFTER MOMENTS

DIST.	CASE 1	CASE 2	CASE 3	CASE 4	CASE 5	CASE 6	CASE 7	CASE 8	CASE 9	CASE 10	CASE 11	CASE 12	CASE 13
0.00	228.31	113.91	151.96	152.31	190.35	116.29	116.29	-9.07	35.32	35.73	80.12	-6.29	-6.29
1.80	110.47	53.49	78.85	68.55	93.91	60.51	60.51	-6.29	23.30	11.28	40.87	1.91	1.91
1.80	110.47	53.49	78.85	68.55	93.91	60.51	60.51	-6.29	23.30	11.28	40.87	1.91	1.91
2.00	101.01	48.67	72.87	61.93	86.13	55.95	55.95	-6.03	22.21	9.44	37.68	2.47	2.47
2.60	75.07	35.50	56.34	43.91	64.75	43.32	43.32	-5.26	19.05	4.55	28.86	3.86	3.86
3.20	52.80	24.27	41.91	28.68	46.32	32.30	32.30	-4.52	16.06	0.63	21.21	4.84	4.84
3.80	34.22	14.98	29.60	16.23	30.85	22.87	22.87	-3.80	13.25	-2.34	14.71	5.41	5.41
4.40	19.32	7.63	19.39	6.57	18.32	15.05	15.05	-3.10	10.61	-4.35	9.36	5.55	5.55
5.00	8.09	2.23	11.30	-0.32	8.75	8.84	8.84	-2.43	8.14	-5.40	5.18	5.28	5.28
5.60	0.55	-1.24	5.31	-4.41	2.14	4.23	4.22	-1.79	5.85	-5.49	2.15	4.58	4.58
6.20	-3.31	-2.77	1.43	-5.73	-1.53	1.21	1.21	-1.17	3.73	-4.62	0.28	3.47	3.47
6.79	-3.50	-2.35	-0.34	-4.26	-2.24	-0.20	-0.20	-0.57	1.78	-2.79	-0.44	1.95	1.95
7.39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

CENTRE SPAN RIGHT RAFTER MOMENTS

DIST.	CASE 1	CASE 2	CASE 3	CASE 4	CASE 5	CASE 6	CASE 7	CASE 8	CASE 9	CASE 10	CASE 11	CASE 12	CASE 13
0.00	228.31	151.96	113.91	190.36	152.31	116.29	116.29	35.32	-9.07	80.12	35.73	-6.29	-6.29
1.80	110.48	78.85	53.49	93.91	68.55	60.51	60.51	23.30	-6.29	40.87	11.28	1.91	1.91
1.80	110.48	78.85	53.49	93.91	68.55	60.51	60.51	23.30	-6.29	40.87	11.28	1.91	1.91
2.00	101.01	72.87	48.67	86.13	61.93	55.95	55.95	22.21	-6.03	37.68	9.44	2.47	2.47
2.60	75.07	56.34	35.50	64.75	43.91	43.32	43.32	19.05	-5.26	28.87	4.55	3.86	3.86
3.20	52.81	41.91	24.27	46.32	28.68	32.30	32.30	16.07	-4.52	21.21	0.62	4.84	4.84
3.80	34.22	29.60	14.98	30.85	16.23	22.87	22.87	13.25	-3.80	14.71	-2.34	5.41	5.41
4.40	19.32	19.40	7.64	18.33	6.57	15.06	15.06	10.61	-3.11	9.37	-4.35	5.55	5.55
5.00	8.10	11.30	2.23	8.76	-0.31	8.84	8.84	8.15	-2.44	5.18	-5.40	5.28	5.28
5.60	0.56	5.31	-1.24	2.14	-4.41	4.23	4.23	5.85	-1.79	2.15	-5.49	4.59	4.59
6.20	-3.31	1.43	-2.77	-1.52	-5.72	1.21	1.21	3.73	-1.17	0.28	-4.62	3.47	3.47
6.79	-3.49	-0.34	-2.35	-2.24	-4.25	-0.19	-0.19	1.78	-0.57	-0.44	-2.79	1.95	1.95
7.39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

'A' FRAME DESIGN TO BS8110 ----- :1985 NUMBER A0164

CENTRE SPAN RAFTER DATA

RAFTER DESIGN STEEL AREAS

DIST. FROM SOP	H	T D'	T BARS SELECTED	T ACTUAL AREA	C D'	C BARS SELECTED	C ACTUAL AREA	MA+	MRC+	MA-	MRC-
1.80	406.	56.	2-T16,2-T20	1030.	31.	2-T12	226.	110.48	116.38	-6.29	-29.25
1.80	406.	56.	2-T16,2-T20	1030.	31.	2-T12	226.	110.48	116.38	-6.29	-29.25
2.00	391.	56.	2-T16,2-T20	1030.	31.	2-T12	226.	101.01	110.78	-6.03	-28.02
2.60	369.	56.	2-T16,2-T20	1030.	31.	2-T12	226.	75.07	102.34	-5.26	-26.18
3.20	347.	56.	2-T16,1-T20	716.	31.	2-T12	226.	52.81	69.18	-4.52	-24.33
3.80	325.	33.	2-T16	402.	31.	2-T12	226.	34.22	40.28	-3.80	-23.39
4.40	303.	33.	2-T16	402.	31.	2-T12	226.	19.40	36.99	-4.35	-21.54
5.00	281.	33.	2-T16	402.	31.	2-T12	226.	11.30	33.71	-5.40	-19.70
5.60	259.	33.	2-T16	402.	31.	2-T12	226.	5.85	30.43	-5.49	-17.85
6.20	237.	33.	2-T16	402.	31.	2-T12	226.	3.73	27.15	-5.73	-16.00
6.79	215.	33.	2-T16	402.	31.	2-T12	226.	1.95	23.86	-4.26	-14.16
7.39	193.	33.	2-T16	402.	31.	2-T12	226.	0.00	20.58	0.00	-12.31

CUT-OFFS: [FROM SOP] 3.04m ,3.84m NONE

'A' FRAME DESIGN TO BS8110 ----- :1985 NUMBER A0164

RIGHT SPAN RAFTER DATA

RIGHT SPAN LEFT RAFTER MOMENTS

DIST.	CASE 1	CASE 2	CASE 3	CASE 4	CASE 5	CASE 6	CASE 7	CASE 8	CASE 9	CASE 10	CASE 11	CASE 12	CASE 13
0.00	225.98	123.73	114.44	161.40	152.12	115.20	115.20	3.83	-7.00	47.79	36.96	-6.11	-6.11
1.80	108.76	57.54	59.15	72.08	73.69	59.71	59.71	-0.49	1.39	16.47	18.35	2.04	2.04
1.80	108.76	57.54	59.15	72.08	73.69	59.71	59.71	-0.49	1.39	16.47	18.35	2.04	2.04
2.00	99.35	52.27	54.64	65.02	67.39	55.18	55.18	-0.79	1.97	14.09	16.84	2.60	2.60
2.60	73.59	37.90	42.15	45.85	50.11	42.64	42.64	-1.55	3.42	7.74	12.71	3.98	3.98
3.20	51.52	25.66	31.28	29.67	35.29	31.70	31.70	-2.10	4.46	2.58	9.14	4.95	4.95
3.80	33.12	15.57	22.00	16.47	22.91	22.36	22.36	-2.43	5.07	-1.37	6.13	5.49	5.49
4.40	18.40	7.61	14.33	6.26	12.97	14.63	14.63	-2.56	5.27	-4.13	3.70	5.62	5.62
5.00	7.36	1.81	8.26	-0.96	5.49	8.50	8.50	-2.47	5.06	-5.70	1.82	5.34	5.34
5.60	0.00	-1.86	3.79	-5.20	0.44	3.97	3.97	-2.17	4.42	-6.07	0.52	4.63	4.63
6.20	-3.68	-3.38	0.92	-6.45	-2.15	1.04	1.04	-1.66	3.36	-5.24	-0.22	3.50	3.50
6.79	-3.68	-2.76	-0.34	-4.72	-2.30	-0.28	-0.28	-0.93	1.89	-3.22	-0.39	1.96	1.96
7.39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

RIGHT SPAN RIGHT RAFTER MOMENTS

DIST.	CASE I	CASE 2	CASE 3	CASE 4	CASE 5	CASE 6	CASE 7	CASE 8	CASE 9	CASE 10	CASE 11	CASE 12	CASE 13
0.00	232.00	147.08	91.20	186.60	130.73	118.00	118.00	27.34	-37.85	73.45	8.27	-6.58	-6.58
1.80	113.18	80.53	41.53	96.43	57.42	61.77	61.77	23.57	-21.93	42.12	-3.38	1.69	1.69
1.80	113.18	80.53	41.53	96.43	57.42	61.77	61.77	23.57	-21.93	42.12	-3.38	1.69	1.69
2.00	103.62	75.00	37.59	89.06	51.65	57.16	57.16	23.06	-20.58	39.47	-4.17	2.26	2.26
2.60	77.39	59.58	26.86	68.71	35.99	44.40	44.40	21.39	-16.78	32.04	-6.13	3.68	3.68
3.20	54.84	45.93	17.78	50.96	22.81	33.24	33.24	19.49	-13.36	25.36	-7.48	4.68	4.68
3.80	35.96	34.05	10.33	35.84	12.11	23.68	23.68	17.37	-10.31	19.45	-8.23	5.27	5.27
4.40	20.77	23.95	4.52	23.33	3.89	15.73	15.73	15.03	-7.65	14.30	-8.37	5.44	5.44
5.00	9.26	15.62	0.34	13.43	-1.85	9.38	9.38	12.46	-5.36	9.91	-7.91	5.19	5.19
5.60	1.42	9.06	-2.20	6.15	-5.10	4.63	4.63	9.68	-3.45	6.29	-6.84	4.52	4.52
6.20	-2.73	4.27	-3.10	1.49	-5.88	1.48	1.48	6.67	-1.92	3.43	-5.17	3.43	3.43
6.79	-3.21	1.25	-2.37	-0.57	-4.18	-0.06	-0.06	3.45	-0.77	1.33	-2.89	1.92	1.92
7.39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

'A' FRAME DESIGN TO BS8110 ----- :1985 NUMBER A0164

RIGHT SPAN RAFTER DATA

RAFTER DESIGN STEEL AREAS

DIST. FROM SOP	H	T D'	T BARS SELECTED	T ACTUAL AREA	C D'	C BARS SELECTED	C ACTUAL AREA	MA+	MRC+	MA-	MRC-
1.80	406.	56.	2-T16,2-T20	1030.	31.	2-T12	226.	113.18	116.38	-21.93	-29.25
1.80	406.	56.	2-T16,2-T20	1030.	31.	2-T12	226.	113.18	116.38	-21.93	-29.25
2.00	391.	56.	2-T16,2-T20	1030.	31.	2-T12	226.	103.62	110.78	-20.58	-28.02
2.60	369.	56.	2-T16,2-T20	1030.	31.	2-T12	226.	77.39	102.34	-16.78	-26.18
3.20	347.	56.	2-T16,1-T20	716.	31.	2-T12	226.	54.84	69.18	-13.36	-24.33
3.80	325.	33.	2-T16	402.	31.	2-T12	226.	35.96	40.28	-10.31	-23.39
4.40	303.	33.	2-T16	402.	31.	2-T12	226.	23.95	36.99	-8.37	-21.54
5.00	281.	33.	2-T16	402.	31.	2-T12	226.	15.62	33.71	-7.91	-19.70
5.60	259.	33.	2-T16	402.	31.	2-T12	226.	9.68	30.43	-6.84	-17.85
6.20	237.	33.	2-T16	402.	31.	2-T12	226.	6.67	27.15	-6.45	-16.00
6.79	215.	33.	2-T16	402.	31.	2-T12	226.	3.45	23.86	-4.72	-14.16
7.39	193.	33.	2-T16	402.	31.	2-T12	226.	0.00	20.58	0.00	-12.31

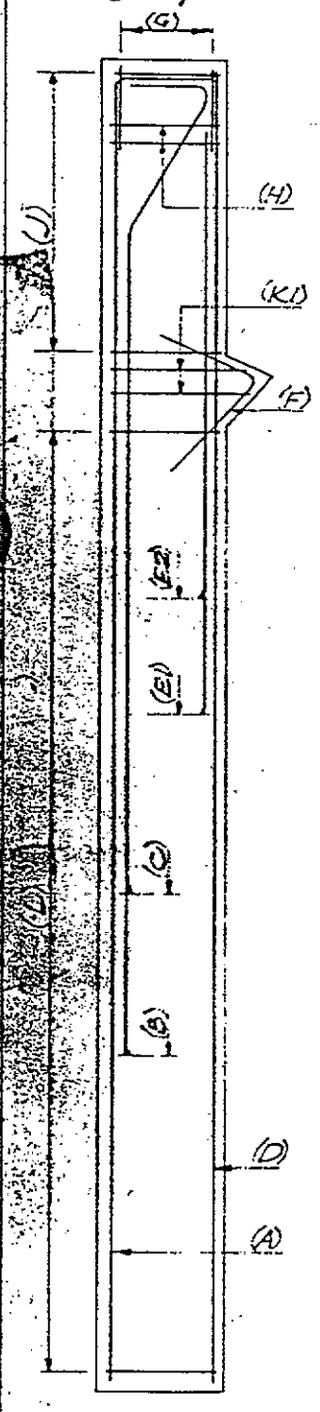
CUT-OFFS: [FROM SOP] 3.04m ,4.04m NONE

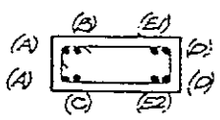
1/1

'A' FRAME

CONCAST H.P. A FRAME
75A COOKSTOWN IND. ESTATE
COLUMN REF C18/60 SP.

Column size
16" x 7"





COVER:-
Nearest to main reinforcement.

MARK	DIA.	LENGTH	Nº	BENDING	WT
A	25mm sq	21'-3"	2	12½"	110.0
B	25mm sq	13'-0"	1	BR 4"ø pin; 10% ; 10½"% ; 1'-6½"	33.6
C	25mm sq	9'-6"	1		24.6
D	20mm sq	20'-4"	2	STRAIGHT	67.3
E1	20mm sq	7'-6"	1	STRAIGHT	12.3
E2	20mm sq	7'-6"	1	STRAIGHT.	12.3
F	6mm SQ	2'-6"	2	1'-1" ; 7½"%	0.7
G	6mm SQ	2'-4"	6	1'-1" ; 3"% ; BR. 2½"ø pin	2.1
H	8mm SQ	3'-4"	2	14" ; 5" ; i/dims BR. 1"ø pin	1.8
J	8mm SQ	3'-8"	17	14" ; 5" ; i/dims BR 1"ø pin	16.5
K1	5g SQ	4'-1"	2	17" ; 5" ; i/dims BR 1"ø pin.	1.3
K2				NOT USED	
L	5g SQ	3'-7"	29	14" ; 5" ; i/dims BR 1"ø pin	15.5

WT OF STEEL = 298 lbs
WT OF CONCRETE = 2295 lbs

RATIO = 7.7 :/
SHIPPING WT = 23.1 cwts.

CONTRACT.

SITE.

JOB No.

FRAME DESCRIPTION
"M" PORTAL FRAME

SPANS
EAVES HT.
BAY SIZE.

ENGINEERS DEPT.
THE PANTILES
TUNBRIDGE WELLS
KENT.
TEL: T.W. 26288

THE FRAME IS DESIGNED AS BEING PINNED AT THE RIDGES AND AT THE FEET. THE FRAME IS DESIGNED IN ACCORDANCE WITH CP 110 : PART 1 : 1972.

THE COLUMNS ARE DESIGNED FOR THE MAXIMUM MOMENT OCCURING ON THE X-X AXIS FROM CASES 1 TO 7 INCLUSIVE.

FOR EAVES HEIGHTS UP TO 7·5 M. THE COLUMNS ARE CONSIDERED TO ACT AS VERTICAL CANTILEVERS ON THE Y-Y AXIS AND ARE CHECKED FOR THE MOMENT INDUCED BY THE WIND BLOWING ON THE GABLE (CASES 4 & 7)

FOR EAVES HEIGHTS OVER 7·5 M. BRACING IS PROVIDED BETWEEN COLUMNS TO TAKE THE WIND FORCES ACTING ON THE GABLE. THE COLUMNS ARE THEN CHECKED FOR BIAXIAL BENDING AT MID HEIGHT BY OBTAINING THE FAILURE MOMENTS OF THE COLUMN AND CHECKING THAT THE VALUE OF THE EXPRESSION:

$$\frac{Mx}{Mux} + \frac{My}{Muy} \quad \text{is} \not> 1.00$$

WHERE Mx AND My ARE THE MOMENTS AT MID HEIGHT ON THE X-X AXIS AND Y-Y AXIS RESPECTIVELY AND Mux AND Muy ARE THE COLUMN FAILURE MOMENTS ON THE X-X AXIS AND Y-Y AXIS RESPECTIVELY.

THE RAFTERS ARE DESIGNED FOR THE HIGHEST MOMENT RESULTING FROM CASES 1 TO 7 INCLUSIVE.

THE FOUNDATIONS ARE DESIGNED FOR CASE 1 AND FOR EAVES HEIGHTS UP TO 7·5 M. CHECKED FOR CASES 4 AND 7.

THE DESIGN HAS BEEN PERFORMED BY USING AN ELECTRONIC COMPUTER.

THE PROGRAMME BEING WRITTEN IN FORTRAN IV BASED ON THE FORMULAE SHOWN ON THE ATTATCHED SHEETS. THE COMPUTER OUTPUTS ARE SHOWN ON SHEET Nos. 13 - 16 A NEGATIVE SIGN INDICATES TENSION ON OUTSIDE OF FRAME.

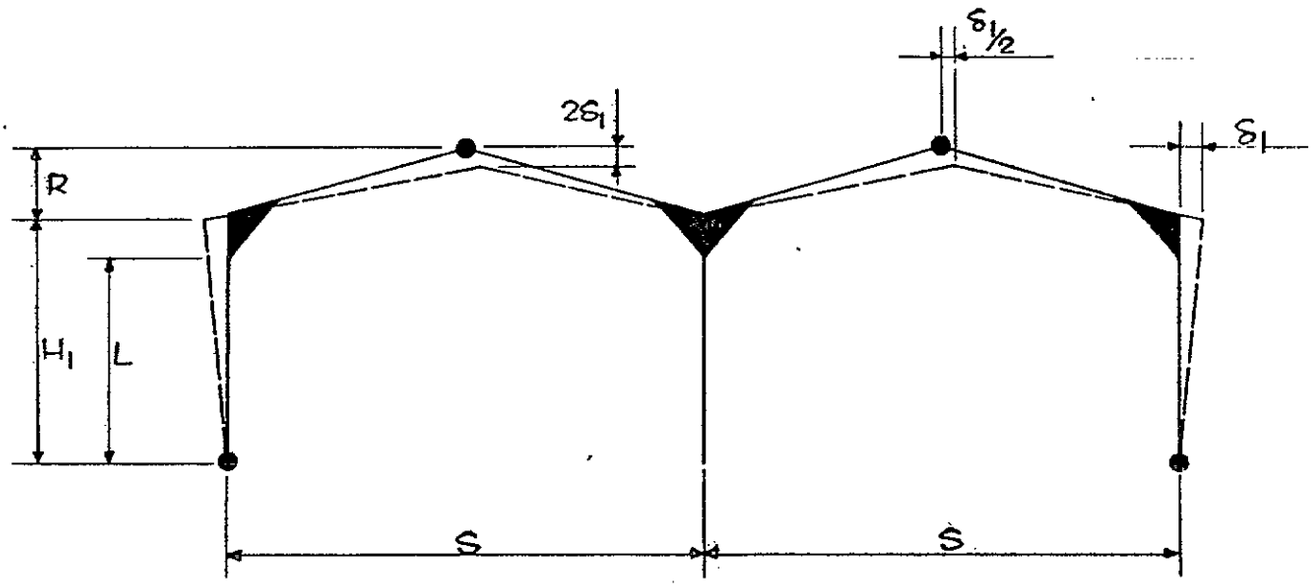
SPAN VARIES FROM 9 M. TO 21 M. IN 1.5 M. INCREMENTS.

EAVES HEIGHT VARIES FROM 3 M. TO 9 M. IN 300 mm. INCREMENTS.

COLOMN AND RAFTER RANGE.										
EAVES HT. RANGE (M)	SPAN (M)	9.0	10.5	12.0	13.5	15.0	16.5	18.0	19.5	21.0
0 - 4.5	COLN SIZE (MM)	300	300	350	400	450	450	450	500	500
	RAFTER TYPE	A	A	B	B	C	D	D	E	E
4.8 - 6.0	COLN SIZE (MM)	300	350	400	450	450	450	500	500	550
	RAFTER TYPE	A	B	B	C	C	D	E	E	F
6.3 - 7.5	COLN SIZE (MM)	300	350	400	450	450	500	500	550	550
	RAFTER TYPE	A	B	B	C	D	D	E	F	F
7.8 - 9.0	COLN SIZE (MM)	350	400	400	450	450	500	500	550	600
	RAFTER TYPE	A	B	B	C	D	D	E	F	F

RAFTER DIMENSIONS.					
RAFTER TYPE	X_1 (MM)	X_2 (MM)	D_1 (MM)	D_2 (MM)	BOLT CRS. (MM)
A	635	915	405	350	700
B	660	855	450	410	700
C	800	1035	470	435	850
D	1000	1335	510	460	1000
E	1130	1490	575	500	1200
F	1140	1400	640	600	1200.

ULTIMATE LOAD OF MAIN BOLTS.	
BOLT DIA. (MM)	ULTIMATE LOAD (KN)
24	172
30	275
36	402.



S = OVERALL SPAN - D M.

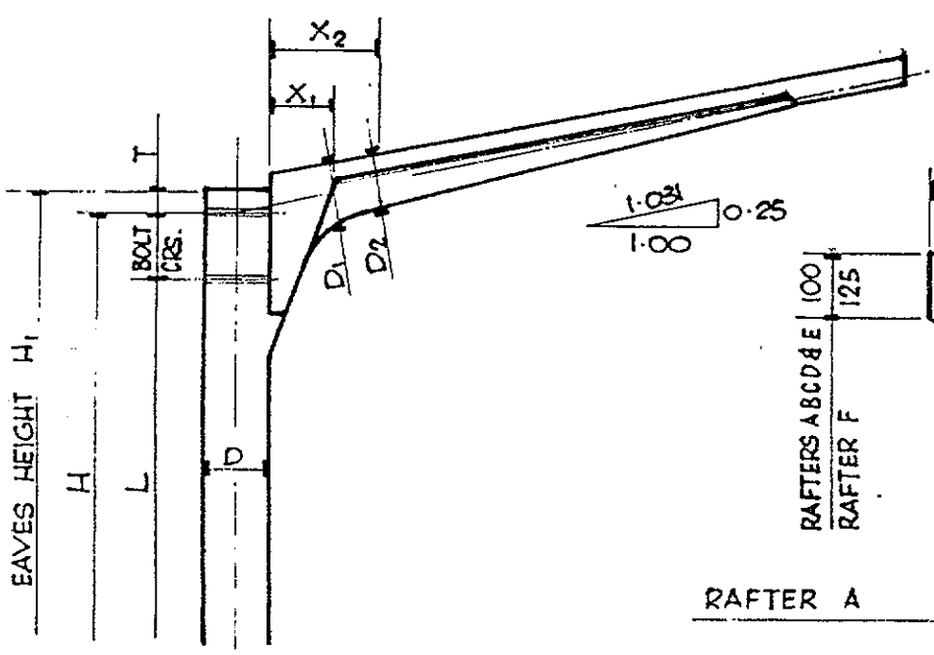
H = EAVES HEIGHT - T M.

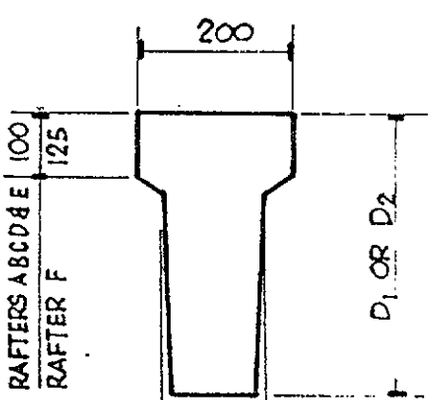
$R = \frac{\text{SPAN}}{8} + T - 0{\cdot}1$ M.

L = H - BOLT CRS. M.

T = 150mm. (RAFTERS A, B & C)

T = 200mm. (RAFTERS D, E & F)





RAFTER A	100	(95 AV.)
RAFTERS B & C	125	(120 AV.)
RAFTERS D, E & F	150	(140 AV.)

THE FRAME IS DESIGNED IN ACCORDANCE WITH CP110.

LOADING.

G M. BAYS.

DEAD	SHEETING	0.27 KN/m²
	RAFTER	0.194 " "
	PURLINS	0.26 " "
G_k =		0.724 KN/m²
SUPER Q_k =		0.75 KN/m²

WIND SPEED = 45 M/SEC. $W_k = 0.12(H+R)^3 - 3.18(H+R)^2 + 58.13(H+R) + 298$ N/M²

DESIGN CONDITIONS.

1) $1.4\ G_k + 1.6\ Q_k$
2) $1.2\ G_k + 1.2\ Q_k + 1.2\ W_k$ (INTERNAL PRESSURE OF 0.2) } Wind blowing
3) $1.2\ G_k + 1.2\ Q_k + 1.2\ W_k$ (INTERNAL PRESSURE OF −0.3) } in direction of span.
4) $1.2\ G_k + 1.2\ Q_k + 1.2\ W_k$ WIND BLOWING AT RIGHT ANGLES TO SPAN.
5) $0.9\ G_k + 1.4\ W_k$ (INTERNAL PRESSURE OF 0.2) } Wind blowing in
6) $0.9\ G_k + 1.4\ W_k$ (INTERNAL PRESSURE OF −0.3) } direction of span.
7) $0.9\ G_k + 1.4\ W_k$ WIND BLOWING AT RIGHT ANGLES TO SPAN.

ALLOWABLE STRESSES.

CONCRETE. GRADE 40 $f_{cu} = 40$ N/mm²

ULTIMATE COMPRESSIVE STRESS = $0.4 f_{cu}$ OVER WHOLE COMPRESSIVE ZONE.

ULTIMATE SHEAR STRESS (N/mm²)

$\frac{100 A_s}{bd}$	Vc
0.25	0.35
0.5	0.55
1.0	0.75
2.0	0.95
3.0	1.00

REINFORCEMENT

COLD WORKED HIGH YIELD (B.S. 4461) $f_y = 425$ N/mm²
HOT ROLLED MILD STEEL (B.S. 4449) $f_y = 250$ N/mm²
TENSILE STRESS COLD WORKED HIGH YIELD $f_y/1.15 = 369$ N/mm²
COMPRESSIVE STRESS COLD WORKED HIGH YIELD $0.72 f_y = 306$ N/mm²
SHEAR STRESS = $0.87 f_y$ COLD WORKED HIGH YIELD = 369 N/mm²
MILD STEEL = 218 N/mm²

DESIGN MOMENTS X·X AXIS

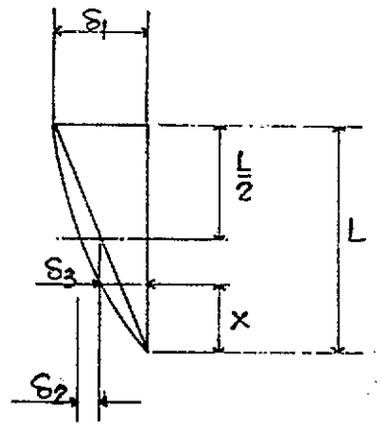
VERTICAL LOADING (CASES 1. 4 & 7)

$$\delta_1 = \frac{D}{1750}\left(\frac{1.5L}{D}\right)^2\left(1 - \frac{.0035 \times 1.5L}{D}\right)$$

$$= \frac{9L^2}{7D^2}\left(D - 5.25L\right) \text{ M.} \qquad \text{WITH D IN MM. AND L IN M.}$$

$$\delta_2 = \frac{D}{1750}\left(\frac{L}{D}\right)^2\left(1 - \frac{.0035L}{D}\right) \text{ M.}$$

$$\delta_3 = \frac{x}{L}\left(\delta_1 + 4\delta_2 - 4\delta_2\frac{x}{L}\right) \text{ M.}$$

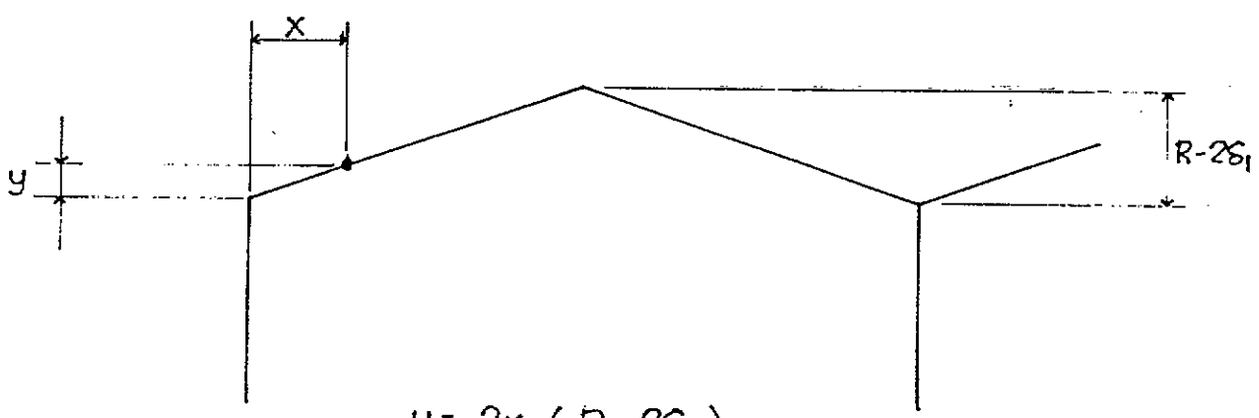


$M_x = -H_A.x - V_A.\delta_3$ KN.M. AND SINCE MAX. MOMENT OCCURS AT L.

COLOMN DESIGN MOMENT $M_{CD} = -H_A.L - V_A.\delta_1$ KN.M.

MOMENT AT MID HEIGHT $M_{x\,MID.}$

$$= -H_A.\frac{L}{2} - V_A.\delta_3 = -H_A.\frac{L}{2} - V_A\left(\frac{\delta_1}{2} + \delta_2\right) \text{ KN.M.}$$



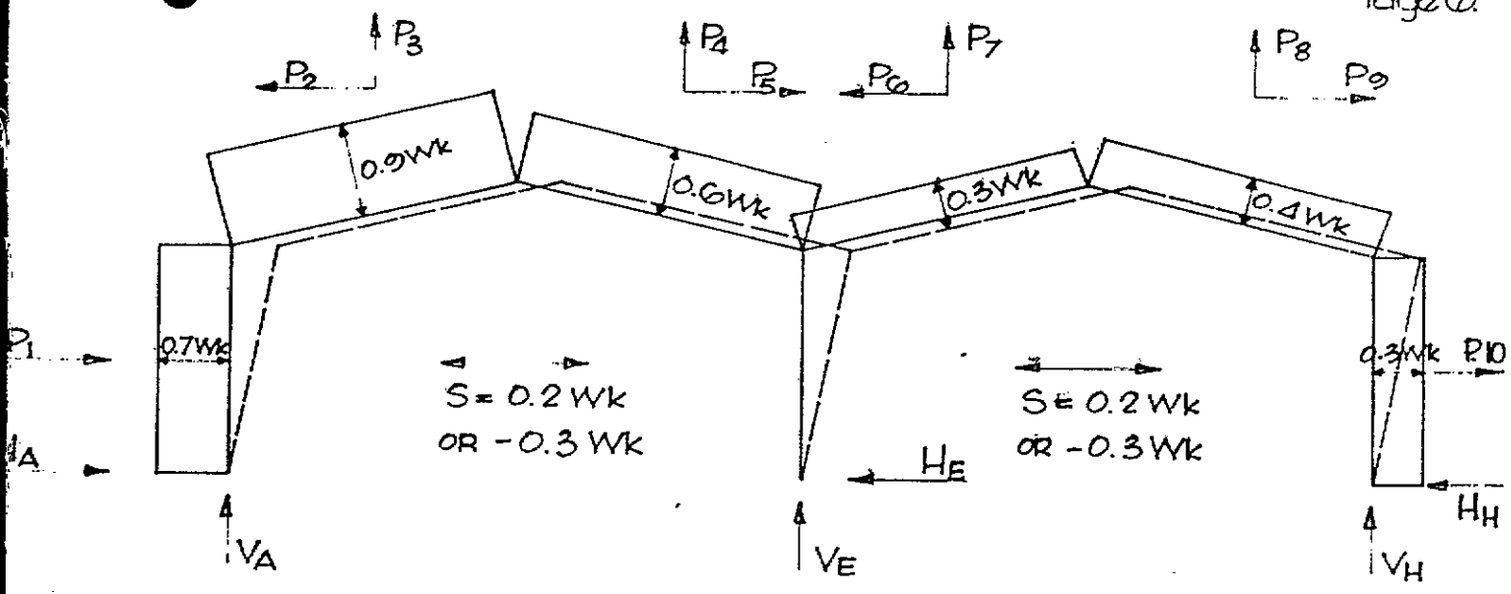
$$y = \frac{2x}{S}\left(R - 2\delta_1\right)$$

RAFTER DESIGN MOMENT – EXTERNAL

$$M_x = V_A\left(x - \delta_1\right) - H_A\left(H + y\right) - \frac{wx^2}{2} \quad \text{kN.M.}$$

RAFTER DESIGN MOMENT – INTERNAL

$$M_x = V_A\left(S - X\right) - H_A(H + y) - w\left(S - \frac{x}{2}\right)^2$$

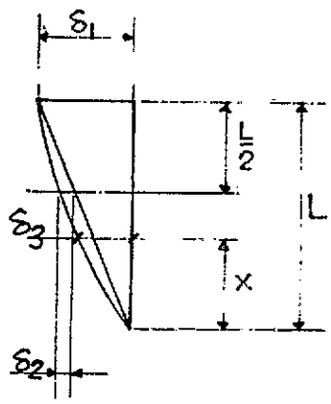


$$\delta_1 = \frac{D}{1750}\left(\frac{1.5L}{D}\right)^2\left(1 - \frac{.0035 \times 1.5L}{D}\right)$$

$$= \frac{9L^2}{7D^2}\left(D - 5.25L\right) M. \qquad \text{WITH } D \text{ IN MM. AND } L \text{ IN M.}$$

$$\delta_2 = \frac{D}{1750}\left(\frac{L}{D}\right)^2\left(1 - \frac{.0035 \times L}{D}\right) M.$$

$$\delta_3 = \frac{x}{L}\left(\delta_1 + 4\delta_2 - 4\delta_2 \frac{x}{L}\right) M.$$



M_X WINDWARD COLUMN $= -\left(H_A.X + \frac{P_1.X^2}{2H} - V_A.\delta_3\right)$ kN.M.

AND SINCE MAXIMUM MOMENT OCCURS AT L

WINDWARD COLUMN DESIGN MOMENT $= -\left(H_A.L + \frac{P_1 L^2}{2H} - V_A.\delta_1\right)$ kN.M.

M_X LEEWARD COLUMN $= -H_H.X + \frac{P_{10}.X^2}{2H} - V_H\delta_3$ kN.M.

AND SINCE MAXIMUM MOMENT OCCURS AT L

LEEWARD COLUMN DESIGN MOMENT $= -H_H.L + \frac{P_{10}.X^2}{2H} - V_H.\delta_1$ kN.M.

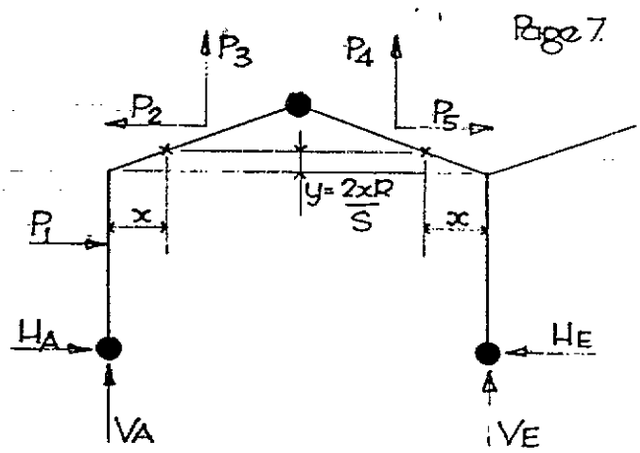
M_X CENTRE COLUMN $= H_E.X + V_E.\delta_3$ kN.M.

AND SINCE MAXIMUM MOMENT OCCURS AT L

CENTRE COLUMN DESIGN MOMENT $= H_E.L + V_E.\delta_1$ kN.M.

MOMENT AT MID. HEIGHT $M_X\,MID = -H_H.\frac{L}{2} - V_H\left(\frac{\delta_1}{2} + \delta_2\right) + \frac{P_{10}.L^2}{8H}$ kN.M.

RAFTER DESIGN MOMENT.

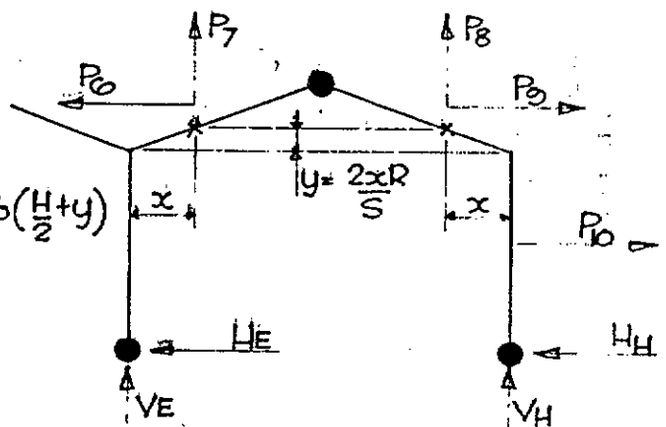


WINDWARD EXTERNAL RAFTER.

$$Mx = V_A(x+\delta_1) - H_A(H+y) - P_1\left(\frac{H}{2}+y\right) + \frac{P_2 y^2}{2R} + \frac{P_3 x^2}{S} \quad \text{kN.M.}$$

WINDWARD INTERNAL RAFTER.

$$Mx = V_A(S+\delta_1-x) - H_A(H+y) - P_1\left(\frac{H}{2}+y\right) - P_2\left(\frac{R}{2}-y\right) + P_3\left(\frac{3S}{4}-x\right) + \frac{P_4}{S}\left(\frac{S}{2}-x\right)^2 + \frac{P_5}{2R}(R-y)^2$$



LEEWARD EXTERNAL RAFTER.

$$Mx = V_H(x-\delta_1) - H_H(H+y) + \frac{P_8 x^2}{S} + \frac{P_9 y^2}{2R} + P_{10}\left(\frac{H}{2}+y\right)$$

LEEWARD INTERNAL RAFTER.

$$Mx = V_H(S-\delta_1-x) - H_H(H+y) + \frac{P_6}{2R}(R-y)^2 + \frac{P_7}{S}\left(\frac{S}{2}-x\right)^2 + P_8\left(\frac{3S}{4}-x\right) - P_9\left(\frac{R}{2}-y\right) + P_{10}\left(\frac{H}{2}+y\right).$$

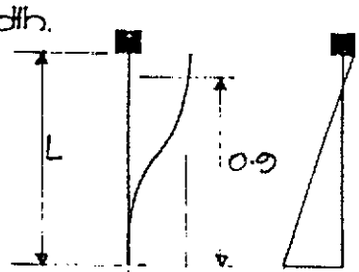
COLOMN MOMENTS. Y-Y AXIS

BRACING WILL BE PROVIDED BETWEEN COLOMNS ON BUILDINGS EXCEEDING 7.5 M. TO EAVES. FOR BUILDINGS WITH EAVES HEIGHTS OF 7.5M. AND LESS THE COLOMNS WILL ACT AS VERTICAL CANTILEVERS TO TAKE THE LONGITUDINAL WIND MOMENTS CAUSED BY THE WIND BLOWING ON THE GABLE END OF THE BUILDING.

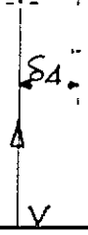
UP TO & INCLUDING 7.5M. TO EAVES

$$\delta_4 = \frac{b}{1750}\left(\frac{1\cdot 8L}{b}\right)^2\left(1 - \frac{\cdot 0035 \times 1\cdot 8L}{b}\right)$$ b= column breadth. = 200mm.

$$= \frac{3\cdot 24L^2}{350}\left(1 - \cdot 0315L\right) \text{ M.}$$



MOMENT DUE TO VERTICAL LOADS = V. δ_4 kN.M.



MOMENTS DUE TO WIND ON GABLE.

SPANS $\leq$ 13·5 M = $wf.\ Wk.\ S.\ L\ (2H_1 + R_1) / 40 \times 10^3$ kN. M.

SPANS $>$ 13·5 M = $wf.\ Wk.\ S.\ L\ (2H_1 + R_1) / 46{\cdot}7 \times 10^3$ kN. M.

TOTAL MOMENT FOR SPANS $\leq$ 13·5 M.

$= V.\delta_4 + wf.\ Wk.\ S.\ L\ (2H_1 + R_1) / 40 \times 10^3$ kN. M.

TOTAL MOMENT FOR SPANS $>$ 13·5 M.

$= V.\delta_4 + wf.\ Wk.\ S.\ L\ (2H_1 + R_1) / 46{\cdot}7 \times 10^3$ kN. M.

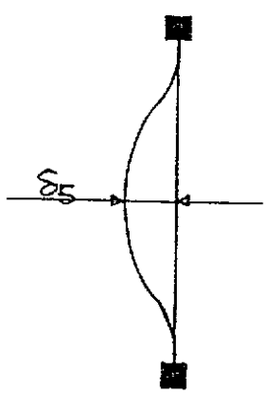
WHERE wf IS THE WIND LOAD FACTOR AND IS 1·2 FOR CASE 4 AND 1·4 FOR CASE 7.

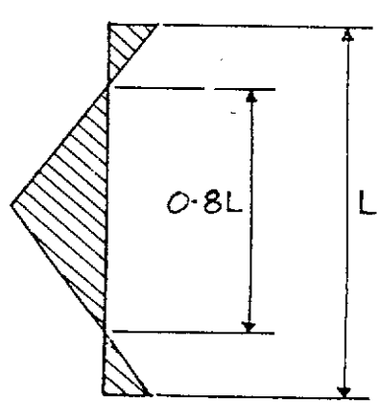
OVER 7·5 M. TO EAVES

MOMENT AT MID HEIGHT = My MID = $V.\delta_5$ kN. M.

WHERE $\delta_5 = \frac{b}{1750}\left(\frac{0{\cdot}8L}{b}\right)^2\left(1 - \frac{{\cdot}0035 \times 0{\cdot}8L}{b}\right)$ b = column breadth = 200 mm.

$= \frac{3{\cdot}2L^2}{1750}\left(1 - {\cdot}014L\right)$ M.





COLUMN DESIGN. X-X AXIS

$$x = d - \sqrt{d^2 - \frac{M + N(d - D/2)}{.008b}} \quad mm.$$

M = COLUMN MOMENT KN mm.
N = VERTICAL LOAD KN.
x = NEUTRAL AXIS DEPTH mm.

$$A_s = \frac{.016bx - N}{.369} \quad mm^2$$

b = COLUMN BREADTH = 200 mm.
d = .8D For columns with D ≤ 450 mm.
d = .85D For columns with D > 450 mm.

$A'_s = 0$

IF $x > .48d$ $\quad A_s = \dfrac{M - .00768\,bd\,(50 - .24d) + N(.5D - 50)}{.369(d - 50)} \quad mm^2$

$$A'_s = \frac{N + .369\,A_s - .00768\,bd}{.306} \quad mm^2$$

COLUMN FAILURE MOMENTS Y-Y AXIS

$$M_{uy} = \frac{55(F_{bt} + F_{bc}) + F_c\left(100 - \frac{x}{2}\right)}{1000} \text{ kN.M.}$$

a = .016D
b = $.331\,\frac{A_{sc}}{2} - N$
c = $-31.5\,\frac{A_{sc}}{2}$

$$x = \frac{-b + \sqrt{b^2 - 4ac}}{2a}$$

A_{sc} = AREA OF LONGITUDINAL REINFORCEMENT.

$F_{bt} = .369\,\frac{A_{sc}}{2}$ kN.

$F_c = 0.016Dx$ kN.

$F_{bc} = .7\,\frac{A_{sc}}{2}\left(x - \frac{45}{x}\right)$ kN.

COLUMN FAILURE MOMENTS X-X AXIS.

$$M_{ux} = F_{bt}\,\frac{(D/2 - 45) + F_c(D/2 - x/2) + F_{bc}(D/2 - 43)}{1000} \text{ KN.M.}$$

$$x = \frac{.369\,A_{sc} + N - .306\,A'_s}{3.2}$$

$F_{bt} = .369\,A_s$ kN.
$F_c = 3.2x$ kN.
$F_{bc} = .306\,A'_s$ kN.

BOLT FORCE = $\frac{\text{COLUMN DESIGN MOMENT}}{\text{BOLT CENTRES}}$ kN.

SHEAR FORCE AT HEAD OF COLUMN V = BOLT FORCE

SHEAR STRESS $u = \frac{V}{bd}$ kN/mm²

% TENSION STEEL = $\frac{100\ A_s}{bd}$

ULTIMATE SHEAR STRESS v_c = SEE CP 110 PART 1 : 1972 TABLE 5.

SHEAR RESISTANCE OF CONCRETE $V_c = \frac{v_c\ b.d}{10^3}$ kN.

SHEAR RESISTANCE OF BENT UP BARS = $A_{s\ SHEAR} \times .5 \times .369$ kN BUT $\frac{1}{2}\ \frac{V-V_c}{2}$
BENT UP AT 30°

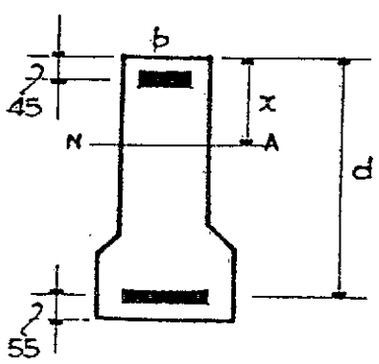
SHEAR TO BE TAKEN BY REINFORCEMENT = $V - V_c$

SHEAR TAKEN BY LINKS = $V - V_c$ - BENT UP BARS

SPACING OF 12mm. T H.T. LINKS = $\frac{56.6 \times .369d}{V-V_c - \text{BENT UP BARS.}}$ mm.

RAFTER DESIGN.

DESIGN OF RAFTERS AT SECTIONS X_1 & X_2



$M_{RC} = 0.15\ f_w bd^2 = .006\ bd^2$ kN mm.

IF $M_{RC} > B.M$ $x = d - \sqrt{d^2 - \frac{BM}{.008b}}$

$A_s = \frac{.016\ bx}{.369}$ mm²

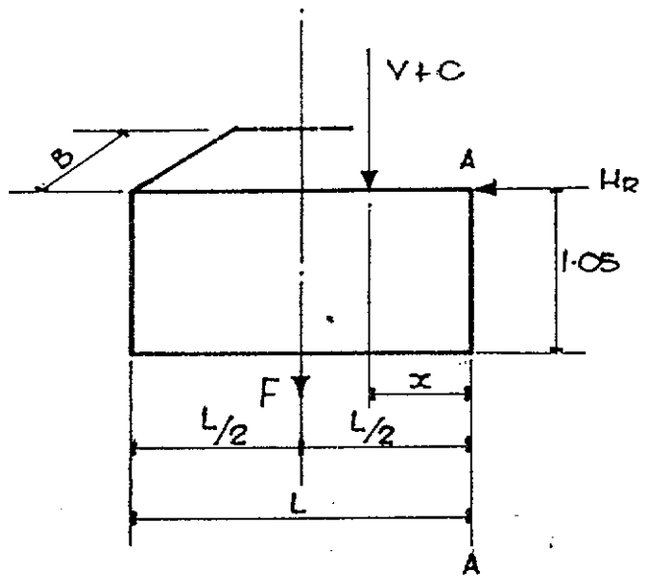
$A'_s = 0$

IF $M_{RC} < B.M.$

$A'_s = \frac{BM - .006\ bd^2}{.306\ (d-45)}$ mm²

$A_s = \frac{.008\ bd + .308\ A'_s}{.369}$ mm²

FOUNDATION DESIGN. - EXTERNAL



LOADING

VERT. REACTION = V

S.W COLUMN = C

S.W FOUNDATION = F

TOTAL = P KN.

FOUNDATION IS DESIGNED FOR CASE 1 AND CHECKED FOR CASES 4 & 7.

MOMENTS ABOUT A-A

$$(V+C)x + F\frac{L}{2} = T \text{ KN.M.}$$

$$C \text{ OF } G = \frac{T}{P} \text{ M.} \qquad \text{SHIFT (SH)} = \frac{1{\cdot}05 \times HR}{P} \text{ M}$$

$$e = \frac{T}{P} + SH - \frac{L}{2} \text{ M.} \qquad \text{GROUND PRESSURE} = \frac{P}{L \times B}\left(1 \pm \frac{6 \times e}{L}\right) + \frac{M_{yy}}{Z_{yy}}$$

CHECK FOR CASES 4 AND 7. IN KN/M²

TOTAL VERTICAL LOAD = P KN.

MOMENT X-X = $1{\cdot}05H - (V+C)\left(\frac{L}{2} - x\right)$ KN.M.

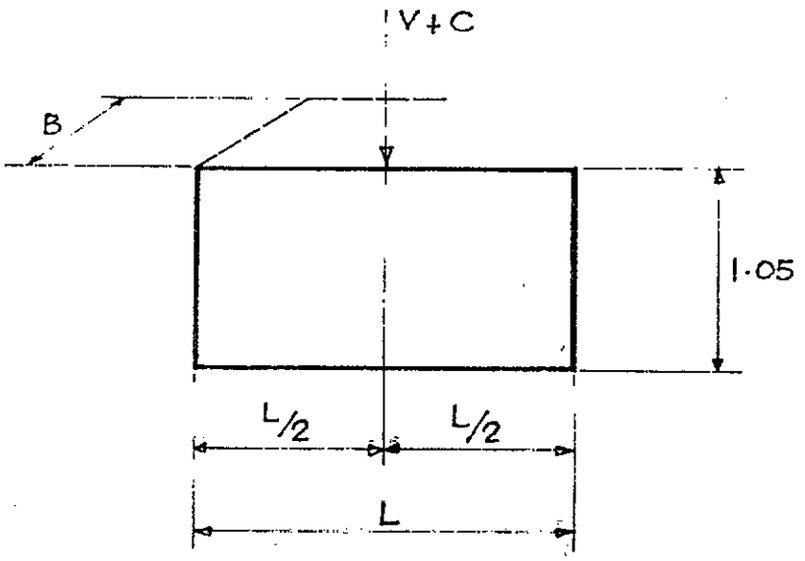
MOMENT Y-Y = WIND MOMENT FOR CASE 4 OR 7

$$Z_{xx} = \frac{BL^2}{6} \text{ M}^3 \qquad Z_{yy} = \frac{LB^2}{6} \text{ M}^3$$

$$\text{GROUND PRESSURE} = \frac{P}{A} \pm \frac{M_{xx}}{Z_{xx}} \pm \frac{M_{yy}}{Z_{yy}} \text{ KN/M}^2$$

$$\text{MAXIMUM GROUND PRESSURE} = \frac{P}{A} + \frac{M_{xx}}{Z_{xx}} + \frac{M_{yy}}{Z_{yy}} \text{ KN/M}^2$$

FOUNDATION DESIGN - INTERNAL.



LOADING

VERT. REACTION = V
S.WT. COLUMN = C
S.WT. FOUNDATION = F
TOTAL = P kN.

FOUNDATION IS DESIGNED FOR CASE 1 AND CHECKED FOR CASES 4 & 7.

GROUND PRESSURE = $\frac{P}{L \times B} + \frac{M_{yy}}{Z_{yy}}$ IN KN/M^2

CHECK FOR CASES 4 AND 7.

TOTAL VERTICAL LOAD = P kN.

MOMENT Y-Y = WIND MOMENT FOR CASE 4 OR CASE 7

$$Zyy = \frac{LB^2}{6} \quad M^3$$

GROUND PRESSURE = $\frac{P}{L \times B} \pm \frac{Myy}{Zyy}$ kN/M^2

MAX. GROUND PRESSURE = $\frac{P}{L \times B} + \frac{Myy}{Zyy}$ kN/M^2

DERIVATION OF FORMULAE FOR ATCOST 'M' FRAME.

ATCOST
ENGINEERS DEPARTMENT
ATCOST LIMITED
THE PANTILES
TONBRIDGE WELLS
KENT. TEL: TW. 26288

(1) WIND PRESSURE $q = kV_s^2$

$k = 0.613$

$V = 45$ M/SEC

$S_1 = 1.00$

$S_2 = 0.6$ $(H \geq 3M)$
0.65 $(H \geq 5M)$
0.74 $(H \geq 10M)$
0.83 $(H \geq 15M)$
} WHERE $H = (H + R)$

$S_3 = 1.00$.

$H = 3 \quad q = (45 \times .6)^2 \times .613 = 447$
$H = 5 \quad q = (45 \times .65)^2 \times .613 = 524$
$H = 10 \quad q = (45 \times .74)^2 \times .613 = 680$
$H = 15 \quad q = (45 \times .83)^2 \times .613 = 855.$

(1) $27a + 9b + 3c + d = 447.$
(2) $125a + 25b + 5c + d = 524$
(3) $1000a + 100b + 10c + d = 680$
(4) $3375a + 225b + 15c + d = 855.$

(4) - (3) $2375a + 125b + 5c = 175.$ (5)
(3) - (2) $875a + 75b + 5c = 150.$ (6)
(2) - (1) $98a + 16b + 2c = 77.$ (7)

(5) - (6) $1500a + 50b = 19$ (8)
(6) - (7) x2.5 $630a + 35b = -30.5$ (9)
(8) x .7 $1050a + 35b = 13.3$ (10)
$630a + 35b = -30.5$ (9)

(10) - (9) $420a = 49.8$ $a = 0.119$

SUBSTITUTE IN (9)

$$b = \frac{-36.5 - (49.8 \times 1.5)}{35} \qquad \underline{b = -3.18}$$

SUBSTITUTE IN (7)

$$c = \frac{77 - (98 \times .119) + (10 \times 3.18)}{2} \qquad \underline{c = 58.13.}$$

SUBSTITUTE IN (1)

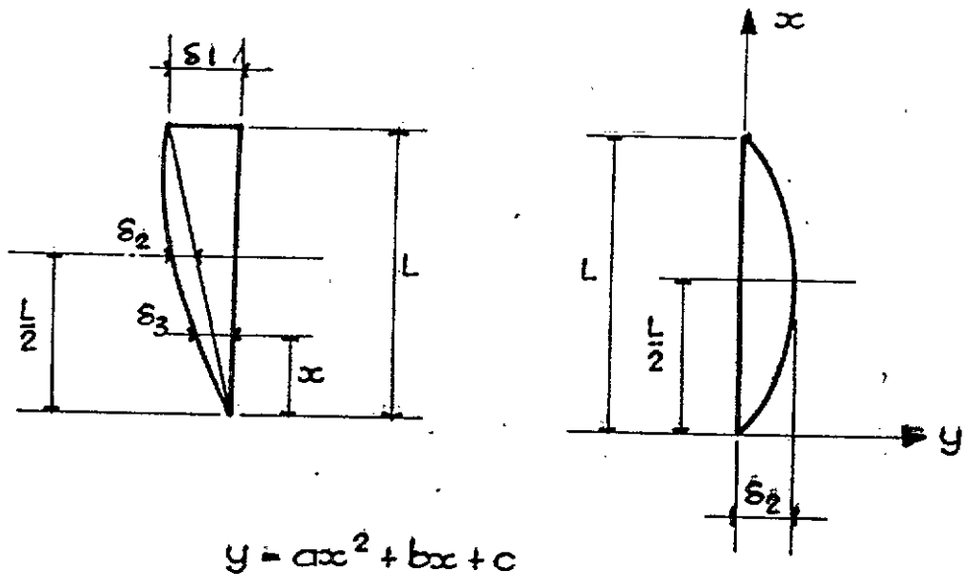
$$d = 447 - (27 \times .119) + (9 \times 3.18) - (3 \times 58.13) \qquad \underline{d = 298}$$

$$q = 0.12(H+R)^3 - 3.18(H+R)^2 + 58.13(H+R) + 298 \ N/M^2 = Wk.$$

FOR V = 50 M/SEC

$$q = Wk = 0.15(H+R)^3 - 4.0(H+R)^2 + 72.15(H+R) + 367.5 \ N/M^2$$

DERIVATION OF FORMULAE.



$$y = ax^2 + bx + c$$

① $x = 0$ $y = 0$ $0 = 0+0+c$ $\therefore y = ax^2 + bx$

② $x = \frac{L}{2}$ $y = \delta_2$ $\delta_2 = \frac{aL^2}{4} + \frac{bL}{2}$

③ $x = L$ $y = 0$ $0 = aL^2 + bL$

② × 2 $2\delta_2 = \frac{aL^2}{2} + bL$

③ $0 = aL^2 + bL$

$2\delta_2 = -\frac{aL^2}{2}$ $a = -\frac{4\delta_2}{L^2}$

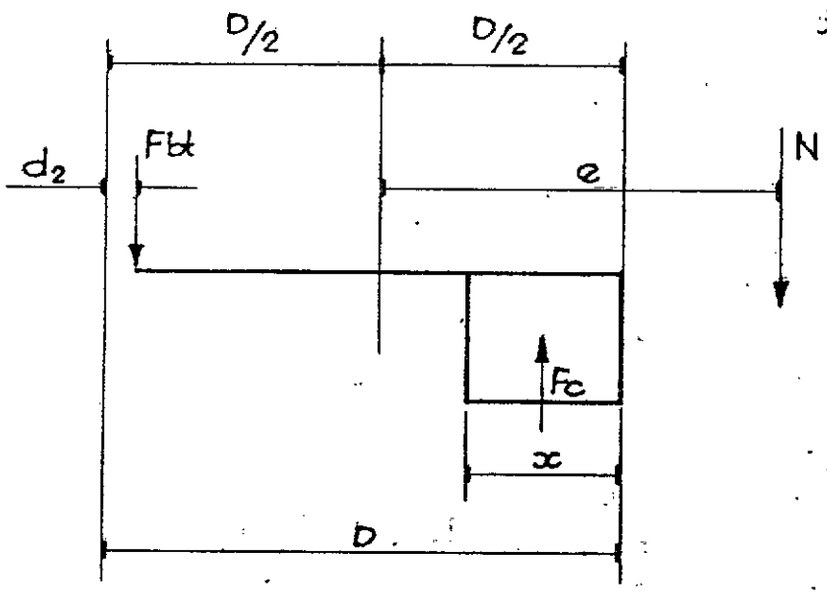
SUBSTITUTE IN ③

$aL^2 + bL = 0$, $-4\delta_2 + bL = 0$ $b = \frac{4\delta_2}{L}$

$$y = -\frac{4\delta_2 x^2}{L^2} + \frac{4\delta_2 x}{L} = \frac{4\delta_2 x}{L}\left(1 - \frac{x}{L}\right)$$

$$y = \delta_3 = \frac{x}{L}\left(\delta_1 + 4\delta_2 - \frac{4\delta_2 x}{L}\right)$$

COLUMN DESIGN. X-X AXIS



$x < .48d$

Units KN

$N = F_c - F_{bt}$.

$Ne = F_c(0.5D - 0.5x) + F_{bt}(0.5D - d_2)$ $\quad Ne = M$

$F_c = .4 \times .04 \times b \times x = .016bx$.

$T = .369\ A_s$

$N = .016bx - .369\ A_s$ ——— (1)

$\therefore .369\ A_s = .016bx - N$

$M = .016bx(.5D - .5x) + .369\ A_s(.5D - d_2)$ ——— (2)

$\therefore M = .016bx(.5D - .5x) + (.016bx - N)(.5D - d_2)$

$\therefore M = .008bDx - .008bx^2 + .008bDx - .016bd_2x - .5ND + Nd_2$

$\therefore .008bx^2 - .016bDx + .016bd_2x + M + .5ND - Nd_2 = 0.$

$\therefore .008bx^2 - .016bx(D - d_2) + M + .5ND - Nd_2 = 0$

$(D - d_2) = d$

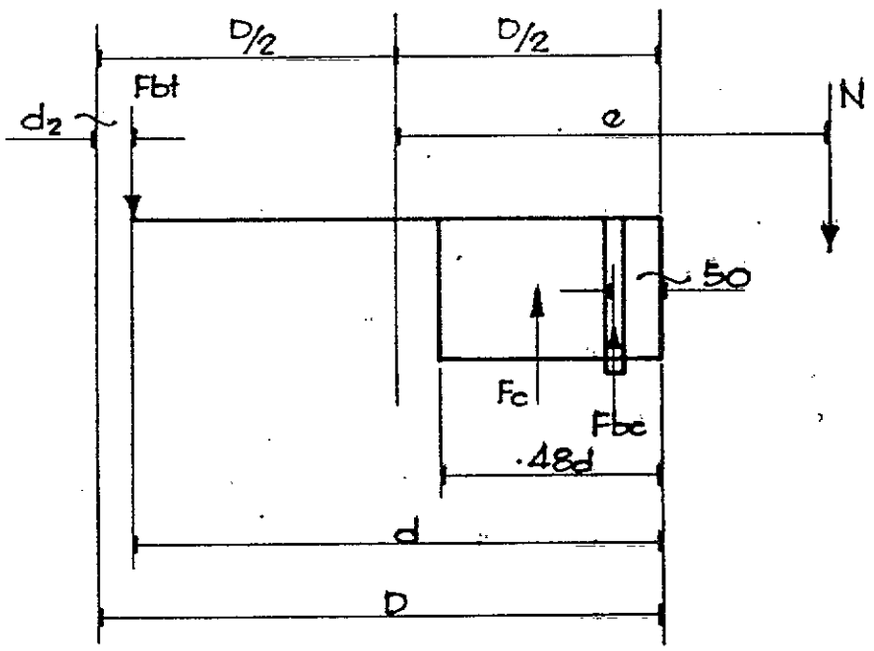
$$\therefore x = d - \sqrt{\frac{d^2 - M + N(d - D/2)}{.008b}}$$

$$A_s = \frac{.016bx - N}{.369}$$

$\underline{A'_s = 0}$

$x > \cdot 48d$

LIMIT x TO $\cdot 48d$



$N = F_c + F_{bc} - F_{bt}$

$Ne = F_c(\cdot 5D - \cdot 24d) + F_{bc}(\cdot 5D - 50) + F_{bt}(\cdot 5D - d_2)$

$F_c = \cdot 00768\,bd$ $\quad 0.48d \times 0.4 \times 0.04.b$ $\quad Ne = M$

$F_{bc} = \cdot 306\,A'_s$

$T = \cdot 369\,A_s$

$N = \cdot 00768\,bd + \cdot 306\,A'_s - \cdot 369\,A_s$ (1)

$M = \cdot 00768\,bd(\cdot 5D - \cdot 24d) + \cdot 306A'_s(\cdot 5D - 50) + \cdot 369\,A_s(\cdot 5D - d_2)$ (2)

(1) $\cdot 306\,A'_s = N + \cdot 369\,A_s - \cdot 00768\,bd.$

SUBSTITUTE IN (2)

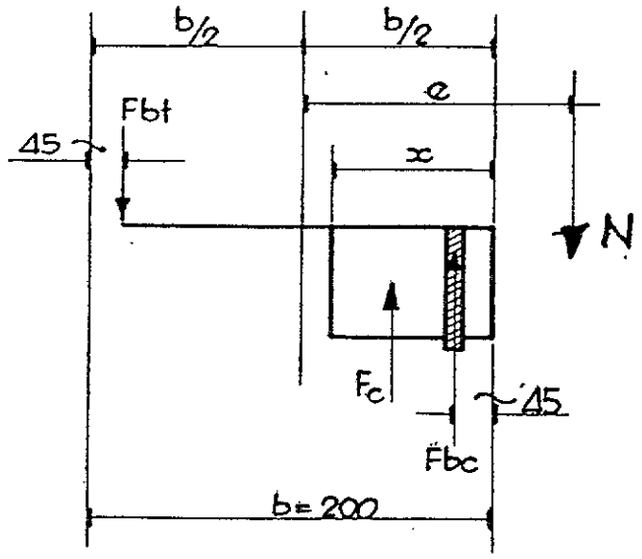
$M = \cdot 00768\,bd(\cdot 5D - \cdot 24d) + (N + \cdot 369\,A_s - \cdot 00768\,bd)(\cdot 5D - 50) + \cdot 369A_s(\cdot 5D - d_2)$

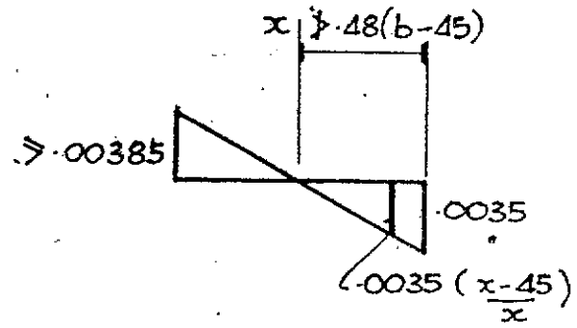
$\therefore M = \cdot 00768\,bd(50 - \cdot 24d) + \cdot 5ND - 50N + \cdot 369\,A_s(D - d_2 - 50)$

$$\therefore A_s = \frac{M - \cdot 00768\,bd(50 - \cdot 24d) - N(\cdot 5D - 50)}{\cdot 369(d - 50)}$$

$$A'_s = \frac{N + \cdot 369\,A_s - \cdot 00768\,bd}{\cdot 306}$$

COLUMN DESIGN. Y-Y AXIS.





STRAIN DIAGRAM

$F_{bt} + N = F_c + F_{bc}$

A_{sc} = Area of longitudinal reinforcement.

$F_{bt} = \cdot 309 \frac{A_{sc}}{2}$

$F_c = \cdot 0160\, D x$

Fig 2. CP110 compression

$= \frac{f_y}{(d_{bt} + \frac{f_y}{2000})} = 0.735 f_y$. = 306 N/mm²

$F_{bc} = \cdot 7 \frac{A_{sc}}{2} \left(\frac{x - 45}{x} \right)$

$\cdot 309 \frac{A_{sc}}{2} + N = \cdot 0160 D x + \cdot 7 \frac{A_{sc}}{2} \left(\frac{x - 45}{x} \right)$

$\cdot 309 \frac{A_{sc}}{2} . x + N.x = \cdot 0160 D x^2 + \cdot 7 \frac{A_{sc}}{2} . x - 31.5 \frac{A_{sc}}{2}$

$\cdot 0160 D . x^2 + \left(\cdot 7 \frac{A_{sc}}{2} - \cdot 309 \frac{A_{sc}}{2} - N \right) x - 31.5 \frac{A_{sc}}{2} = 0$

$a = \cdot 0160 D$

$b = \cdot 331 \frac{A_{sc}}{2} - N$

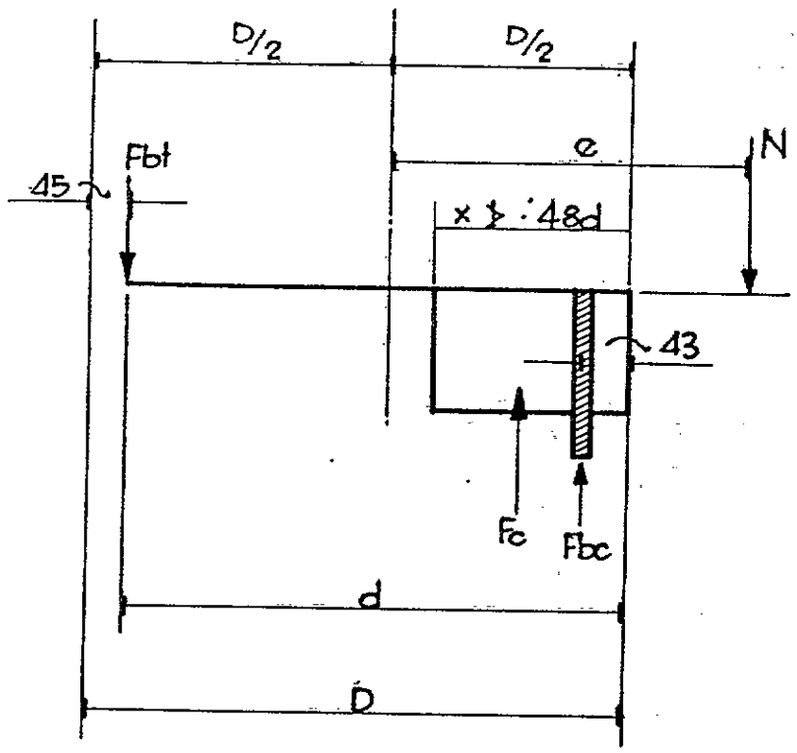
$c = -31.5 \frac{A_{sc}}{2}$

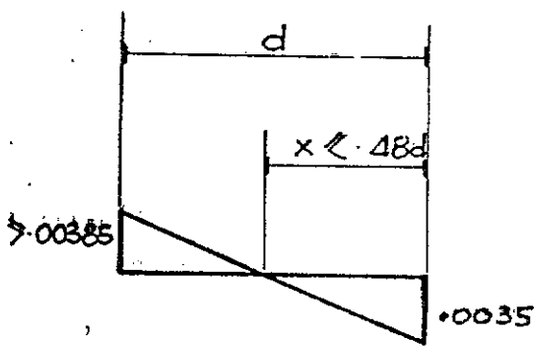
$$x = \frac{-b + \sqrt{b^2 - 4ac}}{2a}$$

$M_{uy} = F_{bt} (b/2 - 45) + F_{bc} (b/2 - 45) + F_c (b/2 - x/2)$

$= 55 (F_{bt} + F_{bc}) + F_c (100 - x/2)$

COLUMN DESIGN X–X AXIS





STRAIN DIAGRAM.

EN 16T

$F_{bt} + N = F_c + F_{bc}$ $\qquad F_c = F_{bt} + N - F_{bc}$

and $F_{bt} = \cdot 369\, A_s$

$F_{bc} = \cdot 300\, A'_s$

$F_c = \cdot 04 \times \cdot 4 \times 200x = 3 \cdot 2x$

$$x = \frac{\cdot 369\, A_s + N - \cdot 300\, A'_s}{3 \cdot 2}$$

$$M_{ux\ MID} = F_{bt}\left(D/2 - 45\right) + F_{bc}\left(D/2 - 43\right) + F_c\left(D/2 - \frac{x}{2}\right)$$

MAIN TIE BOLTS ~ CONNECTING COLUMN TO RAFTER

STEEL TYPE 150 M 28 CHARACTERISTIC STRENGTH 540 N/mm²

$$\text{DESIGN STRENGTH} = \frac{540}{\gamma m} = \frac{540}{1.15} = 470 \text{ N/mm}^2$$

NOMINAL BOLT DIA	MIN. BOLT DIA.	EFFECTIVE AREA	ULTIMATE LOAD
24 mm.	21.588 mm.	366 mm² (245)	172 KN.
30 mm.	27.22 mm.	585 mm² (427.3)	275 KN.
36 mm.	32.88 mm.	852 mm² (32.9)	402 KN.

STEEL TYPE "MACALLOY" CHARACTERISTIC STRENGTH 1030 N/mm²

$$\text{DESIGN STRENGTH} = \frac{1030}{\gamma M} = \frac{1030}{1.15} = 895 \text{ N/mm}^2$$

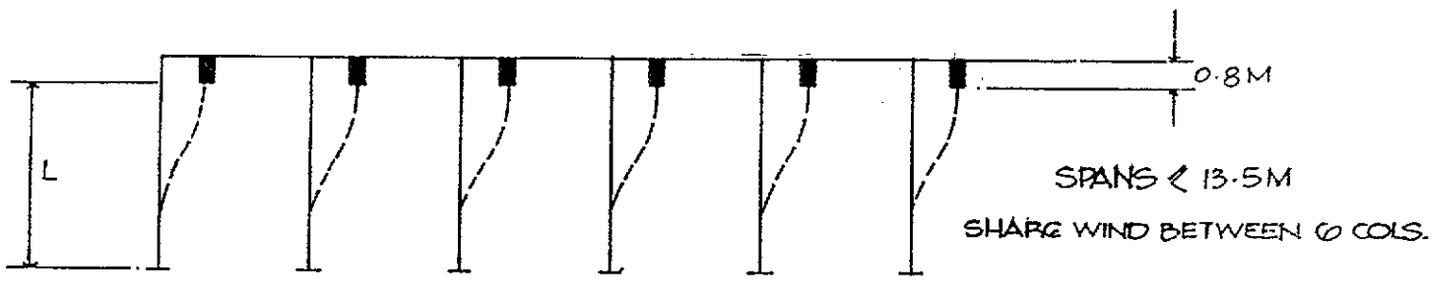
BOLT DIA.	AREA (mm²)	CHARACTERISTIC LOAD	DESIGN LOAD
20mm.	314	325 KN	282 KN.
25mm.	490	500 KN.	438 KN.

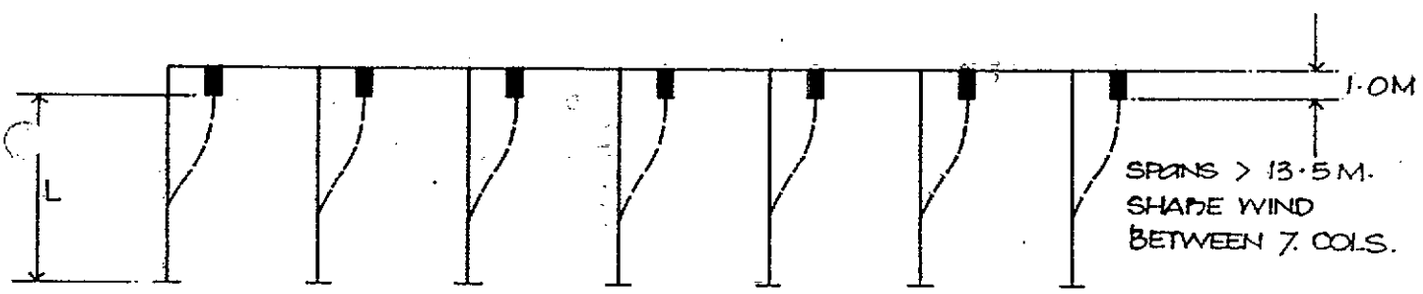
NOTE

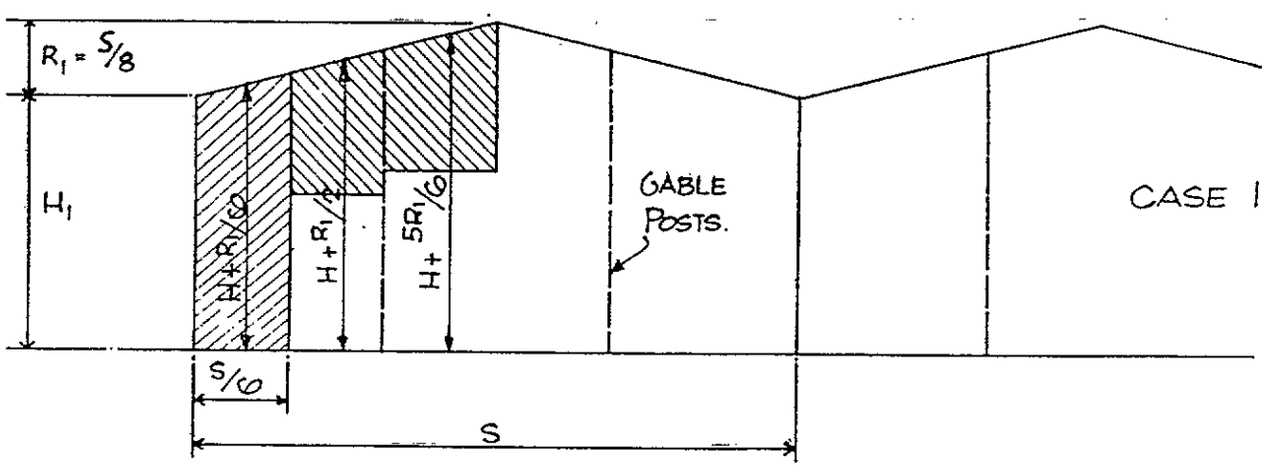
MACALLOY BOLTS WILL BE USED ON MULTI-SPAN BUILDINGS ONLY.

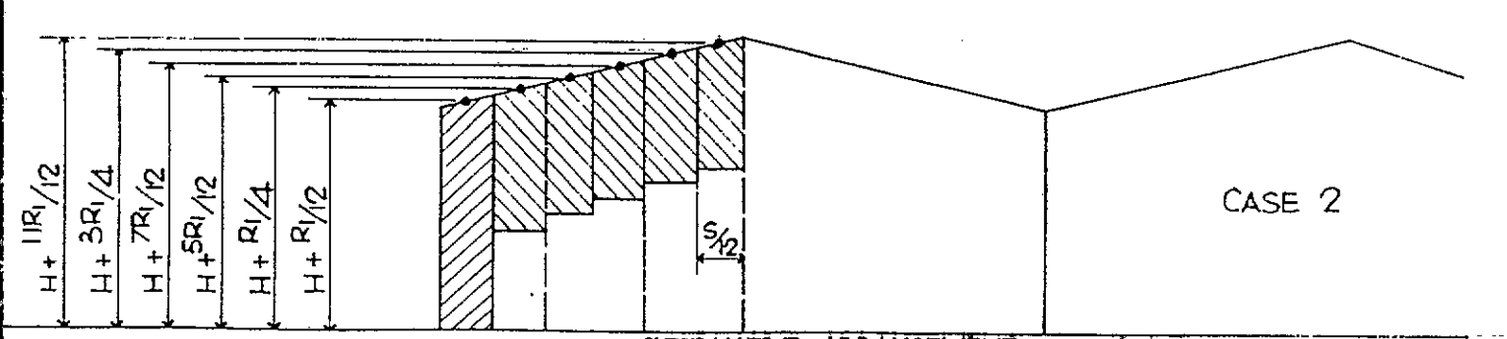
ANALYSIS OF FRAME IN LONGITUDINAL DIRECTION.

WIND BLOWING ON GABLE.





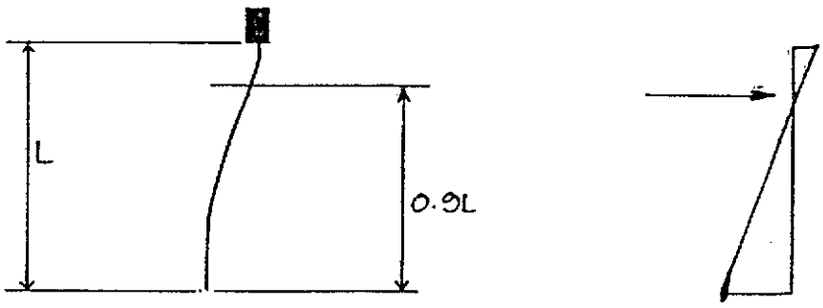




ALTERNATIVE ARRANGEMENT OF GABLE POSTS.

LOAD APPLIED AS U.D.L. ON COLUMN = ▨

LOAD APPLIED AS POINT LOAD AT TOP OF COLUMN = ▨



CASE 1 (2 GABLE POSTS PER SPAN) SPANS ≤ 13.5M

TOTAL LOAD AS U.D.L. = $S/60(H_1 + R_1/60)$

EQUIVALENT LOAD APPLIED AS
POINT LOAD AT POINT OF CONTRAFLEXURE = $S/12(2H_1 + R_1/3) \times L/2 \times 1/.9L$

$= \text{SAY } S/12(H_1 + R_1/60)$

POINT LOADS = $S/60 \times 1/2(H_1 + 5R_1/60) = S/12(H_1 + 5R_1/60)$

$S/60 \times 1/2(H_1 + R_1/2) = S/12(H_1 + R_1/2)$

TOTAL = $S/12(3H_1 + 1.5R_1)$ FOR UNIT WIND PRESSURE

TOTAL B.M. (2 SPANS) = $S/3(3H_1 + 1.5R_1) \times .9L$
SHARED BETWEEN 18 Nº COLUMNS = $S/36(2H_1 + R_1) \times .9L$

$= \dfrac{S(2H_1 + R_1)L}{40}$ FOR UNIT WIND PRESSURE.

CASE 2 (5 GABLE POSTS PER SPAN) SPANS ≤ 13.5 M

TOTAL LOAD AS U.D.L. = $(H_1 + R_1/12) \times S/12 = S/12(H_1 + R_1/12)$

EQUIVALENT LOAD APPLIED AS
POINT LOAD AT POINT OF CONTRAFLEXURE = $S/12(H_1 + R_1/12) \times L/2 \times 1/.9L$

$= \text{SAY } S/24(H_1 + R_1/12)$

POINT LOADS = $S/12 \times 1/2(H_1 + R_1/4) = S/24(H_1 + R_1/4)$

$S/12 \times 1/2(H_1 + 5R_1/12) = S/24(H_1 + 5R_1/12)$

$S/12 \times 1/2(H_1 + 7R_1/12) = S/24(H_1 + 7R_1/12)$

$S/12 \times 1/2(H_1 + 9R_1/12) = S/24(H_1 + 9R_1/12)$

$S/12 \times 1/2(H_1 + 11R_1/12) = S/24(H_1 + 11R_1/12)$

$= S/24(6H_1 + 3R_1)$

TOTAL = $S/12(3H_1 + 1.5R_1)$

TOTAL B.M (2 SPANS) = $S/3\,(3H_1 + 1{\cdot}5R_1) \times {\cdot}9L$

SHARED BETWEEN 18Nº COLUMNS = $S/36\,(2H_1 + R_1) \times {\cdot}9L$

$$= \frac{S(2H_1 + R_1)L}{40}$$ FOR UNIT WIND PRESSURE

SPANS > 13·5M SHARED BETWEEN 21 Nº COLUMNS.

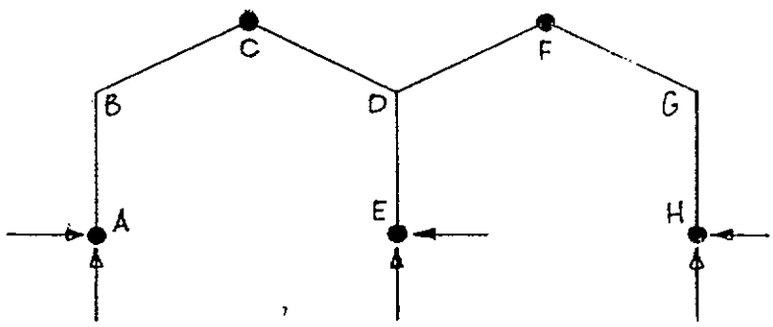
CASE 1. B.M. = $S/42\,(2H_1 + R_1) \times {\cdot}9L = \frac{S(2H_1 + R_1)L}{46{\cdot}7}$ FOR UNIT WIND PRESSURE.

CASE 2. $= \frac{S(2H_1 + R_1)L}{46{\cdot}7}$ FOR UNIT WIND PRESSURE.

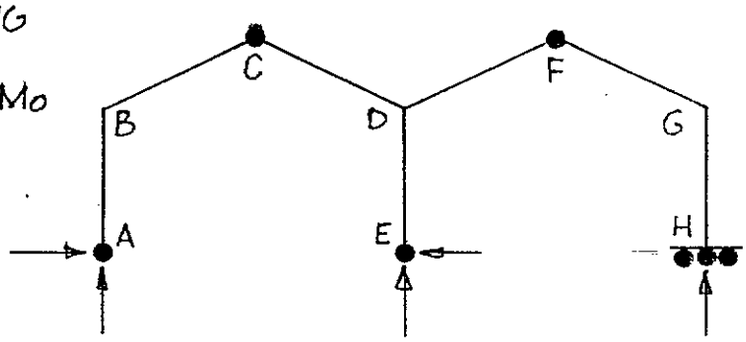
FRAME ANALYSIS.

THE METHOD OF "VIRTUAL WORK" IS USED FOR CALCULATING THE REACTIONS AND MOMENTS. THE METHOD IS OUTLINED BELOW.

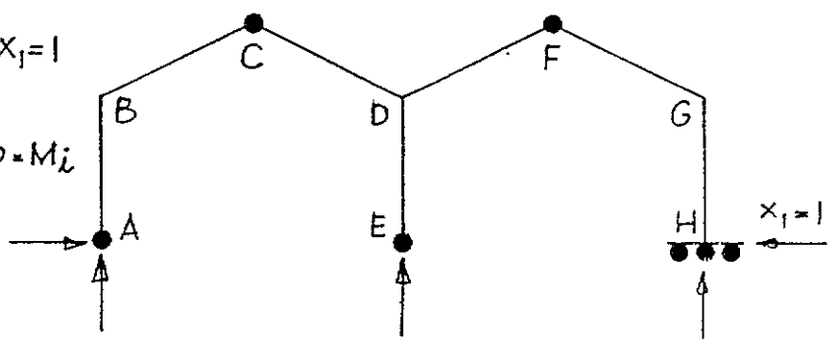
(1) FRAME SHAPE
STATICALLY - INDETERMINATE



(2) ASSUME HORIZONTAL FORCE AT 'H' IS UNKNOWN REPLACING HINGE BY ROLLER BEARING
B.M. DIAGRAM PRODUCED = M_o



(3) HORIZONTAL FORCE OF $X_1 = 1$ PLACED AT 'H'
B.M. DIAGRAM PRODUCED = M_i

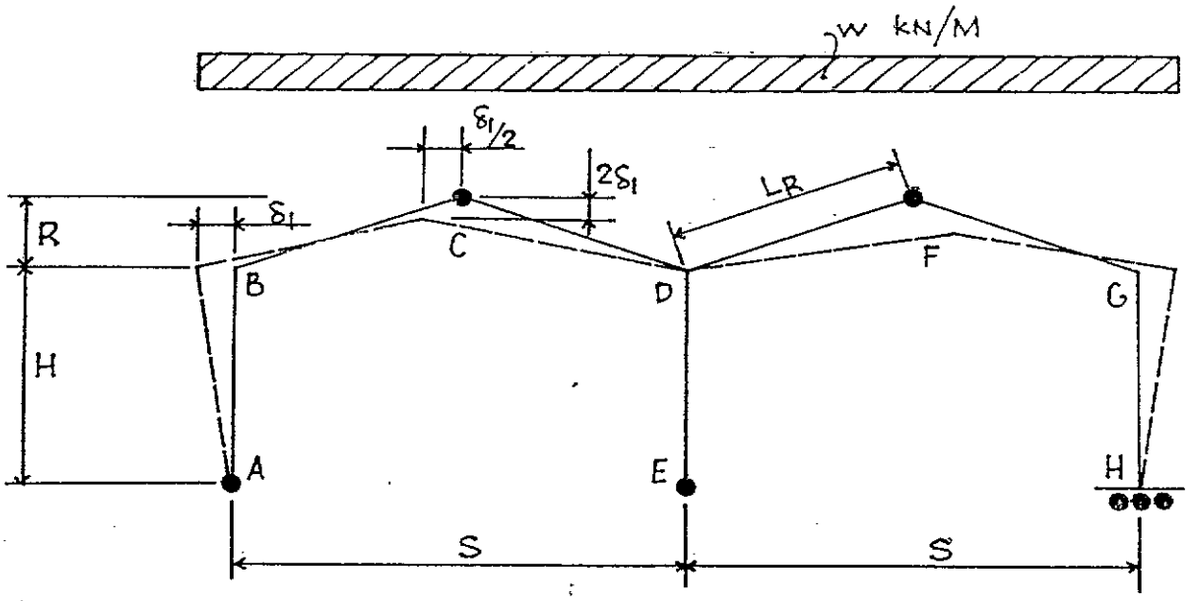


$$\delta_{01} = \int \frac{M_o M_i}{EI} \cdot ds \quad \text{and} \quad \delta_{11} = \int \frac{M_i}{EI} \cdot ds$$

AND $\delta_{01} + X_1 \delta_{11}$ = MOVEMENT OF H = 0

THE METHOD OF ANALYSIS IS TAKEN FROM THE CONCRETE SERIES BOOK "STATICALLY - INDETERMINATE STRUCTURES" BY R. GARTNER.

FRAME ANALYSIS - VERTICAL LOADING



CASE 0 - FRAME LOADED - JOINT H RELEASED HORIZONTALLY.

$$V_{H0} = \frac{w(S+\delta_1)^2}{4(S-\delta_1)}$$

$$V_{E0} = \frac{w(S+\delta_1)(3S-5\delta_1)}{2(S-\delta_1)}$$

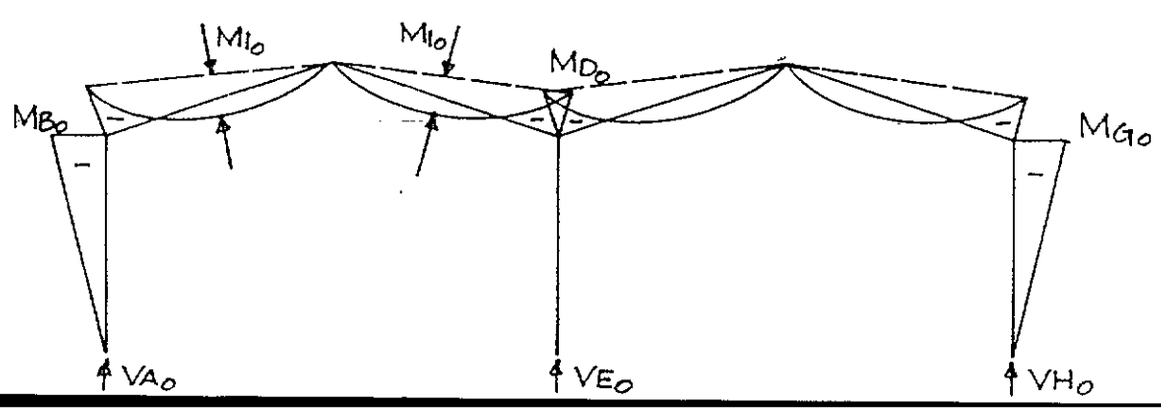
$$V_{A0} = \frac{w(S+\delta_1)^2}{4(S-\delta_1)}$$

$$H_{A0} = H_{E0} = 0$$

$$M_{B0} = -V_{A0}\cdot\delta_1 = M_{G0}$$

$$M_{D0} = \frac{w}{4}\left[S(S-\delta_1) - 2(S+\delta_1)^2\right]$$

$$M_{L0} = \frac{w}{32}(S+\delta_1)^2$$



CASE 1 - UNIT HORIZONTAL LOAD APPLIED AT JOINT H.

$$V_{H_1} = \frac{2(H+R)}{(S-\delta_1)}$$

$$V_{E_1} = \frac{-4(H+R)}{(S-\delta_1)}$$

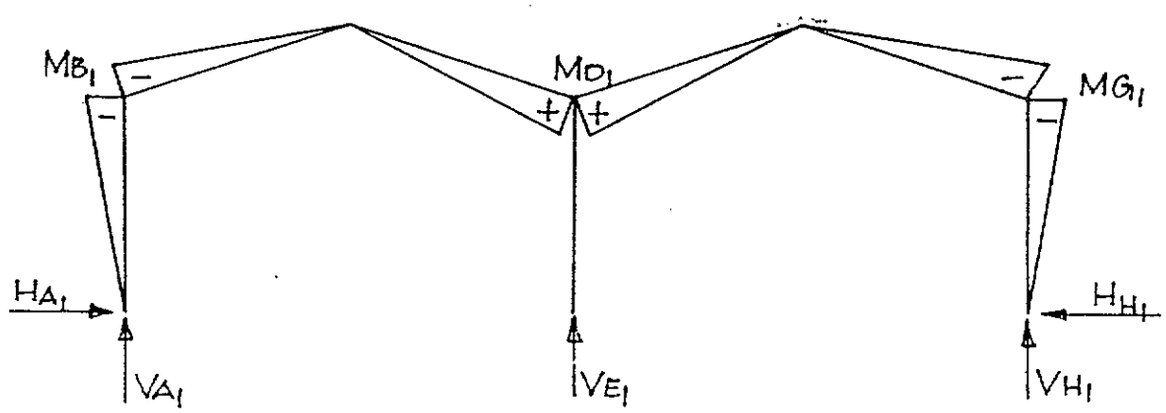
$$V_{A_1} = \frac{2(H+R)}{(S-\delta_1)}$$

$$H_{A_1} = H_{H_1} = 1$$

$$H_{E_1} = 0$$

$$M_{B_1} = -V_{A_1} \cdot \delta_1 - H = M_{G_1}$$

$$M_{D_1} = V_{A_1} \cdot S - H$$



$$\partial_{01} = \frac{2}{3}\left[M_{B_0} \cdot M_{B_1}(H+L_R) - L_R \cdot M_{I_0}(M_{B_1} + M_{D_1}) + L_R \cdot M_{D_0} \cdot M_{D_1}\right]$$

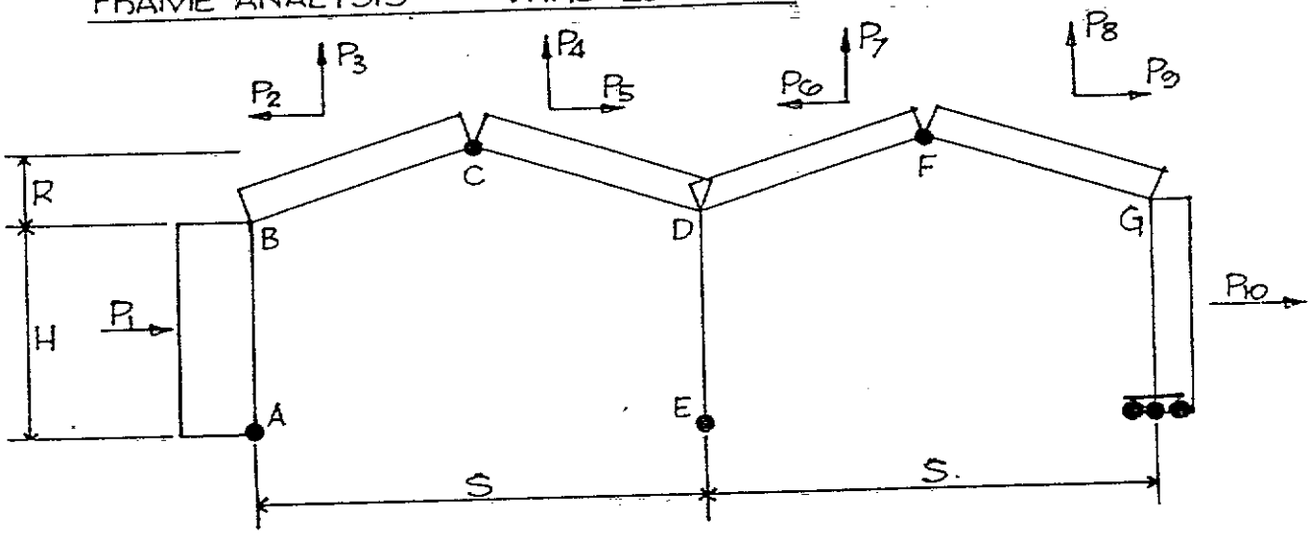
$$\partial_{11} = \frac{2}{3}\left[M_{B_1}{}^2 \cdot (H+L_R) + L_R \cdot M_{D_1}{}^2\right]$$

$$X_1 = \frac{\partial_{01}}{\partial_{11}}$$

FINAL REACTIONS.

$$V_A = V_{A_0} + X_1 \cdot V_{A_1} \qquad H_A = X_1$$
$$V_E = V_{E_0} + X_1 \cdot V_{E_1} \qquad H_E = 0$$
$$V_H = V_{H_0} + X_1 \cdot V_{H_1} \qquad H_H = X_1$$

FRAME ANALYSIS – WIND LOADING.



CASE O – FRAME LOADED – JOINT H RELEASED HORIZONTALLY.

$$V_{HO} = -\frac{1}{2S}\left(P_8.S + 2P_9.R + 4P_{10}R + 2P_{10}.H\right)$$

$$V_{EO} = \frac{H}{2S}\left(P_1 - 2P_2 + 2P_5 - 2P_6 + 2P_9 + 5P_{10}\right) + \frac{R}{2S}\left(P_5 - P_2 - P_6 + 5P_9 + 8P_{10}\right) - \frac{1}{4}\left(P_3 + 3P_4 + 5P_7 + 3P_8\right)$$

$$V_{AO} = -\frac{R}{2S}\left(P_5 - P_2 - P_6 + 3P_9 + 4P_{10}\right) - \frac{H}{2S}\left(P_1 - 2P_2 + 2P_5 - 2P_6 + 2P_9 + 3P_{10}\right) + \frac{1}{4}\left(P_8 + P_7 - P_4 - 3P_3\right)$$

$$H_{AO} = \frac{1}{4(H+R)}\left(2V_{AO}.S - 4P_1.R - 2P_1.H + 2P_2.R + P_3.S\right)$$

$$H_{EO} = H_{AO} + P_1 - P_2 + P_5 - P_6 + P_9 + P_{10}$$

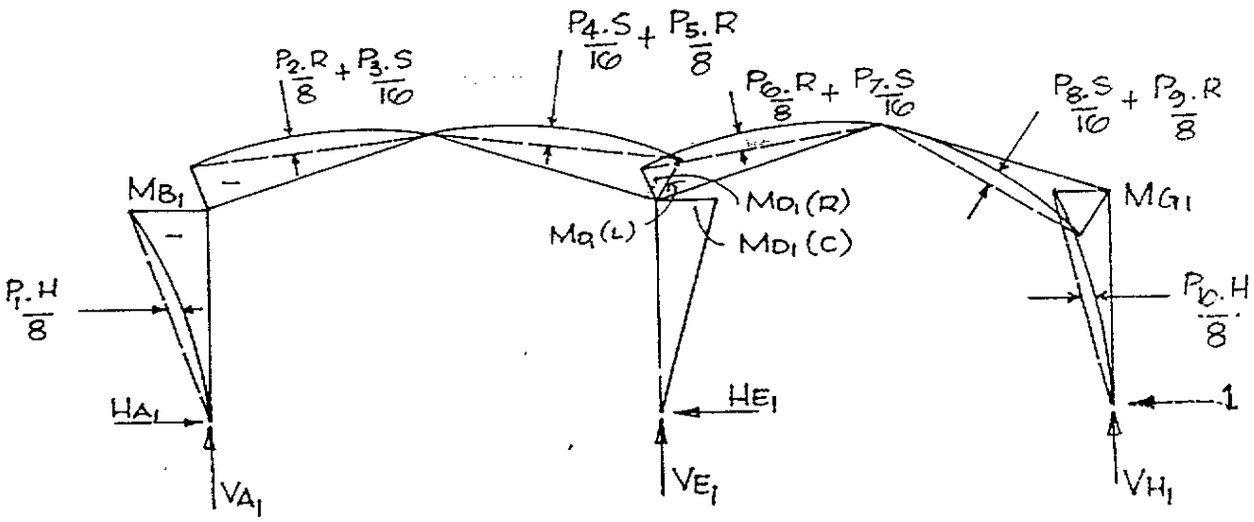
$$M_{BO} = -P_1.\frac{H}{2} - H_{AO}.H$$

$$M_{DO}\,(\text{LEFT}) = V_{AO}.S - P_1.\frac{H}{2} - P_2.\frac{R}{2} + 3P_3.\frac{S}{4} + P_4.\frac{S}{4} + P_5.\frac{R}{2} - H_{AO}.H$$

$$M_{DO}\,(\text{RIGHT}) = V_{HO}.S + P_6.\frac{R}{2} + P_7.\frac{S}{4} + 3P_8.\frac{S}{4} - P_9.\frac{R}{2} + P_{10}.\frac{H}{2}$$

$$M_{DO}\,(\text{COLUMN}) = H_{EO}.H$$

$$M_{GO} = P_{10}.\frac{H}{2}$$



CASE 1 UNIT HORIZONTAL LOAD APPLIED AT JOINT 'H'.

SIMILAR TO VERTICAL LOADING.
SEE PAGE 14 FOR FORMULAE

$$\partial_{01} = {}^{H^2}/_{24}\left[H(P_{10}-P_1)-8(M_{B0}+M_{G0})\right] + {}^{LR.H}/_{48}\left[2R(P_2+P_9)+S(P_3+P_8)-10(M_{B0}+M_{G0})\right]$$

$$+ \frac{LR(H+2R)}{48}\left[10(M_{D1}(L)+M_{D1}(R))-5(P_4+P_7)-2R(P_5+P_6)\right]$$

$$\partial_{11} = {}^{2}/_{3}\left(H^3+2H^2.L_R+4H.R.L_R+4R^2.L_R\right)$$

$$X_1 = -\frac{\partial_{01}}{\partial_{11}}$$

FINAL REACTIONS

$$V_A = V_{A0} + X_1 . V_{A1} \qquad H_A = H_{A0} + X_1$$
$$V_E = V_{E0} + X_1 . V_{E1} \qquad H_E = H_{E0}$$
$$V_H = V_{H0} + X_1 . V_{H1} \qquad H_H = X_1$$

HANLEY PEPPER

Consulting Engineers
Civil and Structural

Contract: #75 Cookstown Industrial Estate — Job ref.

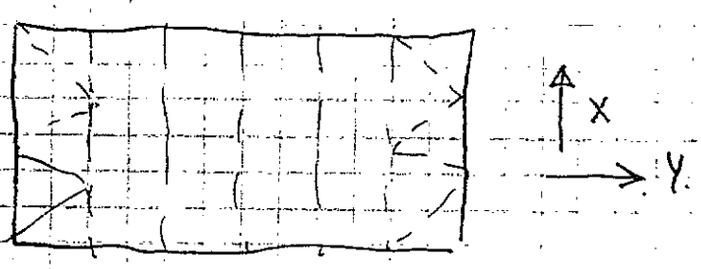
Part of structure: Bye-Law Calculations — Calc. Sheet No.

Drawing ref. — Calculations by: PR — Checked by — Date: July '91

Telephone 832967/8.

Members ref.	CALCULATIONS	OUTPUT

STABILITY



Stability in X direction is provided by portal action of the Precast Concrete frames. Concast Calculations deal with this.

In the Y direction, Bracing in the roof transfers lateral wind load from the Gable Ends to the side walls which act as shear walls.

Maximum force in Bracing members.

= 3.5 x 5.0 x 0.83 = 14.5 kN.

Member size 88.9 ⌀ 4HS.

Using Load Tables.

ⓒ Effective length = 5.0m

Safe load = 29 kN ∴ O.K.

BRACING MEMBERS

88.9⌀ x 3.2t

HANLEY PEPPER
Consulting Engineers
Civil and Structural

Telephone 832967/8.

Contract: #75 Coketown Industrial Estate
Job ref.:
Part of structure: Bye-Law Calculations
Calc. Sheet No.:
Drawing ref.:
Calculations by: PR
Checked by:
Date: July '91

Members ref.	CALCULATIONS	OUTPUT

PURLINS

Span = 4.6 m.

Loading : DL = 0.82 kN/m²

LL = 0.75 kN/m²

1.57 kN/m²

Using 127/157 Multibeams @ 1400 ccs.

⇒ CAPACITY = 1.40 kN/m² excl. Purlins

Actual Load excl Purlins = 1.57 − 0.27

= 1.30 kN/m²

∴ O.K.

Use 127/175 in End Bays.

PURLINS
127/157
@1400 CRS.

Dublin County Council Comhairle Chontae Atha Cliath **Planning Department**

Building Control Department,
Liffey House,
Tara Street,
Dublin 1.
Telephone:773066

Bloc 2, Ionad Bheatha na hEireann,
Block 2, Irish Life Centre,
Sraid na Mainistreach Iacht,
Lower Abbey Street,
Baile Atha Cliath 1.
Dublin 1.
Telephone. (01)724755
Fax. (01)724896

Register Reference : 91A/1113 Date : 4th July 1991

LOCAL GOVERNMENT (PLANNING AND DEVELOPMENT) ACTS, 1963 TO 1990

Dear Sir/Madam,

DEVELOPMENT : Erection of a single storey warehouse building and car parking

LOCATION : 75A Cookstown Industrial Estate, Tallaght

APPLICANT : Petersons Holdings Ltd

APP. TYPE : PERMISSION/BUILDING BYE-LAW APPROVAL

With reference to above, I acknowledge receipt of your application received on 3rd July 1991.

Yours faithfully,

.....

for PRINCIPAL OFFICER

RECEIVED
03JUL1991
REG. SEC.

Hamilton Young & Associates,
12 Terenure Road East,
Rathgar,
Dublin 6.

Hamilton
Young
Associates
Architects

Stuart F. Hamilton, Dip. Arch., Arch. Tech., M.R.I.A.I.
David T. Young, Dip.Arch., M.R.I.A.I.
David Lawlor, Dip.Arch., B.Arch.Sc., M.R.I.A.I.

12 Terenure Road East,
Rathgar, Dublin 6.
Tel: 907577/906637
Fax: 906604
V.A.T. No. 4746674D

Our Ref

Your Ref

91A/1113
1.00
Mrl A.1

Planning Officer,
Dublin County Council,
Irish Life Centre,
Lr. Abbey Street,
Dublin 1.

11th July, 1991.

RE/ Proposed New Warehouse at 75A Cookstown Ind. Estate, Tallaght, Co. Dublin.

Dear Sir,

Further to our recent submission of application for Planning and Bye-Law Approval for the above project, we would note that on the drawings submitted with this application the 'A' of the site number was omitted in error. The title block on the drawings should read 75A Cookstown Industrial Estate.

Yours faithfully,

Gillian Fletcher.
For Hamilton Young & Associates.

11 JUL 91

Dublin County Council
Comhairle Chontae Atha Cliath

Planning Application Form/ Bye - Law Application Form

PLEASE READ INSTRUCTIONS AT BACK BEFORE COMPLETING FORM. ALL QUESTIONS MUST BE ANSWERED.

1. Application for Permission [X] Outline Permission [ ] Approval [ ] Place ✓ in appropriate box.
Approval should be sought only where an outline permission was previously granted. Outline permission may not be sought for the retention of structures or continuances of uses.

2. Postal address of site or building 75A Cookstown Ind. Estate, Tallaght, Dublin 24.
(If none, give description sufficient to identify)

3. Name of applicant (Principal not Agent) Petersons Holdings Ltd.

Address Gardiner Hse., Gracefield Rd., Artane, D.5. Tel. No 312122

4. Name and address of person or firm responsible for preparation of drawings Hamilton Young & Associates, 12 Terenure Rd. East, Rathgar, Dublin 6. Tel. No 907577

5. Name and address to which notifications should be sent Hamilton Young & Associates, 12 Terenure Rd. East, Rathgar, Dublin 6.

6. Brief description of proposed development Single Storey Warehouse Building and Carparking.

7. Method of drainage to Public Sewer 8. Source of Water Supply Public Mains

9. In the case of any building or buildings to be retained on site, please state:-
(a) Present use of each floor or use when last used. None.
(b) Proposed use of each floor N/A

945 3/7
N 44069

10 Does the proposal involve demolition, partial demolition or change of use of any habitable house or part thereof? No

Drink Order 2/7/91

11.(a) Area of Site Circa 1243 sq.m. Sq. m.
(b) Floor area of proposed development Circa 540 sq.m. Sq. m.
(c) Floor area of buildings proposed to be retained within site N/A Sq. m.

1890
N 45118

12.State applicant's legal interest or estate in site (i.e. freehold, leasehold, etc.) Freehold.

13.Are you now applying also for an approval under the Building Bye Laws?
Yes [X] No [ ] Place ✓ in appropriate box.

14.Please state the extent to which the Draft Building Regulations have been taken in account in your proposal:
In so far as is practicable.

15.List of documents enclosed with application 4 copies of Specification, Newspaper Advertisement, Cheque for £2,835 in total. 4 Copies of Drawings No:- A1-1 GF plan, FF plan & Site Plan. A0-1 Drainage Layout. A1-2 Roof Plan & Site Location Map. (21)1 Parapet Wall Detail A1-3 Section A-A, South, East & West Elevations. See letter attached. (21)2 Floor & Foundation Detail.

CO. DUBLIN – Permission is sought from Dublin County Council by Petersons Holdings Ltd. for the erection of a single storey warehouse building and car parking at 75A Cookstown Industrial Estate, Tallaght, Co. Dublin.

Proposed development (See back) 540 Sq. m.

No of dwellings proposed (if any) None Class(es) of Development Class No. 4

Fee Payable £ 2,835.00 Basis of Calculation Development of 540 sq.m.

If a reduced fee is tendered details of previous relevant payment should be given
Planning fee 540 x £1.75 = £945. Bye-Law fee 540 x £3.50 = £1,890.00

Signature of Applicant (or his Agent) [signature] Date 3 July 91

FOR OFFICE USE ONLY

Application Type P/B
Register Reference 91A/1113
Amount Received £
Receipt No
Date 21-8

RECEIVED 03 JUL 1991 2.24.6

LOCAL GOVERNMENT (PLANNING & DEVELOPMENT) REGULATIONS 1977 to 1984.

Outline of requirements for applications for permission or Approval under the Local Government (Planning & Development) Acts 1963 to 1983. The Planning Acts and Regulations made thereunder may be purchased from the Government Publications Sales Office, Sun Alliance House, Molesworth Street, Dublin 2.

1. Name and Address of applicant.

2. Particulars of the interest held in the land or structure, i.e. whether freehold, leasehold, etc.

3. The page of a newspaper, circulating in the area in which the land or structure is situate, containing the required statutory notice. The newspaper advertisement should state after the heading Co. Dublin.

   (a) The address of the structure or the location of the land.
   (b) The nature and extent of the development proposed. If retention of development is involved, the notice should be worded accordingly. Any demolition of habitable accommodation should be indicated.
   (c) The name of the applicant.

   NB. Applications must be received within 2 weeks from date of publication of the notice.

4. Four (4) sets of drawings to a stated scale must be submitted. Each set to include a layout or block plan, proposed and existing services to be shown on this drawing, location map, and drawings of relevant floor plans, elevations, sections, details of type and location of septic tank (if applicable) and such other particulars as are necessary to identify the land and to describe the works or structure to which the application relates (new work to be coloured or otherwise distinguished from any retained structures). Buildings, roads, boundaries and other features bounding the structure or other land to which the application relates shall be shown on site plans or layout plans. The location map should be of scale not less than 1: 2500 and should indicate the north point. The site of the proposed development must be outlined in red. Plans and drawings should indicate the name and address of the person by whom they were prepared. Any adjoining lands in which the applicant has an interest must be outlined in blue.

5. In the case of a proposed change of use of any structure or land, requirements in addition to 1, 2, & 3 are:
   (a) a statement of the existing use and the proposed use, or, where appropriate, the former use and the use proposed.

   (b) (i) Four (4) sets of the drawings to a stated scale must be submitted. Each set to consist of a plan or location map (marked or coloured in red so as to identify the structure or land to which the application relates) to a scale of not less than 1:2500 and to indicate the North point. Any adjoining lands in which the application has an interest must be outlined in blue.

   (ii) A layout and a survey plan of each floor of any structure to which the application relates.

   (c) Plans and drawings should indicate the name and address of the person by whom they were prepared.

6. Applications should be addressed to: Dublin County Council, Planning Department, Irish Life Centre, Lr. Abbey Street, Dublin 1, Tel. 724755.

SEPTIC TANK DRAINAGE: Where drainage by means of a septic tank is proposed, before a planning application is considered, the applicant may be required to arrange for a trial hole to be inspected and declared suitable for the satisfactory percolation of septic tank effluent. The trial hole to be dug seven feet deep at or about the site of the septic tank. Septic tanks are to be in accordence with I.I.R.S. S.R. 6:75.

INDUSTRIAL DEVELOPMENT:
The proposed use of an industrial premises should, where possible, be stated together with the estimated number of employees, (male and female). Details of trade effluents, if any, should be submitted.

Applicants to comply in full with the requirements of the Local Government (Water Pollution) Act,1977 in particular the licencing provisions of Sections 4 and 16.

PLANNING APPLICATIONS

CLASS NO.	DESCRIPTION	FEE
1.	Provision of dwelling — House/Flat.	£32.00 each
2.	Domestic extensions/other improvements.	£16.00
3.	Provision of agricultural buildings (See Regs.)	£40.00 minimum
4.	Other buildings (i.e. offices, commercial, etc.)	£1.75 per sq. metre (Min. £40.00)
5.	Use of land (Mining, deposit or waste)	£25.00 per 0.1 ha (Min £250.00)
6.	Use of land (Camping, parking, storage)	£25.00 per 0.1 ha (Min. £40.00)
7.	Provision of plant/machinery/tank or other structure for storage purposes.	£25.00 per 0.1 ha (Min. £100.00)
8.	Petrol Filling Station.	£100.00
9.	Advertising Structures.	£10.00 per m^2 (min £40.00)
10.	Electricity transmission lines.	£25.00 per 1,000m (Min. £40.00)
11.	Any other development.	£5.00 per 0.1 ha (Min. £40.00)

BUILDING BYE-LAW APPLICATIONS

CLASS NO.	DESCRIPTION	FEE
A	Dwelling (House/Flat)	£55.00 each
B	Domestic Extension (improvement/alteration)	£30.00 each
C	Building — Office/ Commercial Purposes	£3.50 per m^2 (min. £70.00)
D	Agricultural Buildings/Structures	£1.00 per m^2 in excess of 300 sq. metres (min. - £70.00) (Max. - £300.00)
E	Petrol Filling Station	£200.00
F	Development or Proposals not coming within any of the foregoing classes.	£9.00 per 0.1 ha (£70.00 min.) Min. Fee £30.00 Max. Fee £20,000

Cheques etc. should be made payable to: Dublin County Council.

Gross Floor space is to be taken as the total floor space on each floor measured from the inside of the external walls.

For full details of Fees and Exemptions see Local Government (Planning and Development) (Fees) Regulations 1984.

COMHAIRLE CHONTAE ÁTHA CLIATH

RECEIPT CODE

PAID BY — DUBLIN COUNTY COUNCIL
46/49 UPPER O'CONNELL STREET,
DUBLIN 1.

CASH ●
CHEQUE
M.O.
B.L.
I.T.

Issue of this receipt is not an acknowledgement that the fee tendered is the correct application fee.

N 4469

£945.00

Received this 3rd day of July 1991

from Peterson Holdings Ltd.
Gardiner House, Crarefield road, D.5

the sum of nine hundred and forty five Pounds

Pence, being fee for planning application at 75A Cookstown Ind. Estate Class 4

Michael O'Hara Cashier

S. CAREY
Principal Officer

RECEIPT CODE

COMHAIRLE CHONTAE ÁTHA CLIATH

PAID BY — DUBLIN COUNTY COUNCIL

46/49 UPPER O'CONNELL STREET, DUBLIN 1.

CASH
CHEQUE ✓
M.O.
B.L.
I.T.

BYE LAW APPLICATION.

REC. No. N 45118

£1890.00

Received this 3rd day of July 19 91.

from Peterson Holdings ltd

Carding House, Crayfield road, D.5

the sum of one thousand eight hundred and ninety Pounds

Pence, being

application at 75A Coolestown Ind Estate Class

Michael O'Hara Cashier

S. CAREY
Principal Officer

Hamilton
Young
Associates
Architects

Stuart F. Hamilton, Dip. Arch., Arch. Tech., M.R.I.A.I.
David T. Young, Dip.Arch., M.R.I.A.I.
David Lawlor, Dip.Arch., B.Arch.Sc., M.R.I.A.I.

12 Terenure Road East,
Rathgar, Dublin 6.
Tel: 907577/906637
Fax: 906604
V.A.T. No. 4746674D

Our Ref

Your Ref

The Planning Officer,
Dublin County Council,
Irish Life Centre,
Lr. Abbey Street,
Dublin 1.

3rd July, 1991.

RE/ Proposed New Warehouse at 75A Cookstown Ind. Estate, Dublin 24.

Dear Sir,

On behalf of our client Petersons Holdings Ltd., we wish to apply for Planning and Bye-Law Approval for the construction of a new warehouse at Unit 75A Cookstown Ind. Estate.

The site of this development was formerly part of P.E. O'Brien's premises at Unit 75 Cookstown Ind. Estate. P.E. O'Brien have agreed to allow access to this new unit via their forecourt.

Further to our recent meeting with the Planning Officer, Mrs. Boothman, we set out below information requested by her at this meeting:-

1.	Area of original site	3647 sq.m.
	Area of existing building	1400 sq.m.
2.	Area of site of proposed new building	1243 sq.m.
	Area of proposed new building.	540 sq.m.
	This represents 43% site coverage.	
3.	Total floor area of existing unit together with floor area of new development	1940 sq.m.

Under the current planning and development regulations, the requirement for carparking for warehousing is 3 cars per 100 sq.m.

of floor space. Therefore, for this development 16 car spaces are required. 14 car spaces can be accommodated on the site and as our client will have only 3 to 4 employees working in this building we consider that 14 car spaces are more than adequate for this development.

P.E. O'Brien have confirmed that they have 11 members of their staff with cars, adequate parking space will be available for these cars on their site. They also noted that 2 or 3 customers only would visit their premises at any one time.

It has been agreed with P.E. O'Brien that when this proposed development goes ahead the barge trim of their building will be changed to match the new building and the front elevation of both buildings will be painted the same colour.

We will follow the lodgement of these documents with the lodgement of structural calculations and details within the next two weeks.

We enclose herewith four copies of the following documents:-

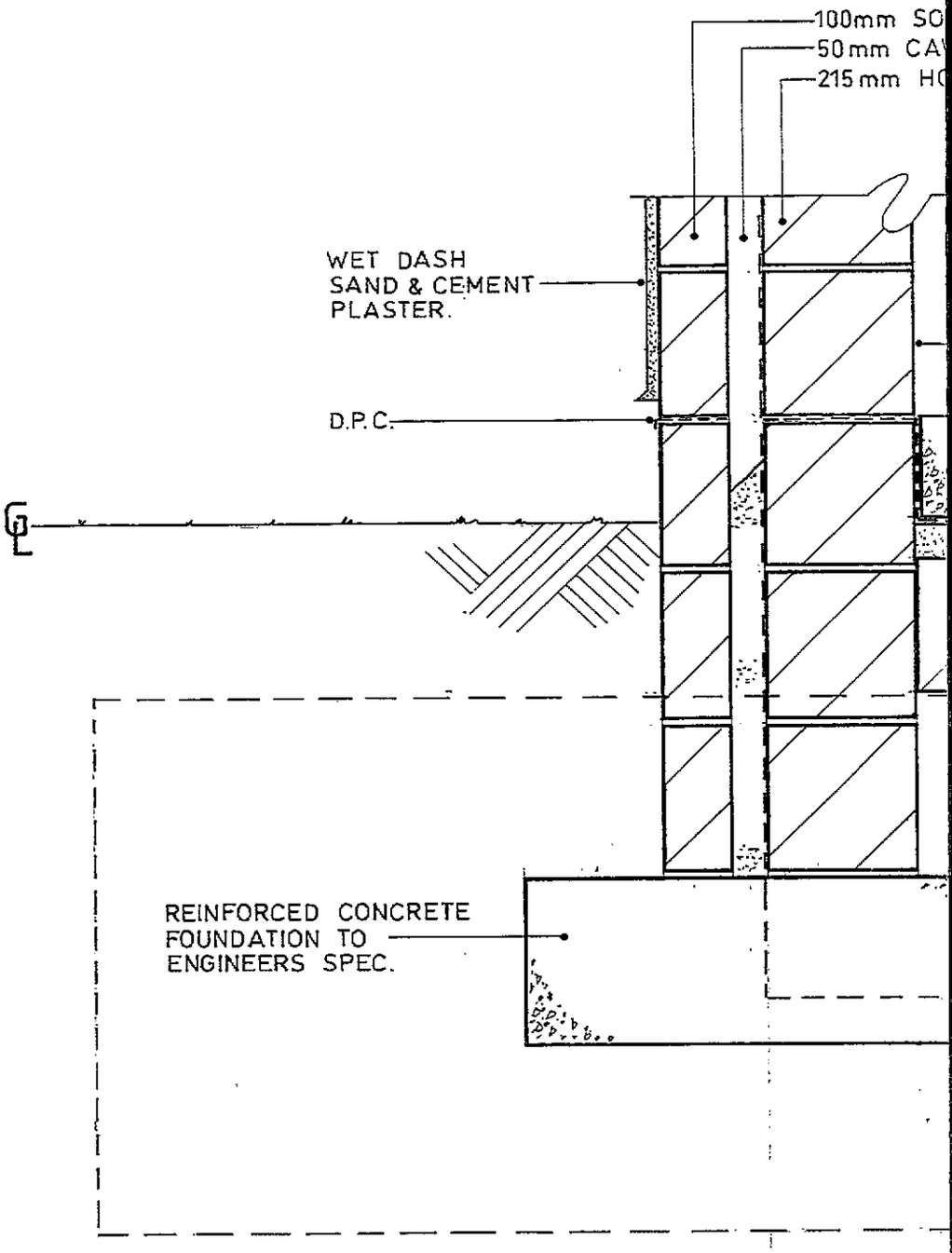
1. 4 no. copies of specification.
2. 4 no. copies of the following Drawings No:-

   A1-1 Ground Floor Plan, First Floor Plan and Site Plan.
   A1-2 Roof Plan and Site Location Map.
   A1-3 Section A-A, South, East, and West Elevations.
   A0-1 Drainage Layout.
   (21)1 Parapet Wall Detail.
   (21)2 Floor and Foundation Detail.

3. Application form duly completed and signed.
4. Cheque in the sum of £945.00 to cover planning fee.
5. Cheque in the sum of £1,890.00 to cover Bye-Law fee.
6. Planning Advertisement in the Irish Independent dated 2nd July, 1991.

Yours faithfully,

Gillian Fletcher.
For Hamilton Young & Associates.



SECTION X-X

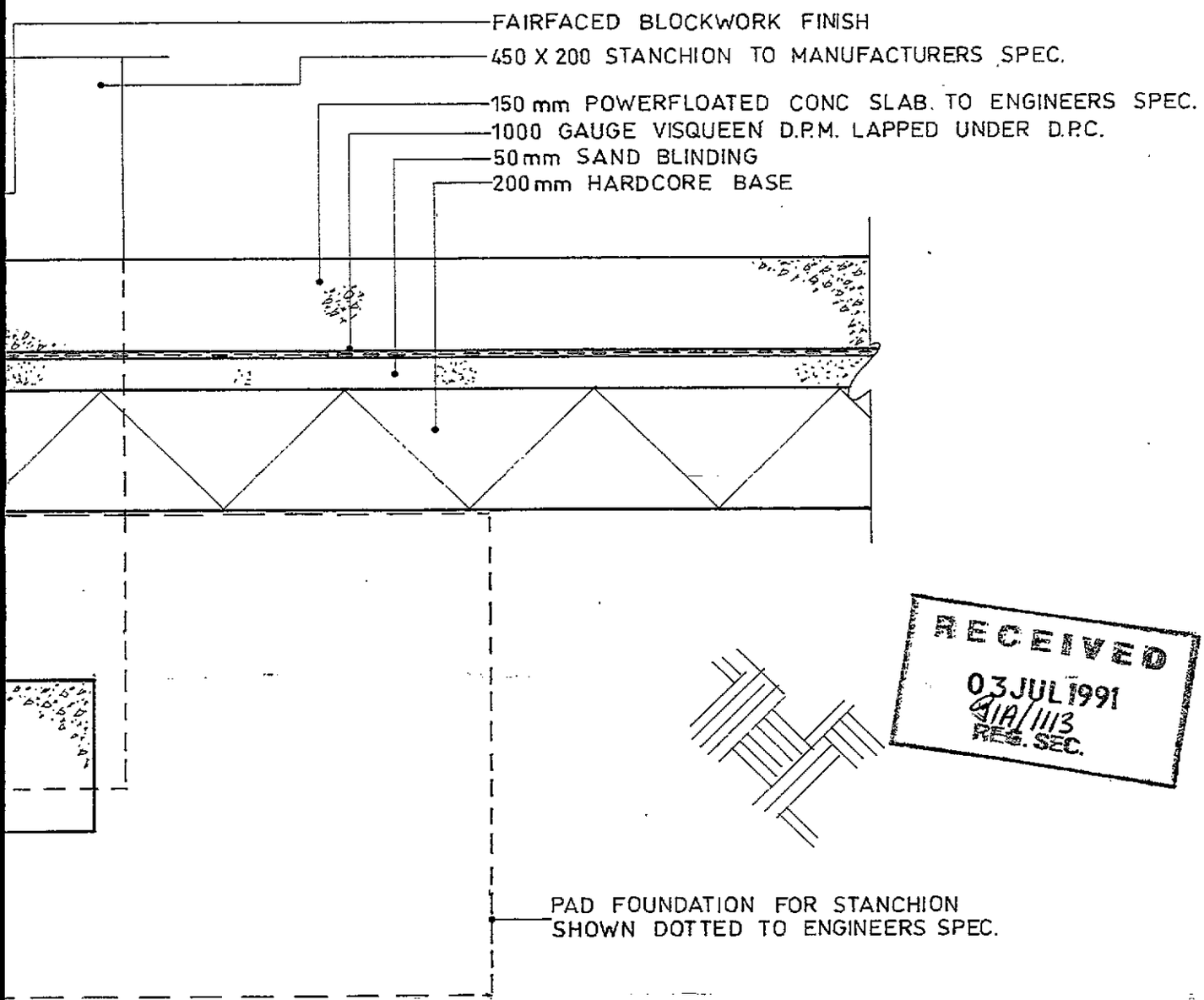
JOB:
PROPOSED EXTENSION TO UNIT NO. 75 A
COOKSTOWN IND. EST. FOR PACE MARKETING.

TITLE:
FLOOR & FOUNDATION DETAIL.

JOB NO:	24·91
SCALES:	1:100
DATE	JUNE '91
DRAWN BY:	P. KENNED

NOTE:
All drawings to be checked on site by the Contractor before any work shall commence
Architects to be informed of any discrepancy immediately
Figured dimensions only are to be taken from this drawing

LID BLOCK WALL
VITY
OLLOW BLOCK WALL



PAD FOUNDATION FOR STANCHION
SHOWN DOTTED TO ENGINEERS SPEC.

Y.

DRAWING NO.

(21) 2

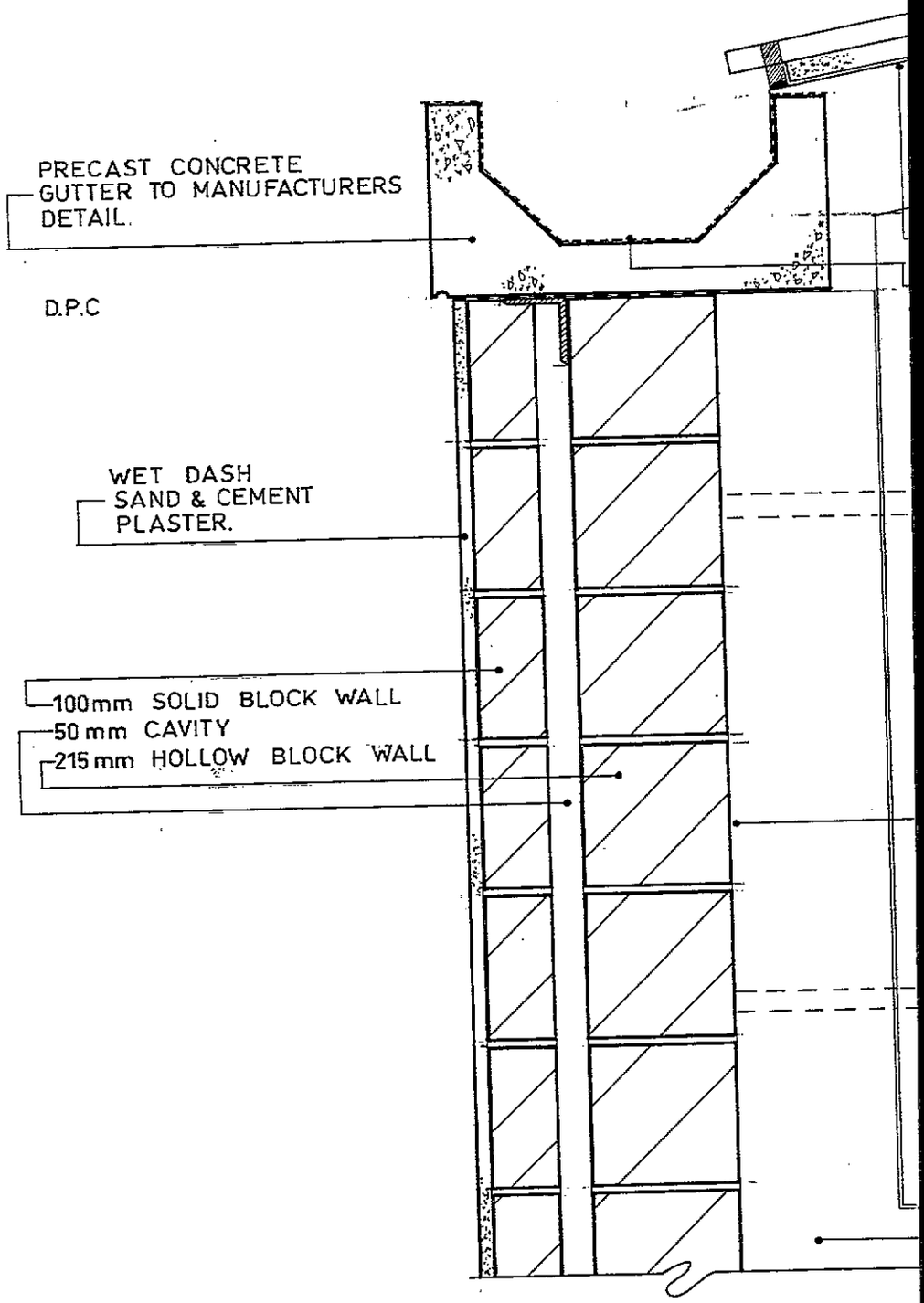
Hamilton
Young
Associates
Architects

12 TERENURE ROAD EAST,
RATHGAR, DUBLIN 6.

Tel. (01) 906637/907577
Fax. (01) 906604

THE ROYAL INSTITUTE
OF THE
ARCHITECTS OF IRELAND

35mm DOUBLE SKIN INSU
P.V.C. COATED METAL DE
ON GALVAISED STEEL PU
TO MANUFACTURERS DET

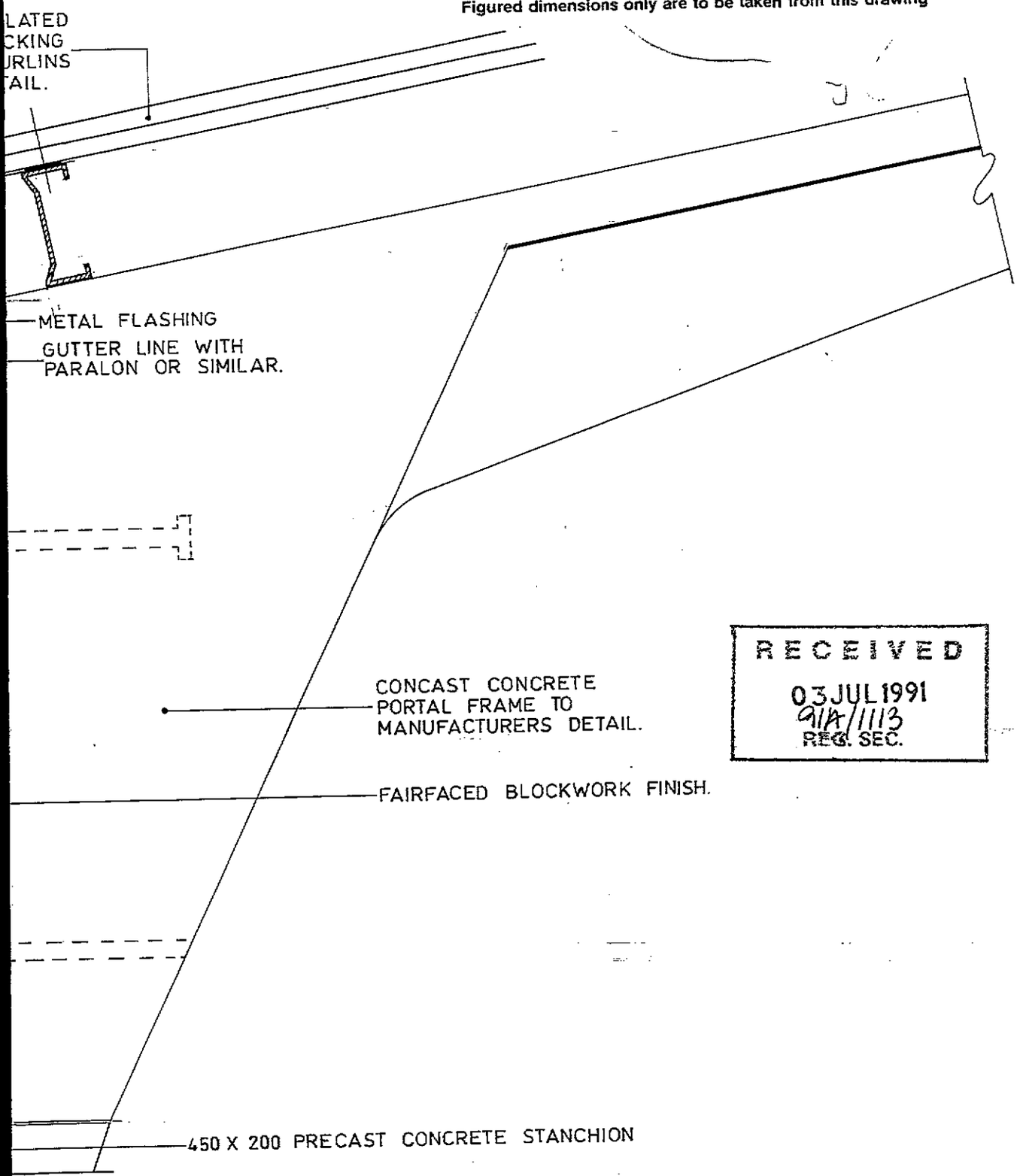


JOB:
PROPOSED EXTENSION TO UNIT NO. 75, A COOKSTOWN IND. EST., FOR PACE MARKETING.

TITLE:
PARAPET WALL DETAIL.

JOB NO:	24 · 91
SCALES:	1:10
DATE	JUNE '91
DRAWN BY:	P. KENNE

NOTE:
All drawings to be checked on site by the Contractor before any work shall commence
Architects to be informed of any discrepancy immediately
Figured dimensions only are to be taken from this drawing



RECEIVED
03 JUL 1991
91A/1113
REG. SEC.

DRAWING NO.

(21) 1

DY

Hamilton
Young
Associates
Architects

12 TERENURE ROAD EAST,
RATHGAR, DUBLIN 6.

Tel. (01) 906637/907577
Fax. (01) 906604

THE ROYAL INSTITUTE
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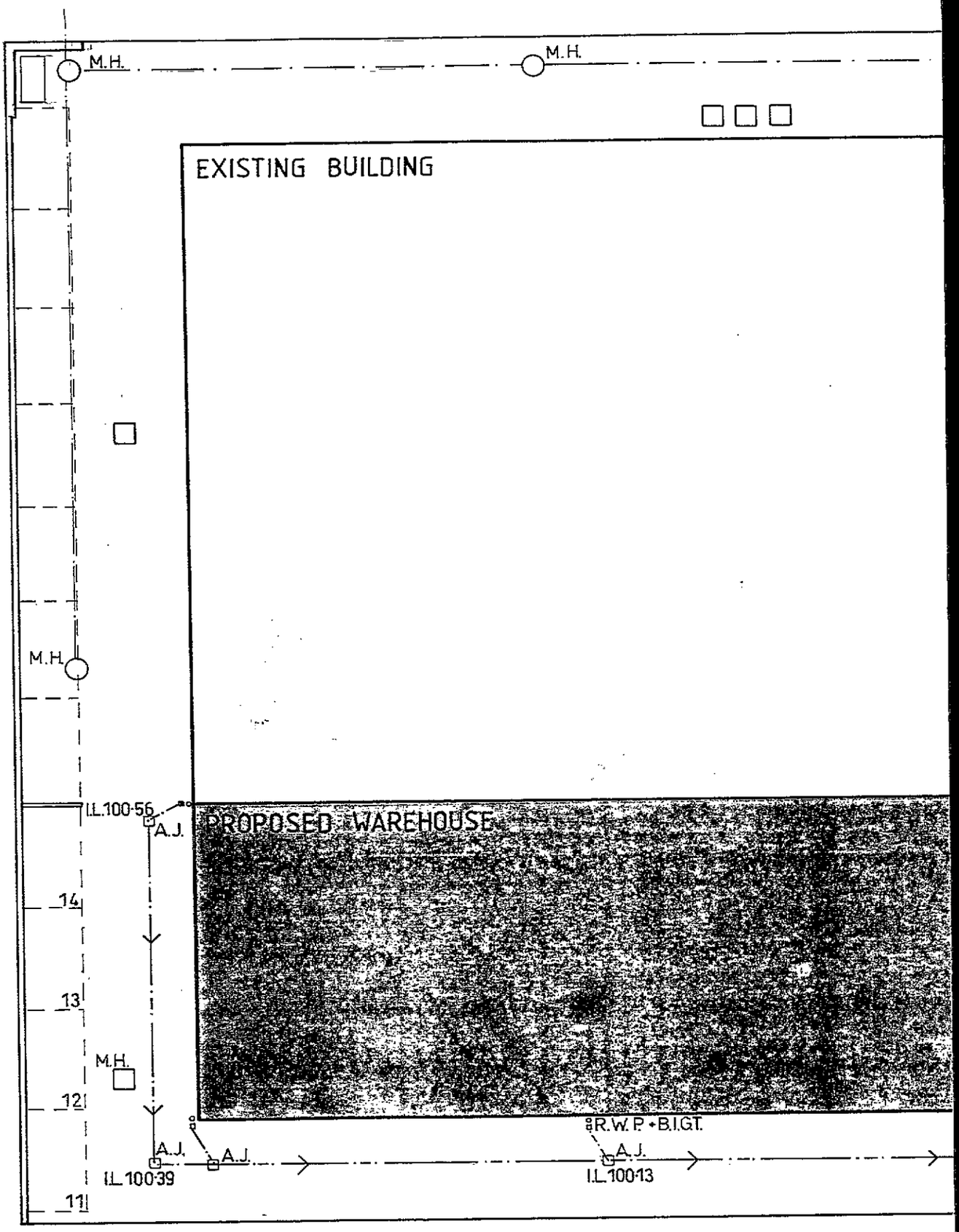
ARCHITECTS OF IRELAND

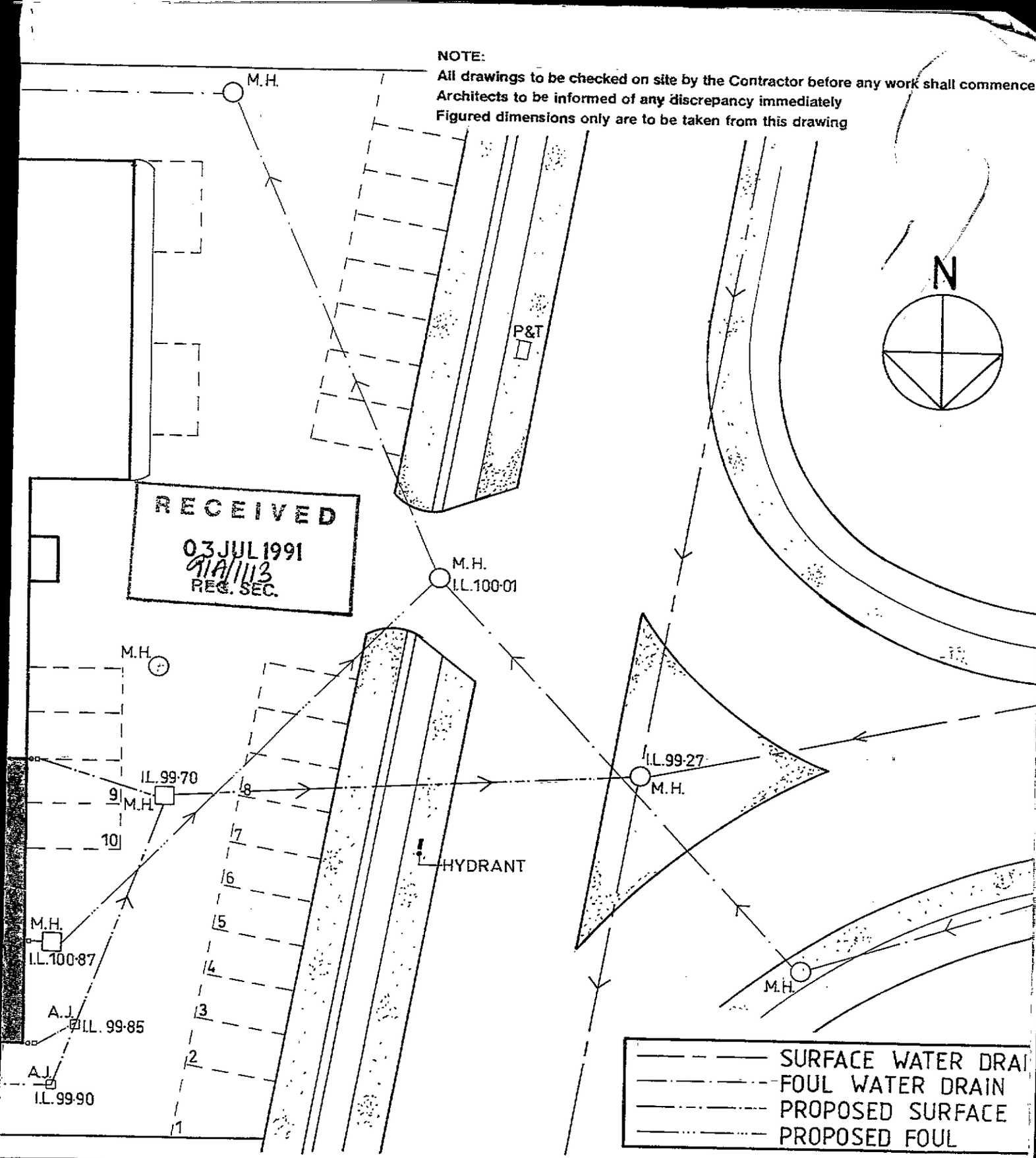


JOB:
PROPOSED EXTENSION TO UNIT NO. 75 A COOKSTOWN IND. EST. FOR PACE MARKETING

TITLE:
DRAINAGE LAYOUT.

JOB NO:	24·91
SCALES:	1:250
DATE	JUNE '91
DRAWN BY:	P. KENNE

NOTE:
All drawings to be checked on site by the Contractor before any work shall commence
Architects to be informed of any discrepancy immediately
Figured dimensions only are to be taken from this drawing



DRAWING NO.

A0-1

Hamilton
Young
Associates
Architects
12 TERENURE ROAD EAST,
RATHGAR, DUBLIN 6.
Tel. (01) 906637/907577
Fax. (01) 906604

THE ROYAL INSTITUTE OF THE ARCHITECTS OF IRELAND

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David Lawlor, Dip.Arch., B.Arch.Sc., M.R.I.A.I.

12 Terenure Road East,
Rathgar, Dublin 6.
Tel: 907577/906637
Fax: 906604
V.A.T. No. 4746674D

Our Ref

Your Ref

Specification of Materials and Standard of Workmanship for New Warehouse and Carparking, at 75A Cookstown Ind. Estate, Tallaght, Co. Dublin, for Petersons Holdings Ltd.

Associate: Anne Lynch, B.Arch., MRIAI.

Sligo Office: 5 Beulah Terrace, Finisklin, Sligo. Tel: 071-61457

INDEX

NOTES ON THE USE OF THIS SPECIFICATION

1) This specification consists of 21 Sections as follows:-

(a) Section 1 : General Conditions and Preliminaries

This section contains an outline description of the works to be carried out and general information relating to the Contract, site and preliminary procedures and other matters not included in the work sections.

(b) Section 2 : General Requirements.

This section contains requirments common to the work sections. It should be read in conjunction with and forms an integral part of each work section.

(c) Section 3 to 21 Inclusive - Work Sections.

The section containing description of works and specification of materials and workmanship arranged in the traditional manner.

---

2) Each section is divided into four sub-sections:

(i) General Requirements:

Sections 1, 2 and other matters relevant to the particular section.

(ii) Materials:

A general specification relating to materials covered by the work section.

(iii) Workmanship:

A general specification relating to workmanship covered by the work section.

(iv) Scope:

Giving the description of the scope and extent of works included in work section for this particular project.

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3) While the SCOPE sub-sections contained in this specification comprise the most immediate and direct route to information required for the Works, it does not relieve the contractor, his Estimators Supervisory Staff or sub-Contractors of the obligation to study the specification in its entirety and everything that is required for the works.

SECTION 1

GENERAL CONDITIONS

AND

PRELIMINARIES

I.0.0 GENERAL CONDITIONS AND PRELIMINARIES

1.1.0 GENERAL REQUIREMENTS

1.1.1 Tender Documents.

a) For the purposes of preparing a tender refer to the Documents, Drawings, Specification and instructions for tendering as scheduled and described within the Form of Tender.

b) Upon receipt of tender documents check that all information necessary for preparing the tender has been provided. Report any missing documents, pages or discrepancies immediately.

c) Do not amend the documents without written authorisation.

1.1.2 Pricing.

Allow for everything indicated by the tender documents and from a careful inspection of the site including any and all foreseeable additional work and risks. Include in the tender price for handing over the works clean, functional and complete, fit for immediate occupation and use as intended.

1.1.3 Form of Contract.

a) The works shall be carried out under the Articles of Agreement and Conditions of Contract as published by the Royal Institute of Architects of Ireland (1988 edition Blue Form for use without a Bill of Quantities).

b) The Contractor shall ensure that all sub-contractors and suppliers, whether nominated or otherwise, and others responsible to the Contractor are fully aware of the conditions of contract and any amendments thereto.

c) Amendments to the above contract are indicated on the schedules attached to the Form of Tender and shall be appended to the Contract prior to execution.

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1.2.9 Lighting, Water, Telephones and Power.

Provide and pay for all temporary services necessary for the proper execution of all the Works. Where such services already exist on site submit final accounts or official meter readings for the dates of commencement and completion.

1.2.10 Temporary Buildings and Compounds.

Provide all temporary or demountable buildings and compounds for offices, security, storage and welfare necessary for the proper execution of the works including adequate sanitary facilities.

1.2.11 Fire Safety.

Ascertain and satisfy the requirements of the Fire Authority in respect of fire fighting equipment means of escape and precautions against fire for the duration of the works.

1.2.12 Temporary Signboards.

Supply and erect a temporary signboard capable of accomodating the Contractors name board and the name panels (500 x 1500 mm) of each of the consultants named under para. 1.1.5.

1.2.13 Handover.

a) Thoroughly clean the Works and site on completion and leave fit for immediate occupation and use. Polish all smooth surfaces as appropriate; vacuum all ducts and behind casings; flush out all drains and leave free of dust, debris and marks or stains.

b) Leave the works secure against unauthorised entry, providing the Employer with all key sets clearly labelled.

c) Provide the Employer with one copy of each manufacturers standard printed operating and maintenance instructions relating to all proprietary goods and systems used in the works.

SECTION 2

GENERAL REQUIREMENTS

2.0.0 GENERAL REQUIREMENTS

2.1.0 SCOPE

The clauses which follow apply to all work sections throughout this specification and shall be read in conjunction with them.

2.1.1 Terms and Definitions.

Terms used throughout this Specification are defined as follows:

a) Architect - an Architect employed by Hamilton Young Associates.

b) Agreement Certificate - a current certificate issued by the British Board of Agreement.

c) Approval/ as directed - approval or directions given by the Architect in writing. Unless otherwise specified in the written approval is limited to the visual appearance of the work and does not relieve the Contractor from compliance with Specification.

d) Attendance - the supervision and co-ordination of all sub contractors to integrate their work with the remainder of the work including the provision of all facilities and assistancy necessary.

e) B.S./I.S. - British or Irish Standards Specifications and Amendments current at the date of issue of the tender documents.

f) C.P. - British Standard Code of Practice and amendments current at the date of issue of the tender documents.

g) Employer - as named at para 1.1.4.

h) Engineer - the Architect unless otherwise named in paragraph 1.1.5

i) Fix Only - the fixing of materials and components obtained from sources as directed including obtaining all information from suppliers, collection, unloading, storing, protection, insurance, dismantling and assembly as necessary.

j) Make good - the repair or reinstatement of any surface material or component to a standard equivalent to new work.

k) Weather - any state of the weather which could damage or otherwise interfere with the execution of the works.

l) Prime Cost Sum - a sum provided for work or services to be executed by a nominated sub-contractor, supplier or other firm excluding Contractors profit, V.A.T. and including Builders Discount.

m) Provisional Sum - a sum provided for the entire cost of anticipated work that cannot be properly drawn or described.

2.1.2 Description of Work.

a) Unless otherwise stated Descriptions of Work shall be deemed to include all matters set forth in Section 1; use of plant, materials and temporary works of every description; all labour in fitting and fixing including cutting and wastage.

b) Unless otherwise stated any dimensions stated in descriptions are in the sequence length X width X height.

2.1.3 Acts Regulations and Other Documents.

Comply with any and all regulations and recommendations made by any authority having jurisdiction over or in connection with the works including, British and Irish Standards, Codes of Practice and printed directions issued by the manufacturers of proprietary materials and components used whether specified or not). Provide any relevant part of the above documents for use on site if necessary for the efficient execution of the work or if so directed.

2.1.4 Setting Out and Tolerances.

Accurately set out the works in accordance with Section 6 of BS5606 Code of Practice for Accuracy in Building. Ensure that all critical co-ordinate points are marked in a manner that cannot be removed or in a manner that makes any subsequent movement immediately apparent.
Work within dimensional limits that are suited to the structural stability and final appearance of the works, tolerances to comply with BS5606.

2.2.0 MATERIALS AND COMPONENTS

Materials and components which are to be selected by the Contractor shall be of the best quality of their respective kinds and shall comply with the relevant C.P., B.S. or I.S. All other materials or components are to be of the make or type specified unless otherwise approved in writing by the Architect.

2.2.1 Delivery, Handling and Storage.

a) Programme deliveries to minimize site handling and storage. Ensure that everything is delivered in manufacturers wrappings and protected against damage at all times.

b) Immediately remove from site any materials that are not in the condition required by this specification.

c) Handle in strict accordance with manufacturers or suppliers recommendations.

d) Store incompatible materials separately.

e) Store all unfixed materials and components neatly and in reverse order of placement; protect at all times any form of damage whatsoever; avoid overloading or otherwise causing damage to the works.

2.2.2 Source of Supply.

Unless otherwise specified use a single source of supply for building materials and components having characteristics that differ according to source or manufacture.

2.2.3 Purpose-made Components.

All components shall be deemed to be purpose made for the works unless otherwise specified as proprietary or standard articles. Protective coatings shall be applied after fabrication. Any subsequent exposure of the protected material shall be made good to the standard of the original coating.

2.2.4 Proprietary Materials, Components and Systems.

Strictly observe all manufacturers instructions. Where such instructions are at variance with this specification refer to the Architect. Ensure that copies of the manufacturers instructions and other information are provided on site while the related work is being executed. Supply copies of instructions to the Architect upon completion.

2.2.5 Samples.

When so directed, supply immediately samples of materials or components, in appropriate packaging, to the Architect for approval.

2.3.0 WORKMANSHIP AND SUPERVISION

Unless otherwise specified the standard of Workmanship described in the relevant C.P. shall be acceptable. In all other cases workmanship shall be of good quality, undertaken with skill and care and equivalent to the standards achieved by the other trades working in accordance with a C.P.

2.3.1 Labour.

All work shall be executed by or under the direct supervision of skilled operatives with suitable training, experience, and competence. Tradesmen or craftsmen shall undertake work requiring special skill. Apprentices or labourers shall not be permitted to work unsupervised. The Contractor shall be responsible for ensuring that his employees and all others engaged on the works conduct themselves at all times in a responsible manner.

2.3.2 Supervision.

The Contractor shall provide competent supervision, during all working hours, by an experienced and capable foreman who is familiar with the codes, standards, drawings, specifications and all other requirements and obligations of the Contract Documents.

2.3.3 Overtime.

Claims for additional costs arising from payments for overtime work shall not be permitted unless due to special circumstances and approved by the Architect prior to carrying out the work.

2.3.4 Care of the Works.

a) Keep the Works and the equipment used, clean at all times. Debris shall be removed promptly from site. Remove immediately any graffiti applied to the Works including hoardings and temporary structures.

b) Do not overload or stress the Works by storage of materials, movement of plant, premature removal of props and shores or in any other way.

c) Protect the works during construction against any form of damage or deterioration, including the provision of coverings, screens, guard rails and temporary heating.

d) Obtain local weather forecasts and take appropriate precautions. The Contractor shall suspend building operations where adverse weather conditions are likely to damage the works and the suspension is directed by the Architect.

e) Take special precautions to avoid the outbreak of fire. Do not permit the accumulation of flammable debris. Do not store flammable liquids or gases other than that quantity required for a single days normal work. Cease any work involving naked flames or sparks at least one hour before work stops. Do not carry out any work involving naked flame or sparking close to an occupied building unless adequately protected to the approval of the building owners.

SECTION 3

DEMOLITION

3.0.0 DEMOLITIONS

3.1.0 GENERAL REQUIREMENTS

3.1.1 Codes of Practice, Rules and Regulations:

Comply with the B.S.C.P. 94: 1971 Demolition.
Notwithstanding the provisions of the CP, ascertain and comply with the requirements of the local authority. Ascertain and comply with the requirements of the utility companies and other statutory bodies with responsiblity for matters affected by the works.

3.1.2 Preliminaries:

Refer to section 1 General Conditions and Preliminaries in this Specification.

3.1.3 General Requirements:

Comply with Section 2 General Requirements which shall be read in conjunction with and form an integral part of this Demolition Specification.

3.1.4 Demolition Contractor:

Ensure that major demolition work is undertaken by specialist contractors who are experienced in working in accordance with the Code of Practice.

3.1.5 Existing Services:

Ascertain the nature and position of all existing services. Advise the appropriate authorities and utility companies of the proposed work before commencing. Protect all common or party services as appropriate. Disconnect, divert, seal off or remove existing services as appropriate. Secure all licences or consents as appropriate. Check for the existence of toxic flammable or other harmful substances prior to commencing work.

Page 3-1

3.1.6 Existing Structures:

Investigate the features and condition of the structure to be removed and all adjoining party structures.

3.2.0 MATERIALS

New materials required for the works shall be as specified hereafter in the appropriate sections of this specification.

3.3.0 WORKMANSHIP

3.3.1 Method:

Do not employ methods of demolition that cause shocks or vibration or which are likely to damage surrounding property, equipment housed therein or buried services. The use of explosives is forbidden. Notify all owners of party structures prior to commencing work.

3.3.2 Precautions and Temporary Supports:

Take all protective precautions referred to in Clause 5 of the CP. Ensure that there is no risk of uncontrollable collapse. Leave partly demolished structures adequately propped and secure. Prevent overloading by debris. Design and provide all necessary shores and temporary supports.

3.3.3 Supervision:

Demolition work to be carried out under the supervision of a responsible person experienced in demolition work who shall ensure that adequate safety precautions are taken at all times.

3.3.4 Safety:

All work shall be performed in such a manner as to ensure the safety of the works and the public. The demolition work is to be carried out in a manner which shall not inconvenience adjoining owners or the public. Provide all scaffolding, hoardings, protective claddings, water sprinklers and dust sheets necessary to contain debris and dust within the site. Do not burn debris on site.

3.3.5 Defects:

Notify the Architect of any apparent structural defect uncovered by the demolition work.

3.3.6 Concrete and Steel:

Reinforced concrete and steel shall be cut into sections prior to removal.

SECTION 4

ALTERATIONS AND REFURBISHMENTS

4.0.0 ALTERATIONS AND REFURBISHMENTS

4.1.0 GENERAL REQUIREMENTS

4.1.1 Preliminaries:

Refer to section 1 General Conditions and Preliminaries in this Specification.

4.1.2 General Requirements:

Comply with section 2 General Requirements which shall be read in conjunction with and forms an integral part of this specification.

4.1.3 Existing Services:

Ascertain the nature and position of all existing services prior to commencing work. Advise the appropriate authorities and utility companies of the proposed work before commencing. Protect all common or party services as appropriate. Disconnect, divert, seal off or remove existing services as appropriate. Secure all licences and consents as appropriate. Check for the existence of toxic flammable or other harmful substances prior to commencing work.

4.1.4 Existing Structures:

Investigate the features and conditions of any structures to be removed and of all adjoining party structures.

4.1.5 Spot Works:

Spot work is alteration or repair work noted on the drawings and in the specification, that should be valued on site and which is intended to allow for all relevant trades. Such work shall be deemed to include the following:

a) All work that can be seen or anticipated at the stated location ('Spot').

b) Ancillary work and Labours normally associated with the type of work involved.

c) The provision of fixing materials of every description.

d) Properly bonding, jointing and making good to surrounding work.

e) Provision for disconnections, reconnections, chasing, opes, etc. associated with services necessary to permit the work to be carried out.

4.2.0 MATERIALS

4.2.1 New Materials:

New materials shall be as specified elsewhere in the appropriate work sections of this specification.

4.2.2 Old Materials:

Refer to para. 4.2.0 Scope for details of old materials to be retained (if any). All other materials shall be removed from the site. Do not permit old materials to accumulate or to become a health or fire hazard. Do not use any old materials, arising from the work, for use as hardcore unless it complies with the requirements of the specifications given in Section 5.

4.3.0 WORKMANSHIP

4.3.1 Terms:

Terms, where used in this specification or on the drawings, are defined as follows:

a) Remove: Take down, dismantle or otherwise unfix materials or work by whatever means the Contractor considers appropriate and remove from site.

b) Carefully Remove: As for (a), handling the component with care, protecting from damage with the intention of preserving for re-use. It is assumed that the Contractor considers that he is able to unfix and handle without damage unless a statement to the contrary is appended to the tender.

c) Set aside for re-use: Clean, repair, restore to serviceable condition, piece in where ironmongery is removed, and store safely.

d) Hand to Employer: Deliver to the Employer as specified (under para. 4.2.0 Scope).

e) Form new opening (ope): The removal of existing built materials, forming of jambs, fixing only of new lintels, formation of new cills or thresholds.

f) Block opening: Cut away finishings to expose sound structures, cut and bond or otherwise make secure connections with the materials specified and wedge up at top.

g) Reduce opening: As last including forming the new jambs.

h) Extend finishings: Extend the existing wall, floor or ceiling finishes over the areas required to be made good including extending plaster, tiling, skirtings, cornices, picture rails, claddings or panelling as appropriate. Allow for cutting back and neatly joining new work with all disturbed old work.

i) Remove wall or partition: as for (a) above and including the removal of doors, frames, rails, skirtings, services and other components which are associated with the walls concerned.

k) Remove sanitary fitting: Remove the type of snaitary fitting stated and associated pipework including either the cutting back and sealing of disused pipes in an

approved manner or providing temporary cappings, suitably identified, where pipes are intended for re-connection.

l) Overhaul: Clean, repair and restore the component to serviceable condition including the replacement of defective parts such as sash chords, hinges, cracked glass, etc.

m) Make good: The removal of defective, damaged or incomplete materials and reinstatement including cutting back and neatly joining old surrounding work with matching new work.

4.3.2 Protection:

Provide general protection as specified in Section 2. Maintain protection against weather and for security. Provide all temporary screens, dust sheets, hoardings, corridors or other protection necessary to facilitate the works.

SECTION 5

EXCAVATION AND EARTHWORKS

5.0.0 EXCAVATION AND EARTHWORKS

5.1.0 GENERAL REQUIREMENTS

5.1.1 Codes of Practice Rules and Regulations.

Comply fully with B.S. 6031 Earthworks and CP 2004 Foundations subject to any qualification given below. Comply with the requirements of the Local Authority.

5.1.2 Preliminaries.

Refer to Section 1 General Conditions and Preliminaries in this Specification.

5.1.3 General Requirements.

Comply with Section 2 General Requirements which shall be read in conjunction with (and forms an integral part of this) Excavation and Earthworks Specification.

5.2.0 PRELIMINARY PROCEDURES

5.2.1 Nature of Ground.

The Contractor shall satisfy himself as to the nature of the ground conditions, water table and any other factors affecting the work prior to commencing operations.

5.2.2 Levels.

Report the existence of any bench marks and protect from movement. Set up and maintain an accurate site datum level based on an established bench mark. Carry out and record a site level grid. Check all existing and proposed levels shown on the drawings prior to excavation.

5.2.3 Site Clearance.

Before commencing excavations clear the site of all debris,

surplus soil, old building materials, general vegetation, tree roots and other materials not required for the works and not scheduled for salvage or re-use. Remove all such materials to a tip authorised by the Local Authority and pay all charges.

5.2.4 Existing Services.

In addition to any services which are identified under Clause 5.2.5 the Contractor shall make enquiries with the Local Authority, Utility Companies and Statutory Bodies to ascertain the nature and location of live services on the site prior to excavation.

5.3.0 MATERIALS

5.3.1 Earth Filling.

Filling materials shall be cohesive soil or well graded granular material capable of being compacted to the bearing capacity appropriate to it's position and placed free from top soil, roots, vegetable matter, combustible or perishable materials and materials incapable of being satisfactorily compacted. Frozen soil or soil with a high moisture content shall not be used.

5.3.2 Hardcore.

Hard, impermeable, incombustible, imperishable, chemically inert material broken to pass a 100mm dia ring in all directions. It shall be free of fines, water soluble sulphates and timber particles.

5.3.3 Top Soil.
Use clean friable soil to BS 3882 with adequate humus content.

5.3.4 Turf.
Where required turf shall be 20 mm thick and weed free to BS 3969 laid immediately after cutting.

5.3.5 Materials on Site.

Sand, gravel or other materials found on site shall not be removed except insofar as it is necessary to avoid hindering the works.

5.4.0 WORKMANSHIP

5.4.1 Reduce Levels.

Reduce levels down to the specified formation levels and remove soil.

5.4.2 Excavation.

a) Excavate beds and foundations to the minimum required depths and profiles.

b) Report immediately whether firm bearing is encountered before or at the required minimum depth.

c) Identify, probe and report to the Architect all soft spots, voids and obstructions.

d) Report existing or disused services to the appropriate authority and protect pending instructions. Plug all disused pipes in the sides of foundations with insitu concrete rammed to refusal.

e) Obtain approval for excavations prior to placing foundations. Remove the final 75 mm of soil and level and compact immediately prior to placing concrete.

f) Record and agree any levels that differ from those specified.

g) Excavations in excess of that required for the works shall be reinstated with lean-mix concrete or as directed.

5.4.3 Formation of Trenches.

Trenches shall be of the correct foundation width, formed with clean sides, adequately planked and strutted as appropriate to their depth and shape. Trench depths are measured from the levels set after reducing site levels.

5.4.4 Surface and Ground Water.

Keep the site and excavations free form water arising from any cause. Protect against flood. Do not discharge water into any drain or watercourse without the approval of the relevant authority or owner. Provide crowns, ditches, sumps and other facilities necessary to control surface and ground water.

5.4.5 Safety in Excavated Areas.

The Contractor is responsible for taking all precautions necessary to protect his operatives, visitors to the works, the public and the rights of adjoining owners against the risk of injury or damage arising from the excavations. The excavations shall be adequately secured and protected at all times.

5.4.6 Rock.

Natural stone formation which can only be removed by recognised quarrying methods such as blasting, pnuematic air plant, or barring and wedging is defined as rock excavation material. Solid boulders exceeding one cubic metre in volume shall be deemed to be rock. The Contractor shall not carry out blasting or other excavation of rock without prior approval.

5.4.7 Backfilling.

Backfilling around foundations and walls shall be made with selected excavated material or hardcore laid in layers not exceeding 225mm thick and compacted to 95% relative compaction as defined in test method 13 of BS 1377.

5.4.8 Pumping.

The use of pumps to keep excavations free from spring or running water, or to drain foundations below normal ground water level shall be permitted subject to written approval of the Architect and subject to the provision of Clause D19 of the SMM. The use of pumps shall be permitted only in these circumstances and where, in the opinion of the Architect, the Contractor could not reasonably have foreseen or made provision against the requirement.

SECTION 6

CONCRETE WORK

6.0.0 CONCRETE WORK

6.1.0 GENERAL REQUIREMENTS

6.1.1 Code of Practice Rules and Regulations:

Comply with the following Codes of Practice, Irish and British Standards; and the latest revisions or editions of the publications whether or not they are listed below:

I.S. (1)	1963	(Rev. 1971) Portland Cement.
I.S. (5)	1974	Aggregates for Concrete.
I.S. (194)	1980	Methods of Production and Supply of Ready-Mixed Concrete.
I.S. (214P)	1980	Precast Prestressed Concrete Units for use in Composite Lintels - Dimensions.
I.S. (215P)	1980	Precast Reinforced Concrete Lintels - Dimensions.
I.S. (216P)	1980	Precast Concrete Window Cills -Dimensions.
I.S. (217P)	1981	Modular Precast Paving Slabs - Dimensions.
I.S. (240)	1980	Precast Prestressed Concrete Units for use in Composite Lintels (Rev. 1983).
I.S. (225)	1983	Precast Reinforced Concrete Lintels.
C.P. 110		The Structural Use of Concrete (B.S. 8110)
B.S. 5328		Methods of Specifying Concrete.
B.S. 1014	1961	Pigments for cement, magnesium oxychloride and concrete.
B.S. 1201	1973	Aggregates for granolithic concrete floor finishes.
B.S. 1881	1970	Part 1. Methods of testing concrete: Methods of sampling fresh concrete.
B.S. 1881	1970	Part 2. Methods of testing concrete: Methods of testing fresh concrete.

B.S.	1881	1970	Part 3. Methods of testing concrete: Methods of making and curing test specimens.
B.S.	1881	1970	Part 4. Plus amendment AMD 782. Methods of testing concrete: Methods of testing concrete for strength.
B.S.	2499	1973	Hot applied joint sealants for concrete pavements.
B.S.	4027	1972	Part 2. Sulphate-resisting Portland Cement.
B.S.	4254	1967	Two-part polysulphide-based sealants for the building industry.
B.S.	4449	1969	Hot rolled steel bars for the reinforcement of concrete.
B.S.	4461	1969	Plus amendment AMD 442. Cold worked steel bars for the reinforcement of concrete.
B.S.	4466	1969	Plus amendments AMD 440, AMD 805. Bending dimensions and scheduling of bars for the reinforcement of concrete.
B.S.	4482	1969	Plus amendment AMD 475. Hard drawn mild steel wire for the reinforcement of concrete.
B.S.	4483	1969	Steel fabric for the reinforcement of concrete.
B.S.	5135	1974	Metal-arc welding of carbon and carbon manganese steels.
B.S.	5215	1975	One part gun grade polysulphide-based sealants.
B.S.	5337	1976	The structural use of concrete for retaining aqueous liquids.
C.P.	110	1972	Part 1. The structural use of concrete: plus amendment AMD 1553.

6.1.2 Preliminaries:

Refer to Section 1 General Conditions and Preliminaries in this Specification.

6.1.3 General Requirements:

Comply with section 2 General Requirements which shall be read in conjunction with (and forms an integral part of) the Concrete Work Specification.

6.1.4 Grades of Concrete:

Prescribed mixes, whose proportions shall be calculated by the Contractor, shall be used for each grade of concrete listed in table 6.1.4.A. below. The mix reference indicates the characteristic 28 day compression strength defined in BS 5328. Retain records of batch weights and strengths for inspection and checking.

Table 6.1.4.A Concrete Mixes

Mix Ref.	Grade	Cement Kg	Aggregate Coarse	Fine
7N/20mm	C7P	50	270	190
10N/20mm	C10P	50	240	155
15N/20mm	C15P	50	215	135
20N/20mm	C20P	50	190	115
25N/20mm	C25P	50	170	90
30N/20mm	C30P	50	155	80

*Slump range for grades shown 25-75 mm.

*The Contractor shall be responsible for selecting the appropriate grade of concrete except where specified on the drawings or elsewhere in this specification. In all cases the grade shall not be less than the minimum shown for the general applications as follows:

a) Blinding, kerb bedding, under suspended floors. 7N/20mm

b) As last but on poor or wet ground. 10N/20mm

c) General Mass Concrete. 15N/20mm

d) Unreinforced concrete not exposed to weather. Ground Floors. 20N/20mm

e) Normal reinforced concrete, concrete to exclude water or subject to abrasion. 25N/20mm

f) R.C. work exposed to weather. 30N/20mm

6.1.5 Samples and Testing:

Where required under Section 6.2.0 provide for sampling and testing as follows and in accordance with B.S. 1881.

a) Aggregates - take two (2 no.) samples per $100m^3$ of aggregates delivered to the works and carry out the tests in accordance with I.S. 5.

b) Concrete Workability - one (1 no.) specimen from each sample of fresh concrete.

c) Air Entrained Content Test - two (2 no.) specimens from each sample of fresh concrete.

d) Crushing Strength Test - two (2 no.) moulded concrete specimens from each sample tested for determination of crushing strength at 7 and 28 days.

6.2.0 MATERIALS

6.2.1 Minimum Standards.

All materials shall comply with the relevant British or Irish Standards as appropriate and to the latest published amendments made to the standards at the time of installation. The standards shall apply whether or not they are listed in the Schedule given under para. 6.1.1.

6.2.2 Cements, Aggregates and Water.

Use materials as specified in BS 5328. Unless otherwise stated cement is to be Ordinary Portland Cement. Do not use High Alumina or masonry cement, shrinkable aggregates, marine aggregates, aggregates containing impurities or water containing impurities capable of adversely affecting the properties of the concrete.

6.2.3 Reinforcement.

a) Hot rolled mild steel bars complying with BS 4449.
b) Hot rolled high yield deformed bars complying with BS 4449.
c) Cold worked steel deformed bars complying with BS 4461.
d) Steel fabric to BS 4483.

6.2.4 Admixtures.

Do not use calcium chloride accelerators.
Do not use admixture or additives without approval.

6.2.5 Waterproof Membranes.

Building paper shall conform to BS 1521 polythene sheet shall be "Visqueen 1000" gauge or approved equivalent.

6.2.6 Storing and Handling of Materials.

a) Cement shall be kept dry. Do not store on site for more than 4 weeks. Mark batches and use in rotation of delivery. Store individual batches separately, raised off floor level, in a well ventilated weatherproof building.

b) Aggregates shall be stored on a hard, clean free draining base with stout dividing walls between aggregate types and sizes.

c) Reinforcement shall be stored raised off ground level and in separate racks according to type and size.

d) Precast concrete units shall be stored raised above ground level on supports located on their designed bearing surface in the position they will adopt when built in. Stack units separately.

6.2.7 Precast Concrete.

Precast concrete elements shall be cast in accurately constructed wrought and oiled moulds, fairfaced on all surfaces intended to be left exposed.

6.3.0 WORKMANSHIP.

6.3.1 Formwork.

a) In addition to designing the formwork for the concrete structures, ascertain the requirements for service routes and items to be cast in, so that all openings and formations required by other trades may be incorporated.

b) Formwork shall be so designed and constructed that it will be grout tight and appropriate to the methods of placing and compacting. It shall contain the concrete without distortion and be capable of providing concrete tolerance of + or - 3mm unless otherwise specified.

c) Unless otherwise specified, upward camber the soffit of beams and slabs of over 6 metre clear spans by 1/500 of the clear span.

d) Provide adequate props carried down to firm bearing without overloading any of the structures. Construct props that will facilitate the smooth lowering of the formwork. Re-propping shall not be permitted.

6.3.2 Reinforcement.

a) Reinforcement shall be in full unjointed lengths and free of any contamination, loose rust, scale, oil, grease or any coating that would impair the bond.

b) Bend the steel cold, but not below $5^{\circ}C$. Bend in accordance with B.S. 4466. Do not rebend any steel.

c) Cut by shearing or sawing. Flame cutting is not permitted.

d) Unless otherwise specified place all reinforcement in a manner to ensure a minimum of 50mm concrete cover.

e) Spacers shall be mortar or plastic of an approved design. Any tying wire shall be stainless steel and, without exception, this shall be the only permanent metal fixing device within the cover.

6.3.3 Concrete.

a) Ready-mix concrete shall be obtained from a single source of supply. Ensure that the concrete complies with this specification and B.S. 5328. Retain all delivery dockets for inspection. Agree the works and depot testing procedures with the Supplier.

b) Batch and mix all concrete stronger than $15N/mm^2$ by weight. Measure water by volume or weight. Comply with Clause 13.2 of B.S. 5328.

c) Transport concrete from the mixer as quickly as practicable and deposit as near as possible to it's final position. Mixers, chutes, tools and means of transport shall be kept free of all extraneous materials and hardened concrete.

d) Compact by mechanical vibrator within 30 minutes of ceasing mixing, until it forms a solid mass free from voids and is thoroughly worked around all corners and cast in elements.

e) Place and compact without disturbance to reinforcement, formwork, cast-in elements, sheet membranes or the unsupported sides of excavations.

f) All surfaces of structural concrete shall be protected from loss of moisture for a curing period of 4 days. Select a type and method of curing that will ensure the concrete attains a satisfactory durability and strength with a minimum of distortion, shrinkage cracking and efflorescence.

g) Before formwork is removed ensure that the concrete has attained sufficient strength for striking to proceed. The Contractor shall keep records of surface temperatures of poured concrete. The time before removal of formwork to structural members shall not be less than the times listed in Table 6.3.3.A below. The safe removal of any part of the formwork or props shall be the sole responsibility of the contractor.

TABLE 6.3.3.A MIN. STRIKING TIMES

Type of Formwork	Cement Type			
	Normal Portland Cement		Rapid Hardening Portland Cement	
	Mean Air Shade Temperature		Mean Air Shade Temperature	
	7°C	16°C	7°C	16°C
Vertical facing to columns, walls and beams.	12 hrs	12 hrs	12 hrs	12 hrs
Soffit facing to slabs.	5 days	3 days	4 days	2 days
Supports to slabs	12 days	10 days	10 days	8 days
Soffit facing to beams.	5 days	3 days	4 days	2 days
Support to beams	18 days	15 days	15 days	12 days

* Note: Structural props to remain in position for a minimum of 3 days.

6.3.4 Construction Joints.

Construction joints shall be as few as possible consistent with precautions against shrinkage faults. They shall be located at right angles to the general direction of a member and to coincide with any features in the work. Form vertical joints with clean flat stop boards, split and notched where appropriate to any reinforcement. Before recommencing

casting remove laitence, expose aggregate and clean and roughen the surface of the joint.

6.3.5 Weather Precautions.

Take precautions to prevent damage due to weather of any description as stated in Section 2.

6.4.0 COMPLETION.

6.4.1 Cutting.

Excluding unavoidable minor cutting do not cut hardened concrete without approval.

6.4.2 Making Good.

Make good minor defects and formwork tie holes with cement mortar (1:3) mixed fairly dry and well rammed. Remove any ribs and projections.

6.4.3 Sealants.

Apply correct primer to joint and insert sealant to the full width of the joint finished neatly and smoothly.

6.4.4 Falls.

Form falls, currents, cambers and slopes where required. Ensure that the surface is free from hollows and that water drains naturally towards outlets or run off points.

SECTION 7

BRICKWORK AND BLOCKWORK

7.0.0 BRICKWORK & BLOCKWORK

7.1.0 GENERAL REQUIREMENTS

7.1.1 Codes of Practice, Rules and Regulations:

I.S. 1 - Cement.
I.S. 5 - Sand.
I.S. 8 - Lime.
I.S. 20 - Solid concrete blocks.
I.S. 91 - Clay bricks.
I.S. 157 - D.P.C. materials.
I.S. 189 - Concrete bricks.
I.S. 190 - Calcium Silicate Bricks.

B.S. 12/B.S. 146- Portland Cement.
B.S. 187 - Class 3 Calcium Silicate bricks.
B.S. 273 - Perforated clay bricks.
B.S. 449 - Precast concrete lintels.
B.S. 743 - D.P.C. materials.
B.S. 890 - Hydrated lime powder.
B.S. 1014 - Pigments.
B.S. 1180 - Concrete bricks - Class B.
B.S. 1181 - Clay flue liners.
B.S. 1200 - Sand.
B.S. 1243 - Wall Ties.
B.S. 1758 - Refactory bricks.
B.S. 2028 - Class C Breeze Blocks.
B.S. 3291 - Part 2 - Common bricks.
B.S. 4027 - Sulphate resisting cement.
B.S. 4721 - Ready mix mortars.
B.S. 4729 - Brick standard/special shapes.
B.S. 4887 - Plasticisers.
B.S. 5224 - Masonry cement.
B.S. 5977 - Part 1 - prestressed r.c. lintels and steel lintels.
B.S. 6073 - Dense/Lightweight concrete blocks.
C.P. 101.
C.P. 111 - 1964.
C.P. 121 - Part 1 - Brick and Block Masonry.

7.1.2 Preliminaries.
Refer to Section 1 General Conditions and Preliminaries in this Specification.

7.1.3 General Requirements.
Comply with Section 2 General Requirements which shall be read in conjunction with (and forms an integral part of) the Brickwork and Blockwork Specification.

7.2.0 MATERIALS

7.2.1 Minimum Standards.

All materials shall comply with the relevant British or Irish Standards as appropriate and the latest published amendments made to the standards at the time of installation. The standards shall apply whether or not they listed in the Schedule under para. 7.1.1.

7.2.2 Bricks and Blocks.

Comply with the standards referred to in this Specification.

7.2.3 Mortars.

Comply with the standards referred to in this specification. Do not use calcium chloride additives. Do not use admixtures or additives without approval.

7.2.4 Wall Ties.
Wall ties shall be stainless steel of the type specified to B.S. 1243.

7.2.5 Samples.

At the commencement of work on site provide samples of all bricks and blocks to be used and keep samples on site for reference purposes.

7.2.6 Storage and Handling.

Store all materials as specified under Section 9. Stack bricks and blocks neatly on a dry level surface raised above ground and protected from rain, soil, or other contaminating materials.

7.3.0 WORKMANSHIP

7.3.1 Setting Out.

Comply with Section 2 of this specification. Provide and maintain securely, all pegs, rods, templates, and level marks necessary for the accurate setting out of the walls. Check all dimensions and ensure that broken or irregular bond is kept to a minimum.

7.3.2 Mortar Mixes.

a) Use mortars that comply with Table 7.3.2.A. Use a single mortar type for each type of work. Adjust proportions to suit the sand and weather conditions. Mixes are designated in nominal volume proportions of cement or lime to dry sand. For sulphate resisting mixes, substitute sulphate resisting cement for ordinary cement.

Table 7.3.2.A. Proportions of Mortar Mixes.

Type	General Brickwork	Block-work	Below Ground/ exposed conditions
Cement:lime:sand	1:1:5-6	1:2:8-9	1:¼:3
Masonry cement:sand	1:4-5	1:6	-
Cement:sand:plast-iciser.	1:5-6	1:7-8	-

b) Ready mixed building mortars shall only be used where they comply with B.S. 4721 and a dated certificate to this effect can be provided by the suppliers.

c) Prepacked mortars may be used in small isolated portions of the work, subject to compliance with the Specification and B.S. 5838 Part 2.

d) Keep mixing, handling equipment, and bases clean. Do not permit traces of different mortar types to mix. Do not remix mortars.

e) Mix mortars only in quantities sufficient for immediate use. Use within two hours of addition of cement to the mix. Do not temper or use mortar beyond these time limits.

7.3.4 Laying.

a) Lay bricks and blocks in true and regular courses on a full, fairly smooth and levelled bed of mortar and fill all joints, frogs and other recesses solid (except hollow blocks and cellular bricks). Press joints back with the trowel and strike off. Keep faces of work free of mortar.

b) Keep joints to a consistent average thickness of 10mm. Subject to approval, the specified joint thickness may be modified to suit adjacent work. Check overall panel size to establish the correct joint thickness before commencing work.

c) Keep perpends and quoins plumb, the perpends in line with and of the same thickness as the horizontal joints.

d) Carry up work evenly, raising the skins of cavity walls together. All variations in level to be evenly stepped. Coursing heights of skins at wall ties to be equal and level.

e) Keep cavities clean and free of all mortar droppings or other debris. Preserve cavity insulation, wall ties and stepped d.p.c.'s free from damage.

f) Ensure that cavity insulation fits tightly against the inner skin of cavity walls and covers every part of it.

g) The bottom of cavities in cavity walls shall be in a minimum of 150mm below the lowest damp proof course at any point.

h) Leave open perpends as weep holes at approximately 800mm centres at the base of cavities and where cavities are bridged.

i) Cavity wall ties shall be stainless steel, bedded 50mm onto each skin, laid evenly spaced in staggered configuration at 450 centres vertically and horizontally. Provide additional ties within 225mm of the sides of vertical openings at maximum 300mm vertical centres.

j) Mix bricks from batches in accordance with manufacturers recommendations.

7.3.5 Ancillary Work.

a) Do not cut or chase masonry until mortar has hardened. Do not chase walls less than 75mm thick. Do not chase deeper than one sixth wall thickness when horizontal or one third when vertical.

b) Build in lintels with a minimum 100mm bearing (150 for steel or boot lintels). Prop heavy and all prestressed lintels until mortar has set.

c) Construct small ducts, drains, etc., through external walls with a slight fall to the outer face.

d) Totally embed metal reinforcements in mortar joints and keep back 10mm from inner face and 20mm from outer face.

e) Lay damp proof courses a minimum of 150mm above ground level and lapped to form a watertight joint with adjacent damp proof membranes. Provide d.p.c. to the heads, cills, thresholds and vertical jambs of all openings. Seal laps over openings in cavity walls and extend 150mm beyond lintels. Provide stepped d.p.c.'s over at heads of openings and over each location where the cavity is bridged by meter boxes, pipes, etc.

7.3.6 Weather.

Take precautions to prevent damage due to weather of any description as stated in Section 2. Take particular precautions in respecct of cold or freezing conditions.

SECTION 9

MEMBRANES AND INSULATION

Not Applicable

SECTION 10

ROOFING AND CLADDING

10.0.0 ROOFWORK AND CLADDING

10.1.0 GENERAL REQUIREMENTS

10.1.1 Preliminaries:

Refer to Section 1 General Conditions and Preliminaries of this Specification.

10.1.2 General Requirements.

Comply with section 2 General Requirements which shall be read in conjunction with (and forms an integral part of) the Roofing and Cladding Specification.

10.2.0 FLASHINGS AND WEATHERINGS

Comply with CP 143 : Part 11 Sheet Roof and Wall Coverings.

10.2.1 Materials:

(a) Solder to BS 219 Grade J.

(b) Copper clips cut from min. 0.6 mm sheet to BS 2870 designation C104 $\frac{1}{4}$ hard temper.

(c) Copper nails to BS 1202 Part 2, Table 2 jagged shank min. 25 mm with large flat heads.

(d) Brass screws to BS 1202.

(e) Bitumen: Black LCoating Solution to BS 3416 Type 1.

(f) Milled Sheet Lead to BS 1178.
All flashings, soakers, valleys and aprons to be in leadwork (unless otherwise specified hereunder) to minimum thickness recommended by BS 5534, laid to CP 143 Part 2 1990, in accordance with recommendations of the Lead Development Association and the following table:

Code No.	Thickness (mm)	Colour Code	General Application	Max Sheet Size
3	1.25	Green	Soakers	
4	1.80	Blue	Soakers	500 x 1800
5	2.24	Red	Flashings	600 x 2000
6	2.50	Black	Hips, Ridges & Clips	760 x 2100
7	3.15	White	Gutters & flats	900 x 2400
8	3.55	Orange	-	

(g) Others as specified in the following sections.

10.2.2 Workmanship:

(a) Do not exceed sheet sizes recommended in CP 143.

(b) Dress and box to the necessary profiles without reducing thickness.

(c) Coat with bitumen the backs of leadwork in close unventilated contact with concrete, mortar, or other alkaline materials.

(d) Fix lead securely in a manner that will permit unrestricted thermal movement without wind disturbance. Do not use solder unless specified or unavoidable.

(e) Nail at 75 mm centres.

(f) Secure free edges with lead or copper tacks at suitable centres. Fix each tack with three nails or two screws. Let tacks into the background where necessary. In exposed or vulnerable positions use copper tacks.

(g) Lead Dots: make a smooth concave sinking in the background, dress in the lead and fix with a round head brass screw and washer. Fill with solder to form a neat flush finish.

(h) Wedging: fold strips of lead and wedge fully into grooves.

(i) Lead burning: produce solid welds approximately one third thicker than the lead being joined.

(j) Joints in lead: joint by folding if possible; otherwise lead burn or make joints as recommended by CP 143 or the published standard details of the Lead Development Association. Make all folded or lapped joints in a manner that naturally rejects water.

(k) Lengths and laps: lay flashings and weatherings, etc. in 1.50 m max. lengths. Provide 100 mm min. lapped joints.

SECTION 11

CARPENTRY

Page 11-1

11.0.0 CARPENTRY

11.1.0 General Requirements

11.1.1 Code of Practice, Standards and Regulations:

Comply with CP 112: Parts 2 and 3 "The structural use of timber" subject to any qualifications given hereunder. Comply with the following British and Irish Standards.

11.1.2 Preliminaries:

Refer to Section 1 General Conditions and Preliminaries in this Specification.

11.1.3 General Requirements:

Comply with section 2 General Requirements which shall be read in conjunction with (and forms an integral part of) the Carpentry Specification.

11.2.0 MATERIALS

1.2.1 Minimum Standards:

All materials shall comply with the relevant British or Irish Standards as appropriate and to the latest published amendments made to the standards at the time of installation. The standards shall apply whether or not they are listed in the Schedule given under para. 11.1.1.

11.2.2 All Timber:
All timber shall be clean, sound, merchantable, properly seasoned, and free from any defects or combination of defects, natural or otherwise, making it unsuitable for it's function in the works. Timber shall be sorted and selected, at the time of fabrication, for suitability for it's purpose. All timber shall be sawn unless otherwise stated. Timber species are specified by the standard names given in BS 881 and 589.

11.2.3 Native Timber:

This specification does not preclude the use of native grown Irish timber where:

a) The timber complies with the clauses of this specification.

b) The scantlings are adjusted dimensionally to comply with the recommendations of the Timber Development Association, and the I.I.R.S., and such adjustments are approved by the Architect prior to use.

c) The timber is suitable in dimensions, finish, strength and quality for it's intended function in the works.

11.2.4 Moisture Content:

Moisture content, after treatment with preservatives and at the time of fabrication and erection, shall not exceed the maximum value specified in I.S. 96 (Moisture Content of Timber for Building) for it's position in the Works.

11.2.5 Structural Timber:

The dimensions of structural timbers specified on the drawings (or under para. 11.2.0 Description of Work) are based on imported European Redwood/Whitewood General Structural (G.S.) Grade to BS 4978 : 1973 (Timber grades for structural use), unless otherwise stated.
Comply with CP 112 : 1971 (The structural use of timber) or where revised BS 5268 Part 2 of the same title.

11.2.6 Wrot Timber for External Use:

Timber for fascias, verge and barge boards, eaves soffits and similar external work scheduled for painting shall comply with BS 1186 : Part 1, Class 1, selected for suitability from Appendix A of the BS and free from pith, arris knots and plugs.

11.2.7 Boards:

Comply with the following standards for man-made boards where specified:

a) Plywood and blockboard for clear finish: Grade 1 B.S. 1455.

b) Plywood and blockboard for painting: Grade 2 B.S. 1455. INT Bonding not to be used for any work.

c) Exterior Grade Plywood: full waterproof bond plywood to Table 42 of CP112 to BS 1455 WBP Bond. Surface to be not inferior to BS 1455 Grade 2.

d) Marine Plywood: balanced construction to BS 1088.

e) Chipboard Flooring and Roof Decking: tongued and grooved to BS 5669.

f) Softwood Flooring: wrought tongued and grooved boarding to BS 1297.

g) Woodwood Slab: to BS 1105 Type B. reinforced on long edges with galvanised steel channels.

h) Hardboards and softboards to BS 1142 Parts 2 and 3.

11.2.8 Preservative Treatments:

All timber described as treated shall be impregnated under one of the following methods unless otherwise specified:

a) Pressure treatment with copper/chrome/arsenic solution to BS 4072.

b) Diffusion treatment with Boron to British Wood Preserving Association Standard 105.

c) Double vacuum treatment with organic solvent to British Wood Preserving Standards 112 to 116 inclusive.

d) Immersion treatment with organic solvent to BS 5707.

The Contractor shall ensure that the type of treated timber selected for use shall be appropriate to it's intended position and function in the works and shall be compatible and non-reactive with the fixings used and any other materials in direct contact. All surfaces, sawn, cut, trimmed, or planed after treatment shall be re-impregnated with preservative. Secure certificates of treatment for every consignment delivered to the works.

11.2.9 Fastenings:

Protect all ferrous metalwork, nails, screws, bolts and other mechanical fastenings by galvanizing or other suitable plating for all external work, work in areas of high humidity or corrosive conditions. Fastenings shall comply with the following:

a) Nails - BS 1202.
b) Wood Screws - BS 1210.
c) Bolts - BS 1494, BS 4933, BS 4190.
d) Washers - large diameter to BS 4320.
e) Connectors - BS 1579.

11.2.10 Adhesives:

Use cold setting resins to BS 1204 type MR for internal work, type WBR for external work and areas of high humidity. Ensure the adhesive is not affected by the timber preservative treatment. Type INT is not to be used.

11.2.11 Storage and Handling:

Comply with requirements of Section 2. Do not store any timber or board materials in recently built wet construction.

a) Store all materials in clean, dry, well ventilated conditions, protected from the weather and in accordance with manufacturers instructions.

b) Stack all materials flat off the ground on levelled bearers and handle in a manner to prevent damage to surfaces and edges. Avoid distortion of components.

c) Keep each batch, grade and type separated from each other.

11.2.12 Priming & Protection:

All timber work to be exposed to moisture, humidity or weather to be primed prior to completion of first fixing and/or exposure. Provide and maintain all necessary covers and taping until elements are ready to receive protective or decorative coatings.

11.3.0 WORKMANSHIP

11.3.1 Dimensions:

Timber dimensions for carpentry work where shown on the drawings shall be basic sawn sizes.

11.3.2 Tolerances for Structural Timber:

The permissable dimensional deviations for timber work generally shall be as follows:

a) +- 10mm for any nominally horizontal surface. +- 5mm over 3 metre length in floors at any point.

b) +- 10mm for any vertical surface from its designed position on plan.

c) +- 2mm in one metre for vertical plumb with a maximum value of 10mm.

d) Cross sectional sizes at 20% M.C. as specified in CP 112 : Part 2.

e) Dimensional reduction from basic sawn size for planing 3mm for in excess of 100mm dimension and 6mm for in excess of 150mm dimension.

f) Distortion due to bow and spring, twist and cup to limits specified in BS 4978.

11.3.3 Timber Selection:

Select the best of timber for stressed work: Reject any bowed, sprung, twisted, or cupped timber unless it can be used in suitable locations without adversely affecting the finished work.

11.3.4 Shaping and Jointing:

Unless otherwise detailed, undertake carpentry work as follows:

a) Saw timber truly square. Bore at right angles to the face. Make joints and provide bearings in a manner that brings and maintains all surfaces in full contact.

b) Make joints that resist load or tension as appropriate to the function of the structural element. Do not make joints in the length of a structural member unless made in an approved manner over bearings or otherwise designed to develop the full strength required of the member.

11.3.5 Fixing and Fastening:

Nail, screw, bolt, glue or otherwise fix and fasten members or joints as necessary.

a) Use fastners of adequate length and strength to provide a secure fixing.

b) Use appropriate spacing or pre-drilling to avoid splitting timber.

c) Drive nails on the slant. Fix screws and bolts at right angles. Do not hammer screws into position.

d) Use durable proprietary fibre composition or plastic plugs let into drilled holes for screw fixing to masonry, brickwork and blockwork.

e) Fix all proprietary straps, anchors, hangers, angles and plates in accordance with manufacturers recommendations.

11.3.6 General Framing:

a) Provide all grounds, battens, bearers, packings, bracketing, cradling, skeleton frameworks and support work of every description necessary for the carpentry work shown on the drawings or described in para. 11.2.0 Scope.

b) Position frames truly plumb or level, check the diagonals, and provide temporary bracings to hold secure during fixing.

SECTION 12

JOINERY

12.0.0 JOINERY

12.1.0 General Requirements:

12.1.1 Code of Practice, Standards and Regulations:

Comply with BS 1186 to the extent stated herein. Comply with the standards listed under Section 11 Carpentry where appropriate.

12.1.2 Preliminaries:

Refer to Section 1 General Conditions and Preliminaries in this Specification.

12.1.3 General Requirements:

Comply with section 2 General Requirements which shall be read in conjunction with (and forms an integral part of) this Specification.

12.1.4 Specialist firms:

The Contractor shall ensure that the work is carried out in its entirety by competent persons, skilled in the trade of joinery, who are conversant with the standards and requirements cited in this Specification.

12.2.0 MATERIALS

Comply with the standards and requirements cited in Section 11 Carpentry except where directed otherwise hereunder.

12.2.1 All Timber:

Merchantable, properly seasoned, straight timber free from any defects, natural or otherwise, making it unsuitable for its function in the Works. Sort and select at the time of fabrication for suitability for purpose with particular reference to appearance of finished product.

12.2.2 Named Species:

Timber species are specified by the standard names given in BS 881 and BS 589.

12.2.3 General Joinery:

Timber for joinery to be decorated with opaque coatings shall comply with BS 1186: Part 1 as qualified hereunder.

a) Hardwood or softwood selected for suitability of usage from Appendix A and B of the BS but excluding hardwood described as resinous.

b) Seasoned, at time of fixing, to the moisture content specified in Clause 4 of the BS.

c) Defects limited to those described in the BS for timber Class 2.

d) No pith, arris knots, plugs or inserts permitted on any faces, concealed or otherwise, in external joinery.

12.2.4 Clear Finished Joinery:

Timber for joinery specified as 'clear finished' to comply with BS 1186 : Part 1 Class 2 / Class 1 / Class 1s as appropriate.

12.2.5 Timber Sizes:

Timber is specified in finished sizes (unless stated to be ex ...) for which no deviation is allowed from any stated size.

12.2.6 Boards and Sheets:

Man-made boards and sheets shall comply with the following standards or approved equivalent. Types shall be selected as appropriate to their function in the works.

a) Plywood - BS 1455.

b) Blockboard - BS 3444.

c) Laminaboard - BS 3444.

d) Chipboard - BS 5669 Type 1/11/111.

e) Hardboard - BS 1142 Type S/TN/TE.

f) Fibreboards - BS 1142 Medium/Types LMN/LME/HMN/HME.

g) Laminated plastic sheet - BS 3794 Part 1.

Timber veneers on boards to BS 1455 or BS 3444 as follows:

(i) For painting - Grade II.
(ii) For clear finishing - Grade I.
(iii) Unseen surfaces - Grade III.

All board material described as veneered one side shall have a compensating veneer the reverse. This requirement applies to wood, plastic or other veneer materials.

12.2.7 Adhesives:

Generally synthetic resin to BS 1203 or BS 1204 as appropriate of the correct class for the duty and the type of joint. Unless otherwise stated glue bond shall be:

a) INT for internal work removed from damp sources and not subject to high humidity.

b) MR for internal work is high humidity.

c) WRP for external work.

12.2.8 Mechanical Fastenings:

a) Protect all metalwork, nails, screws and other mechanical fastenings by galvanizing or other suitable plating for all external work, work in areas of high humidity or corrosive conditions. For acidic woods use brass or stainless steel.

b) Fixings and fastenings to be as specified under Section 11 Carpentry.

12.2.9 Flush Doors Generally:

All flush doors and panels, whether proprietary or made by Contractor, solid or hollow core, or cut from boards to consist of the following as appropriate:

a) Metal free construction.

b) Lippings, glue bond and facings as previously described.

c) Perfectly flat, smooth facings free from core patterning.

d) Suitable solid blockings in hollow core doors, their locations marked.

12.2.10 Fire Resistant/Fire Check Door, Doorsets and Screens:

a) To be constructed to pass the fire tests described in BS 476 : Parts 8 20 and 22 for the time periods stated.

b) To be fitted with rebated intumescent seals, strips and smoke stops in accordance with BS 476.

12.2.11 Storage and Handling:

Comply with the requirements specified under Section 11 Carpentry.

12.3.0 WORKMANSHIP

Comply with the requirements specified under Section 11 Carpentry. Produce joinery in accordance with good quality joinery practice as follows:

a) Undertake as much fabrication as possible in humidity controlled workshops equipped with efficient machinery manned by skilled joiners.

b) Restrict site work to assembly of prefabricated components, fixings and other operations that cannot be undertaken off site.

12.3.1 Fabrication and Jointing:

Subject to any qualification made hereunder make joints in accordance with BS 1186 : Part 2.

12.3.2 Finished Appearance:

Comply with the following requirements:

a) Clear finished - finely finished without cutter or sanding marks, raised grain, stains or other blemishes.

b) Opaque coated finishes - a fine smooth appearance free from imperfections that might appear after decoration.

c) Angles and edges slightly rounded subject to details.

d) Visible gaps between fixed and moving parts not to exceed 1.5mm and to be of consistent width.

e) All pins, nails, screws and other fixings to be punched through, countersunk or otherwise concealed, with plugs and pointing neatly executed maintaining grains and finish.

12.3.3 Concealed Surfaces:

All concealed surfaces abutting structures including bottoms and heads of doors, backs of frames, sheeting, boarding or otherwise to be protected with preservative treatment and/or decoration as appropriate.

12.3.4 Ironmongery:

a) Provide and fix in accordance with manufacturers recommendations all ironmongery as scheduled.

b) Provide cramps, dowels, stiffening plates and general ironmongery of every description as required for joinery work.

12.3.5 Tolerances and Clearances:

a) Gaps between fire resisting elements and structure not to exceed 13mm and to be filled with non-combustible material.

b) Do not exceed a total accumulative tolerance of 6mm between each joinery item and structures unless architraves or other masking forms part of the design.

c) Hang doors to provide clearances of 2mm between leaf and jamb/head and 3mm to threshold. Deviation not to exceed +1mm or -0.5mm.

SECTION 13

STRUCTURAL STEELWORK

13.0.0 STRUCTURAL STEELWORK

13.1.0 GENERAL REQUIREMENTS

13.1.1 Codes of Practice, Standards and Regulations.

Comply with B.S. 449 Part 2 The Use of Structural Steel in Building subject to any qualifications given hereunder.

13.1.2 Preliminaries.

Refer to Section 1 General Conditions and Preliminaries in this Specification.

13.1.3 General Requirements.

Comply with Section 2 General Requirements which shall be read in conjunction with and forms an integral part of this Structural Steelwork Specification.

13.2.0 MATERIALS

13.2.1 Grade of Steel.

Steel complying with BS 4360, Grade 43.

13.2.2 Hot Rolled Sections.

a) I - Sections, T sections and channels to BS 4 : Part 1.

b) Angles to BS 4848 : Part 4.

c) Hollow Sections to BS 4848 : Part 2.

13.2.3 Fixings.

a) Black bolts and nuts to BS 4190 Grade 4.6.

b) Black washers to BS 4320.

c) Indented holding down bolts and nuts to BS 1494: Part 2 metric thread, Grade 4.6 as BS 4190.

d) Holding down bolts for grouting into undercut mortices in foundations - black bolts fitted with large heavy gauge plate washer spot welded on.

13.2.4 Storing and Handling.

Comply with Section 2.

13.3.0 WORKMANSHIP

13.3.1 Fabrication and Erection.

Comply with BS 449: Part 2. Unless otherwise approved fabricate the steelwork set off-site workshops with welded joints. Prepare all other connections for bolted assembly at the Works. Clearly mark all pieces to facilitate erection.

13.3.2 Welding.

To BS 5135 undetaken by skilled welders.

13.3.3 Priming.

Clean and prepare the steel and prime before delivery with Calcium Plumbate primer to BS 3698, Type A.

13.3.4 Foundation Bolts.

Ensure foundation bolts are correctly cast in.

13.3.5 Site Erection.

Erect fabricated steelwork as follows:

a) Do not enlarge or damage bolt holes:use drifts with care.

b) Provide tapered washers at all inclined faces.

c) Seal bolts through hollow sections.

d) Provide any bracing required.

13.3.6 Hollow Sections.

Ensure the sections are internally clean, dry and sealed with welded caps or in other approved manners.

13.3.7 Column Bases.

Pack up to correct level with steel wedges and grout with cement/fine sand retained by temporary sides. Ensure base plates are drilled to facilitate grouting.

13.3.8 Building In.

Bed bearing surfaces of steel beams, etc. on clean prepared bearings. Provide levelling wedges where required and bed on strong dry mixed cement mortar for the full bearing. Do not load until mortar has hardened.

13.3.9 Site Priming.

Re-coat damaged priming and all areas bolted or built-in.

13.3.10 Protection.

Comply with Section 2.

SECTION 14

METALWORK

14.0.0 METALWORK

14.1.0 GENERAL REQUIREMENTS

14.1.1 Codes of Practice:

Comply with BS 449. Part 2 in respect of fabricating steel sections. Comply with all relevant B.S.'s in respect of fabricating and finishing all other metalwork.

14.1.2 Preliminaries:

Refer to Section 1 General Conditions and Preliminaries in this Specification.

14.1.3 General Requirements:

Comply with Section 2 General Requirements which shall be read in conjunction with (and forms an integral part of) the metalwork specification.

14.1.4 Contractors Responsibility for Grades of Metal:

It shall be the Contractors responsibility to ensure that the correct grade or alloy of metal, suited to its application in the Works, is used.

14.1.5 Specification Application:

Proprietary and standard metal components which can be fixed without any knowledge or skill in metalwork are not necessarily specified in this section. Metal fabrications forming an integral part of a joinery element are specified in Section 12 Joinery. Metalwork associated with carpentry work is specified in Section 14. Other standard or proprietary metal items are specified with the trade involved in their fixing.

14.2.0 MATERIALS

14.2.1 Metals:

a) Mild Steel to BS 4: Part 1, BS 1449: Part 1, BS 4360 or BS 4848. Hollow sections to BS 4848: Part 2.

b) Stainless Steel: Austenitic steel.

c) Aluminium: Wrought aluminium alloys for general engineering purposes in accordance with the BS 1470 .. 1475 series.

d) Copper Alloy and Brass: BS 2870 and BS 2874.

14.2.2 Mechanical Fastenings:

Fastenings generally to be in the same metal and finish as the work being fixed. Where different metals are used they shall be of a variety and finish that will not react chemically, cause corrosion or otherwise be affected by other metals in contact.

a) Bolts, Screws and Nuts to BS 4190 for general purposes; to BS 3692 when a greater degree of precision is required by the nature of the work. Unless otherwise stated, steel grade 4.6 with matching grade nuts.

b) Expanding Bolts shall be a proprietary fixing comprising a corrosion resistant expanding insert and removeable bolt or threaded stud to suit the work being fixed.

c) Set Screws to BS 4183.

d) Self Tapping Screws to be steel thread forming or thread cutting to BS 4174 with rustproofed finish.

14.2.3 Protective Coatings:

In addition to specified surface finishes, treat or seal the permanently hidden parts of metalwork from deterioration and corrosion (excluding the inside face of standard hollow sections). Use primers as specified in section 13 and 17 or Bitumen coatings to BS 3416 Part 1.

14.2.4 Storage and Handling:

Comply with the requirements of Section 2. Keep all small components and fastenings dry. Protect from corrosion immediately they have been installed. Protect all prefinished work with non absorbent coverings during storage and fixing and maintain in place until hand over.

14.3.0 WORKMANSHIP

14.3.1 General.

Undertake metalwork in accordance with sound engineering practice:

a) Undertake all metalwork if possible, in properly equipped workshops. Restrict site work to fixings and other operations that cannot be undertaken off site.

b) Remove burrs, sharp edges and angles; coarse file marks, excess weld materials and remove similar imperfections from all work.

c) Fix in the works in a manner that prevents corrosion with other incompatible metals and materials. Do not permit work to rust or deteriorate between fabrication and final treatment. Prevent damage due to incorrect temperatures when carrying out work requiring heat.

14.3.2 Drawings:

Prepare fully dimensioned shop drawings.

14.3.3 Welding:

Undertake welding as follows:

a) In accordance with the appropriate BS for the type of metal being joined.

b) By welders who have passed the BS welding test appropriate to the metals being joined.

c) Form continuous welds suited to the type of work. Finish welds to match the surface: on surfaces unseen in the finished work the welds may be left as laid.

d) Spot welds are not permitted unless specified or used to assist assembly.

e) Clean off all welds and remove flux residues.

14.3.4 Bending Metal:

Machine bend, press, cold roll, forge or otherwise shape metal without weakening or otherwise damaging.

14.3.5 Joint Faces:

Form to fit accurately in full contact. Use a suitable joint coating for bolted or screwed connections (eg a primer for fabrications which will be painted).

14.3.6 Protective Finishes:

Apply after fabrication as specified in Section 2. Mechanically and Chemically clean metals before treatment. Comply with the following as appropriate:

a) Prime concealed parts of joints as joints are made. Use the appropriate primer applied by the brush. Spray application is not permitted.

b) Galvanising by hot dip process to BS 729 to provide a weight of coating in accordance with Table 1 of the BS. Recoat unavoidable accidental damage such as post fabrication welding with at least two coats of zinc rich primer to BS 4652.

c) Sherardizing: Zinc coat all small articles (eg bolts etc) associated with galvanized work (or where described as sherardized or zinc coated) in accordance with BS 4921 Class 1 (external or humid conditions) or Class 2 (indoor) as appropriate.

d) Chromium Plating to BS 1224 to service condition 1 (indoors dry), 2 (indoors humid), 3 (outdoors normal) or 4 (outdoors corrosive) as appropriate and to Architects selected finish.

e) Stove Enamelling of a hard wearing coating of full gloss enamel, resistant to weak acids and detergents. Ferrous articles to be phosphated before stoving. Coating to extend into concealed areas to afford full protection.

f) Anodizing to BS 1615 or BS 3987 as appropriate to the material and its intended use in the works.

g) Protect aluminum from direct contact with mortar, concrete or other alkaline surfaces.

SECTION 15

FINISHINGS

15.0.0 FINISHINGS

15.1.0 General Requirements.

15.1.1 Codes of Practice:

Comply with the relevant Codes of Practice Standards or Regulations as stated with the appropriate workmanship clauses given hereafter.

15.1.2 Preliminaries:

Refer to Section 1 General Conditions and Preliminaries in this Specification.

15.1.3 General Requirements:

Comply with Section 2 General Requirements which shall be read with (and forms an integral part of) this Specification for Finishings.

15.1.4 Cleanliness:

All Finishings work shall be carried out with particular attention to cleanliness. Comply with the following:

a) Do not permit contact between different types of adhesives, plasters and other materials which are not compatible.

b) Keep tools and equipment clean.

c) Remove all traces of each batch of mixed materials from containers before adding a fresh mix.

d) Do not permit wet materials to splash or contaminate other surfaces. Avoid contact with glass. Mask surfaces as appropriate.

e) Ensure completed work is kept clean and protected.

15.1.5 Preliminary Work:

Ensure backgrounds are fit to receive specified screeds, backings and finishings and will enable the required finished levels, flatness and tolerances to be attained. Undertake everything necessary to obtain a satisfactory bond between backgrounds, backings, finishings and layers of finishings. Such work will include:

a) Ensuring the curing and drying shrinkage of structural backgrounds is achieved prior to application of finish.

b) Conditioning of board materials.

c) Compliance with manufacturers specifications and recommendations for proprietary and prefabricated materials or elements.

d) Fungicidal wash to remove organic growth. Removal of grease deposits, laitence, efflorescence or loose materials.

e) Wetting to reduce suction or to obtain uniformity of suction.

f) Application of splatterdash or cement/latex emulsion adhesive grout to hard smooth surfaces (eg high grade concrete) to provide an adequate key.

15.1.6 Materials Preparation:

Proportion and mix materials in accordance with sound building practice or manufacturers recommendations as appropriate. Comply with the following:

a) Dense screeds and backings as for Section 6 (Concrete Work).

b) Rendering, coarse stuff, and travelled backings as specified for Section 7 (Brickwork and Blockwork).

c) Lightweight plasters mixed by hand in a clean trough.

d) Lime putty mixed to consistency of thick cream and allowed to stand for a minimum of 16 hours.

e) Adhesives and other proprietary setting materials in accordance with manufacturers recommendations. Ensure that the makers stated pot life has not been exceeded.

f) Mix only sufficient materials that can be used immediately and within their working times.

g) All stated mixes for mortar and renderings etc. are in volume proportions unless otherwise stated.

15.1.7 Conditioning:

Ensure all finishings, boards sheets, and tile materials are properly conditioned at suitable temperature and humidity levels for an adequate time period prior to fixing.

15.1.8 Rules and Framework:

Provide and fix all temporary or permanent battens, fillets, rules, spacers and formwork necessary for each finish.

15.1.9 Programming:

Do not commence finishing work until all other work is completed wherever possible: complete "wet" finishings prior to commencing "dry" finishes.

15.2.0 MATERIALS

15.2.1 Generally:

a) Selection and Samples: unless precise colour and pattern references are specified, assume for tendering purposes

that finishing materials are in the standard price range (or other price range indicated) and submit samples for selection where requested.

b) Cement: unless otherwise stated, to be ordinary Portland Cement to BS 12 or Portland Blastfurnace Cement to BS 146. White Portland Cement, where required, to BS 12. Coloured Portland Cement to BS 12 incorporating colouring additive to BS 1014 not exceeding 5% of the cement by weight. Use only one type of cement in any one mix.

c) Admixtures and Additives: do not use without approval. Where approved, pigments to BS 1014 and plasticisers to BS 4887.

d) Water: as specified under "Section 6 Concrete Work."

e) Lime and Ready Mixed Coarse Stuff: as specified under "Section 7 Brickwork and Blockwork."

f) Galvanised Metal Lathing: unless otherwise specified to BS 1369 weighing not less than 1.2kg/m^2 for light-weight plaster, 1.6kg/m^2 for sanded plaster and internal rendering, 1.9kg/m^2 for external rendering.

g) Metal Beads and Stops: standard proprietary beads, etc. to suit the plastering or rendering thickness and location, manufactured from steel galvanised to BS 2989 or from aluminium alloy.

h) Plasterboards: gypsum wallboard, plank, lath, or baseboard to BS 1230. When described as "insulating" to have a bright reflective membrane bonded to one side as specified under BS 1230.

i) Bonding Agent: a proprietary emulsion of PVAC to BS 5270 or suitable bituminous emulsions.

15.2.2 Plasterwork and Internal Rendering:

a) Gypsum plaster to BS 1191: Part 1.

b) Lightweight plaster to BS 1191: Part 2.

c) Sands for gypsum plasters to BS 1198, Table 1, Type 1.

d) Sand for cement/lime rendering to BS 1199 Table 1.

e) Galvanised wire reinforcement to BS 1485 wire 0.71mm/500mm max. mesh.

f) Plastering mixes to BS 5492 Table 2, selected for suitability, in minimum two coats (three coats to expanded metal lathing) to finished thickness of 13mm. Apply single coat board finish to plasterboard to 5mm thickness. Proprietary plasters to be mixed and applied in accordance with manufacturers instructions.

g) Spatterdash where specified or required to provide a key to be a wet mix of cement and coarse sand (1:1½-3) forcibly thrown and left as thrown. Under dry conditions spray with water at intervals until fully hardened.

15.2.3 External Rendering:

a) Sand for rendering to BS 1199 Table 1.

b) Coarse aggregate for rough cast of fine gravel to BS 882 graded from 5 to 13mm.

c) Crushed stone for dry dash to be clean, of even grading, good appearance and durable quality. Submit samples for approval.

d) Pigments as for para. 15.3.1(a).

e) Ribbed lathing to BS 1369. Galvanised wire reinforcement to BS 1485.

f) Rendering mixes to BS 5262 Tables 1 and 2, selected for suitability to the background and conditions of exposure. Apply not less than two coats to a well keyed background and to a finished thickness as recommended in the B.S.

15.2.4 Wall Tiling:

Materials to comply with BS 1281.
Adhesives, backings, levelling compounds and grouting to be as recommended by the tile manufacturer for their proposed location, exposure and use.

15.2.5 Dense Screeds:

a) Unless otherwise specified comply with "Section 6 Concrete Work" of this specification.

b) Aggregates to BS 882, fine aggregate to Table 2 Zones 1, 2 or 3 - coarse aggregate to Table 1 max. 10mm.

c) Screed mixes to be selected for suitability to the background and conditions of exposure. In general comply with the following:

(i) Up to 40mm thick - cement: sand (1 : 4) using sand to BS 882 Table 2 Zone 2 or 3.

(ii) Over 40mm thick - 30N/10mm concrete
or
Cement: sand: 10mm aggregate (Kgs 50: 75: 150 dry materials).

15.2.6 Tile and Slab Flooring:

Materials to comply with the following standards as appropriate:

(i) Clay Tiles (ceramic/quarry) - BS 1286.

(ii) Terrazzo tiles - BS 6357.

(iii) Concrete tiles - BS 1197.

(iv) Acid resisting bricks and tiles - BS 3697.

Adhesives, backings, levelling compounds and grouting to be as recommended by the tile or slab manufacturer for their proposed location, exposure and use.

15.2.7 Thin Sheet and Tile Flooring:

Comply with the following standards as appropriate:

a) Linoleum sheet and tiles to BS 810.

b) Felt backed sheet linoleum to BS 1863.

c) Thermoplastic tiles to BS 2592.

d) PVC (vinyl) asbestos tiles to BS 3260.

e) Unbacked flexible PVC sheet and tile to BS 3261.

f) Backed flexible PVC sheet to BS 5085.

g) Rubber sheet and tile to BS 1711.

Adhesives, backings, levelling compounds and grouting to be as recommended by the tile/sheet manufacturer for their proposed location, use and exposure.

15.2.8 Carpeting:

a) Comply with the manufacturers recommendations for the storage, handling and laying of carpets.

b) Before laying provide two samples (500 x 500mm) of each carpet type, levelled with brand name and ordering reference. Seal the cut edges.

SECTION 16

GLAZING

16.0.0 GLAZING SPECIFICATION

16.1.0 GLAZING REQUIREMENTS

16.1.1 Code of Practice Standards and Regulations:

Comply with "BS 6262 Glazing for Buildings" subject to any qualifications given hereunder. Comply with all other appropriate British and Irish Standards and the latest amendments of the same. Refer to the Glass and Glazing Foundation's "Glazing Manual" and the recommendations contained therein.

16.1.2 Preliminaries:

Refer to Section 1 General Conditions and Preliminaries.

16.1.3 General Requirements:

Comply with Section 2 General Requirements which shall be read with (and forms an integral part of) this specification.

16.2.0 MATERIALS

16.2.1 Glass.

Glass to B.S. 952 clean cut, without edge faults and free from defect.
Hollow glass blocks to B.S. 1207.

16.2.2 Compounds.

Linseed Oil Putty to I.S. 28 and B.S. 544.
Plastic glazing compounds, one part sealant curing type and non-structural gaskets shall comply with the recommendations of the Glass and Glazing Federation (London).

16.2.3 Components.

Double Glazed Units to B.S. 5713.

Beading for Fire Resistant Glazing.
Capable of compliance with B.S. 476 Part 8.

Patent Glazing B.S. 5516.

Aluminium framed sliding glass doors B.S. 5286 (1976).

16.2.4 Storage and Handling.

Comply with the requirements of Section 2.
Store glass dry in shaded and ventilated areas, stacked on edge on even supports.

16.3.0 WORKMANSHIP

16.3.1 Measuring.

Check that surrounds, frames, rebates and other surfaces are dimensionally true prior to measuring. Allow 3mm edge clearance for single panes and insulating units. Allow 5mm clearance for panes exceeding 12mm thick and panes exceeding 2.0 metres long. Ditto to laminated panes 18 to 30mm thick and insulating units exceeding 18mm thick.

16.3.2 Cutting.

Cut to produce clean square edges. Do not nip the edge of multiple glazed units. Do not carry out any work that causes damage to toughened glass or the surface of special glass.

16.3.3 Preparation.

Clean and dry all rebates before priming or sealing as appropriate. Check that primers/sealers/glazing compounds are compatible.

16.3.4 Placing in Surrounds.

Use 25mm long spacers to locate and prevent movement of glass or glazing units over $0.2m^2$. Setting blocks of non-compressible material such as scaled hardwood, lead or rigid nylon. Location and distance blocks of resilliant material such as plasticised PVC to B.S. 2571 softness nos. 35 to 45.

(i) Setting Blocks:
Place under bottom edge, sized and located as follows:

a) Width: thickness of glass plus back clearance in order to locate the block against the back of the rebate.

b) Thickness: to suit edge clearance specified at clause 195.

c) Location: at the surrounds point of least deflection (eg. over a vertical pivot; over a slider; at quarter-distance from each corner of a fixed light).

(ii) Location Blocks:

Place at sides of panes or units in opening windows or doors, sized and located as follows:

a) Width: as stated for setting blocks.

b) Thickness: as specified at para. 16.4.1.

c) Location: at points which will restrict the likely sideways movement (dropping) when the frame is opened (eg. at the top of the opening side and diagonally opposite, at the top of horizontally pivotted reversible windows i.e. treat as setting blocks).

(iii) Distance Pieces:

Place in pairs on both sides of bead fixed panes or units (except where preformed tapes are specified), sized and located as follows:

a) Thickness: equal to the specified thickness of the glazing compound.

b) Width: depth of bedding less min. 3mm to ensure adequate cover.

c) Location: to coincide with bead fixing points but at max. 300mm centres and not coinciding with setting and location blocks. Where beads are continuously fixed, locate about 50mm from each corner and then at 300mm centres.

16.3.5 Patent Glazing.

Patent glazing shall comply with CP 145 and be carried out by a firm specialized in the work.

16.3.6 Protection and Cleaning.

Mark glazing with removable tape, whiting or other non-alkaline medium. Upon completion remove all marks, excess compound and sealants and leave both sides clean and free from scratches. Seal putties as soon as sufficiently hardened. Leave opening lights fixed shut until putty has set.

SECTION 17

PAINTING AND DECORATION

17.0.0 PAINTING & DECORATION

17.1.0 GENERAL REQUIREMENTS

17.1.1 Code of Practice, Rules and Regulations.

Comply with BS 6150 Painting of Buildings subject to any qualification given hereunder. It is a condition of tendering that the contractor prices the painting and decorating work taking full account of the recommendations of that Code of Practice.

The Contracts compliance with the CP is limited to the recommendations in respect of materials and workmanship. Submit with the tender the name of the paint manufacturer from whom the Contractor intends to obtain the bulk of the decorating materials. Comply with the Irish Standards scheduled as follows:

I.S. 55	1953	Wallpaper Base (Amended 1957, 1959).
I.S. 56	1953	Finished Wallpaper (Amended 1964).
I.S. 18	1963	Oil Based Priming Paints.
I.S. 33	1962	Zinc Chromate Priming Paints for use on Metal Surfaces.
I.S. 115	1963	Oil Based Paints for Undercoating and Finishing.
I.S. 32	1963	Hard Glass and Enamel Paints and Appropriate Undercoats.(Amended 1965)(Under Revision).
I.S. 10	1960	Undercoating Varnish (Natural Resin).
I.S. 103	1960	Finishing Varnish (Natural Resin).
I.S. 104	1960	Finishing Exterior Varnish (Synthetic Resin).
I.S. 73	1956	Grade "A" Water Paint for Interior Use (Amended 1961).
I.S. 22	1956	Grade "B" Water Paint for Interior Use (Amended 1961).
I.S. 74	1956	Washaable Distemper for Interior Use.
I.S. 75	1956	Non-Washable Distemper for Interior Use.
I.S. 129	1964	Emulsion Paints.
I.S. 11	1958	White Spirits.

I.S. 92	1958	Gum Spirit of turpentine.
I.S. 12	1958	Turpentine.
I.S. 14	1958	Raw Linseed Oil for Paints.
I.S. 93	1958	Refined Linseed Oil for Paints.
I.S. 94	1958	Boiled Linseed Oil for Paints.
I.S. 15	1958	Liquid Driers for Oil Paints.
I.S. 16	1958	Knotting.
I.S. 17	1960	Gold Size.
I.S. 19	1960	Extenders for Paints.
I.S. 21	1961	White Pigments for Paints.
I.S. 110	1962	Zinc Chromes for Priming Paints.
I.S. 28	1964	Linseed Oil Putty.

17.1.2 Preliminaries:

Refer to Section 1 General Conditions and Preliminaries in this Specification.

17.1.3 General Requirements:

Comply with Section 2 General Requirements which shall be read in conjunction with (and forms an integral part of) this painting and decorating specification.

17.1.4 Specialist Firms:

The Contractor shall ensure that the work is carried out in its entirety by competent persons, skilled in the trade of painting and decorating and who are conversant with the standards, rules and regulations cited in this specification.

17.2.0 MATERIALS

17.2.1 Preparatory.

Abrasive and cleaning materials, knotting, fillers, white spirit and other ancillary materials as recommended by the C.P. or paint manufacturer.

17.2.2 Materials Generally.

Use primers and undercoats as recommended by the manufacturer for the surface and paint system. Do not use lead paint except as a primer. All materials to comply with the British and Irish Standards scheduled above.

17.2.3 Delivery.

All materials shall be delivered to site unopened in the manufacturers sealed containers or wrappings. Liquid materials shall be in containers not exceeding 5 litres capacity and sized to suit the extent of work and to prevent deterioration of residual quantities.

17.2.4 Storage and Handling.

Comply with the basic requirements of Section 2. Store wallpaper in manufacturers wrappings on the flat. Store paints in dry conditions at approx. 15°C. Protect paints containing volatile solvents from heat and paints containing water from frost.

17.3.0 WORKMANSHIP

17.3.1 Quality.

A high degree of quality is required in the preparation and finishing of all work.

17.3.2 Generally.

Prepare the surfaces and apply the coatings in accordance with Section 5 of the Code of Practice and with the manufacturers instructions. A brief summary of the procedures is given hereunder and the clause numbers refer to B.S. 6150.

17.3.3 Order of Work.

Work in an agreed sequence which ensures that finishing work is not contaminated from subsequent preparatory work or the work of other trades. (CL 43.1).

17.3.4 Ironmongery, Fittings and Surfaces.

Remove all ironmongery and other removable fittings prior to decoration and replace upon completion - mask or protect all adjacent and finished surfaces with suitable sheeting.

17.3.5 Preparation of Surfaces.

Clean, fill and rub down all surfaces to be decorated. (45.1-4).

17.3.6 Preparation of Paints.

Do not use any decorating materials unless obtained from a source specified with the tender or subsequently approved and unless supplied in containers marked with the manufacturers name, reference, mixing instructions and pot life.

Do not use thinners unless specified. Stir, mix or otherwise prepare for use as directed. (45.5.1-4).

17.3.7 Conditions.

Apply the coatings under suitable conditions of temperature, humidity and cleanliness. (44).

17.3.8 Painting.

Apply the coatings by brush, roller or spray as determined by the type of material and nature of the work. Apply all primers by brush. (45.7-8 and 46).

17.3.9 Defective Work.

Inspect the paintwork and if any work is defective take remedial action as recommended in Table 17 of the C.P.. If materials appear defective notify the manufacturer and the Architect. (45.9 and 47.2.4).

17.3.10 Paper-hanging.

Prepare the surface and hang linings as follows:

a) Do not commence until surfaces are dry and all other work (including paintwork but excluding carpet laying) is completed.

b) Fill and rub down the surfaces until perfectly flat and smooth.

c) Do not commence hanging until the complete quantity of material is supplied with due allowance for waste. Check each roll to ensure the pattern, shade and other references are correct and identical.

d) If necessary, trim all linings to give straight edges.

e) Apply size or primer if necessary to control porosity and as recommended by the adhesive/lining manufacturer.

f) Apply adhesive as specified by the manufacturer of the linings.

g) If necessary or specified, hang lining paper with butt joints at right angles to the wall linings. Finish perfectly smooth.

h) Hang wall linings with pattern aligned and close butted edges. Finish perfectly smooth with imperceptible joins and without any adhesive marks or other imperfections. Neatly trim at all junctions with other finishings, etc..

i) Carefully roll and wrap and label all surplus linings and sizeable offcuts and hand to Employer.

17.4.0 COMPLETION

Clean down all surfaces upon completion. Remove all masking and protective sheeting materials. Provide Employer with a small quantity, suitable for touching up/minor repair purposes, of each variety of material used in sealed containers with the appropriate marks identifying manufacturer and type.

SECTION 18

PLUMBING AND HEATING INSTALLATION

18.0.0 PLUMBING AND HEATING INSTALLATION

18.1.0 GENERAL REQUIREMENTS

18.1.1 Codes of Practice, Rules and Regulations:

Comply fully with BS 5572 Sanitary Pipework BS 6465: Part 1 Sanitary Appliances and BS 6367 Drainage of Roofs subject to any qualifications given below. Comply fully with the requirements of the Local Authority. Comply fully with the HVCA Guide to Good Practice Parts 1 and 2, Guide to Safe Installation (I.I.R.S.), and BS 5410 Parts 1 and 2. Comply with BS 5422.

18.1.2 Preliminaries:

Refer to Section 1 General Conditions and Preliminaries in this Specification.

18.1.3 General Requirements:

Comply with Section 2 General Requirements which shall be read in conjunction with (and forms an integral part of) the Plumbing and Heating Installation Specification.

18.1.4 Specialist Firms:

The Building Contractor shall ensure that the work is carried out in its entirety by competent persons, skilled in the installation of plumbing and heating systems who are conversant with the standards, codes rules and regulations cited in this Specification.

18.1.5 Schedule of British and Irish Standards.

a) Rainwater goods.

Cast Iron	B.S. 460.
Pressed Steel	B.S. 1091.
Asbestos Cement	B.S. 569.
Aluminium	B.S. 2997.

	Copper/Zinc	B.S. 1431.
	Plastics	B.S. 4576.
	Lead	B.S. 1178.
b)	Sanitary Pipework.	
	Cast Iron	B.S. 416.
	Grey Cast Iron	B.S. 4622.
	Plastic	B.S. 4514.
	Steel	B.S. 1387.
	(Fittings Iron)	(B.S. 143/1256).
	Galvanized	B.S. 3868.
	Copper	B.S. 2871.
	(Fittings)	(B.S. 864).
	Plastic Waste Pipes	B.S. 5254/5255.
c)	Water Services.	
	Copper	B.S. 2871/659.
	(Fittings)	(B.S. 864).
	Underground Copper	B.S. 1386.
	Stainless Steel	B.S. 4127.
	(Fittings)	B.S. 864.
	Galvanized Steel	B.S. 1387.
	Polyethyene	B.S. 1972.
	Unplasticised P.V.C.	B.S. 3505/4346 (part 1).
	Gate Valves	B.S. 1952.
	Thinwall Copper Tubes	B.S. 3931.
	Cast Iron	B.S. 78/1211/3464/3961.
d)	Sanitary Fittings.	B.S. 5572/6465 Part 1.
e)	Cisterns and Tanks.	
	Asbestos Cement (non potable supplies only)	B.S. 2777.
	Galvanized Steel	B.S. 417.
	Plastics	B.S. 4213.
	Glass Reinforced Plastic (No B.S. but shall be the best of their kind available on the national market).	
f)	Cylinders.	
	Copper Direct	B.S. 699.
	Copper Indirect	B.S. 1566.
g)	Insulation	B.S. 1334/1588/3958.
h)	Heating Services	
	Mild Steel	B.S. 1387 Medium Grade.
	Copper	I.S. 238: 1980.
	Underground Copper	B.S. 2871 Table Y.
	Oil	B.S. 1837 Heavy Grade.
	Mild Steel Welding Fittings	B.S. 1965.
	Malleable Iron Screwed Fittings	B.S. 1256.
j)	Fire Fitting Hose Reels	B.S. 5274 and B.S. 5306: Part 1 (1976)

18.2.0 MATERIALS

18.2.1 Minimum Standards.

All materials used shall comply with the relevant British or Irish Standards as appropriate and to the latest published amendments made to the standards at the time of installation. The standards shall apply whether or not they are listed in the Schedule given under 21.1.5.

18.2.2 Ancillary and Fixing Materials:

a) All materials to be rustproofed; materials in direct or indirect contact to be compatible to prevent electrolytic or chemical corrosion.

b) The Contractor shall supply and install fixings of every description, brackets, clips, saddles, sleeves, earth bonding washers, etc. necessary for the purpose of the work.

18.2.3 Equipment Generally.

The Contractor shall be responsible for the calculation of sizes and selection of all pipework necessary for the installation in accordance with the standards cited except where otherwise stated in this specification.

18.2.4 Storing and Handling Materials.

Comply with the general requirements of section 2.

a) Pipes:

Store on bearers or in racks clear of the ground, barrel on barrel. Protect spigots and sockets from damage. Shield plastic pipes from sunlight.

b) Sanitary Appliances:

Store in manufacturer's wrappings in reverse order of fixing. Wrappings shall be left in position whenever practicable during fixing and protection provided until time of handover. Deliver built in brackets in advance.

c) Boiler and Water Storage Vessels:

Cap all points of connection to closed vessels.

18.2.5 Radiators.

Radiators shall have outputs certified to B.S. 3528 or DIN 4704 for normal conditions and shall be tested at works to 700 KPA and rust protected by Phosphating, followed by stove primer and stove enamelled finish to agreed colour.

18.3.0 Preliminary Procedures

18.3.1 Setting Out.

Approximate positions of the plumbing and heating equipment are indicated on the contract documentation. The Contractor shall agree all pipework runs and ascertain locations of all outlets and appliances prior to commencing installation.

18.3.2 General Principles.

Subject to specified and predetermined requirements, plan the layout of the installations with consideration for the following:

a) Adequate overflows, pressure release pipes and other precautions to ensure all systems fail safe.

b) Pipes self draining and free from air locks.

c) Pipes routed as follows:

(i) To drop not rise to outlets.
(ii) To avoid areas prone to frost.
(iii) Pipes carrying drinking water and plastic pipes kept away from heat sources.
(iv) Cold pipes fixed below hot pipes when unavoidably routed together horizontally.

d) Adequate access for operation and maintenance.

e) Adequate clearance for insulation or painting.

18.3.3 Attendance and Co Ordination.

The Building Contractor shall be responsible for ensuring that the work necessary for the Plumbing and Heating installation is fully co ordinated with the work necessary for the other trades including nominated sub contractors and suppliers.

18.4.0 WORKMANSHIP

18.4.1 Gutters.

(a) Fixing Gutters.

Subject to gutter type and specific requirements, fix as follows:

(i) To fall evenly to outlets at 1 mm in 3.50 m.
(ii) With adequate supports to prevent sagging and ponding.
(iii) Provide additional support at outlets and changes in direction.
(iv) Wherever possible locate outlets vertically above drain connections/gullies.
(v) When fixing flat back gutters direct to backgrounds, ensure front overspill level is below the level of any fixings through the gutter back.

(b) Gutter Jointing Generally.

In mastic joints spread the compound evenly in the surface and remove surplus after tightening bolts. Place a thin washer under each nut. If bolts occur in the gutter sole, tighten them first.

(c) Jointing Cast Iron and Steel Gutters.

Paint the joint contact surfaces and cut ends before fixing. Join with red lead putty/bituminous mastic/compressible neoprene. Bolt with rustproofed bolts and nuts as appropriate.

(d) Jointing Asbestos cement gutters:

Join with gutter manufacturers recommended mastic and/or compressible strip. Bolt with rustproofed bolts and nuts.

(e) Jointing Aluminium Gutters

Join with gutter manufacturers recommended mastic or compressible strip. Bolt with aluminium bolts and nuts. Use strap fixings or seamless gutters.

(f) Jointing Plastic Gutters

Join with gutter manufacturers compressible strip; if strips are already fixed to the sockets do not dislodge or damage. Allow for thermal movement.

18.4.2 Bird and Leaf Guards.

(a) Roof and Gutter Outlets:
Fix Removeable grilles.

(b) Stacks:
Fix Balloon gratings to all open stacks.

18.4.3 Jointing of Pipes.

(a) Generally.

Comply with the following procedures when making pipe joints:

(i) Ensure pipes are clean internally and undamaged.

(ii) Cut pipes square with sharp tools.

(iii) File/ream cut ends and finish smooth.

(iv) Re round any deformed ends.

(v) Ensure pipe ends enter fittings and sockets to full depth of jointing area.

(vi) Assemble pipe work in a manner that does not entail making joints in restricted locations.

(vii) Leave external vertical rainwater pipe socketted joints open unless otherwise specified. Centralise each metal pipe spigot with three lightly wedged pieces of hardwood or folded lead.

(b) Capillary Joints:

Joint copper pipes to capillary fittings as follows:

(i) Abrasively clean pipe with steel wool or sandpaper if necessary.

(ii) Lightly flux and insert fully into fitting.

(iii) Heat fitting evenly until complete capillary solder ring appears, using solder ring fitting or applying end feed solder as appropriate.

(iv) Leave undisturbed until cool and remove all flux.

(c) Non Manipulative Compression Fittings:

Join stainless steel and hard copper pipes to compression fittings as follows:

(i) Place compression nut and compression ring (olive) on pipe and insert fully into fitting.

(ii) Tighten nut sufficiently to obtain a mechanical seal and prevent pull out.

(d) Manipulative Compression Fittings:

Join annealed and half hard copper pipes (BS 2871, Tables X,Y and Z) and stainless steel pipes (BS 4127) to manipulative compression fittings as follows:

(i) Place compression nut (and compensating or slip ring where supplied) on pipe.

(ii) Expand end with a suitable tool and engage into fitting.

(iii) Lubricate end of pipe if required and tighten nut sufficiently to obtain a mechanical seal and resist pull out.

(e) Screwed Joints to Steel Pipes:

Make screwed joints to steel pipes with suitable sockets and fittings as follows:

(i) Cut threads using sharp dies producing clean cut tapered screw ends of adequate length.

(ii) Remove any swarf and apply PTFE tape or linseed oil based paste and hemp.

(iii) Ensuring that no jointing material enter the pipe, tighten joints to obtain a watertight seal.

(iv) Clean and prime any thread left exposed.

(f) Flanged Joints:

Make flanged joints as follows:

(i) If pipes not provided ready flanged obtain approval for welding brazing or otherwise jointing predrilled mating flanges to the pipes.

(ii) Using specified gaskets or joint rings, tighten the flange bolt nuts progressively in opposing pairs until the jointing is sufficiently compressed to obtain a watertight seal.

(g) Rigid Joints in Socketted Cast Iron Pipework:

Make traditional caulked lead joints as follows:

(i) From a gaskin of dry jute yarn and caulk into the bottom of the socket to centralise the spikot and seal the bore from lead water contact.

(ii) Fill the remainder of the joint space with molten lead (or cold lead in fibrous form).

(iii) Thoroughly caulk and consolidate the lead with a 1.5 kg (min) hand hammer or powered hammer of equivalent force.

(iv) Finish the joint 3 mm inside the socket.

(h) Flexible Joints in Cast Iron Pipework:

Make joints in socketted/plain ended pipes with compressible socket joint rings/separate connectors as appropriate. Check compression rings, apply a suitable lubricant and ensure the pipe spigots are fully inserted.

(i) Joints in Plastic Pipes:

Comply with the following conditions when making joints in plastic pipes.

(i) Use the fittings and jointing methods recommended by the manufacturer of each type of plastic pipework.

(ii) Use the recommended adaptors when jointing to pipes of different materials or to appliances etc.

(iii) Make provision for thermal movement. At push fit joints push the pipe fully in and slightly withdraw about 5mm. Use slide fit pipe brackets at suitable spacings.

(iv) Obtain approval before making any joint or using any fitting not included in a manufacturer's range.

(j) Joints subject to Approval:

Do not make joints of the following types unless specified or approved.

(i) Mechanically expanded copper pipes, i.e. expanding the ends for capillary joints without fitting.

(ii) Adhesive joints to stainless steel pipes.

(iii) Capillary joints to stainless steel pipes.

(iv) Brazed or welded joints to copper pipes.

(v) Welded joints to steel pipes.

(vi) Joints involving a risk of corrosion (eg steel to copper).

(vii) Improvised joints (eg joints for which no suitable connector is manufactured or specified.

(k) Additional Requirements:

Make joints in pipes carrying water for drinking and culinary purposes as stated in clauses 365 to 405 subject to the following additional requirements:

(i) Clean pipes and fittings internally (taking particular care to remove any material such as sand, soil, metal filings etc.).

(ii) Any unspecified jointing material (eg flux: sealant: lubricant) shall comply with the Water Research Council's lists of approved materials.

(iii) Keep jointing material clean and free from contamination: use the minimum necessary to produce watertight joints.

(iv) Jointing surfaces to be clean: remove any coatings or cutting oils, etc.

(v) Do not use jointing compound on compression fittings (PTFE tape is permitted).

(vi) Yarn for gaskins to be sterilized.

(b) Joints between dissimilar Materials:

(i) Use suitable adaptors: Use adaptors with ends made to suit each type of pipe being joined and join as stated in clauses 365 to 405, as appropriate.

(ii) Avoid improvisation: Use factory or workshop formed sockets and threaded bosses etc. on materials not suited for adaptation on site (e.g. cast iron).

18.4.4 Bends in Pipework.

(a) Limitations:

Do not bend galvanized pipes. Do not bend other pipework unless:

(i) Such bends are specified.
(ii) The type of pipe is classified by the manufacturer as suitable for site bending.

(b) Making the Bends

Make approved bends and offsets etc. on pipe bending machines. Reject any pipework with flattened or corrugated walls or other evidence of stress.

(c) Bends in Annealed Copper Pipes:

Avoid making joints between the designated connections, make bends to as a large a radius as possible.

18.4.5 Fixing Pipes.

(a) Generally:

Fix all stacks truly vertical unless otherwise specified. Fix pipes securely in a manner that will provide adequate support without permitting stress or deflection. Do not fix pipes to lightweight panels without approval or in any other way that could transmit noise or vibration.

(b) Thermal Movement:

Fix pipes to allow adequate thermal movement without transmitting noise due to friction or other causes. Allow particularly for the considerable thermal movement of plastic pipework.

(c) Painted Pipework:

Allow 30 mm min. clearance at back.

(d) Insulated Pipework:

Allow adequate back clearance to permit the fixing of the insulation.

(e) Taps and Valves:

If taps and valves etc. are not provided with fixings (eg backplates) fix the connecting pipework in a manner that will not permit any strain due to the manual operation of the fittings.

(f) Pipes through Walls and Floors, etc:

Fix in a manner that permits free movement (eg through sleeves). Maintain integrity of fire stopping. Ensure no cable or other pipe shares a sleeve with a water pipe. Seal to exclude vermin, particularly pipes passing through external walls.

(g) Pipes in Trenches:

See Section 21 External Works.

(h) Concealed Pipework:

Do not conceal or embed any pipework without approval. Any pipes unavoidably embedded shall be without joints. Ensure that adequate maintenance and inspection access is provided. Provide adequate space at access points for the operation of hand tools (1.1.min 250 mm square or diameter).

(i) Warning Pipes:

Subject to specified requirements, fix as follows:

(i) Fix to a slight fall and locate to discharge in a conspicuous position.

(ii) Locate to avoid freezing by turning down the outlet outside the building and turning down the end in the cistern to 50 mm below the water line.

(iii) Provide 0.65 mm mesh screen to all overflow and vent pipe outlets.

(iv) Do not fix a hinged flap to the end of a warning pipe.

(j) Spacing of Fixings for Plastic Pipes:
If the facing centres of pipe clips, holderbats and other supports are unspecified, fix them at spacings not greater than those recommended by the manufacturer of the pipes.

(k) Spacings of fixings for Metal Pipes:
Subject to specified requirements fix pipe clips, holderbats and other supports at spacings not greater than those in table 1 below. Pipe sizes are the nominal diameters given in the relevant BS specifications.

Table 1 Spacing of Fixings for Metal Pipes.

Type of Pipe	Size of Pipe (not more than) mm.	Spacings Horizontal Pipes.	Vertical Pipes.
Light Guage	15	1.20	1.80
(BS 2871:Part 1)	28	1.80	2.40
Stainless	42	2.40	3.00
Steel(BS4127	54	2.70	3.00
Part 2	133	3.00	3.60
	159	3.60	4.20
Heavy Gauge	15	1.80	2.40
Copper (BS2871:	28	2.40	3.00
Part 2)	35	2.70	3.00
	54	3.00	3.60
Steel(BS1387)	80	3.60	4.50
	133	3.90	4.50
	159	4.50	5.40
Cast Iron (BS 1211)	51	1.80	1.80
Spun Iron (BS 2035)	102	2.70	2.70
Ductile Iron(BS 4772)	152	3.60	3.60

18.4.6 Fittings for Inspection and Maintenance

(a) Valves:

In addition to specified control valves, provide valves in order that appliances and sections of pipework can be isolated for inspection and maintenance.

(b) Access Points:

Provide access fittings and cleaning eyes etc. on rainwater and waste installations at:
(i) Connections to drains.
(ii) Changes in direction of stacks.
(iii) Ends of branches receiving multiple connections.

(c) Draining Down:

In each section of pipework provide air release vents at the highest point and hose connection drain cocks at the lowest point.

18.4.7 Identification of Pipework and Valves, etc.

Generally
Provide means of identification as follows:

(a) Prepare "as fixed" record drawings for the Employer.

(b) Mark all valves and pipes etc. in some clear and permanent manner to indicate the function and routing Colour band and code in accordance with BS 1710.

(c) See Section 21 in respect of making pipes in trenches.

18.4.8 Cisterns and Tanks

(a) Locating and Fixing

Locate, fix and connect to pipework as follows:

(i) Locate to provide access for inspection and maintenance. Provide 350mm minimum headroom over cisterns, increaased to 600mm for cisterns over 115 litres capacity, further increased if physical entry into a cistern is likely to be required.

(ii) Ensure that cisterns and tanks are rigidly supported to avoid any possible stress to the connected pipework.

(iii) If required by the manufacturer, provide a flat rigid platform under the entire base area.

(iv) Do not make holes in the bottom: make them not less than 25mm above the bottom (to prevent sediment entering the pipework).

(v) Do not connect cold water distribution pipes below connections to pipes supplying hot water appliances.

(b) Galvanized Cisterns:

Coat internally with two coats of non tainting bitumen paint to BS 3416, Type 1.

18.4.9 Joints to Cisterns and Tanks:

(a) Cutting Holes:

Cut truly circular holes with sharp tools designed for use on the material involved. Do not burn or punch holes. Remove burrs and leave a clean edge for the connection.

(b) Making the Connection:

Using a flanged connector suited to the pipe being connected, fit with compressible washers both sides and

tighten back nut to obtain a watertight seal. Use additional soft washers for tanks with an irregular wall surface.

(c) Connecting to Flexible Plastic Cisterns:

Mark cistern without scribing or scoring (eg with chalk). Support the cistern during cutting (eg with flat timber clamped on). Connect as above using softwashers.

(d) Fixing Ballvalves to Flexible Plastic Cisterns:

If the cistern is not provided with a stiffened area designed for this connection, seek approval to provide a suitable external backplate to minimise the flexing (and possible fracture) caused by the movement of the lever arm.

(e) Cleaning:

Remove all residue from hole cutting and thoroughly clean cisterns and tanks prior to filling.

18.4.10 Fixing Appliances:

(a) Sanitary Appliances:

Subject to the type of appliance and specific requirements, fix in accordance with BS 6465 and the following.

(i) Leave protective wrappings in position for as long as possible.

(ii) Place in correct position or mark out in order that pipework can be fixed or partially fixed first.

(iii) Fix in a manner that will facilitate subsequent removal if necessary.

(iv) Securely fix all appliances. Use manufacturers brackets and fixing methods where ever possible use compatible rust proofed fixings. Fix in a manner that minimises noise transmission.

(v) Do not bed appliance (eg WC pans, pedestal units in thick strong mortar that could crack the unit (eg a ceramic unit).

(vi) Make pipe connetions with demountable unions. Do not fix pipework in such a manner that it supports or partially supports an appliance.

(vii) Fix appliances so that water falls to the outlet (eg baths).

(viii) Do not use appliances without approval.

(b) Fixing Tanks and Cylinders:

Comply with the above clause and the following additional requirements.

(i) Locate with adequate clearance for fixing insulation and for replacing immersion heaters.

(ii) Do not perforate in position ie temporarily locate fragments before fixing.

(iii) Fix immersion heaters with compressible jointing and replacement. Do not use a jointing compound.

(iv) Locate immersion heaters so that temperature dials can be easily read.

(c) Fixing Shower and Sink Heaters:

Comply with the above clauses and fix instantaneous and small water storage heaters as follows:

(i) If connected direct to water-main use a tap or valve that controls the inlet and has a permanently open outlet.

(ii) If connected to a low pressure heater tank with a closed outlet tap, provide an expansion pipe.

(iii) Locate so that any temperature dials can be easily read.

(d) Fixing Boilers:

Comply with the above clauses CP 342, CP 403 with particular attention to the following.

(i) Fix to an incombustible background.

(ii) Locate with adequate clearance from combustible materials.

(iii) Locate with adequate access for adjustment, servicing and flue cleaning.

(iv) Ensure that the air supply complies with the manufacturer's specifications.

18.4.11 Sterilization:

(a) Sterilization of Installation:

Appoint an approved specialist firm to sterilize the potable water installation in accordance with CP 310

(b) Sterilization of Installation:

Sterilize the potable water installation in accordance with CP 310 and as follows:

(i) Fill cisterns and pipes and flush out: close all taps.

(ii) Refill whilst adding a proprietary sterilizing admixture containing 50 parts chlorine to one million parts water.

(iii) When cistern is full, open all taps progressively and allow each to run until the water smells of chlorine.

(iv) Top up the cistern and add more sterilizer.

(v) Leave three hours and test for residual chlorine; if none found, drain and repeat the process.

(vi) Finally drain and flush out the installation before use.

18.4.12 Insulation:

a) All boilers, boilerhouse pipework, cylinders, storage tanks, vessels and pipework elsewhere concealed or not required for heat emmission purposes shall be insulated, employing "Class O" insulation, to the requirements of B.S. 5422 as regards thickness and type.

b) Completely cover pipes. Cut and fit around brackets, fittings and valves etc. Seal all joints. Use coloured tapes to identify pipes.

c) Fix min. 50mm expanded polystyrene or equivalent rigid insulation around the sides of cisterns secured with rustproof straps. Provide loose covers of same material, neatly fixed and secured.

18.4.13 Connection of Water Mains:

Allow for connection to existing water mains as appropriate.

18.4.14 Welding and Brazing.

Site welding and brazing shall not be permitted except by written permission.

18.5.0 COMPLETION

18.5.1 Spares, Tools and Manuals:

Provide a full set of any tools, spare parts operation manuals, normally supplied with the appliances, neatly boxed and labelled to the Employer at handover.

18.5.2 Guarantees:

Complete and arrange all guarantees form manufacturers for appliances provided under this contract and provide the employer with original copies at handover.

18.5.3 Connection to Mains Supply.

Provide for the connection of the installation to the mains supply in accordance with the requirements of the relevant Local Authority or Utility Company including any attendance necessary.

18.5.4 Inspection.

Check all valves, taps, sanitary apliances, cisterns, boilers, cylinders, fuel tanks and other functional components and ensure that they are clean, in new condition and functioning correctly.

18.5.5 Testing.

Test each installation in progressive stages and before any plumbing work is concealed. Ensure all pipes are unobstructed and block pipes and outlets where necessary with expanding rubber or other suitable stoppers forming airtight seals. Provide test plugs, control cocks, manometer and all other testing equipment. Test each installation for leaks as stated below. Repeat tests until approval is given.

a) Rainwater Installation.

Block outlets and flood flatted areas. Block gutter outlets and flood gutters. Allow full discharge through stacks. Block both ends of internal stacks and apply air test at 38mm water guage for min. 3 minutes in accordance with BS. 6367.

b) Sanitary Installation.

Test water seals in appliance. Block ends of waste and ventilation pipes and apply air test at 38mm for minimum 3 minutes in accordance with BS 5572.

c) Down Services.

Fill cistern and all pipework, leave for one day and check for leaks.

d) Service Mains.

Test at 1½ times working pressure or 350 Kpa for 2 hours.

e) Hot Water and Heating Installation.

Provide sufficient fuel for a seven day winter heating cycle. Operate fully for 24 hours making such final adjustments as necessary.

18.5.6 Protection.

a) Generally.

Provide general protection as specified in Section 2.

b) During Installation.

Temporarily seal all outlets, pipe ends, appliance connections and other possible points of entry of contamination and blockage. Do not permit any pipe or appliance to carry any load. Take particular care to protect pipes with ring seal joints from deflection. Protect sanitary appliances (particularly those with glazed enamelled or plated surfaces).

c) Upon Completion:

Remove any protective tapes or casings etc. from sanitary fittings and other appliances. clean and polish all self finished surface drains. Drain down or protect against frost as directed.

18.5.7 Commissioning Certificates and Service Contract:

Arrange for the commissioning of the Installation and provision of completion certificates as appropriate. Secure a copy of the service contract agreement for completion by the Employer at handover if so required.

SECTION 19

ELECTRICAL INSTALLATION

19.0.0 ELECTRICAL INSTALLATION

19.1.0 General Requirements

19.1.1 Code of Practice Rules and Regulations.

Comply fully with the National Rules for Electrical installations of the Electro Technical Council of Ireland Part 1 General Requirements, and Parts 2.1 and 2.2. Particular requirements as appropriate, in addition to the requirements of the Electricity Supply Board, the Regulations for Electrical Installations (15th Edition) of the Institution of Electrical Engineers and all subsequent amendments made to these rules and regulations.

19.1.2 Preliminaries:

Refer to Section 1 General Conditions and Preliminaries in this Specification.

19.1.3 General Requirements:

Comply with Section 2 General Requirements which shall be read in conjunction with (and forms an integral part of) the electrical specification.

19.1.4 Specialist Firms:

The Building Contractor shall ensure that the work is carried out in its entirety by competent persons skilled in the installation of Electrical supply distribution systems and who are conversant with the standards, rules and regulations cited in this Specification.

19.2.0 MATERIALS

19.2.1 Minimum Standard.

All materials shall comply with the Recommendations and minimum requirements laid down in the rules and regulations

cited under paragraph 22.1.1 and the latest relevant British and Irish Standards whether or not they are referred to in this Specification.

19.2.2 Fixings and Minor Accessories.

The following shall be included with all items required under this Specification:

a) Fixings of every description.
b) Conduit fittings including couplers, bushes, locknuts and clips etc.
c) Cable clips and saddles.
d) Earthing clamps.
e) Cable bonding nipples.
f) Insulating bushes.
g) All other minor accessories.

19.2.3 Equipment Generally.

The Contractor shall be responsible for the calculation of sizes and the selection of all cables, conduit, metal boxes, switches, switch gear and consumer units necessary for the installation in accordance with the minimum standards cited above. Due regard shall be taken for local conditions, ambient temperature and voltage drop.

19.2.4 Luminaries and Appliances.

The Contractor shall supply, install and connect all luminaries and appliances specified or scheduled under paragraph 22.2.1. Description of Installation and in accordance with the relevant manufacturers recommendations.

19.2.5 Storing and Handling Materials.

Comply with the requirements of Section 2 General Requirements. Store luminaries and appliances in manufacturers wrappings in warm dry conditions. Wrappings shall be left in position, whenever practicable, during fixing and adequately protected until the time of handover.

19.2.6 Wiring:

Rubber (including vulcanised, silicon and butyl) PVC, PVC/PVC and polythene insulated cables shall comply with Irish Standards 201; (1979), 202: (1980) and 204: (1981) and shall carry the IIRS Irish Mark of Electrical Conformity (IMEC) unless otherwise specified.

19.2.7 Conduits:

Galvanized steel conduits shall be heavy guage Class B type. Conduit and associated accessories shall comply with BS 4568: (1970) Parts. 1 and 2.

19.2.8 Fire Alarm:

The fire alarm indicator panel and power unit shall meet the requirements of BS 3116 Part IV. Fire Alarm installations to comply with the requirements of BS 5839: (1988) Part 1.

19.2.9 Emergency Lights:

Emergency lighting layouts and fittings to comply with BS 5266: (1988) Part 1.

19.3.0 PRELIMINARY PROCEDURES

19.3.1 Setting Out:

Approximate positions of the electrical equipment are indicated on the Contract Documentation. The Contractor shall agree all cable routes and ascertain precise locations of all outlets, luminaries, appliances, control gear and other equipment before commencing the installation.

19.3.2 Attendance and Co-ordination:

The Contractor shall be responsible for ensuring that the work necessary for the Electrical Installation is fully co-ordinated with the work necessary for the other trades

including nominated sub-contractors and suppliers.

19.4.0 WORKMANSHIP

19.4.1 Generally

All work shall be carried out in accordance with the recommendations and minimum requirements laid down in the rules and regulations cited under paragraph 22.1.1. and the latest relevant British and Irish Standards whether or not they are referred to in this Specification.

19.4.2 Mounting Heights.

The mounting heights of wall mounted distribution equipment and accessories shall be as follows unless otherwise shown on the drawings or described under para. 22.2.1. Description of Installation. The Contractor shall be responsible for ensuring that the heights are suitable in every case before proceeding.

a)	Switchgear and distribution equipment	1800mm
b)	Control Equipment (motor starters, etc)	1370mm
c)	Lighting Switches, control switches etc	1370mm
d)	Socket Outlets for general purposes	300mm
e)	Socket Outlets for general purposes	1070mm
f)	Thermostats	1650mm
g)	Local isolators, starters, etc.	1350mm
h)	Clocks	2250mm
i)	Alarm Sounders.	2250mm
j)	Break glass contacts	1370mm

19.4.3 Wiring Systems:

Undertake the wiring on the "Looping in" principle. Make all joints at distribution boards, switches, specified outlet boxes and switchboxes. Joints in joint boxes and through joints are not permitted. Provide earth continuity.

19.4.4 Cable Routes:

Run cables as far as possible through floor and ceiling voids. Run parallel to walls and joists, etc., do not route diagonally. Maintain 250mm min. clearance from hot water pipes. Do not embed in insulation.

19.4.5 Location of Cables:

Locate horizontal cables in walls within 150mm of the ceiling or within the band of 150 to 300 mm above the floor. Locate vertical cables directly above or below the switch or outlet being served. Do not embed any cable in walls or other part of the building's structure. Do not run cables in the cables in the cavity of hollow walls.

19.4.6 Fixing Cables.

Adequately support and secure cables without kinking and fix flat at max. 1.00 m centres with correctly sized plastic clips. Run through conduit as specified and provide rubber bushes at open ends.

19.4.7 Conduits:

Fix conduits where specified. Fix close jointed conduit with the seam of the wall. Tees and elbow fittings are not permitted, bends if avoidable, shall be large radius machine made.

19.4.8 Drops to Switches and Sockets:

Run the cables through metal conduit with min 6mm plaster

cover terminated 300mm above floor level or 150mm above working surfaces and extended 50mm into floor or roofspace.

19.4.9 Damp Conditions:

Run cables through galvanized conduit or use mineral insulated cables to BS 6207. Make provision for condensation to drain from conduit.

19.4.10 Fittings Generally:

Undertake plugging, screwing, bolting and make general fixings as specified in Sections 14, 15 and 17 as appropriate.

19.4.11 Circuit List:

Provide a comprehensive circuit list inside the door of the meter housing or on the consumer unit, to be typewritten or clearly hand printed in indelible ink. All boxes and fusses to be clearly identified with securely fixed self adhesive labels.

19.4.12 Fire Alarm and Emergency Lighting:

Refer to Paragraphs 19.2.8 and 19.2.9.

19.4.13 Earthing, Testing and Inspection:

a) Earthing throughout the Installation must comply with the 15th Edition of the I.E.E. Regulations and the National Rules for Electrical Installations published by the E.T.C.I.

b) Supply and install earth conductor and earth electrode to comply with Regulations.

c) Carry out equipotential bonding between the earthing bar and the following utilizing 16 m^2 P.V.C. E.C.C. mechanically protected:

(i) Mains water pipe at entry into building.

(ii) Hot water, heating flow and return pipes.

(iii) Mains gas pipe (where appropriate) where it enters the building.

(iv) Structural Steelwork.

d) Carry out all supplementary bonding to sinks and water pipework.

e) Carry out the following tests and note results on E.T.C.I. Completion Form and submit to Employer.

(i) Verification of Polarity.
(ii) Insulation resistance tests.
(iii) Earth loop impedance tests.
(iv) Conductance of earth electrode.
(v) Test of effectiveness of earthing.

19.5.0 COMPLETION

19.5.1 Lights:

Supply and install bulbs and flourescent tubes of the appropriate wattage to all light fittings to be fixed as part of this contract.

19.5.2 Guarantees:

Complete and arrange all guarantees from manufacturers for appliances provided under this contract and provide the employer with original copies at handover.

19.5.3 Connection to Mains Supply:

Provide for the connection of the installation to the mains supply in accordance with the requirements of the Electricity Supply Board including any attendance necessary.

19.5.4 Inspection:

Check all luminaries and appliances etc. and ensure that everything is clean, in new condition and functioning correctly at handover.

19.5.5 Testing:

The Contractor shall arrange for the testing of the installation as prescribed in the I.E.E. and E.T.C.I. Regulations. The polarity of all switches and sockets shall be checked. Provide everything necessary and pay all costs.

19.5.6 Commissioning and Certificates:

Arrange for the comissioning of the installation and the provision of completion certificates to the Employer at handover.

SECTION 20

DRAINAGE

20.0.0 DRAINAGE

20.1.0 REQUIREMENTS

20.1.1 Preliminaries:

Refer to Section 1 General Conditions and Preliminaries.

20.1.2 General Requirements:

Comply with Section 2 General Requirements which shall be read in conjunction with (and forms an integral part of) this drainage specification.

20.1.3 Standards:

Comply with "BS CP 301 Building Drainage" subject to any qualifications given hereunder.

20.1.4 Site Exploration and Existing Services:

Comply with Section 5 Excavation and Earthworks of this specification concerning trial holes, site investigation and the location of existing services.

20.2.0 MATERIALS

20.2.1 Materials Generally:

Comply with the requirements as specified in the work sections for concrete, brickwork, blockwork and othermaterials in this specification as appropriate. Use only materials appropriate to their proposed location and use taking local conditions into consideration. In addition comply wiht the following:

a) Concrete grade 20N/20mm.

b) Clay bricks to BS 3291 Class B.

Page 20-1

c) Mortar cement: lime mortar (1: ¼: 3).

d) Hardcore as for Section 5 but free from lines.

e) Cast iron pipes and fittings to BS 437, BS 497, BS 4622 or BS 4772 as appropriate.

f) Vitrified clay pipes and channels to BS 65.

g) Concrete pipes and fittings to BS 5911.

h) Plastic pipes, channels and fittings to BS 4660 with ring seal joints.

i) Pitch fibre pipes to BS 2760.

j) Circular concrete manholes to BS 5911.

k) Manhole step irons to BS 1247.

20.2.2 Storage and Handling:

a) Store all pipes adequately supported on bearers clear of the ground in such a manner as to protect from damage.

b) Protect all plastic materials from direct sunlight or very cold weather.

c) Keep all jointing materials clean and dry at all times prior to use.

20.3.0 WORKMANSHIP

20.3.1 Excavations:

Comply with Section 5 Excavations and Earthworks of this Specification.

20.3.2 Drain Trenches:

Excavate drainage trenches in compliance with the following:

a) Clear topsoil from along the route and store neatly in temporary spoil heaps.

b) Remove existing features and temporarily store for reinstatement upon completion of the works.

c) Portions of paved surfaces to be reinstated are to be cut neatly to a straight edge.

d) Excavate trenches to the minimum practicable width but not less than 300mm wider than the external diameter of the pipe. Do not leave trenches exposed to weather for longer than is avoidable. Remove final layer immediately prior to laying of pipes.

e) Remove any soft or hard spots and replace with suitably compacted granular material to provide a consistent bearing.

f) Keep excavations free from water.

g) Provide and maintain in place all necessary hoardings, fencings, covers, signs, tapes and other protection necessary for safety around excavations.

20.3.3 Pipe Laying:

a) Lay pipes to correct lines and levels using only pipes that are clean, straight, and undamaged. Support evenly over barrell length. Remove temporary supports before filling in.

b) Changes of direction at manholes only.

c) Lay pipes from lowest part of the drain run with sockets facing upward.

d) Do not cover over until tested and approved in convenient sections. Give notice of testing.

20.3.4 Pipe Bedding:

Lay all beds for full width of excavated trench unless otherwise approved.

20.3.5 Gullies, etc.

Encase all gullies and other specified terminal fittings including bends where permitted in concrete min. 150mm thick. Similarily encase any pipework rising at a steep angle to the fittings. Provide raised pieces or brickwork to enable gratings to be fixed at the correct level with the surfacings.

20.3.6 Concrete Encasement:

Totally encase pipework in 150mm concrete where indicated and generally as follows:

a) Through walls and under floors.

b) Where the minimum cover is less than:
   (i) 0.6m in private gardens.
   (ii) 0.9m in public pavements and open space.
   (iii) 1.2m in roads and driveways.

20.3.7 Pipe Jointing:

a) Ensure joint surfaces are clean and dry.

b) Form connections with rigid, flexible taper, snap ring or other joints in accordance with manufacturers recommendations as appropriate.

c) Use adaptors with ends especially made to suit each type of pipe being joined where dissimilar materials meet.

SECTION 21

EXTERNAL WORKS

21.0.0 EXTERNAL WORKS

21.1.0 GENERAL REQUIREMENTS

21.1.1 Preliminaries:

Refer to Section 1 General Conditions and Preliminaries.

21.1.2 General Requirements:

Comply with Section 2 General Requirements which shall be read in conjunction with (and forms an integral part of) this specification.

21.1.3 Previous Work Sections:

Work in this section is partially specified in previous work sections especially in respect of common materials and workmanship. Comply with those sections in respect of similar materials and workmanship subject to any qualifications and additional requirements given hereunder.

21.1.4 General Landscaping Work:

Comply with BS 4428 General Landscaping Operations subject to any qualifications given hereunder.

21.2.0 Materials:

a) Imported top soil to be clean uncontaminated friable soil of medium texture with adequate humus content obtained from unpolluted previously cultivated land. Soil to be free from unrotted vegetable material or materials other than soil and a max. 20% content by dry weight of stones not exceeding 50mm.

b) Plants specified under "SCOPE" to be provided in accordance with BS 3936.

c) Pressed precast concrete slabs to BS 368.

d) Paving bricks to BS 3921.

e) Bitumen macadam materials to BS 4987 and other relevant standards referred to therein.

f) Precast concrete kerbs to BS 340.

g) Fencing gates and posts generally to BS 1722, BS 5709, BS 3470 as appropriate.

21.3.0 Workmanship:

a) Comply with Section 5 in respect of site investigations and enquiries concerning existing services in the ground. These enquiries shall apply to functioning land drain systems.

b) Protect any bench marks and establish levels as referred to in Section 5.

c) Protect all existing trees and planting from damage unless scheduled for removal or until approved for removal.

d) Excavated top soil to be retained for the works is to be stored in spoil heaps without mixing with sub-soils and to be kept free of weed growth and germination.

e) Finished levels to be 150 below d.p.c. levels and to have a min. even fall of 1: 80 on flat areas.

f) Reinstate any areas of uneven settlement.

g) Undertake specified planting, wherever practicable, at the season and under conditions appropriate to plant type. Comply with BS 3936 and BS 5236 as appropriate. Provide all protection as specified in Section 2.

h) Mow, weed and maintain any landscaped areas until practical completion.

i) Comply with BS 4043 recommendations for transplanting semi-mature trees where applicable.

j) Comply with the manufacturers instructions and recommendations for the installation of proprietary or prefabricated materials and elements.