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Publisher's version / Version de l'éditeur:

<https://doi.org/10.4224/20329034>

Building Practice Note, 1983-05-01

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BUILDING PRACTICE NOTE

COMMENTARY ON STANDARD

CAN3-B78.3-M77-BUILDING DRAWINGS

by

Charles S. Strelka and D.C. Westwood

Division of Building Research, National Research Council Canada

Ottawa, May 1983

ANALYZED



COMMENTARY ON STANDARD
CAN3-B78.3-M77-BUILDING DRAWINGS

ANALYZED

BY

CHARLES S. STRELKA AND D.C. WESTWOOD*

DIVISION OF BUILDING RESEARCH, NATIONAL RESEARCH COUNCIL OF CANADA

OTTAWA, MAY 1983

* School of Architecture
Carleton University
Ottawa, Ontario

3953894

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INTRODUCTION

The National Standard of Canada, CAN3-B 78.3-M77 - Building Drawings, has been prepared as one of the first metric standards related to the building industry. It replaced the previous Standard on Architectural Drawing Practices 33-GP-7 published by the Canadian Government Specifications Board on July 28, 1961. The new Standard gave designers and builders an important tool for the changeover to the new system of metric measurements. Quoting from the preface to the first edition of the Standard:

This is the first edition of CSA Standard CAN3-B78.3, Building Drawings, and is written in SI (Le système international d'unités).

In the preparation of this Standard, current building drawing practices both in Canada and in other countries were investigated. The work of ISO TC10/SC8, in which Canada is active, was also considered and every effort will be made to achieve substantial agreement between this Standard and the proposed ISO standards on building drawings. The procedures set forth in this Standard are considered to be good practice in the light of Canadian needs, especially for conversion to metric, but they do not necessarily reflect current practices, which vary considerably in many aspects.

A set of drawings has been included in this Standard to illustrate procedures and to show the symbols used in building drawings. The drawings are considered to be typical of a small commercial building and contain enough detail to illustrate all the aspects of building drawings that should be standardized. Owing to obvious limitations of space in a document of this type, it is not a complete set of drawings and the details shown in a particular drawing may represent only part of what would normally be a larger drawing. Also, because of the format of this Standard, the shape and size of the drawings are unorthodox.

At the time this Standard was being prepared, metric sizes of most materials and components had not yet been established. Therefore, assumed values have been used for illustrative purposes.

The authors of this Note are members of the CAN3-B 78.3 Standard Drafting Committee and of the Canadian Advisory Committee to International Standard Organization, Technical Committee 10, Subcommittee 8 - Building Drawings (CAC-ISO/TC10/SC8) dealing with the same subject. Since the CAN3-B 78.3-M77 standard came into effect, they have answered numerous inquiries on interpretation of its clauses. The codifying language of

the standard and its size did not allow for explicit explanations of each rule established in it. It has become obvious that not all users of the standard are aware of the reasoning behind these rules.

In the following commentary the authors try to show the rationale behind the current standards for the preparation of building drawings, by sequentially listing the various basic rules on metric usage in Part 1, and the consequent rules for the preparation of architectural working drawings in Part 2. Part 3 includes a selection of the set of drawings mentioned in the preface to the standard to illustrate the rules and practices outlined in Parts 1 and 2. Part 4 covers additional information usually included in a set of architectural working drawings but not included in the standard.

It is hoped that this condensed commentary will serve as a ready reference in the office and as a guide to students.

The authors wish to express their thanks to the Canadian Standards Association for their kind permission to reprint parts of the CAN3-B78.3-M77 - Building Drawings Standard, for explanatory purposes and to Mr. N. Masika, P. Eng., another member of the original B78.3 Committee, for his comments on structural drawings.

NOTE:

ALL AUTHORS' NOTES, COMMENTS AND ALTERNATIVES ARE SHOWN IN THIS TYPEFACE. THE INTENTION IS TO CLARIFY THE ORIGIN OR RATIONALE FOR A RULE OR RECOMMENDATION AND TO SUGGEST APPROPRIATE ALTERNATIVES.

PART 1. BASIC RULES ON SI USAGE

The International System of Units (SI) represents a coherent system usable for measurement of all physical quantities in present-day technology. Seven base units are used together with two supplementary units and a series of prefixes denoting decimal multiples or submultiples. Definitions and symbols of the complete system are given in National Standards CAN3-Z.234.2-76, the International System of Units (SI) and CAN3-Z.234.1-79, Metric Practice Guide.

Three of these base units (the second, ampere and candela) were already in use with the imperial system. Further, the base unit of thermodynamic temperature, kelvin (K), is used mainly in calculations. For everyday use in construction the unit of temperature difference is degree Celsius ($^{\circ}\text{C}$), often mistakenly referred to as "centigrade". The two supplementary units mentioned above refer to the physical quantities of plane angle, the unit of which is radian (rad) and of solid angle, unit steradian (sr). The construction industry in all metric countries has kept the measurement of angle, both in horizontal and vertical plane, in degrees, minutes and seconds as used previously in Canada with the imperial system of measurements.

1.1 GENERAL

METRE	m
KILOGRAM	kg
SECOND	s
AMPERE	A
KELVIN	K
CANDELA	cd
MOLE	mol

Multiplication Factors	Prefix	SI Symbol
1 000 000 000 000 = 10^{12}	tera	T
1 000 000 000 = 10^9	giga	G
1 000 000 = 10^6	mega	M
1 000 = 10^3	kilo	k
100 = 10^2	hecto	h
10 = 10^1	deka	da
0.1 = 10^{-1}	deci	d
0.01 = 10^{-2}	centi	c
0.001 = 10^{-3}	milli	m
0.000 001 = 10^{-6}	micro	μ
0.000 000 001 = 10^{-9}	nano	n
0.000 000 000 001 = 10^{-12}	pico	p
0.000 000 000 000 001 = 10^{-15}	femto	f
0.000 000 000 000 000 001 = 10^{-18}	atto	a

1.2 RULES FOR WRITING SI UNITS AND SYMBOLS

SYMBOLS
NOT
ABBREVIATIONS

L = LITRE
IN
CANADA, USA

One of the main advantages of the SI is the designation of a unique symbol for each unit. Throughout this text, the word "symbol" refers to the signs used to represent the various units and prefixes of their multiples or submultiples. They are symbols, not abbreviations; and they remain the same in all languages. Use of the word "symbol" makes for greater clarity and reduces the chance of error. The following are the basic rules for the use of these symbols.

1.2.1 Symbols are always printed in upright (roman) type. According to ISO Standard 1000 - SI Units, when the symbol for the litre, a lower case l (ell), is used without a prefix, it may be confused with the figure 1 (one). Canadian practice, therefore, has been to use the script ell (ℓ). However, the CSA Committee on Metric Practice Guide has recommended that a capital ell (L) be used as the symbol for litre in all applications.

45 m NOT 45 ms

1.2.2 Symbols do not change in the plural.

1.2.3 A full stop after a symbol is not used, except when the symbol occurs at the end of a sentence.

1.2.4 When symbols consist of letters, there is always a full space between the quantity and the symbol.

45 kg NOT 45kg
BUT
32°C and 45°12'10"

However, when the first character of a symbol is not a letter, no space is left.

1.2.5 Symbols are written in lower case, except when the unit is derived from a proper name. Examples: m for metre, s for seconds; but A for ampere, K for kelvin, N for newton, W for watt. Prefixes are printed in upright type with no spacing between the prefix and the unit symbol: km for kilometre.

km NOT Km

K = kelvin
NOT
1000

1.2.6 When associated with a number, symbols should always be used and unit names not written out; however, when no number is involved, the unit should be spelled out in full. Abbreviations such as "sq.mm" are not acceptable.

16 mm²
NOT
16 square millimetres
OR
16 sq.mm.

1.2.7 Where a decimal fraction of a unit is used, a zero should always be placed before the decimal marker. This practice draws attention to the decimal marker, and helps avoid errors of scale when the decimal marker becomes obscure in print or microfilming.

0.45 NOT .45

1 t = 1000 kg

1.2.8 Confusion may arise with the word "tonne" (1000 kg). When this occurs in French text of Canadian origin, the meaning may be a "ton of 2000 pounds".

N · m
OR
NEWTON METRE

1.2.9 Names and symbols should not be mixed; DO NOT USE N·metre or newton·m. A multiplier dot is used between symbols in a compound unit but no dot is required when that unit is written out, e.g., W/(m²·°C) is written as "watt per square metre degree Celsius".

km/h NOT kph
"PER"
NEVER ABBREVIATED
TO "p"

1.2.10 Compound units formed by division employ an oblique stroke (solidus) when symbols are used. When the units are written out, the word "per" is used, e.g., kilometres per hour NOT kilometres/hour.

METRE LONG

1.2.11 In text, a symbol should not be used to begin a sentence.

1.3 RULES FOR WRITING NUMBERS

1.3.1 The decimal marker is independent of any language or system of units. Both the point and the comma are widely used throughout the world as the decimal marker. In Canada and the United States the decimal marker is the point. The comma may be used, however, depending on industrial, commercial or regional requirements.

1.3.2 To facilitate the reading of long numbers, the digits are commonly separated into groups of three, counted from the decimal marker to the left and right. To avoid confusion with the decimal marker, the separator should be a space, not a comma, period, or any other mark. The space is optional with a 4-digit number.

32 453.246 072 5

1234 OR 1 234

1.4.1 The act of metric conversion can take two basic forms:

"soft conversion" defined as "a change of measurement language to SI units, which may include physical changes not exceeding those permitted by former measurement tolerances", and

"hard conversion" defined as "a change of measurement language to SI units, which necessitates physical changes outside those permitted by former measurement tolerances".

1.4 CONVERTING NON-METRIC VALUES

WOOD STUD (ACTUAL
DIMENSIONS NOT
CHANGED) 38 x 89 mm

PLYWOOD SHEET
CHANGED TO
1200 x 2400 mm

1.4.2 In "soft conversion" the actual dimensions of a product (or of a set-back distance, floor area, etc.) are not changed but are only expressed in appropriate SI units. Inevitably in most practical cases, when a workable number is required, a certain rounding off of the calculated figure will be involved. Here common sense, practice and technical knowledge will come into play. The intention is to convey the degree

4'-0" = 1219.2 mm
= 1220 mm

1 1/2" = 38.1 mm
= 38 mm

of precision implicit in the original dimension; therefore a decision on the appropriate number of digits to be retained is necessary prior to rounding off the result of calculation. As an example, assume that by exact calculation using conversion factors the resulting figure has more digits than required. Then the procedure is as follows:

7.151 426 ROUNDED
TO 4 DIGITS -
7.151

a) when the first digit discarded is less than five, the last digit retained should not be changed;

3.41672 ROUNDED
TO 4 DIGITS - 3.417

b) when the first digit discarded is greater than five, or if it is a five followed by at least one digit other than zero, the last digit retained should be increased by one unit;

2.213 501 ROUNDED
TO 4 DIGITS - 2.214

2.35 ROUNDED
TO 2 DIGITS - 2.4

2.45 ROUNDED
TO 2 DIGITS - 2.4

c) when the first digit discarded is five, followed only by zero, the last digit retained should be increased by one if it is odd, but no adjustment made if it is an even number.

The most accurate equivalents in conversion are obtained by multiplying the quantity to be converted by the conversion factor and then, and only then, rounding the product. If the equivalent is obtained by first rounding the conversion factor to the same number of significant digits as in the quantity being converted, the calculation will probably not be accurate.

1.4.3 Hard conversion to metric, with very few exceptions (such as products originally manufactured in metric dimensions and formerly described in imperial units only for convenience), involves a physical change. As far as manufactured goods are concerned, the change to metric dimensions offers in many instances an opportunity to rationalize product lines. For the construction industry this may lead to dimensional standardization of units and components. Advantages of this spin-off of metric conversion are numerous and can only improve the economy of the industry.

WOOD DOOR HEIGHT
(STANDARD)
IMPERIAL

6'-8", 6'-10", 7'-0"

METRIC

2030 mm

PART 2. ARCHITECTURAL WORKING DRAWINGS

2.1.1 Architectural working drawings have the following functions:

2.1 GENERAL

- a) to record clearly the client's requirements expressed by the architect in such a way that cost estimating and bidding are facilitated;
- b) to form a part of the contract between the client and the builder;
- c) to provide instruction to the builder for the purpose of construction.

2.1.2 Drawing Types/ISO Definitions.

- a) Design concept drawing - Drawing illustrating the designer's concept of a project.
- b) Production drawing - One of a set of drawings for the manufacture of components for, and construction of, buildings and other structures, completely sized and bearing all the information required.
- c) Contract drawing - Drawing which is legally binding upon parties to a contract.
- A1 - A5 d) Location drawing - Drawing used to locate sites, structures, buildings, spaces, elements, assemblies or components.
- A1 e) Block plan - Drawing to identify a site and locate the outlines of construction works in relation to a town plan or other context.
- A2 f) Site plan - Drawing used to locate the position of construction works in relation to setting out points, means of access and general layout of site. It may also contain information on service networks, roadworks and landscape.
- A3 g) General arrangement drawing - Drawing showing the layout of construction works. It includes location, references and sizes.
- A7, A8 h) Assembly drawing - Drawing showing details of construction or of joints.
- A6 i) Component range drawing - Drawing in which a component or part of it is represented and in which all the information needed to define that component or part is provided.
- A7, A8 j) Assembly detail drawing - Drawing, generally to a large scale, showing a component or part of an assembly.
- A9, A10 k) Component detail drawing - Drawing in which a component or part of it is represented and in which all the information needed to define that component or part is provided.
- A3 l) Layout drawings - Drawing of spaces or rooms supplementing information on location drawings.

To fulfill these functions, the drawings must be complete, accurate, and concise. Just as the use of uniform practices in producing the drawings is a valuable aid toward achieving this goal, the quality of drafting and lettering is decisive in communicating the intent of the architect to the builder.







2.2.1 The minimum thickness of line is largely dependent upon the method of reproduction that will be used. The minimum line thickness recommended for 1:1 reproduction is 0.25 mm. Where drawings are made for reproduction at a reduced scale, either by microfilming or other method, the minimum line thickness and spacing used in the original drawing shall be such that, in the print to be made, the lines will have a thickness of not less than 0.18 mm, and the minimum space between lines will be 0.7 mm. Lines thinner than 0.18 mm do not reproduce well and space between lines less than 0.7 mm apart can become blurred.

2.2 DRAFTING PRACTICE

LINE THICKNESS (mm)
GROUPINGS

A	B	C	D
1.0	0.7	0.5	0.35
0.7	0.5	0.35	0.25
0.5	0.35	0.25	0.18

The recommended range of line thickness for general use is 1.0 mm, 0.7 mm, 0.5 mm, 0.35 mm, 0.25 mm and 0.18 mm. These thicknesses form a series that follows a $\sqrt{2}$ progression in accordance with sizes of drawing sheets.

	1.0 mm
	0.7 mm
	0.5 mm
	0.35 mm
	0.25 mm
	0.18 mm

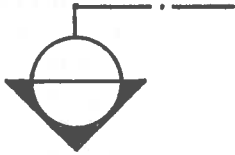






It is not necessary or desirable that all of the line thicknesses be used together. For any one drawing lines from only one of the groups shown should be employed. For general office use, Group C is recommended. For special graphic effects, this rule is often disregarded.

2.2.2 A guide to the relative thicknesses of lines for specific purposes is given in the following table, but this is only a guide and carries no contractual obligation.

LINES FOR SPECIFIC PURPOSES

Drawing Type	Items	Type of line
Block plan location drawings	Site outline of new building	_____ thick
	Existing building	_____ medium
	Reference grids, dimension lines, leader lines and hatching	_____ thin
Site plan location drawings	Site outline or new building	_____ thick
	General details	_____ medium
	Reference grid, dimension lines, leader lines and hatching, elevation contours proposed	_____ thin
	Elevation contours existing and other site features	_____ thin
General location drawings	Primary functional elements in horizontal or vertical sections (e.g. loadbearing columns, walls and structural slabs)	_____ thick

Drawing Type	Items	Type of line
Assembly drawings	Secondary elements and components in horizontal and vertical sections (e.g. non-loadbearing partitions, windows, doors) building outline in structural drawings	medium
	Reference grids, dimension lines, leader lines and hatching (also components, etc. in elevation)	thin
	Primary functional elements in horizontal or vertical section (e.g. loadbearing columns, walls, structural slabs)	thick
	Secondary elements and components in horizontal and vertical section (e.g. non-loadbearing partitions, windows, doors)	medium
	Reference grids, dimension lines, leader lines and hatching, (also components, etc. in elevation)	thin
Component ranges	Outlines requiring emphasis	thick
	Outlines of components	medium
	Reference grids, dimension lines, leading lines and hatching	thin
Component details	Profiles in horizontal or vertical section, reinforcing steel in structural drawings	thick
	General details, architectural and structural	medium
	Reference grids, dimension lines, leader lines and hatching	thin

Drawing Type	Items	Type of line
Planes of sections	Pointers should be used to show the direction of view. Sections should be labelled with capital letters, omitting 0 and I, and reference drawing number.	 thick
Work not visible Work to be removed	The purpose and position of the line should be noted in relation to the plane of section.	 medium
Breaks in continuity of drawings	Thin line with break, or if necessary a thin continuous line with zig-zag	
Pipe lines, services, drains	Thin chain lines Medium chain lines	 
Centre and axial lines	Thick chain lines	
Grid lines	Indicated by a circle at the end of the line	

2.2.3 Lettering should be used on drawings to convey information that is not readily or clearly indicated by graphics alone, and the combination of lettering and graphics should fully and concisely define the object being drawn.

BEWARE OF:

- 1) FINE DETAIL
- 2) CLOSE SPACING
- 3) ILLEGIBLE LETTERING
- 4) INCONSISTANT
DELINEATION
- 5) INCOMPLETE
ERASURES
- 6) HEAVY GUIDELINES
FOR LETTERING

The most important requirements for lettering are legibility, reproducibility and ease of execution. These are particularly important due to the increased use of microfilming, which requires optimum clarity and adequate size of all details and lettering.

In placing notes on drawings the following principles should be applied:


a) Generalized notes, that apply to the drawings as a whole or involve similar parts of detail over the body of the drawing, should be consolidated in a prominent position on the sheet or, preferably, in the notes column of the information panel and referred to if necessary by a notation adjacent to the detail, e.g., Note 1 and 2.

SEE TITLE BLOCK
DRAWING, P 36

b) Special notes should be placed clear of, but as close as practicable to, the items to which they refer. In no case should lettering obscure any part of the drawing.

DRAWINGS A1 – S4

c) Leaders linking notes with details should be used only where confusion might otherwise arise.

CLOSED ARROW ON
 LEADERS
(NEW ISO RULE
NOT APPLIED ON
DRAWINGS A1 – S4)

d) The underlining of lettering or notes is not recommended. If special attention is to be drawn to a note, the word "Important" or "Note" should prefix the lettering.

e) Lettering, when not written to be viewed from the bottom of the sheet, should be placed for viewing from the right-hand side of the sheet.

2.2.4 The requirements and principles listed in the clauses above are best met by the style of lettering known as standard upper case roman (simple block without serif or scroll) which should be used

ABCDEFGHIJKLMN

OPQRSTUVWXYZ

abcdefghijklmnopqrstuvwxyz

0123456789 IVX

exclusively, except for metric symbols requiring lower case letters, e.g., millimetres (mm). Condensed or extended styles are not recommended. Minimum lettering size for dimensions and notes is 3.5 mm; character height is measured to the centerline of the line thickness. Recommended character heights and character line thicknesses (in mm) are shown in the following table.

3.5 mm MIN.

CHARACTER HEIGHT
&
LINE THICKNESS

Nominal character height	2.5	3.5	5.0	7.0	10	14	20
Line thickness (0.1 × height)	0.25	0.35	0.5	0.7	1.0	1.4	2.0

EXCEPTIONS

For drawings size A1 (P1) and larger, the recommended character height is 7.0 mm (minimum 5.0 mm). For very large drawings it may be desirable to use a character height of 10 mm or greater. Larger characters should be used for drawing titles and numbers, and it is permissible to use smaller letters (2.5 mm) in the revision table.

2.2.5 There should be adequate and even spacing between letters and adequate space inside enclosed letters such as P and R. Words should be compact without being cramped and close enough to one another to allow sentences to be easily read.

The clear space between letters and figures should be not less than double the thickness of the line used.

The space between words should be equal to that required by the letter O if touching both words and the space between sentences should be double that between words.

Spacing between lines of lettering should be not less than one half the height of the characters.

2.2.6 Where variable typeface typewriters are used, the previously recommended relations between height and thickness of letters should be maintained, particularly if reduction of the drawing is planned.

A	B	C	D	E	F	G	H	I	J	K	L
M	N	O	P	Q	R	S	T	U	V	W	X
Y	Z	1	2	3	4	5	6	7	8	9	.
,	:	;	=	÷	+	-	±	@	#	×	%"
'	()	°	/							

Where typewriting is used, the type face, size and density should be selected or controlled to conform as nearly as possible to the line work previously recommended and to that used on the drawing. A typeface without serifs is preferred as is microfont, recommended by CSA Standard B-78.1 and in the U.S.A. by National Microfilm Association.

2.3 LAYOUT AND IDENTIFICATION OF DRAWING SHEETS

2.3.1 All drawing sheets require certain basic information, such as title and scale, but additional information is generally desirable. The use of preprinted sheets enables the inclusion of information which would be uneconomical if done by hand. Sheets may be preprinted for general use or for a particular project.

Every sheet should include the following:

MANDATORY

- a) Border lines
- b) Binding margin
- c) Title panel
- d) Information panel.

Sheets may also contain:

NON-MANDATORY

- e) Sheet grid reference systems
- f) Camera alignment marks for microfilming
- g) Marks to facilitate folding.



2.3.2 All drawing sheets should have a border on all four edges; the left-hand border should be substantially wider than the others to provide a binding margin.

When borders are not provided, there is a risk of information being lost should the printing paper slip or be carelessly trimmed, or should the print be damaged in use. Recommended border widths are shown in the following table.

2.3.3 Dimensions of Drawing Sheets, mm

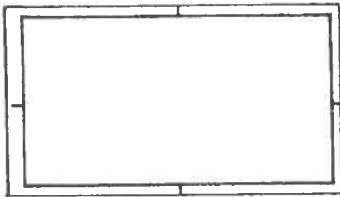
Designation	Drawing Sheet Sizes	Width of Borders			Rectangular Drawing Frame Sizes	DIMENSIONS OF DRAWING SHEETS
		Top and Bottom	Left Side	Right Side		
A0	841 × 1189	20	40	16	801 × 1133	
A1	594 × 841	14	28	12	566 × 801	
A2	420 × 594	10	20	8	400 × 566	
A3	297 × 420	7	20	6	283 × 394	
A4	210 × 297	7	20	6	283 × 184	

NOTE: Binding margin on A4 sheets is on a long edge, on other sheets it is on a short edge.

2.3.4 Where ISO-RA (oversize) drawing sheets are used, the trimming line should be indicated on the sheets. This may be broken lines forming a frame, sized to the cut sheet dimensions of regular size sheets specified above, or by other suitable methods of indication.

2.4 MICROFILMING

2.4.1 The ISO-A series drawing sheets are particularly well suited to reduction on 35-mm microfilm. Their aspect ratio is $1:\sqrt{2}$ throughout the range; this is also the aspect ratio of the microfilm frame. A selection of print sizes on A series standard sensitized sheets can be obtained by employing uniformly related reduction and enlargement ratios. For example, a plan produced at 1:100 on an A2 sheet can be reproduced as 1:50 on A1 or 1:200 on A3 size.



2.4.2 Where required, camera alignment marks should be provided at the centre of each of the four sides of the drawing sheet. Marks should be in the form of an outline arrowhead pointing inwards and should be placed outside the drawing frame.

2.4.3 Drawings prepared for microfilming should contain means of determining the original size. This should be achieved preferably by indicating the drawing frame dimensions. These may be shown outside the drawing frame near a corner. In addition, a graduated line 100 mm long should be shown in a suitable location representing the scale of the drawing for use when a microfilm printout to a different sheet size is required.



A North point should be shown on every location plan, adjacent to the title panel, and preferably facing the top of the drawing sheet.

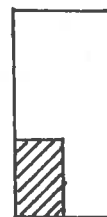
2.5 ORIENTATION OF PLANS



Whenever practicable all plans for a particular project should be drawn with the same orientation on the drawing sheet.

Where a particular plan occupies more than one sheet, a key diagram may be included to relate graphically the particular block to the overall design. This key, with the appropriate part hatched or blacked in, should be located in or adjacent to the information panel on each relevant drawing sheet.

2.6 KEY DIAGRAMS



SEE DRAWING A5

The need to communicate information contained in the drawings both accurately and adequately calls for the drawings to be carried out in a precise scale. Careful consideration must be given to this choice. The preferred scales for various classifications of drawings are shown in the following table. If the recommended range is not sufficient for the intended use, it can be extended both up and down, but the new

2.7 SCALES

scale should be derived from one of the scales shown by multiplying the numerator or denominator by the power of 10.

2.7.1 Preferred Scales for Different Types of Drawings

Stage	Type of Drawing	Scale	Notes
Design	Sketch and preliminary drawings		Scales will vary but it is recommended that preference be given to those used in the working drawing stage.
	Location drawings		Scale will vary according to maps used as reference.
	Block plan	1:2000 1:1000	
Working drawing	Site plan	1:500 1:200	
	General location drawings	1:200 1:100 1:50	
	Component range drawings	1:100 1:50 1:20	The preferred scale is 1:50
	Assembly drawings	1:20 1:10 1:5	
	Component detail drawings	1:10 1:5 1:1	

Notes 1) Examples see drawings A1-S4.

2) Use of derived scale 1:2 is discouraged in architectural practice as it can be confused visually with the scale 1:1 in component details. This rationale is not necessarily shared by other professions.

The dimensioning method should be consistent and meticulous.

2.8 DIMENSIONING

2.8.1 Linear dimensions should be expressed in millimetres (mm) on building drawings, and in metres (m) on site plans. According to the standard convention in drafting, the unit symbol can be omitted if the following requirements are met:

mm, m	YES
cm, dm	NO

- a) a note indicating the unit used is displayed in a conspicuous place on the drawing sheet;
- b) all linear dimensions including those for spot levels and land elevation contours are given in one dimensioning unit only.

**ALL LINEAR
DIMENSIONS
IN MILLIMETRES
ONLY**

For easier reading, group the digits in triads on both sides of the decimal marker (e.g., 123.456 789). All dimensions shown in metres must be taken to three decimal places, even when all decimals are zeros.

1.235 m, 1.000 m

2.8.2 Area dimensions should be expressed in:

- a) hectares (ha) for areas on survey plans, plans of subdivisions and lot plans to three decimals;

1.234 ha

1.25 m²

b) square metres (m²) for floor areas of rooms, cross-section areas of earthworks, large glass panes, etc., to two decimals;

15 mm²

c) square millimetres (mm²) for structural areas and other sections, bars, etc., using no decimals.

Symbols of these units MUST ALWAYS BE SHOWN on drawings where appropriate.

12.5 m³

2.8.3 Volume dimensions should be expressed in:

a) cubic metres (m³) for volumes of earthwork, excavations, concrete, fluids in large quantities;

60 L

b) litres (L) for containers of fluids or gases only.

Symbols of these units MUST ALWAYS BE SHOWN on the drawings.

2.8.4 As mentioned in 2.8.1 the preferred units for linear dimensions of building drawings are millimetres and metres. This convention enables the designer to avoid using unit symbols with every measurement notation on the drawing.

Moreover, the convention helps eliminate possible errors in reading the drawing, even when the decimal marker is omitted or obliterated in print.

There can be no hard-and-fast rule about when to use metres and when millimetres, as the dimensional unit on a particular drawing. Indeed, no such rule existed in the inch system; a light fixture or ceiling panel, for example, could have been described as either 48 in. or 4 ft. long, depending on circumstances or individual preference.

Recommended convention is to use millimetres for all dimensions related to actual building works and metres for site or lot dimensions. Conventions establishing a cutoff point for the use of one unit or another are only rules of thumb and should not be slavishly followed; there will always be cases where the context or personal "feel" requires an exception. It is obviously preferable, regardless of the convention adopted, to employ only one unit for linear dimensions on any single drawing. Levels and elevations are always shown in metres to three decimal places.

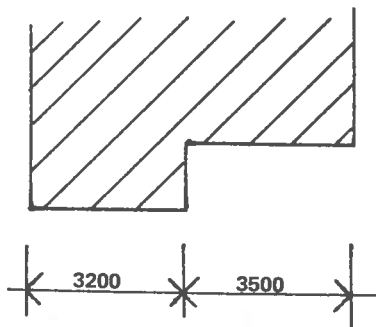
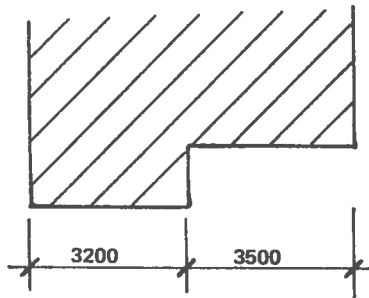
ELEV. + 120.345

200 mm²4.5 m²

25 kg

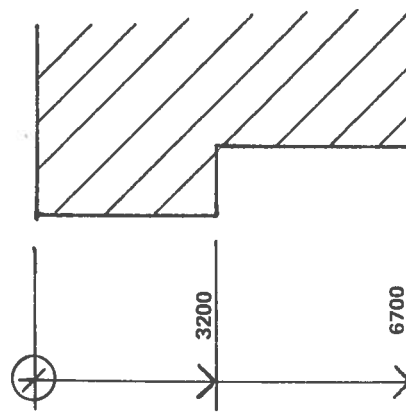
All dimensions and notations relating to area, mass, and other nonlinear quantities must, of course, be followed by the appropriate unit symbol.

A complete system of dimensioning is made up of dimension lines, extension lines, terminals, and numbers indicating the actual size of the depicted object. Both dimension lines and extension lines should be drawn as solid lines, thinner than the outlines of the part they refer to. They should be placed where they cannot be confused with the outlines of the structure. Extension lines should always be drawn at right angles to dimension lines in normal orthographic projection.



The ISO recommends that terminals, indicating the limits of various dimensions, be shown as thick, oblique strokes drawn at a 45° angle to the dimension line. If an oblique stroke terminal could be confused with the contour of the depicted object or would otherwise interfere with the outline, an arrow may be used as a terminal (as shown in drawings in Part 3). ISO recommends that the arrowhead be drawn at 45° angles to distinguish it from arrowheads used on leader lines from notes.

Where running dimensions are used, as on a survey drawing of an existing building or where the actual construction is carried out in linear sequence, the starting point should be shown by an oblique stroke within a circle, and the succession points should be indicated by single 45° arrowheads as recommended by ISO. It is also recommended that the numerical values associated with successively dimensioned points be written at right angles to the dimension line. This convention helps prevent possible confusion with normal dimensions.



2.9.1 Several different means of expressing slope are now in use. A slope may be indicated in degrees and minutes, as a percentage, or as a ratio of horizontal to vertical dimensions. This last method is particularly common in building work; roof slopes were typically expressed as 4" in 12", drainage slopes are given as 1½" in 10', and so on. The necessity of employing conversion factors in the inch system made it difficult to apply such ratios universally; each use - roofs, crossfalls, drainage, ramps - had to be considered individually, and related to the limitations of the measurement instrument customarily used. By contrast, in SI, which is decimally based, there is no

2.9 EXPRESSION OF SLOPE


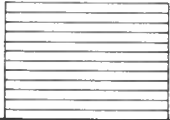
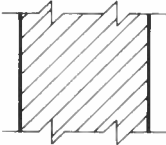
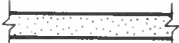




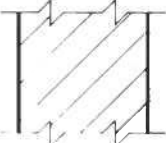







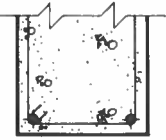


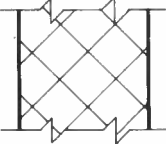
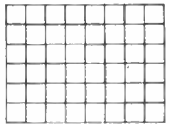
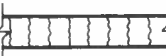
Ratio ($\frac{Y}{X}$)	Angle	Percentage (%)
Shallow Slopes		
1:100	0° 34'	1
1:67	0° 52'	1.5
1:57	1°	1.75
1:50	1° 09'	2
1:40	1° 26'	2.5
1:33	1° 43'	3
1:29	2°	3.5
1:25	2° 17'	4
1:20	2° 52'	5
1:19	3°	5.25
Slight Slopes		
1:17	3° 26'	6
1:15	3° 48'	6.7
1:14.3	4°	7
1:12	4° 46'	8.3
1:11.4	5°	8.75
1:10	5° 43'	10
1:9.5	6°	10.5
1:8	7° 07'	12.5
1:7.1	8°	14
1:6.7	8° 32'	15
1:6	9° 28'	16.7
1:5.7	10°	17.6
1:5	11° 19'	20
1:4.5	12° 30'	22.2
1:4	14° 02'	25
Medium Slopes		
1:3.7	15°	26.8
1:3.3	16° 42'	30
1:3	18° 26'	33.3
1:2.75	20°	36.4
1:2.5	21° 48'	40
1:2.4	22° 30'	41.4
1:2.15	25°	46.6
1:2	26° 34'	50
1:1.73	30°	57.5
1:1.67	30° 58'	60
1:1.5	33° 42'	67
1:1.33	36° 52'	75
1:1.2	40°	84
1:1	45°	100
Steep Slopes		
1.2:1	50°	119
1.43:1	55°	143
1.5:1	56° 19'	150
1.73:1	60°	173
2:1	63° 26'	200
2.15:1	65°	215
2.5:1	68° 12'	250
2.75:1	70°	275
3:1	71° 34'	300
3.73:1	75°	373
4:1	75° 58'	400
5:1	78° 42'	500
5.67:1	80°	567
6:1	80° 32'	600
11.43:1	85°	1143
∞	90°	∞

conversion factor and no constraint on the use of pure number ratios. For example, a ratio of 1:3 can be utilized as 1 mm vertical rise to 3 mm horizontal run, or 1 m to 3 m, or 100 mm to 300 mm, or any multiple of 1 and 3 that suits the circumstances. A crossfall slope formerly expressed as $1\frac{1}{2}$ " in 10' can be given in nondimensional terms as 1:80, which in SI can then be employed in the form 10 mm in 800 mm or 100 mm in 8 m or 50 mm in 4 m or any other convenient multiple.

Pure number ratios - that is, nondimensional ratios - are the preferred means of expressing slope in SI construction. The convention adopted in B 78.3-M77 is that the vertical component is always shown first, the horizontal second. Furthermore, for slopes shallower than 1:1 (45°) the vertical component is given as unity, whereas for slopes steeper than 1:1 the second, horizontal component is given as unity. Thus the safe slope for a ladder, for example, might be specified as 3:1, indicating 3 m vertically to 1 m horizontally.

When a high degree of accuracy is essential, slopes may be expressed in terms of degrees, minutes, and seconds.

2.10 DRAFTING SYMBOLS- MATERIALS

GENERAL LOCATION DRAWINGS SCALE 1:50 OR SMALLER		ASSEMBLY DRAWINGS SCALE 1:10 OR LARGER
PLAN & SECTION	ELEVATION	PLAN & SECTION
	 SPACING TO REPRESENT COURSING	
		
 LINE SPACING TWICE AS WIDE AS FOR BRICK	 STIPPLE DENSITY ONE-HALF OF THAT FOR CUT STONE	
TOO FINE TO HATCH		
	 STIPPLE DENSITY ONE-THIRD OF THAT FOR CUT STONE	
	 STIPPLE DENSITY ONE-THIRD OF THAT FOR CUT STONE	
 LINE SPACING THREE TIMES AS WIDE AS FOR BRICK	 SPACING TO REPRESENT COURSING	
TOO FINE TO HATCH		

Brick masonry

Cut stone masonry

Artificial stone masonry

Marble

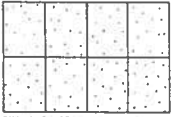


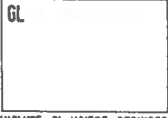












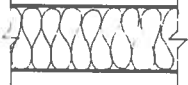

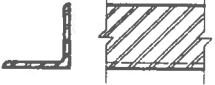




Concrete

Reinforced concrete














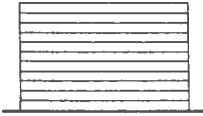
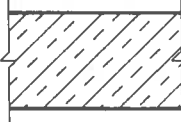
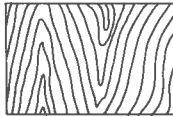


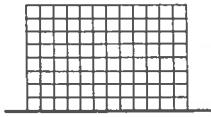
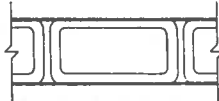


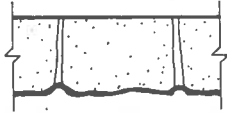

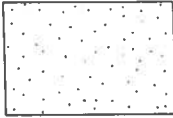
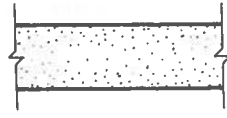
Concrete or cinder block

Ceramic tile

DRAFTING SYMBOLS—MATERIALS

	GENERAL LOCATION DRAWINGS SCALE 1:50 OR SMALLER		ASSEMBLY DRAWINGS SCALE 1:10 OR LARGER
	PLAN & SECTION	ELEVATION	PLAN & SECTION
Terrazzo	TOO FINE TO HATCH	 SHOW PATTERN OF STRIPS	
Glass		GL  INCLUDE GL WHERE REQUIRED FOR CLARITY	
Wood framing	 FOR NEW WORK  FOR ALTERATION WORK		
Wood (finished)	TOO FINE TO HATCH		
Rigid insulation			
Batt insulation			
Structural Steel	I [L ⊥		
Bronze, brass, copper, and associated alloys	AS FOR STRUCTURAL STEEL		
Aluminum	AS FOR STRUCTURAL STEEL		

DRAFTING SYMBOLS—MATERIALS

GENERAL LOCATION DRAWINGS SCALE 1/8" = 1' OR SMALLER		ASSEMBLY DRAWINGS SCALE 1/4" = 1' OR LARGER
PLAN & SECTION	ELEVATION	PLAN & SECTION
		
		
		
		
		
		
		
		
		

Earth

Rock

Gravel fill

Cinder or slag fill

Fire brick

Plywood

Glass block

Natural stone -
rip rap, field stone, etc.Sand, fill, plaster,
gypsum board and cement

PART 3. EXAMPLES OF DRAWINGS

The following set of drawings for a hypothetical building has been prepared to illustrate procedures and symbols set out in this standard.

Any other symbols shown, (e.g. the north-point arrow) are not necessarily standard, and are used for demonstration purposes only. It is also recognized that the shape and size of the drawings is unorthodox; this has been dictated by the format of this publication.

As a consequence, some drawings here represent only a part of what would normally be a larger drawing (e.g. A5) in order to show the whole building. Similarly, no attempt has been made to incorporate the complete title block; only a title, the scale and a drawing number have been shown, to facilitate identification and cross-referencing.

An explanation of the cross-reference "bubble" is incorporated in the complete recommended title block, (illustrated on page 36) as it is a required piece of information on all drawings. Similarly, a note stating that all linear dimensions are in millimetres only, should appear on all drawings; in addition, a note stating that all levels are given in metres only, to three decimals, should appear on all relevant drawings.


If drawings are being prepared for reduction, then the numerical scale must be accompanied by a graphic scale. It is recommended that reduced

or enlarged prints be stamped to indicate that the print is no longer to the original scale.

Dimension values attributed to materials and components in the following drawings are assumed values for illustrative purposes only; equivalent metric sizes of such products were not available at time of publication.

OUTLINE OF LOCATION FOR HORIZONTAL TITLE BLOCK 

3		
2		
1		
no.	revision	date



— plan, section, elevation or detail no.

— no. of drawing where above is drawn


ALL LINEAR DIMENSIONS IN MILLIMETRES ONLY

architect/engineer/consultant

project title

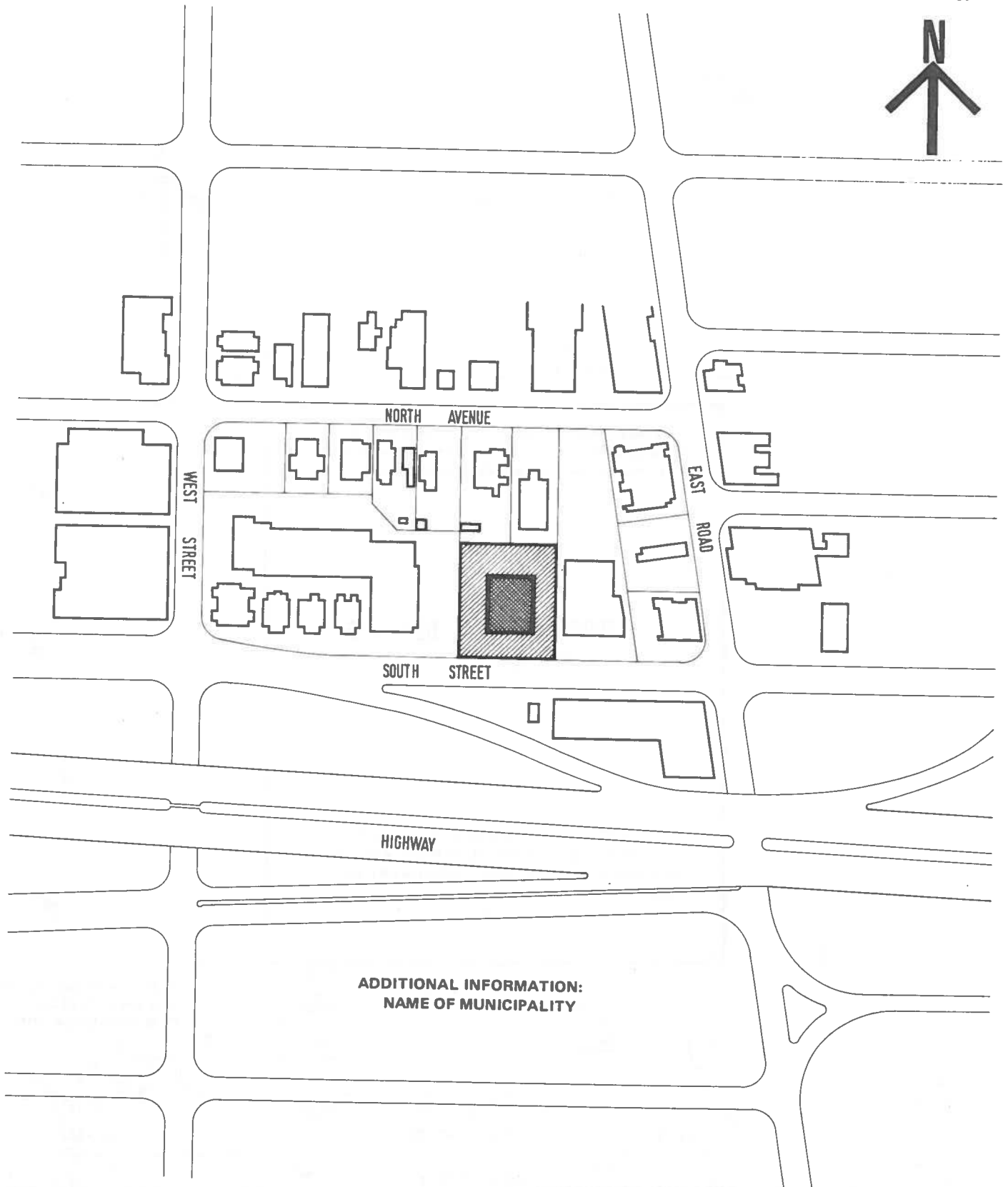
drawing title

scale



designed by	date
drawn by	date
approved by	date

project no.	drawing no.	rev.
-------------	-------------	------



BLOCK PLAN

1

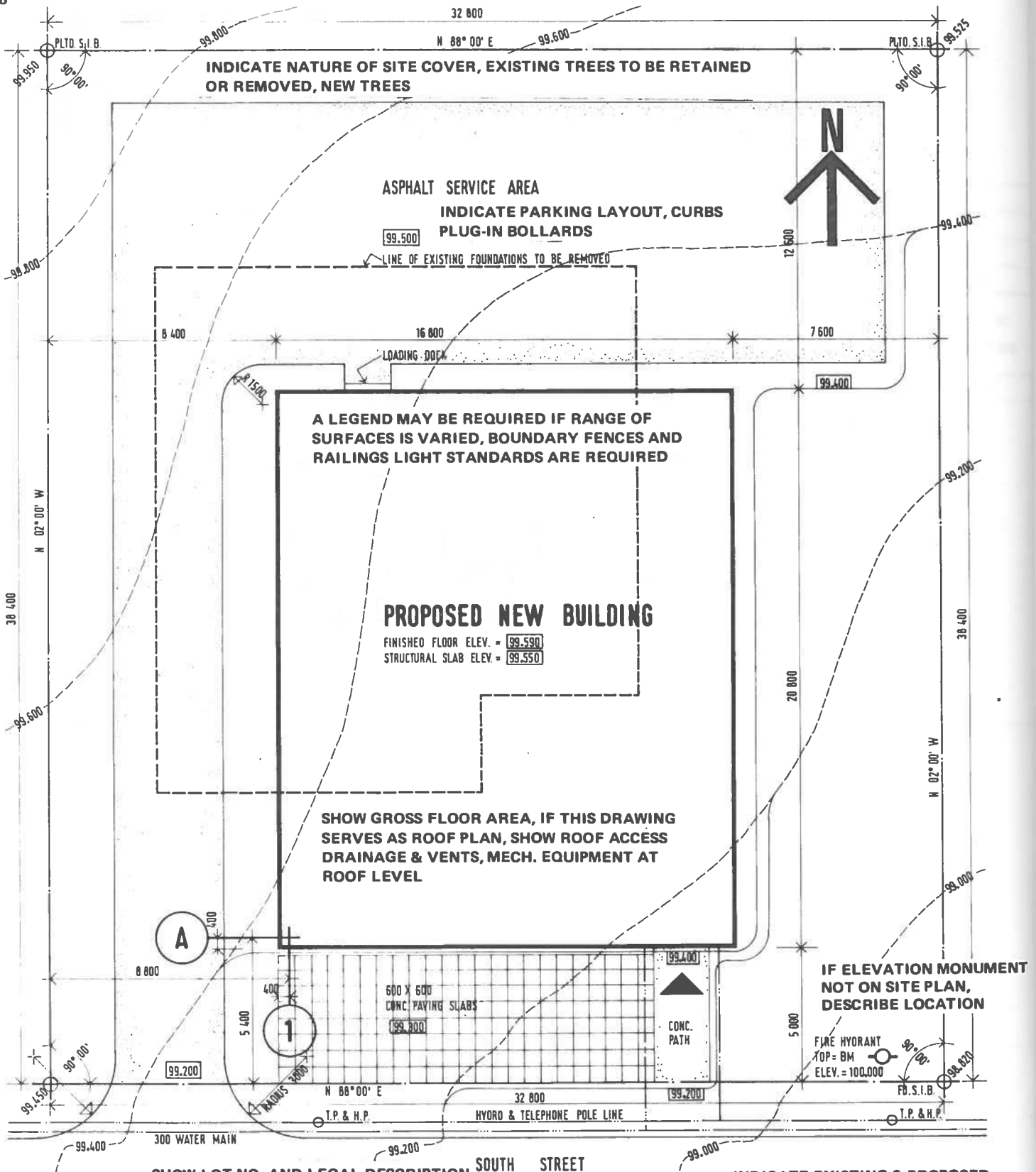
LOCATION DRAWING

SCALE 1 : 2 000

drawing no.

A1

INDICATE ZONING AND FIREROUTE SETBACKS
HYDRO AND OTHER RIGHT OF WAY



SITE PLAN

- SHOW LOT NO. AND LEGAL DESCRIPTION (BLOCK NO...OF REGISTERED PLAN NO... OF MUNICIPALITY ...)
- SHOW NAME OF ORIGINAL SURVEYOR
- ZONING, SITE AREA
- NOTE WHERE ADDITIONAL INFORMATION CAN BE OBTAINED AS BORE-HOLE FINDINGS AND SPECIAL SITE FEATURES

LOCATION DRAWING

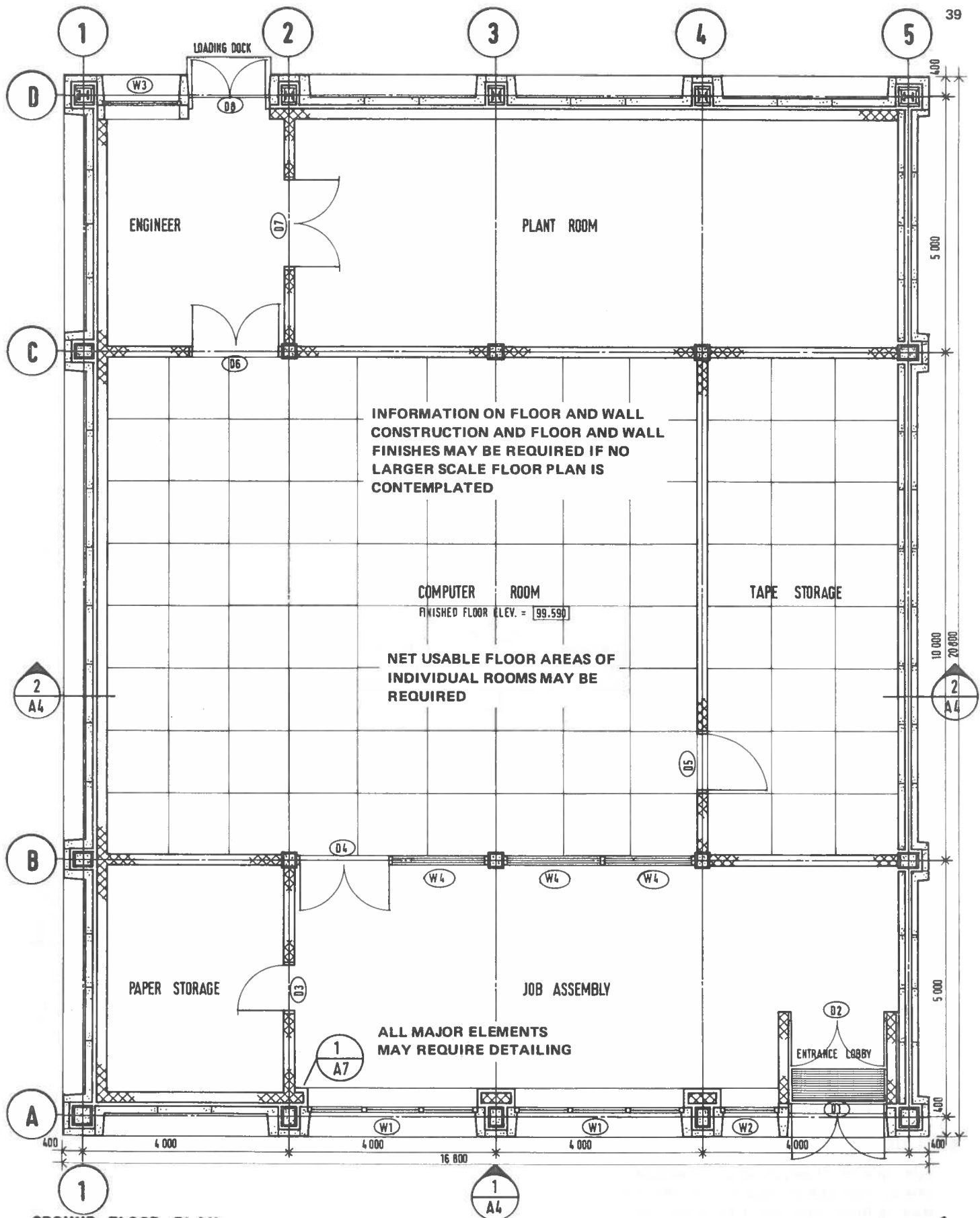
CROSS-REFERENCE WITH
LANDSCAPE DRAWINGS IF ANY

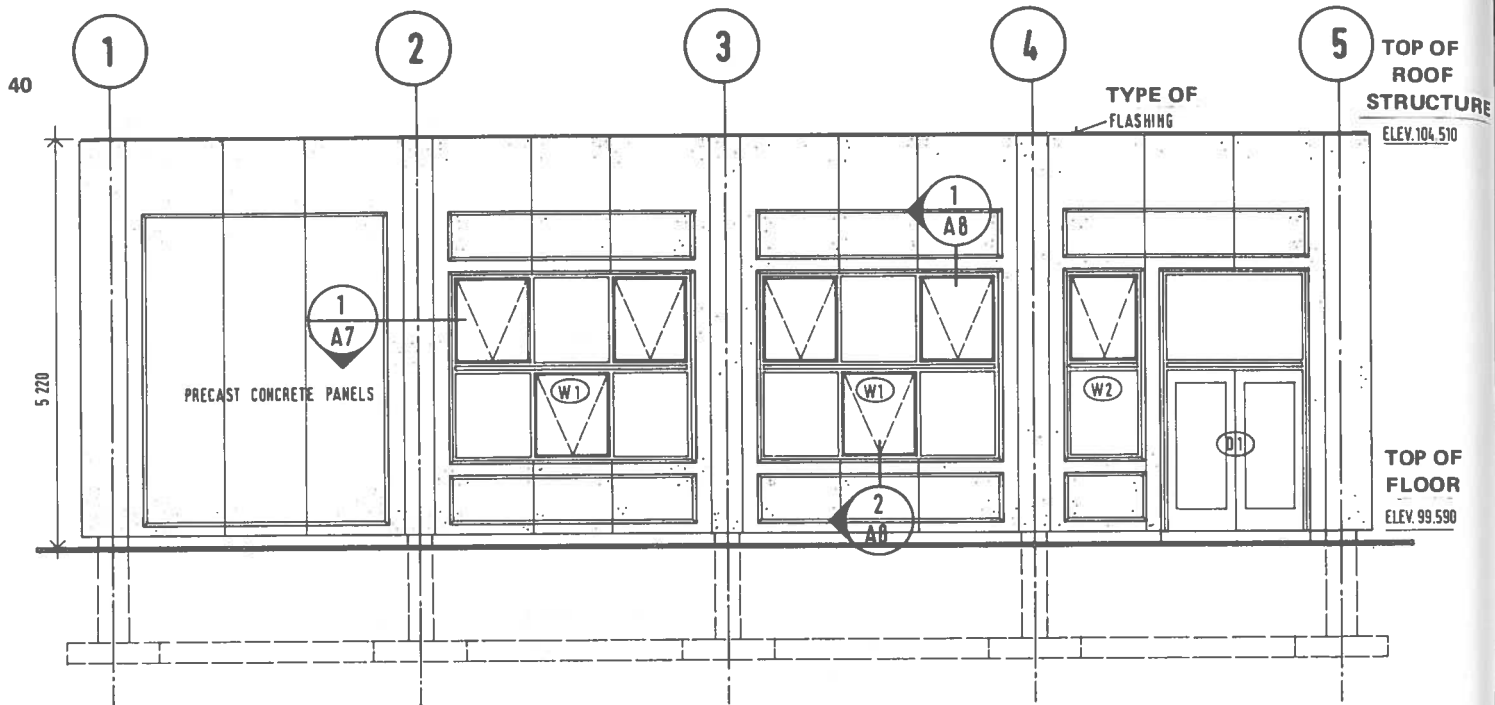
SCALE 1 : 200

INDICATE EXISTING & PROPOSED
MANHOLES & CATCH BASINS
GIVE THEIR STREET ELEVATIONS,
AND/OR INVERT ELEVATION, SHOW
CONNECTIONS OF SERVICES TO THE
BUILDING

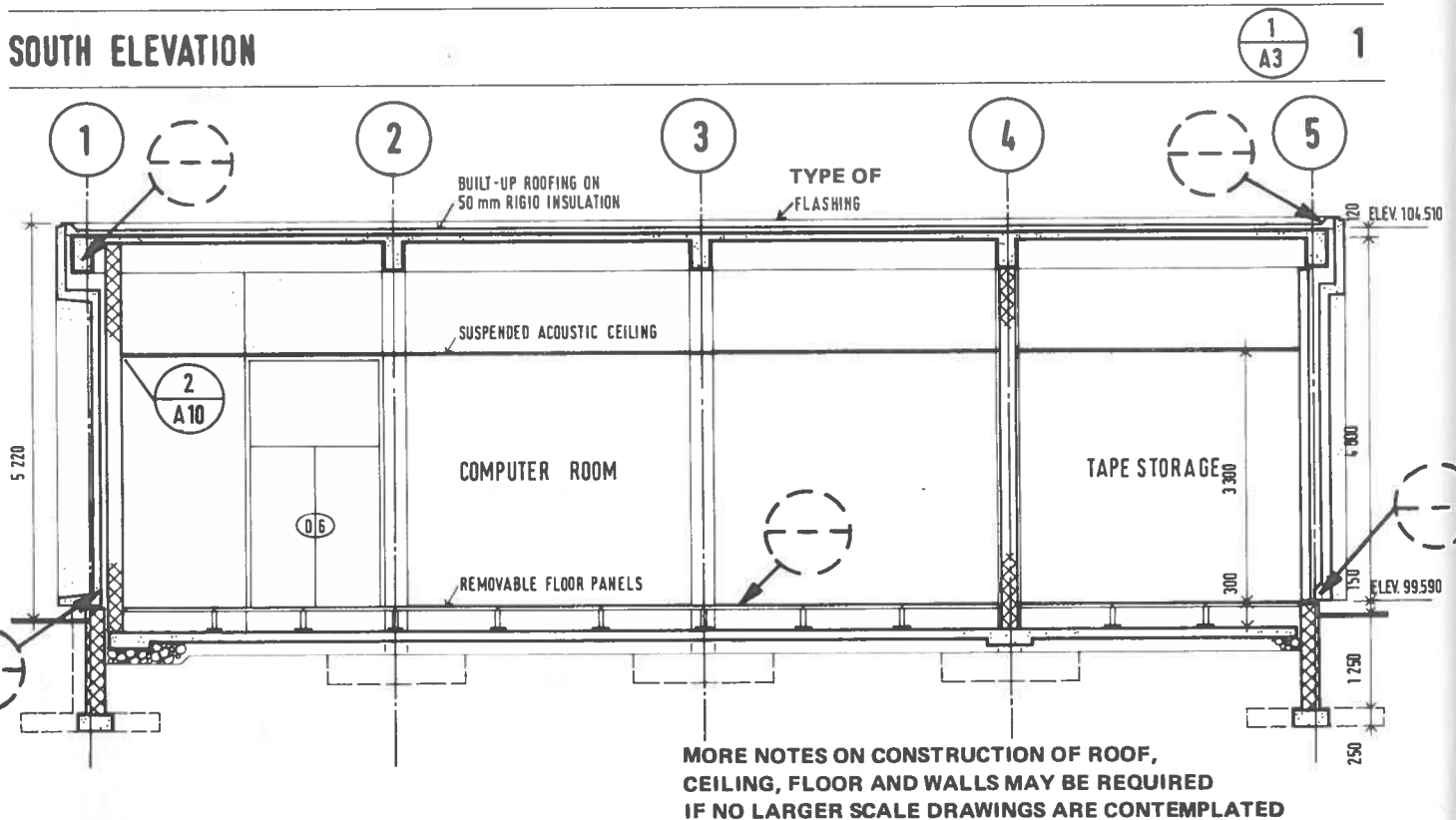
drawing no.

A2





SOUTH ELEVATION



SECTION

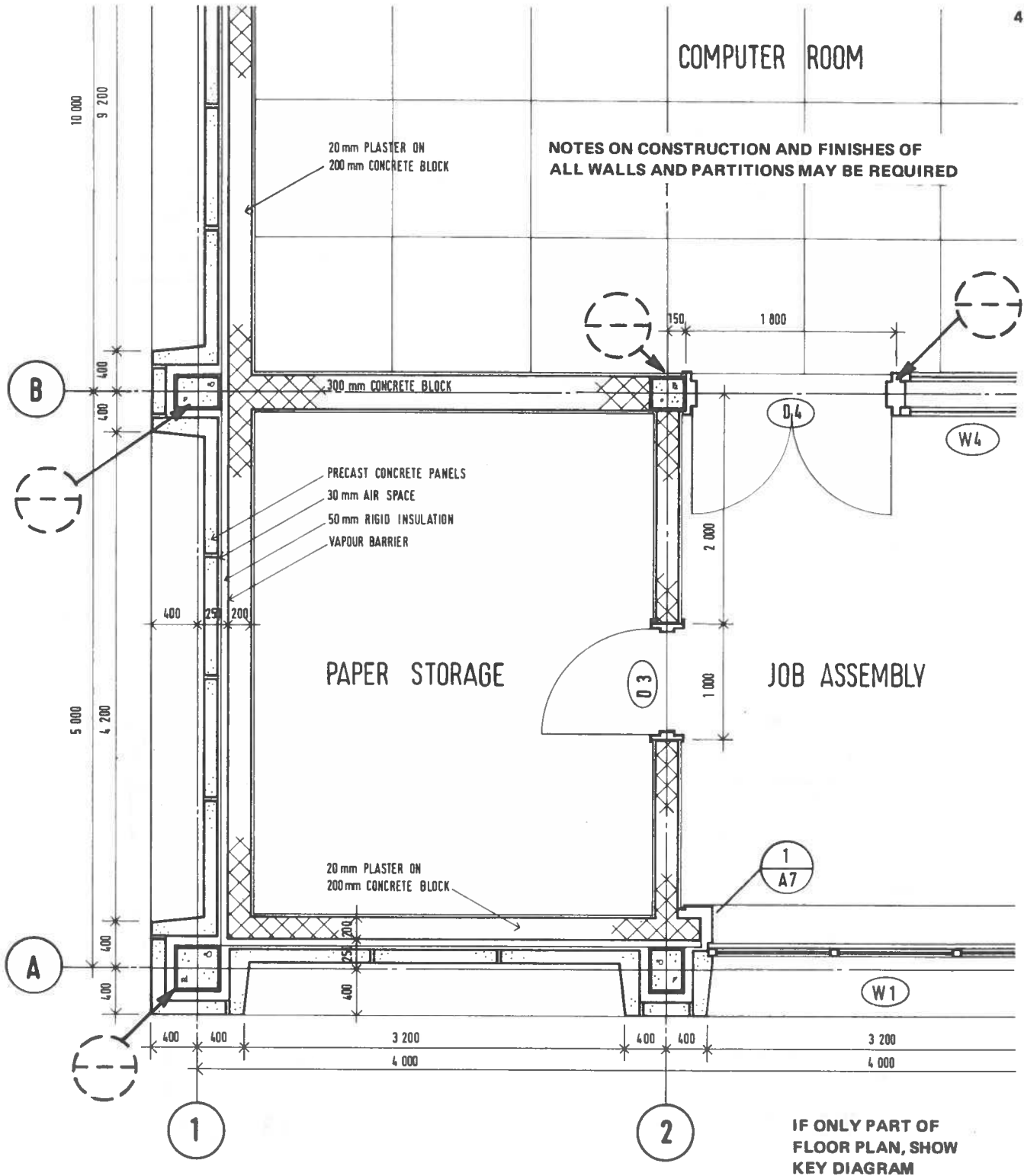
FURTHER SECTIONS ESPECIALLY WHERE
STRUCTURE VARIES AND AT STAIRWELLS
MAY BE REQUIRED. WALL SECTION 1:50
MAY BE REQUIRED

LOCATION DRAWING

SCALE 1:100

drawing no.

A4



GROUND FLOOR PLAN

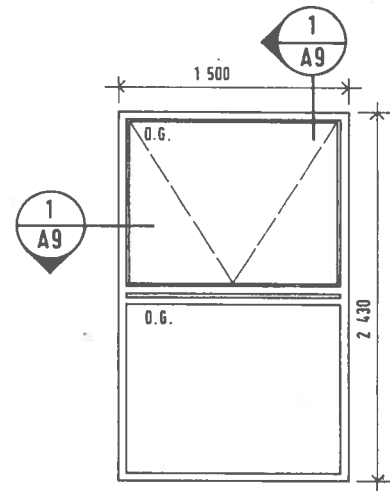
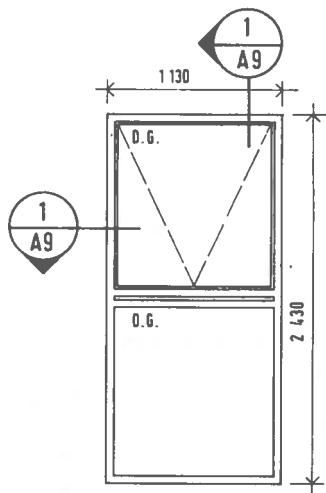
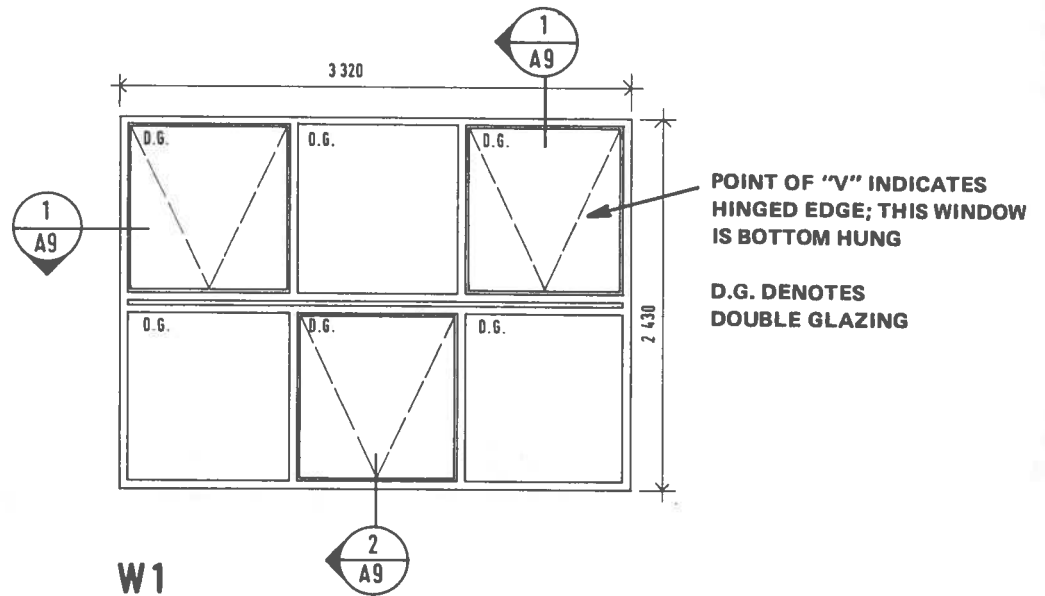
1

LOCATION DRAWING

SCALE 1 : 50

drawing no.

A5



A SIMILAR DRAWING MAY BE REQUIRED
FOR DOORS. BOTH CAN BE COMBINED
WITH WINDOW AND DOOR SCHEDULES
SEE PART 4

COMPONENT RANGE DRAWING

SCALE 1 : 50

drawing no.

A6

**FINISHES MAY
BE INDICATED**

20mm PLASTER.

200 mm CONCRETE BLOCK

VAPOUR BARRIER

50 mm RIGID INSULATION

METHOD OF SECURING INSULATION TO STRUCTURE

WOOD BLOCKING

PRECAST CONCRETE PANEL

300 x 400 REINFORCED CONCRETE COLUMN

OD OF SECURING
ST PANELS TO
RETE FRAME SHOULD
ICATED AND DESCRIBED.

**RECOMMENDED FIXING
COLUMNS SO
CONTINUOUS
OUR AND AIR
RIER IS NOT
TURED)**

- INDICATE USAGE OF PIPE

**ALTERNATIVE
LOCATION OF
WINDOW UNIT
IF "COLD BRIDGE"
POTENTIAL
CONSIDERED
LIKELY**

CONT.
VAPOUR BARRIER

GRIDLINE DESIGNATION

AIR SEAL

**MATERIALS SHOULD
BE INDICATED**

SEALANT

PLAN AT EXTERNAL COLUMN

RECOMMENDED SYMBOL FOR VAPOUR AND/OR AIR BARRIER IN LARGE SCALE DETAILS

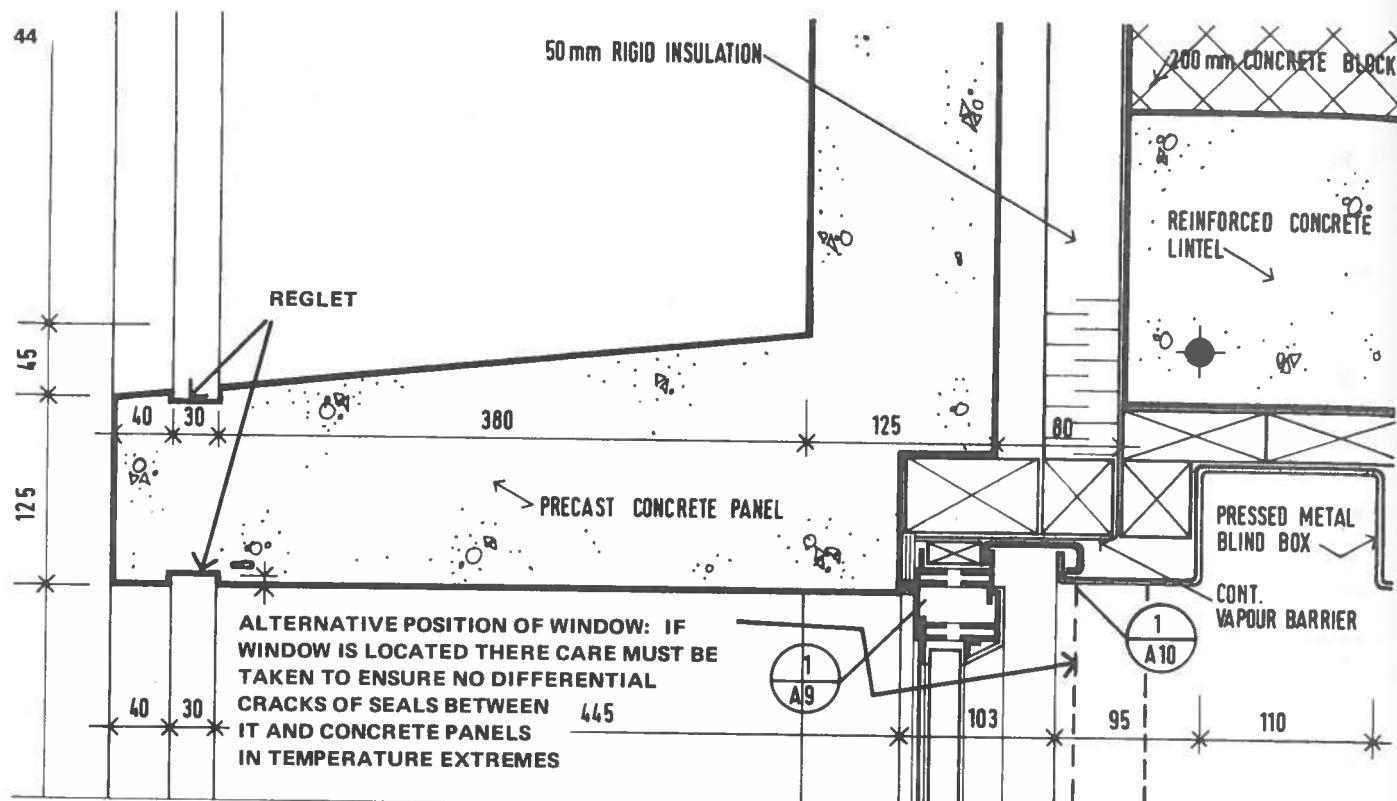
GRIDLINE DESIGNATION

ASSEMBLY DRAWING

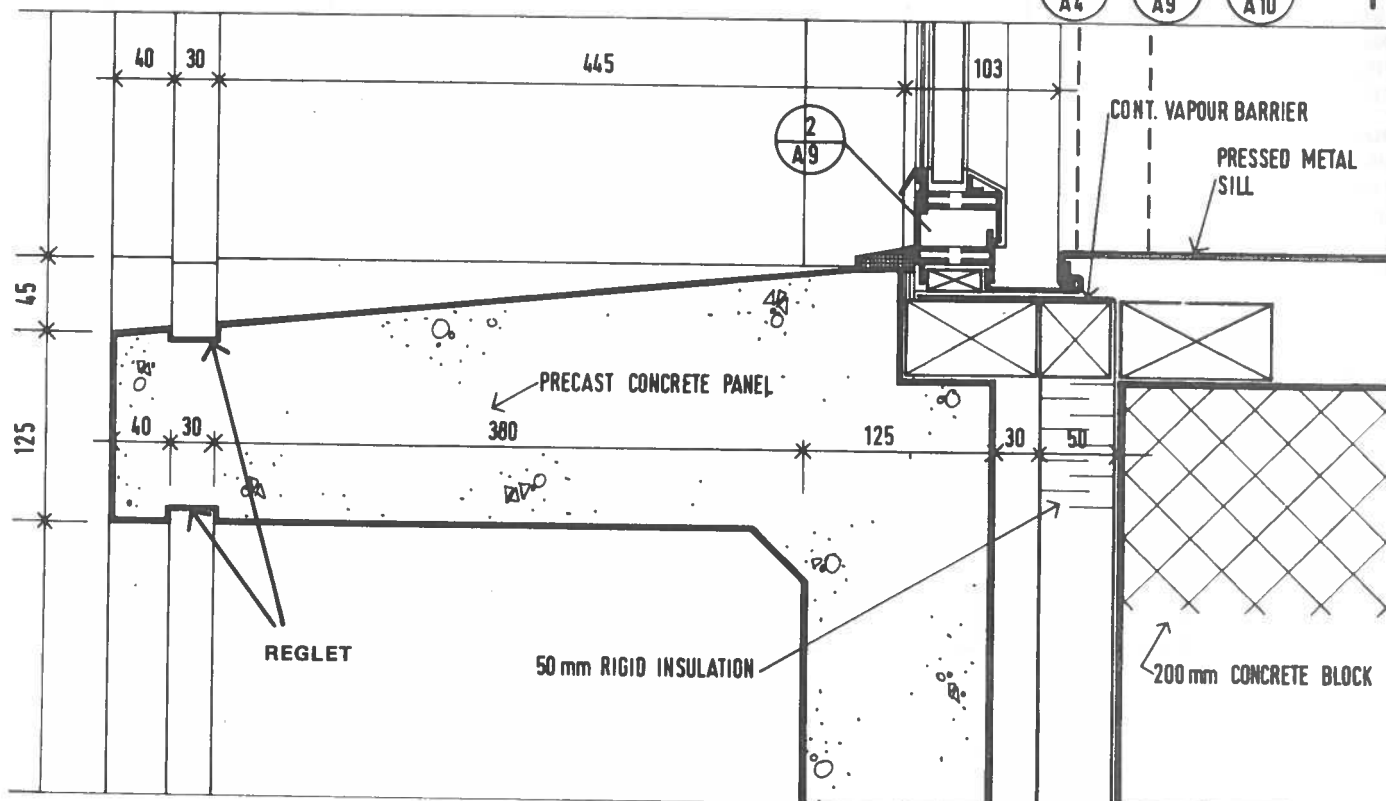
SCALE 1 : 5

drawing no:

A7



SECTION AT WINDOW HEAD



SECTION AT WINDOW SILL

RECOMMENDED SYMBOL FOR VAPOUR AND/OR AIR BARRIER IN LARGE SCALE DETAILS

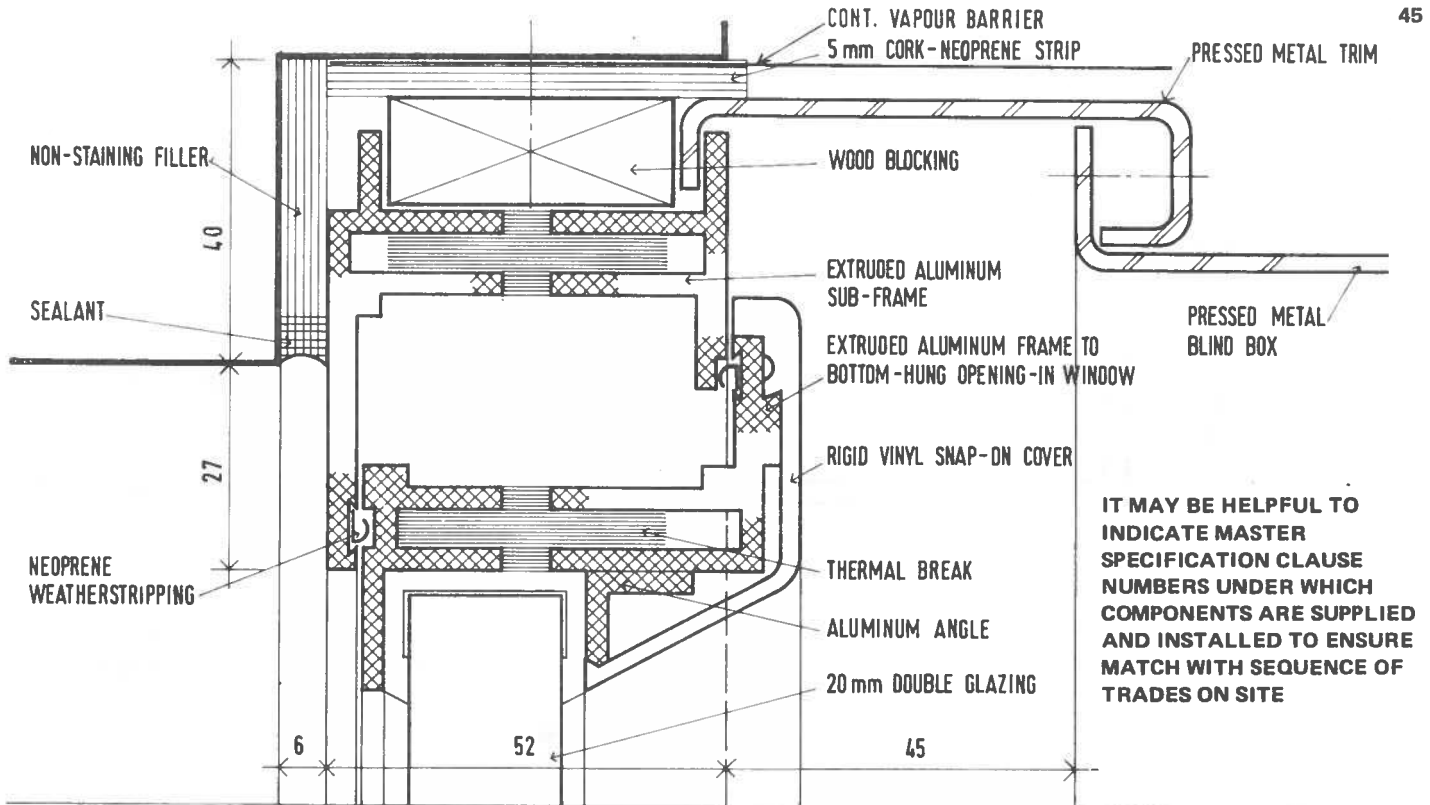


ASSEMBLY DRAWING

SCALE 1 : 5

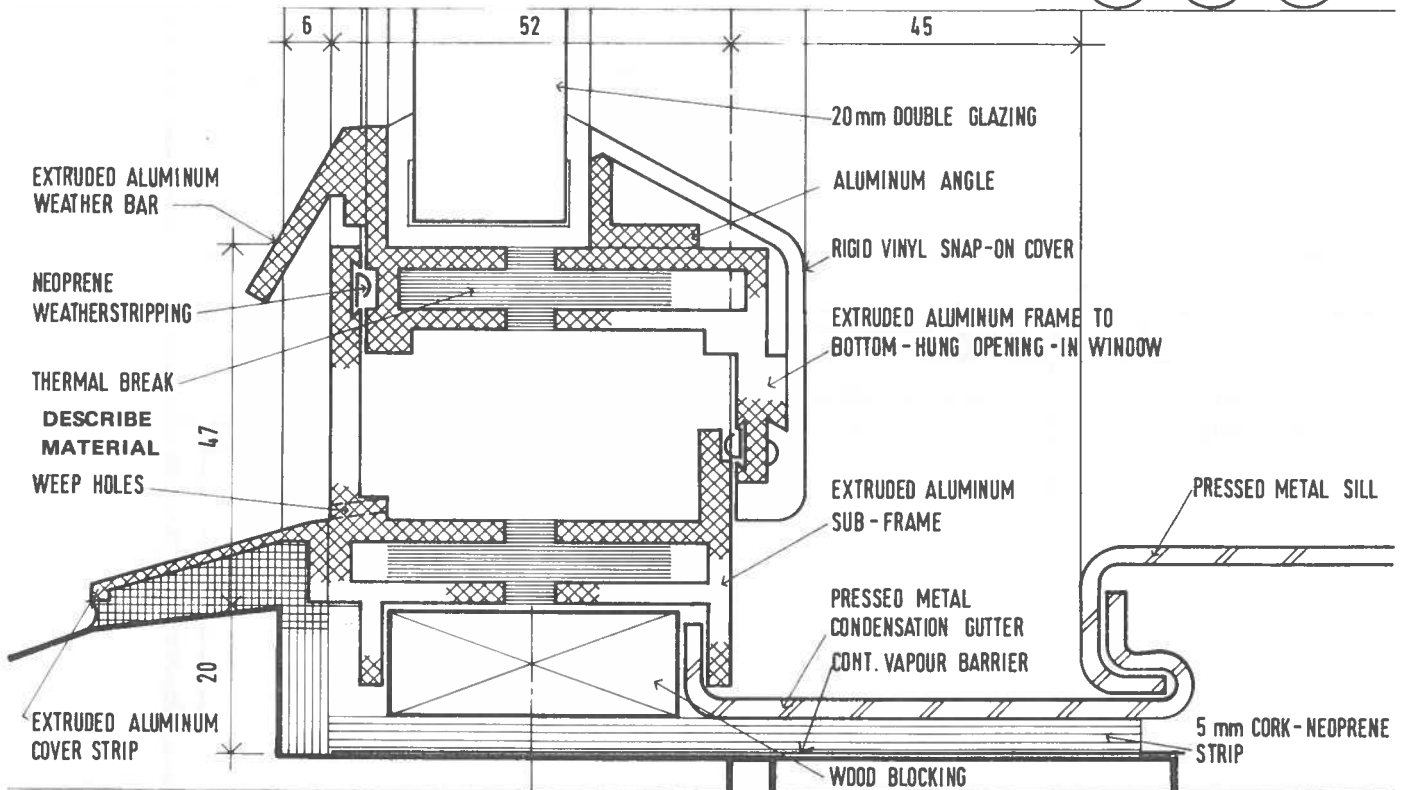
drawing no.

A8



SECTION DETAIL

WINDOW HEAD - JAMB SIMILAR



SECTION DETAIL

WINDOW SILL

PROVIDE SIMILAR DETAIL FOR DIFFERENT TYPES AND INSTALLATION OF WINDOWS

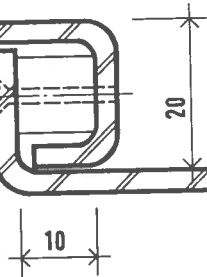
COMPONENT DETAIL DRAWING

SCALE 1:1

drawing no:
A9

PRESSED METAL TRIM, PANEL OR BLIND BOX

COUNTERSUNK
SCREW FIXING



PLAN DETAIL

TYPICAL METAL PANEL JOINT

1
A8

1
A7

1

SUSPENSION ROD CEILING HANGERS
AT 1500 O.C.

EXTRUDED ALUMINUM TRIM
TO CEILING EDGE

38

STAY WIRES AT 2 000 O.C.

PRESSED METAL
BLIND BOX

38

25mm GLASS WOOL
ACOUSTIC QUILT

12

PERFORATED ALUMINUM
REMOVABLE CEILING PANELS

INDICATE DIMENSIONS
OF PANELS

VARIES - TOLERANCE +0, -5

LINE OF PRESSED
METAL PANEL OR
PLASTER

SECTION DETAIL

TYPICAL CEILING EDGE

2
A4

2

METAL ACCESS PANEL

PRESSED METAL PANEL

COUNTERSUNK
SCREW FIXING

METAL TEE SPOT WELDED
TO METAL PANEL

PLAN DETAIL

METAL ACCESS PANEL

1
A7

3

PRESSED METAL PANEL

COUNTERSUNK FIXING

15

METAL SPACER

15

CONTINUOUS METAL CLIP ANGLE
SECURED TO WALL

INDICATE TYPE
OF ANCHOR,
NUT, BOLT

PLAN DETAIL

PRESSED METAL PANEL EDGE FIXING

1
A7

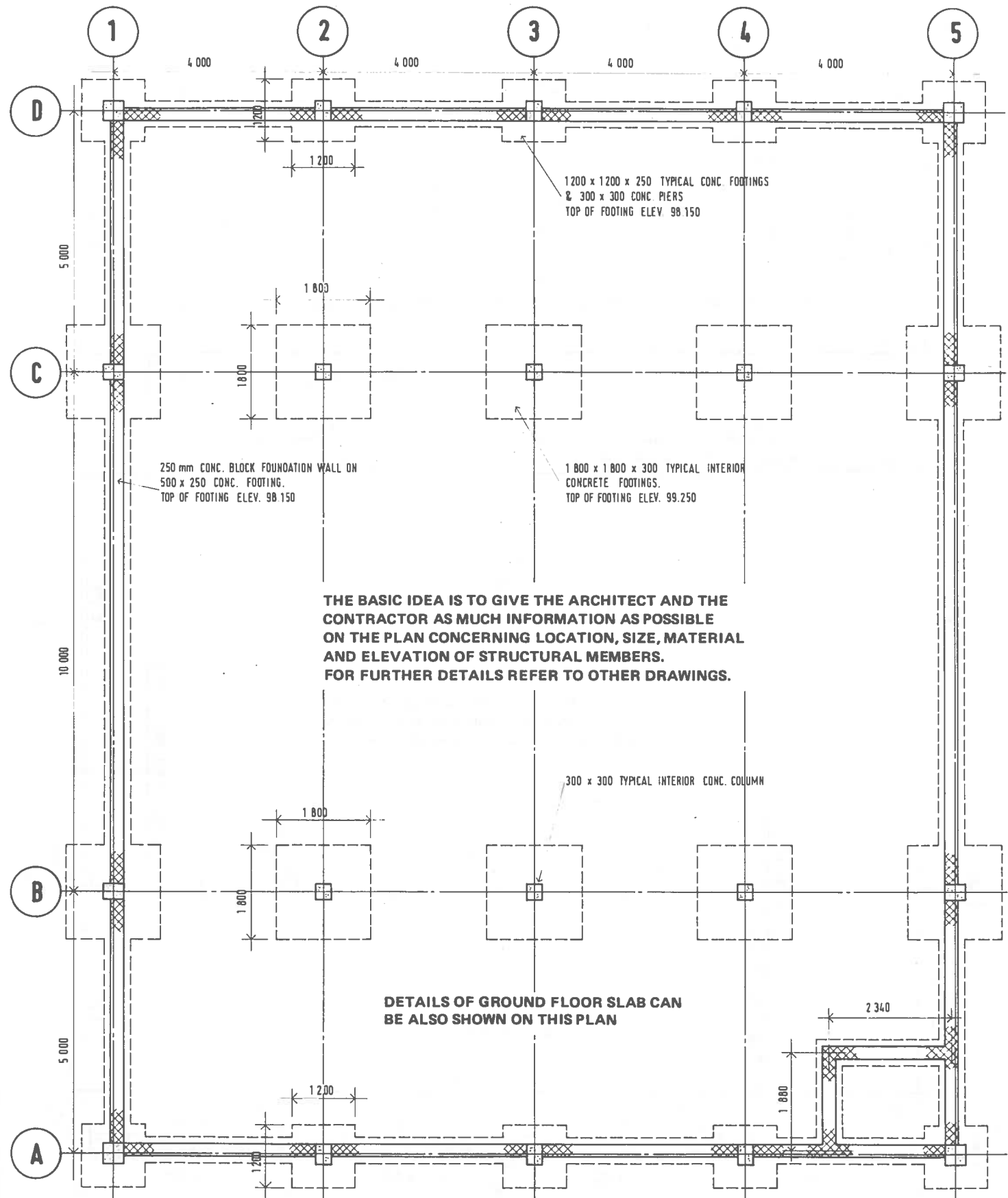
4

COMPONENT DETAIL DRAWING

SCALE 1:1

drawing no:

A10



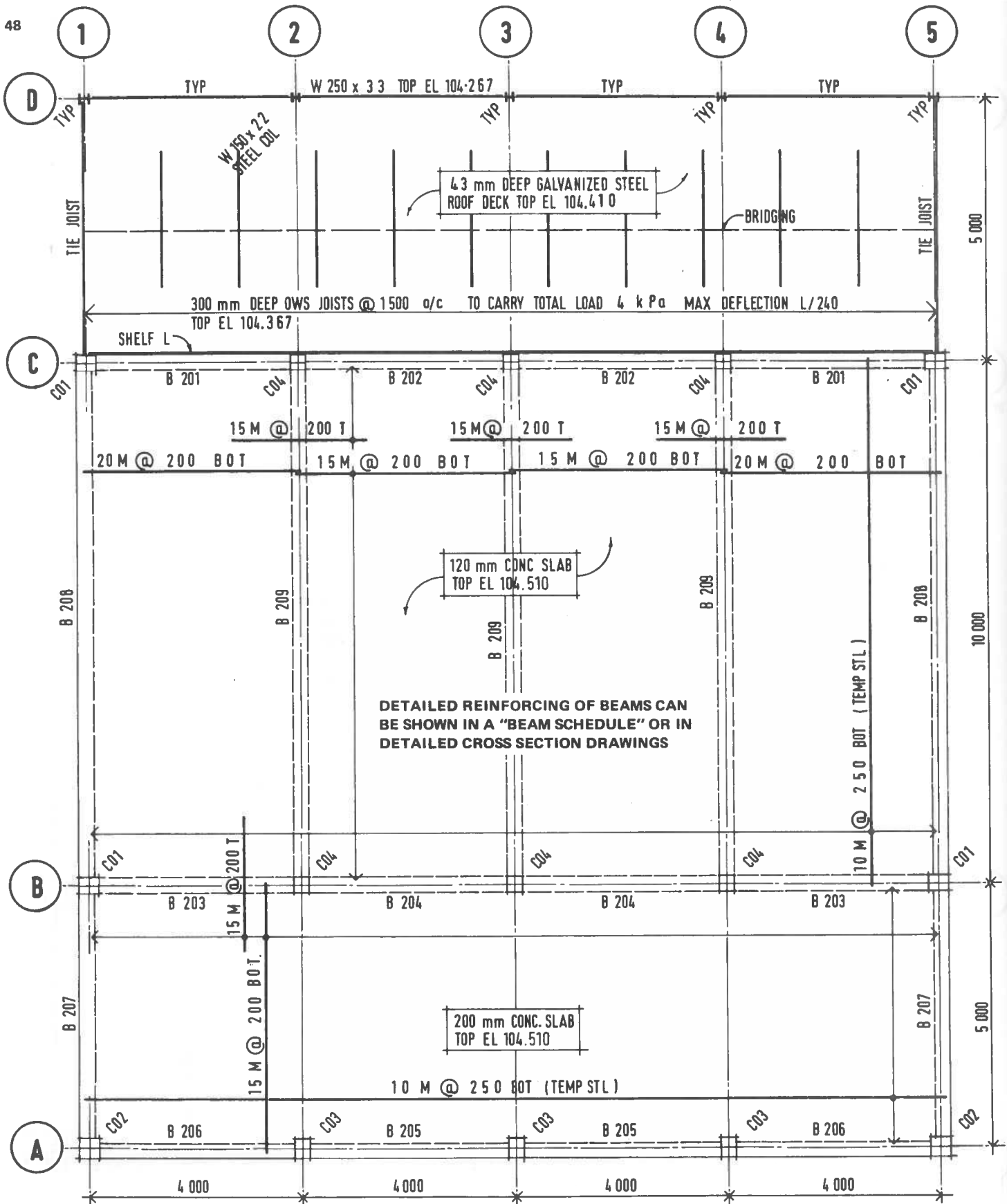
FOUNDATION PLAN

STRUCTURAL DRAWING

SCALE 1 : 100

drawing no.

S1



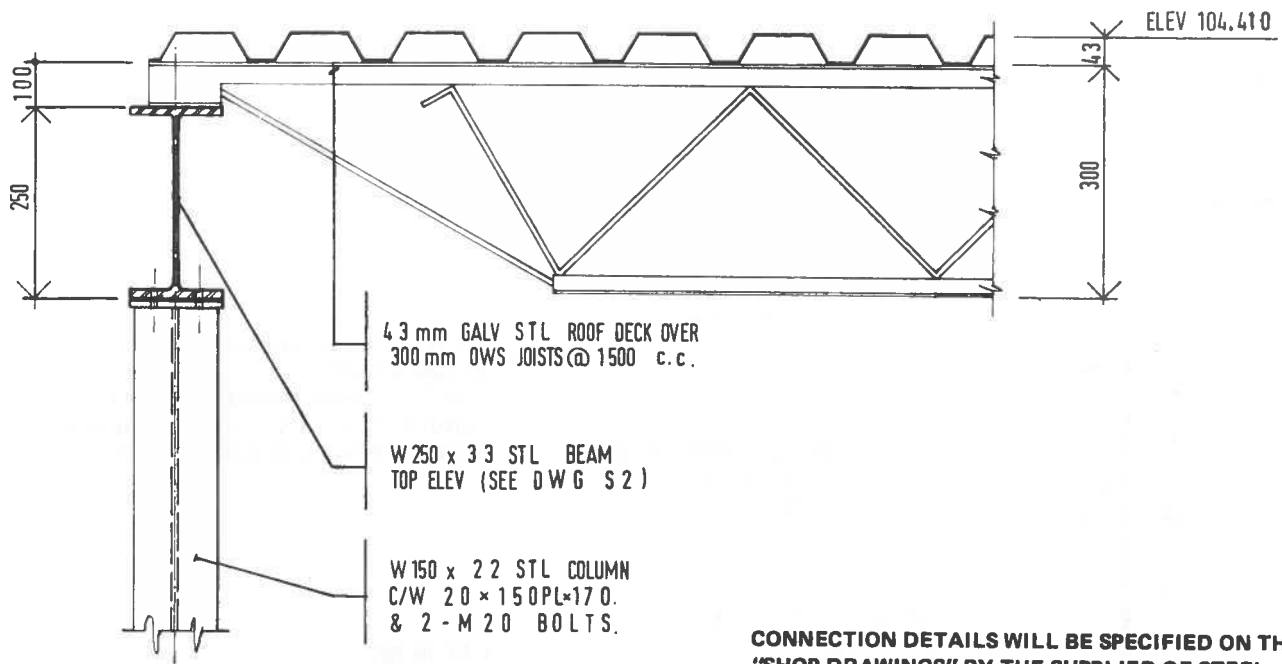
ROOF REINFORCING AND FRAMING PLAN

STRUCTURAL DRAWING

SCALE 1 : 100

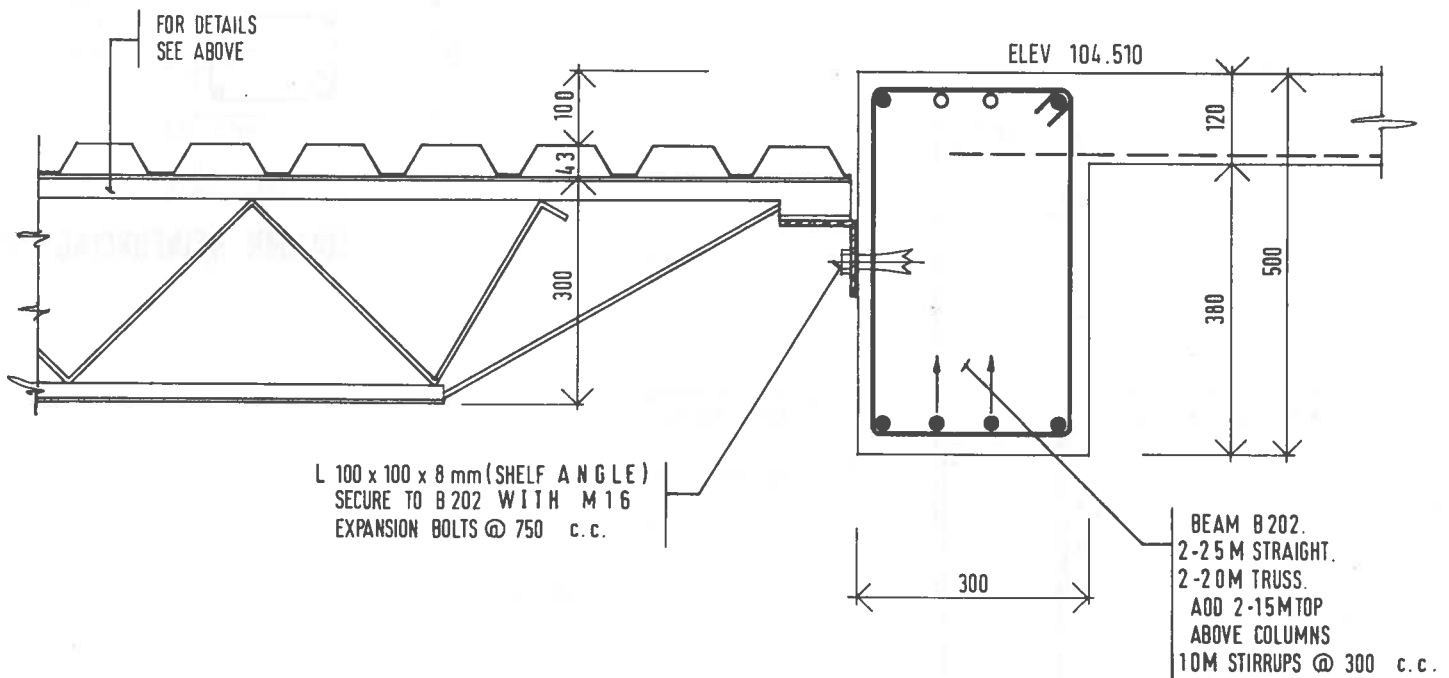
drawing no

S2



TYPICAL ROOF FRAMING DETAIL

CONNECTION DETAILS WILL BE SPECIFIED ON THE
"SHOP DRAWINGS" BY THE SUPPLIER OF STEEL;
THE DESIGN ENGINEER REVIEWS THE "SHOP
DRAWINGS" FOR SIZES AND CONNECTIONS



DETAIL OF BEAM B 202

SPACING OF "PWG WELDS"
AT ROOF DECK CAN ALSO
BE SPECIFIED HERE (USED
MOSTLY FOR LARGE SPAN
BUILDINGS, WAREHOUSES)

STRUCTURAL DRAWING

SCALE 1 : 10

drawing no.

S3

12mm PREMOULDED JOINT
FILLER AND CAULKING.

2-15M CONT'S

150 mm CONC SLAB WITH
152 x 152 MW 18-7 x MW 18-7
0.15 mm POLYETHYLENE V.B.
180 mm CRUSHED STONE

ELEV 99.550

40 mm RIGID INSULATION.

250 mm CONC BLOCK FOUND WALL
REINF WITH 15 M BARS @ 600 c.c.
IN GROUTED CORES.

250 x 450 CONC FOOTING
2-15M CONT'S BARS &
15 M DOWELS @ 600 c.c.

ELEV. 98.150

SHOW DEPTH OF INSULATION
BELOW GRADE
FOR SOIL CONDITIONS REFERENCE
SHOULD BE MADE OF SOIL ENGINEER'S
REPORT (NAME, JOB NUMBER)

TYPICAL FOUNDATION WALL DETAIL

300 x 400 CONC COL
4 - 20M VERTICAL
10 M TIES @ 300 c.c.

400

COLUMN REINFORCING (CO 4)

12mm PREMOULDED JOINT
FILLER AND CAULKING.

4-20M DOWELS
FROM FOOTING.

GR. FLOOR ELEV 99.550

ELEV. 99.250

TYPICAL INTERIOR FOOTING DETAIL

15M @ 250 E W (BOT) 80mm COVER

1800 x 1800 CONC FOOTING

STRUCTURAL DRAWING

SCALE 1 : 20

drawing no.

S4

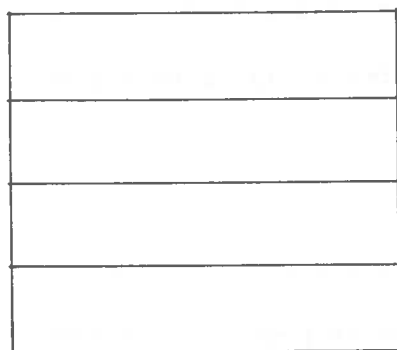
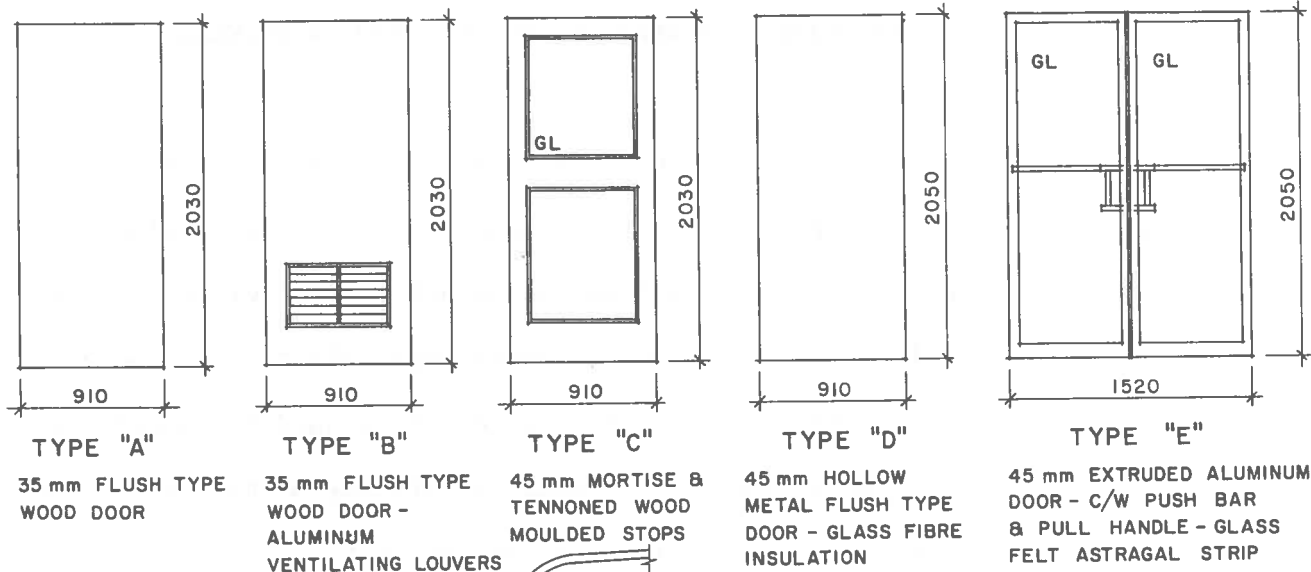
PART 4. ADDITIONAL INFORMATION NOT INCLUDED IN STANDARD

4.1 Notes - It is recognized that no strict rules can or should be proposed as to the exact form, content and arrangement of general and explanatory notes furnishing additional information on drawings. Notes covering information to the contractor and/or owner which cannot be well expressed graphically and are of general interest, should be introduced in the set of drawings as soon as possible, preferably on the first sheet of drawings. Notes covering information particular to an individual assembly or component should be placed close to it, using leader lines to indicate parts of construction concerned. For rules applying to style and size of lettering see 2.3.2.

4.2 Door and Room Finish Schedules - Here again no strict rules are set in the standard. The examples shown on the following pages illustrate door and room finish schedules in common use in architectural drawing practice in Canada and are shown only to illustrate the kind of information that should be provided.

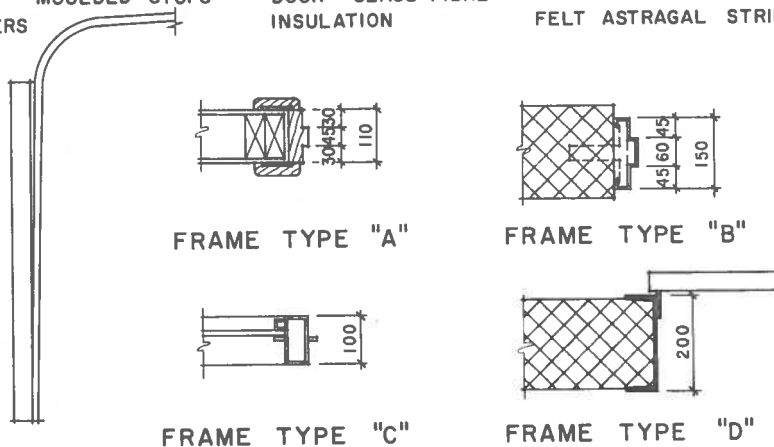
DOOR & HARDWARE SCHEDULE

EXAMPLE 1



TYPE "F"

SECTIONAL OVERHEAD ALUMINUM DOOR
C/W TRACKS, COUNTERBALANCE, LOCK
LATCH, ETC.



FRAME TYPE "C"

FRAME TYPE "D"

[illegible]

DOOR & HARDWARE SCHEDULE

EXAMPLE 2

DOOR SCHEDULE																
FLOOR	NUMBER OF DOORS	REVISIONS	LOCATION OF DOOR		DOOR							FRAME			HARDWARE	REMARKS
			OUTSIDE ROOM	INSIDE ROOM	SWING	TYPE	WIDTH	HEIGHT	THICKNESS	MATERIAL	FINISH	TYPE	THICKNESS	MATERIAL		
FIRST FLOOR	2		EXTERIOR	VESTIBULE R-01	PD	D-1	910	2050	35	AL		F-1	AL			SEE DWG #14
	2	A*	VESTIBULE R-01	FOYER R-02	PD	D-2	910	2050	45	WOOD	LAQ	F-2	2	MET		
			FOYER R-02	GEN OFFICE R-04	RH	D-4	760	2030	45	WOOD	LAQ	F-3	2	MET		
			FOYER R-02	CORRIDOR R-03	RHR	D-3	1220	2030	35	MET		F-5	2	MET		
			CORRIDOR R-03	PUBLIC LAV R-07	LH	D-6	760	2030	45	WOOD	LAQ	F-3	2	MET		
			COFFEE SHOP R-10	KITCHEN R-12	DA	D-5	910	2030	35	AL		F-7	2	AL		

* REVISION TABLE ADDED ONLY WHEN NECESSARY

SWINGS PD - PAIR OF DOORS
 DA - DOUBLE - ACTING
 RH - RIGHT HAND
 LH - LEFT HAND
 RHR - RIGHT HAND REVERSE
 LHR - LEFT HAND REVERSE

A	83-01-14	SWING CHANGED TO LH FROM RH
	DATE	REVISIONS

EXAMPLE 1

[illegible]

THE SCHEDULE IS USUALLY EXTENDED IN WIDTH TO INCLUDE MORE DETAILED SUBDIVISIONS UNDER FLOORS, WALLS, ETC.

ROOM NUMBER SHOULD BE INDICATED ON PLAN THUS 

EXAMPLE 2

EXAMPLE 3